Providing fast and economical options for manufacturing your prototypes and small series

Complete 3D printing solutions: expert consulting on 3D printing methods – from CAD to finished cast parts

Final inspection of a PMMA model

Unpacking a VX4000 job box (sand)

VX4000 build space (sand)

Service centre in Friedberg
voxeljet offers industrial 3D printing solutions on demand

COMPLETE SOLUTIONS
voxeljet SERVICES operates global service centres for on-demand manufacture of molds and models for industrial applications. Main applications are the production of molds and cores for sand casting, PMMA models for investment casting, as well as display models for various industrial fields. Our customers include well-known automotive OEMs, their suppliers and foundries as well as innovative art and design enterprises.

“DESIGN FOR ADDITIVE MANUFACTURING”
There are nearly no limits to part design, as the manufacturing process is based on CAD data. Due to the layering process, complex and demanding geometries can be easily integrated into the components. This process enables total new freedom of design whereby entirely new construction methods can be developed.

The result: Components at maximum functionality and optimized weight.

FLEXIBILITY AND TIME SAVING
Our service centre uses one of the world’s largest industrial 3D printers* with a build volume up to 8 cubic meters. Our system’s efficient printing technology enables the flexible manufacture of various different models, sizes and quantities in a single manufacturing step. Thus, we can usually ship high-quality molds and models within a few working days.

ECONOMIC FEASIBILITY
Depending on the part geometry, 3D printing enables the economical and toolingless production of prototypes to small series. Using hybrid design, it is possible to combine 3D printing technology with conventional manufacturing methods. This simplifies mold assembly and post-processing for our customers.

SERVICE
Customer satisfaction is one of our top priorities. We are always happy to advise you about various possibilities within 3D printing for your individual requirements. We will guide you along the entire value-added process chain and offer complete solutions, from CAD design to finished castings.

* Comparing the discontinued print volume
Plastic

ADVANTAGES OF PLASTIC MODELS

- Model sizes up to 1,000 x 600 x 500 mm (LxWxH)
- up to 600 dpi print resolution
- Same handling as for conventional wax parts after wax infiltration
- No shell cracking due to negative coefficient of thermal expansion.
- Suitable for autoclaves, even for thin-walled shells
- Low residual ash content
- No heat distortion as hardening process is purely a chemical process
- Coloured display models through epoxy infiltration

PLASTIC

<table>
<thead>
<tr>
<th>Base material</th>
<th>PMMA particulate material (55 µm)</th>
<th>PMMA particulate material (85 µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binder-type</td>
<td>Polypor B (PPB)</td>
<td>Polypor C (PPC)</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>≥ 2.0 MPa</td>
<td>≥ 2.0 MPa</td>
</tr>
<tr>
<td>Yield point</td>
<td>1 %</td>
<td>1 %</td>
</tr>
<tr>
<td>Burn-out temperature</td>
<td>700 °C</td>
<td>600 °C</td>
</tr>
<tr>
<td>Residual ash content</td>
<td>&lt; 0.01 % weight</td>
<td>&lt; 0.01 % weight</td>
</tr>
<tr>
<td>Especially suitable for</td>
<td>investment casting; design models</td>
<td>investment casting; architectural models</td>
</tr>
<tr>
<td>Advantages</td>
<td>sharp edges; for highest accuracy and true-to-detail; reusable particle material</td>
<td>burns out well with practically no residual ash content; reusable particle material</td>
</tr>
</tbody>
</table>

TECHNICAL DATA PLASTIC PARTS

| Layer thickness              | Standard 150 µm                  |
| Resolution x, y              | up to 600 dpi                    |
| Accuracy                     | ± 0.4 % (min. ± 0.3 mm)          |

SUITABLE FINISHING TREATMENT

<table>
<thead>
<tr>
<th>Wax</th>
<th>Epoxy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile strength</td>
<td>see base material</td>
</tr>
<tr>
<td>see base material</td>
<td>up to 25 MPa</td>
</tr>
<tr>
<td>Softening temperature</td>
<td>73 °C</td>
</tr>
<tr>
<td>see base material</td>
<td>80 °C</td>
</tr>
<tr>
<td>Burn-out temperature</td>
<td>smooth liquid-resistant surface</td>
</tr>
<tr>
<td>see base material</td>
<td>solid material, dyeable</td>
</tr>
</tbody>
</table>

3D printing process

1. Transfer of CAD data
2. Application of powder
3. Selective addition of binder
ADVENTAGES OF SAND MODELS

- Large-format printing up to 4,000 x 2,000 x 1,000 mm (LxWxH)
- Hybrid molds and cores in combination with traditional modelling
- Close to production model and casting properties
- Suitable for all common alloys
- Manufacture complex, consolidated and replicable parts
- Integrate and print gating systems optionally
- Economical process right from prototype to small series
- High flexibility regarding number of pieces, mold design and base material

TECHNICAL DATA

<table>
<thead>
<tr>
<th>Build platform</th>
<th>4,000 x 2,000 x 1,000 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molding material</td>
<td>Silica sand of different grain size</td>
</tr>
<tr>
<td>Binder-type</td>
<td>Cold hardening furan resin</td>
</tr>
<tr>
<td>Layer thickness</td>
<td>300 – 400 µm; standard 300 µm</td>
</tr>
<tr>
<td>Accuracy</td>
<td>± 0.1 % (min. ± 1,5* layer thickness)</td>
</tr>
</tbody>
</table>

MOLDING MATERIAL

<table>
<thead>
<tr>
<th>Molding material</th>
<th>Silica sand</th>
<th>Cerabeads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>GS 14</td>
<td>GS 19</td>
</tr>
<tr>
<td>Medium grain size [µm]</td>
<td>140</td>
<td>190</td>
</tr>
<tr>
<td>Application</td>
<td>Molds and cores with high surface requirements</td>
<td>Cores with high gas permeability</td>
</tr>
<tr>
<td>Loss on ignition (weight %)</td>
<td>≤ 1.9</td>
<td>≤ 1.9</td>
</tr>
<tr>
<td>Layer thickness (µm)</td>
<td>300</td>
<td>300/400</td>
</tr>
<tr>
<td>Bending strength (N/cm²)</td>
<td>≥ 220</td>
<td>≥ 220</td>
</tr>
<tr>
<td>Gas permeability</td>
<td>≥ 80</td>
<td>≥ 180</td>
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</tbody>
</table>

ADVANTAGES OF SAND MODELS
