VIM
Vacuum Induction Melting and Casting Furnaces

VIM 02 to VIM 100
Vacuum induction melting is one of the most common processes in secondary metallurgy. It makes possible the effective degassing of the melt and precise adjustment of alloy composition.

The application of vacuum in the induction melting process is indispensable for the production of high purity metals that react with atmospheric oxygen. The vacuum melting process limits the formation of non-metallic oxide inclusions that are responsible for premature part failure.

Particularly critical applications such as jet engine parts demand the production of alloys with a very low concentration of undesired volatile trace elements.

**VIM Process Characteristics:**

- High flexibility and versatility
- Fast change of programs
- High efficiency due to desoxidation
- Close compositional tolerances
- Precise temperature control
- Low dust output
- Removal of undesired elements

Vacuum induction melting enables an extremely precise adjustment of the alloy composition and melt homogenization since:
- Melt temperature,
- Vacuum,
- Gas atmosphere,
- Pressure and kinetics

can be adjusted independently. Several casting and mold treatment processes can be combined with the VIM technology.

**Applications:**

- Semi-finished products, like:
  - Strips and rods
  - Ingots and electrodes
  - Targets and flakes

by the following procedures:

- Mold casting
- Continuous casting
- Vacuum induction distillation
- Flake casting

in:

- Research & development
- Electronic industry
- Dental application
- Automotive and aerospace industry
- Ferrous applications
- Non-ferrous applications
- Precious metal industry

**Standard VIM Furnaces**

ALD's vacuum induction melting and casting furnaces of the VIM 02 to VIM 100 product line are modular, universal standard systems endowed with a broad range of accessories to tailor them to customers' individual production needs.

Available for all furnaces, for example, are:

- Additional coils to be used for different melt materials and crucible sizes
- Ingot mold turntable for pouring into several molds under identical conditions
- Facilities for charging
- Temperature measurement
- Sampling
- Mold treatment

**Add-ons** The VIM-line is based on a modular design concept

**Observation of vacuum induction melting and casting process via sight glass**

**Melting and degassing under vacuum**

**The revolver on the furnace lid enables charging, temperature measurement, sampling without interrupting the furnace atmosphere**
## VIM 02 to VIM 100

The nomenclature of different furnace designs:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIM 02</td>
<td>Vacuum Induction Melting in range of 0.2 to 100 litres crucible volume, basic equipment</td>
</tr>
<tr>
<td>VIM-TC</td>
<td>with Mold Treatment</td>
</tr>
<tr>
<td>VIM-VCC</td>
<td>with Vertical Continuous Casting</td>
</tr>
<tr>
<td>VIM-HCC</td>
<td>with Horizontal Continuous Casting</td>
</tr>
<tr>
<td>VIM-DS</td>
<td>with Directional Solidification</td>
</tr>
<tr>
<td>VIM-FC</td>
<td>with Flake Casting</td>
</tr>
<tr>
<td>VIM-HMC</td>
<td>with separate Horizontal or Vertical Mold Chamber</td>
</tr>
<tr>
<td>VIM-MC</td>
<td>alternatively Vertical or Horizontal Mold Chamber</td>
</tr>
<tr>
<td>VIM-P</td>
<td>with Over-Pressure-Operation</td>
</tr>
<tr>
<td>VIDIST</td>
<td>Vacuum Induction Distillation</td>
</tr>
</tbody>
</table>

Charging with bulk charging basket for coarse material

Alloying with fine charger

Temperature measurement with thermocouple and reusable protection tube

A large number of add-on components allow to adapt or retrofit any furnace model to meet special process requirements.
Vacuum Induction Melting and Casting:

Basic system can be easily modified with special devices to produce a system tailored to individual production needs like „Vacuum Induction Distillation furnace“ or „Vacuum Induction Melting furnace“ with separate mold chamber for inserting molds into the melt chamber shortly before casting.

**Add-ons** The VIM-line is based on a modular design concept. A large number of add-on components allow...

Gas purging with pivotable gas inlet into the melt

Homogenization of melt

Sampling and temperature measurement

**VIM 12** VIM basic equipment furnace single chamber design with melt chamber, induction coil, vacuum pump set, melt power supply, controls and accessories

**VIM basic single chamber design**
Various Applications

**VIM FC** with Flake Caster for producing metallic flakes

**VIM HMC** Two Chamber Design with Horizontal Mold Chamber allows to lock in molds prior to casting without interrupting the furnace atmosphere - this avoids excessive temperature losses of preheated molds

**VIM 50**
VIM furnace with tundish heater and oxygen resp. inertgas blowing device for research and development

Casting via tundish with heater enables filtering of undesired inclusions and precise pouring stream into e.g. barstick molds

Mold heater keeps the cast liquid and allows subsequent controlled solidification

VIM with bottom purging, tundish heating and rotary mold table
Customized VIM Furnaces

Continuous casting for strips and wires under inert gas atmosphere minimizes surface oxidation of the cast metal.

Therefore, vacuum melting technology combined with modern continuous casting technology in one system results in high quality end products. Consistent high quality at low operating costs yield cost effective production.

Vacuum provides an extremely low gas content in the melt and avoids oxidation of sensitive alloy elements. Backfilling with inert gas after melting-in guarantees that the purity of the melt which is a result of the vacuum treatment is preserved. Continuous casting allows intensive cooling of the poured metal and an exact range of solidification. That prevents segregation.

Add-ons  The VIM-line is based on a modular design concept. A large number of add-on components allow

Vacuum system - a wide range of pumping systems tailored to every need, including dust filters, enables processing under vacuum

Induction melting and casting need melt power supply, coaxial power leadthrough and tiltable coil
Control Systems

Control and process display
- Manually via manual valve
- With buttons for pumps, gas-inlet valves with LED display
- By operator control with recipe management and cleartext display
- Programmability for diverse melt recipes
- Automatic system for melting down and casting
- Display on mosaic mimic diagram or video screen

VIM VMC Two chamber design with swiveling vertical mold chamber

VIM 70 VMC Furnace with separate vertical mold chamber for ferrous and nonferrous alloys
(In combination with mold treatment directional solidification is possible)

VIM HCC Vacuum induction melting with horizontal continuous casting

Control with colour TFT display in swivable operator control box
### Technical Data

#### Crucible

<table>
<thead>
<tr>
<th>Features</th>
<th>Unit</th>
<th>VIM 02</th>
<th>VIM 05</th>
<th>VIM 2</th>
<th>VIM 4</th>
<th>VIM 6</th>
<th>VIM 12</th>
<th>VIM 20</th>
<th>VIM 50</th>
<th>VIM 70</th>
<th>VIM 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom. capacity (from...to...)</td>
<td>(l)</td>
<td>0.1–0.2</td>
<td>0.04–0.5</td>
<td>0.5–1.95</td>
<td>1.95–3.5</td>
<td>3.5–5.8</td>
<td>5.5–12</td>
<td>12–21.4</td>
<td>21.4–50</td>
<td>50–70</td>
<td>80–100</td>
</tr>
<tr>
<td>Nom. capacity, max. (g St.=7.2g/cm³) (kg)</td>
<td>1.5</td>
<td>4</td>
<td>14</td>
<td>25</td>
<td>40</td>
<td>85</td>
<td>150</td>
<td>350</td>
<td>500</td>
<td>1200</td>
<td></td>
</tr>
<tr>
<td>Hydraulic assisted tilting</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

#### Max. Size/Mold Setup

<table>
<thead>
<tr>
<th>Features</th>
<th>Diameter (mm)</th>
<th>Height (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIM 02</td>
<td>100–180</td>
<td>180–220</td>
</tr>
<tr>
<td>VIM 05</td>
<td>180–360</td>
<td>360–400</td>
</tr>
<tr>
<td>VIM 2</td>
<td>220–320</td>
<td>320–440</td>
</tr>
<tr>
<td>VIM 4</td>
<td>280–480</td>
<td>440–480</td>
</tr>
<tr>
<td>VIM 6</td>
<td>320–560</td>
<td>480–750</td>
</tr>
<tr>
<td>VIM 12</td>
<td>420–800</td>
<td>750–1000</td>
</tr>
<tr>
<td>VIM 20</td>
<td>500–1200</td>
<td>1000–1100</td>
</tr>
<tr>
<td>VIM 50</td>
<td>700–2800</td>
<td>1100–1200</td>
</tr>
<tr>
<td>VIM 70</td>
<td>850–3600</td>
<td>1200–1700</td>
</tr>
<tr>
<td>VIM 100</td>
<td>1200–5000</td>
<td>1700–2000</td>
</tr>
</tbody>
</table>

#### Vacuum Equipment

<table>
<thead>
<tr>
<th>Features</th>
<th>Medium-vacuum pumping system</th>
<th>High-vacuum pumping system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal speed (lxs⁻¹)</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Vacuum equipment</td>
<td>2 x10⁻³</td>
<td>1 x10⁻⁵</td>
</tr>
<tr>
<td>Nominal speed (m³/h)</td>
<td>150</td>
<td>50</td>
</tr>
<tr>
<td>Vacuum equipment</td>
<td>2 x10⁻³</td>
<td>1 x10⁻⁵</td>
</tr>
</tbody>
</table>

#### Recommended Power Supply for Melting

<table>
<thead>
<tr>
<th>Features</th>
<th>MF power at 250 V</th>
<th>Frequency</th>
<th>Coil voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIM 02</td>
<td>6 kW</td>
<td>200 Hz</td>
<td>250 V</td>
</tr>
<tr>
<td>VIM 05</td>
<td>20 kW</td>
<td>100 Hz</td>
<td>250 V</td>
</tr>
<tr>
<td>VIM 2</td>
<td>40 kW</td>
<td>40 Hz</td>
<td>250 V</td>
</tr>
<tr>
<td>VIM 4</td>
<td>60 kW</td>
<td>4 kHz</td>
<td>250 V</td>
</tr>
<tr>
<td>VIM 6</td>
<td>80 kW</td>
<td>4 kHz</td>
<td>250 V</td>
</tr>
<tr>
<td>VIM 12</td>
<td>120 kW</td>
<td>2 kHz</td>
<td>250 V</td>
</tr>
<tr>
<td>VIM 20</td>
<td>180 kW</td>
<td>1 kHz</td>
<td>250 V</td>
</tr>
<tr>
<td>VIM 50</td>
<td>250 kW</td>
<td>200 Hz</td>
<td>250 V</td>
</tr>
<tr>
<td>VIM 70</td>
<td>350 kW</td>
<td>100 Hz</td>
<td>250 V</td>
</tr>
<tr>
<td>VIM 100</td>
<td>500 kW</td>
<td>400 Hz</td>
<td>250 V</td>
</tr>
</tbody>
</table>

#### Electr. connected Loads incl.

<table>
<thead>
<tr>
<th>Features</th>
<th>High-Vacuum Pumping Unit</th>
<th>Cooling-Water Consumption</th>
<th>Compressed Air Pressure</th>
<th>Space Requirement</th>
<th>Total Weights (approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIM 02</td>
<td>20 kVA</td>
<td>(l/min) 20</td>
<td>(bar) 6</td>
<td>(m x m) 1.1 x 1.1</td>
<td>(kg) 475</td>
</tr>
<tr>
<td>VIM 05</td>
<td>40 kVA</td>
<td>(l/min) 60</td>
<td>(bar) 6</td>
<td>(m x m) 1 x 2.7</td>
<td>(kg) 1500</td>
</tr>
<tr>
<td>VIM 2</td>
<td>60 kVA</td>
<td>(l/min) 80</td>
<td>(bar) 6</td>
<td>(m x m) 1 x 2.9</td>
<td>(kg) 1750</td>
</tr>
<tr>
<td>VIM 4</td>
<td>100 kVA</td>
<td>(l/min) 120</td>
<td>(bar) 6</td>
<td>(m x m) 1.4 x 3</td>
<td>(kg) 1900</td>
</tr>
<tr>
<td>VIM 6</td>
<td>120 kVA</td>
<td>(l/min) 150</td>
<td>(bar) 6</td>
<td>(m x m) 2.7 x 3.4</td>
<td>(kg) 3150</td>
</tr>
<tr>
<td>VIM 12</td>
<td>190 kVA</td>
<td>(l/min) 200</td>
<td>(bar) 6</td>
<td>(m x m) 3.4 x 3.7</td>
<td>(kg) 4000</td>
</tr>
<tr>
<td>VIM 20</td>
<td>320 kVA</td>
<td>(l/min) 290</td>
<td>(bar) 6</td>
<td>(m x m) 4.8 x 4.8</td>
<td>(kg) 7000</td>
</tr>
<tr>
<td>VIM 50</td>
<td>460 kVA</td>
<td>(l/min) 400</td>
<td>(bar) 6</td>
<td>(m x m) 5.6 x 6.7</td>
<td>(kg) 11500</td>
</tr>
<tr>
<td>VIM 70</td>
<td>650 kVA</td>
<td>(l/min) 700</td>
<td>(bar) 6</td>
<td>(m x m) 8 x 9.0</td>
<td>(kg) 15200</td>
</tr>
<tr>
<td>VIM 100</td>
<td>800 kVA</td>
<td>(l/min) 1200</td>
<td>(bar) 6</td>
<td>(m x m) 8.0 x 9.0</td>
<td>(kg) 39000</td>
</tr>
</tbody>
</table>

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