ATOMET EM-1
Ferromagnetic Composite powder
ATOMET EM-1 Ferromagnetic Composite powder is specifically engineered for soft-magnetic applications where high permeability, high induction and low loss is desirable. QMP starts with a high purity iron powder, which is essential for good magnetic properties. The high purity iron, when combined with a unique resin-binder system, provides for a highly compressible product with high densities and strengths after curing. This results in a low-cost, high-performance material directly applicable to powder metal fabrication techniques and soft magnetic components.

Features:
- Ease of shaping
- Low Cost (final assembly)
- Low core loss (low Eddy currents)
- Isotropic properties:
  - Magnetic Properties:
    - Design new 3D magnetic structures
    - Optimize the use of copper
  - Thermal Properties:
    - Better heat transfer
    - Higher current densities
    - Higher torque-to-weight ratio

Potential Applications:
- Chokes, Transformers and Inductors:
  - Ignition and impulse cores
  - Transformers
  - Inductors/pole pieces
  - Lighting ballasts
- Stators and Armatures:
  - DC motors (control motors)
  - Switched reluctance motors (servo motors)
  - Alternators
  - Starters
### Mix Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent density</td>
<td>g/cm³</td>
<td>2.75</td>
</tr>
<tr>
<td>Hall flow</td>
<td>s/50 g</td>
<td>30</td>
</tr>
</tbody>
</table>

### Physical and Mechanical Properties

(Measured on bars pressed at 45 tsi (620 MPa).

<table>
<thead>
<tr>
<th>Property</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>g/cm³</td>
<td>7.10</td>
</tr>
<tr>
<td>Electrical resistivity</td>
<td>μohm-m</td>
<td>150</td>
</tr>
<tr>
<td>Thermal conductivity</td>
<td>W/K-m</td>
<td>20</td>
</tr>
<tr>
<td>Strength (TRS)</td>
<td>Psi (MPa)</td>
<td>18,000(124)</td>
</tr>
</tbody>
</table>

### Magnetic Properties

(Measured on rings pressed at 45 tsi or 620 MPa).

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC characteristics μmax</td>
<td>290</td>
</tr>
<tr>
<td>Bmax at applied field of 150 Oe (11.9k A/m)</td>
<td>Tesla 1.4</td>
</tr>
<tr>
<td>Core loss at 1.0 Tesla</td>
<td>60 Hz 35 99</td>
</tr>
<tr>
<td>W/lb</td>
<td>5 35 99</td>
</tr>
<tr>
<td>W/kg</td>
<td>11 77 218</td>
</tr>
</tbody>
</table>

### Cured Strength

![Graph of Cured Strength](image)

**ATOMET EM-1**

Cured at 200°C for 30 min

**Density, g/cm³**

**Transverse Rupture Strength**

**Density, g/cm³**

**Compressibilty**

![Graph of Compressibility](image)

**ATOMET EM-1**

Cured at 200°C for 30 min

**Compacting Pressure**

**Density, g/cm³**

**Compacting Pressure**

**Density, g/cm³**

**Compacting Pressure**

**Density, g/cm³**

**Compacting Pressure**

**Density, g/cm³**

**Compacting Pressure**

**Density, g/cm³**

**Compacting Pressure**

**Density, g/cm³**

**Compacting Pressure**

**Density, g/cm³**

**Compacting Pressure**
Process flow

ATOMET EM-1

Die Wall Lubrication

Pressing

Curing 200ºC/30 min

Strength VS. Curing Temperature

ATOMET EM-1
Cured for 30 min in air

Resistivity VS. Curing Temperature

ATOMET EM-1
30 min curing (air)
**ATOMET EM-1 Magnetic Properties**

### Core Loss at 1 Tesla

- **1008 Lamination**
- **ATOMET EM-1**

### Core Loss VS. Induction

- Frequency: 60 Hz, 400 Hz, 1000 Hz
- Induction: 1000 Gauss, 10000 Gauss

### Typical DC Magnetization

- **Applied Field H, A/cm**
- **Magnetization B, T**
- **ATOMET EM-1**
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