VDM® Powder 625
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VDM® Powder 625 is the powder variant of a nickel-chromium-molybdenum-niobium alloy for use in additive manufacturing with excellent resistance to a variety of corrosive media.

VDM® Powder 625 is characterized by:

- Spherical particles
- High purity
- Low oxygen content

Designations (based on VDM® Alloy 625)

<table>
<thead>
<tr>
<th>Standard</th>
<th>Material designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN</td>
<td>2.4856 - NiCr22Mo9Nb</td>
</tr>
<tr>
<td>ISO</td>
<td>NC22DNb</td>
</tr>
<tr>
<td>UNS</td>
<td>N06625</td>
</tr>
<tr>
<td>AFNOR</td>
<td>NC22DNb</td>
</tr>
</tbody>
</table>

Table 1 – Designations

Chemical composition

<table>
<thead>
<tr>
<th></th>
<th>Ni</th>
<th>Cr</th>
<th>Fe</th>
<th>C&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Mn</th>
<th>Si</th>
<th>Co</th>
<th>Al</th>
<th>Ti</th>
<th>P</th>
<th>S</th>
<th>Mo</th>
<th>Nb + Ta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.</td>
<td>58</td>
<td>21</td>
<td>5</td>
<td>0.03</td>
<td>0.5</td>
<td>0.4</td>
<td>1</td>
<td>0.4</td>
<td>0.4</td>
<td>0.01</td>
<td>0.01</td>
<td>8</td>
<td>3.2</td>
</tr>
<tr>
<td>Max.</td>
<td>71</td>
<td>23</td>
<td>5</td>
<td>0.03</td>
<td>0.5</td>
<td>0.4</td>
<td>1</td>
<td>0.4</td>
<td>0.4</td>
<td>0.01</td>
<td>0.01</td>
<td>10</td>
<td>3.8</td>
</tr>
</tbody>
</table>

<sup>1</sup> The chemical analysis may differ slightly in some elements in other specifications and contain additional elements; according to DIN EN 10905 for example, the value for C is 0.03 to 0.10 wt.-% and the value for Cu is 0.50 wt.-% max; UNS specifies C as 0.10 wt.-% max. and other elements are also different.

Table 2 – Chemical composition (wt.-%) according to VdTÜV data sheet 499

VDM® Powder 625 contains low amounts of oxygen of up to 0.03%.
Physical properties

<table>
<thead>
<tr>
<th>Density</th>
<th>Melting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.47 g/cm³ (0.306 lb/in³)</td>
<td>1,290-1,350 °C (2,354-2,462 °F)</td>
</tr>
</tbody>
</table>

Microstructural properties

VDM® Alloy 625 has a cubic face centered lattice.

Corrosion resistance

The corrosion resistance depends on the processing and heat treatment of the material. The conventionally produced VDM® Alloy 625 usually has excellent corrosion resistance to a variety of corrosive media in the soft annealed condition (grade 1):

- Excellent resistance to pitting and crevice corrosion in chloride-containing media
- Virtual immunity to chloride-induced stress corrosion cracking
- High resistance to corrosion attack by mineral acids such as nitric, phosphoric, sulfuric, and hydrochloric acid; as well as by concentrated alkalies and organic acids, both under oxidizing as reducing conditions
- Very good resistance in seawater and brackish water, even at elevated temperatures
- High resistance to intergranular corrosion after welding and heat treatment
- High resistance to erosion corrosion

In the solution annealed variant VDM® Alloy 625 (grade 2) is usually highly resistant to many corrosive gas atmospheres:

- Good resistance to carburizing and scaling under static and cyclic conditions
- Resistance to nitriding
Applications

The soft annealed version of VDM® Alloy 625 (grade 1) is used in the oil and gas industry, the chemical process industry, marine engineering and environmental engineering. Typical applications include:

- Equipment for the production of super phosphoric acid
- Plants for the treatment of radioactive waste
- Production pipe systems and linings of risers in oil production
- Offshore industry and seawater exposed equipment
- Sea water piping in shipbuilding
- Stress corrosion cracking resistant compensators
- Furnace linings

The solution annealed variant of VDM® Alloy 625 (grade 2) is used for high temperature applications up to 1,000 °C (1,832 °F). Typical applications include:

- Flaring systems in refineries and offshore platforms
- Recuperators and compensators for hot exhaust gases
Availability

According to the AM process requirements of our customers, VDM® Powder 625 is available in a wide range of particle fractions from 15 to 250 μm.

Standard particle fractions

<table>
<thead>
<tr>
<th>Particle size distribution (μm)</th>
<th>Oxygen content (%)</th>
<th>Porosity &lt; 10μ (pore area) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-53</td>
<td>&lt; 0.03</td>
<td>&lt; 0.5</td>
</tr>
<tr>
<td>53-150</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional particle fractions are available on request. Please contact us.

The picture shows a typical micrograph of VDM® Powder 625 as an example.
Technical publications

The following articles were published on VDM® Alloy 625:


Legal notice

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58791 Werdohl
Germany

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