Heraeus Thick Copper Conductor Pastes
Heraeus Thick Copper Conductor Pastes are a lead-free material system developed for applying thick layers of copper onto AlN or Al₂O₃ substrates. It is intended for use where high thermal and electrical properties are required.

Heraeus offers the following Copper Conductor Systems as a more reliable alternative to DBC (Direct Bonded Copper) for:
- Lapped AlN substrates
- Al₂O₃ substrates

The two paste system C7403 / C7404C is optimized for lapped AlN substrates but also works with some as fired substrates. This system offers excellent adhesion to the AlN substrate.

The low cost two paste system C7403C / C7404C is optimized for application on alumina substrates.

All pastes are applied by screen or stencil printing, dried in air and fired in a Nitrogen atmosphere. High tech stencils such as MTeCK-stencils of Christian Koenen GmbH offer quick build-up of thickness in few layers.

In order to achieve ever thicker layers in one firing step it is also possible to print/dry the copper paste up to three times and then co-fire this build-up.

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<table>
<thead>
<tr>
<th>Design Guideline for Thick Copper Conductor Pastes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
<tr>
<td>Min. width of Cu pattern</td>
</tr>
<tr>
<td>Min. spacing between Cu patterns</td>
</tr>
<tr>
<td>Min. spacing between Cu pattern and ceramic edge</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>General Recommendation of an ENIG Plating Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Step</td>
</tr>
<tr>
<td>Cleaner</td>
</tr>
<tr>
<td>Catalyst</td>
</tr>
<tr>
<td>Electroless Ni</td>
</tr>
<tr>
<td>Immersion Au</td>
</tr>
</tbody>
</table>
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For detailed information please contact your local Heraeus office.
# Product Overview: Thick Copper Conductor Pastes

## Thick Copper Conductor Advantages

<table>
<thead>
<tr>
<th>Product number</th>
<th>Adhesion layer</th>
<th>Build-up layer</th>
<th>Plug Hole</th>
</tr>
</thead>
<tbody>
<tr>
<td>C7403C</td>
<td>C7404C</td>
<td>C7463*</td>
<td></td>
</tr>
</tbody>
</table>

### Substrates recommended

- 96% Al₂O₃
- AIN
- Be₂O
- AIN
- 96% Al₂O₃

### Fired film thickness (FFT)

<table>
<thead>
<tr>
<th>Screen printing:</th>
<th>Advanced stencil printing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 x Print Dry Fire: 20 – 60 µm</td>
<td>1 x Print Dry Fire: ≥ 100 µm</td>
</tr>
<tr>
<td>5 x Print Dry Fire: 200 – 300 µm</td>
<td>3 x Print Dry Fire: ≥ 300 µm</td>
</tr>
</tbody>
</table>

### Fired film thickness (FFT) for C7403 and C7404

- Up to 750 µm diameter

### Sheet Resistance

- ≤ 0.7 mΩ/□ (FFT: 50 µm)

### Solderability

- > 95% coverage with SAC 305 at 245°C, 5 sec dip, RMA flux

### Adhesion (N) (SAC 305)

- > 20 / 4 mm² / 48 h / 150°C

### 300 µm Al-wire bonding onto 300 µm FFT

- Initial: 100% wire break
- 1000 TS Cycles: 100% wire break

### Shear strength (N/mm²)

- > 40

### mAgic® silver sintering

- > 40

### ENIG (Ni/Au plating)

- Yes

### Suitable for Cu-galvanic reinforcement

- Yes

### Coverage (cm²/g, 30 µm FFT)

- 45

* compatible with C7403 only  
N/A = not applicable

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**SAC 305: Sn96.5 Ag3 Cu0.5**

The descriptions and engineering data shown here have been compiled by Heraeus using commonly-accepted procedures, in conjunction with modern testing equipment, and have been compiled as according to the latest factual knowledge in our possession. The information was up-to-date on the date this document was printed. Although the data is considered accurate, we cannot guarantee accuracy, the results obtained from its use, or any patent infringement resulting from its use (unless this is contractually and explicitly agreed in writing, in advance). The data is supplied on the condition that the user shall conduct tests to determine materials suitability for a particular application.

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**Thermal shock** (-40 to +150°C): > 1000 cycles with zero failures on Al₂O₃ and lapped AIN

**Improved versatility**

- Additive screen or stencil printing offers material savings because varied layer thicknesses are possible within the same design

**Ability to print over 100 microns fired thickness, with one print-dry-fire cycle**

**Wire bondable, solderable, plateable**

**Handle multiple circuits on one panel and singulate afterwards**