



ALD Vacuum Technologies

High Tech is our Business

VIM 02 – VIM 100

Vacuum Induction Melting and Casting Furnaces



Vacuum Induction Melting and Casting

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

Melting and degassing under vacuum

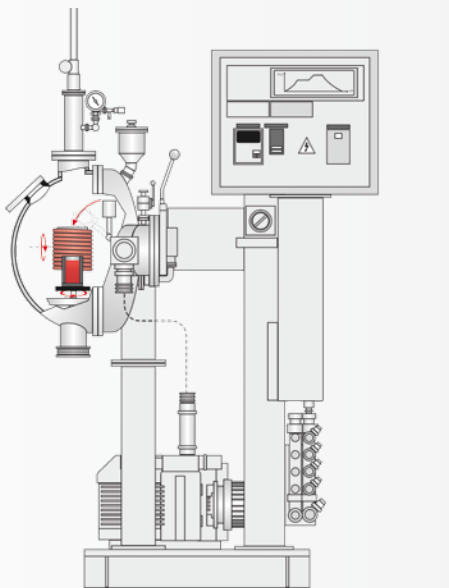


◀ Observation of vacuum induction melting and casting process via sight glass



◀ Temperature measurement with thermocouple and reusable protection tube

VIM 02
Laboratory furnace with
0.2 ltr. melt volume



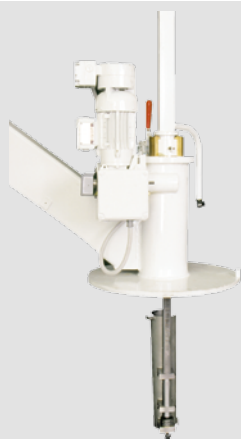
The nomenclature of different furnace designs:

VIM 02-100 - Vacuum Induction Melting
in range of 0.2 to 100 litres crucible
volume, basic equipment
VIM-MT - with Mold Treatment Module
VIM-VCC - with Vertical Continuous
Casting
VIM-HCC - with Horizontal Continuous
Casting

VIM-DS - with Directional Solidification
VIM-FC - with Flake Casting
VIM-HMC/VIM-VMC - with separate
Horizontal or alternatively Vertical Mold
Chamber
VIM-P - with Over-Pressure-Operation
VIDIST - Vacuum Induction Distillation

- 1** The revolver on the furnace lid
enables charging, temperature
measurement, sampling without
interrupting the furnace
atmosphere
- 2** Alloying with fine charger
- 3** Charging with bulk charging
basket for coarse material

Add-ons A large number of add-on components allow to adapt or retrofit any furnace model to meet special process requirements.

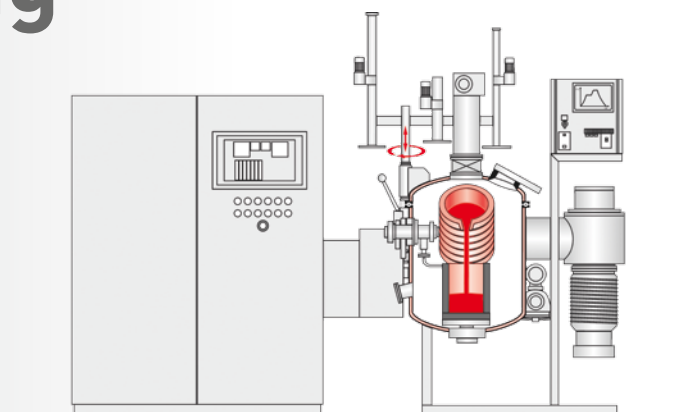


Vacuum Induction Melting and Casting

Various Applications

VIM

Basic single chamber design



VIM 12

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



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.



▲ Sampling and temperature measurement

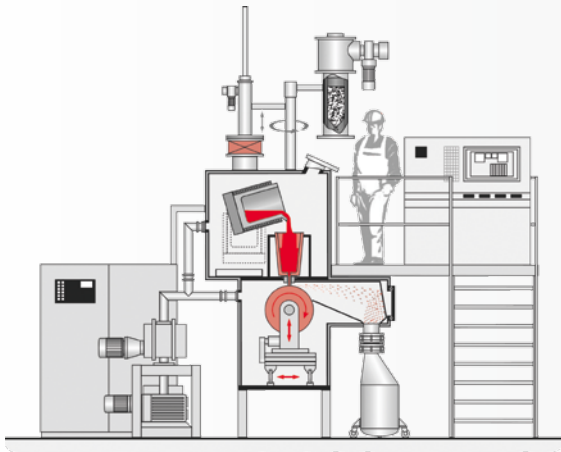


◀ Homogenization of melt

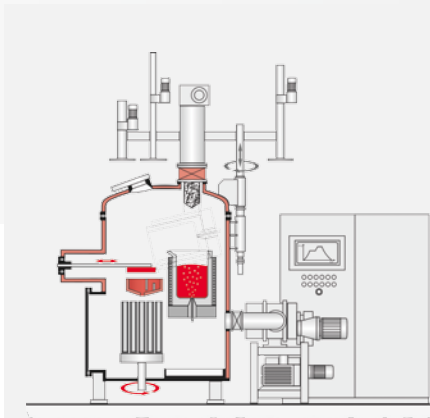


◀ Gas purging with pivotable gas inlet into the melt

VIM FC
with Flake Caster
for producing metallic flakes

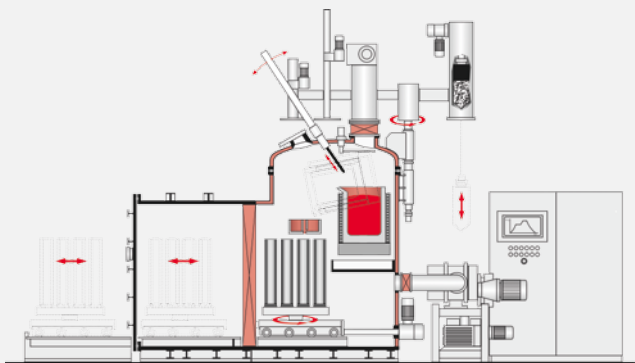


VIM
with bottom purging,
tundish heating and rotary mold table



▲
VIM 50
VIM furnace with tundish heater and
oxygen resp. inert gas blowing
device for research and development

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
▼



- 1 Mold heater keeps the cast liquid and allows subsequent controlled solidification
- 2/3 Casting via tundish with heater enables filtering of undesired inclusions and precise pouring stream into e.g. barstick molds

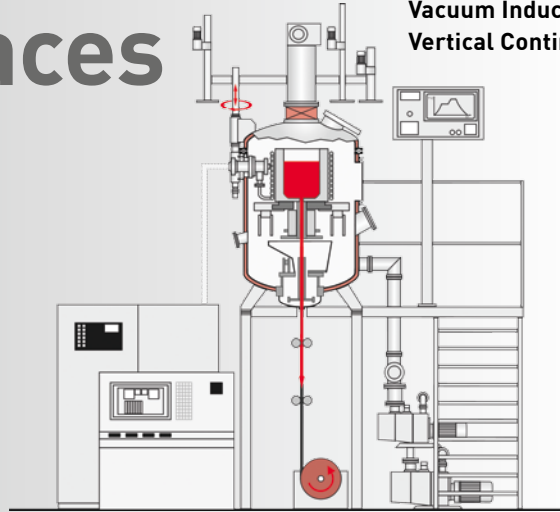
Add-ons A large number of add-on components allow to adapt or retrofit any furnace model to meet special process requirements.



Customized VIM Furnaces

VIM VCC

**Vacuum Induction Melting with
Vertical Continuous Casting**



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.



VIM 12 VCC

**Vacuum Induction Melting with
Vertical Continuous Casting for
precious metal application**

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

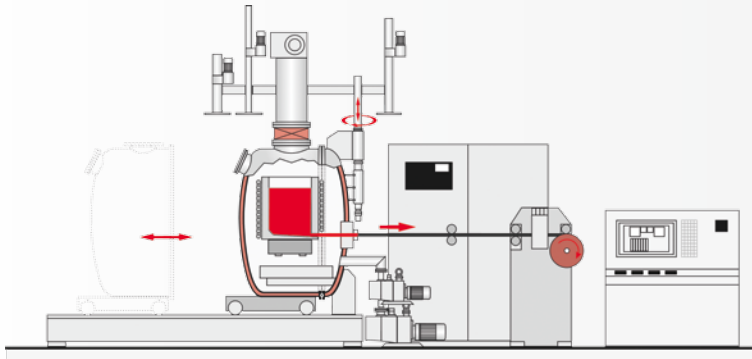


**Control with
colour TFT
display in
swivable operator
control box**



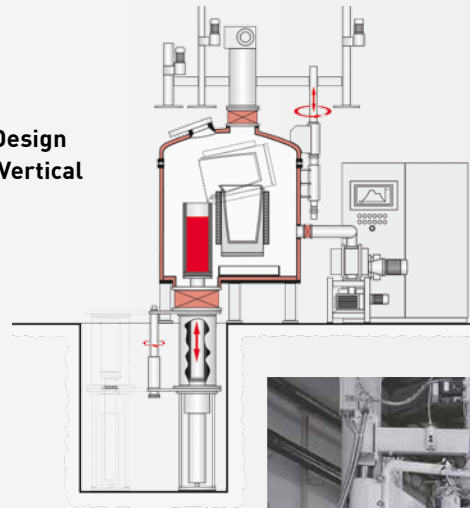
VIM HCC

Vacuum Induction Melting with Horizontal Continuous Casting



VIM VMC

Two Chamber Design with swiveling Vertical Mold Chamber



▲ VIM P

Vacuum Induction Melting furnace designed for melt treatment in the overpressure range up to 100 bar

VIM 70 VMC

Furnace with separate Vertical Mold Chamber for ferrous and nonferrous alloys (in combination with mold treatment directional solidification is possible)

1/2

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

3

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

Add-ons A large number of add-on components allow to adapt or retrofit any furnace model to meet special process requirements.





Technical Data

	Unit	VIM 02	VIM 05	VIM 2	VIM 4	VIM 6	VIM 12	VIM 20	VIM 50	VIM 70	VIM 100
Crucible											
Nom. capacity (from...to...)	[l]	0.1–0.2	0.04–0.5	0.5–1.95	1.95–3.5	3.5–5.8	5.5–12	12–21.4	21.4–50	50–70	80–100
Nom. capacity, max. (g St.=7.2 g/cm ³)	(kg)	1.5	4	14	25	40	85	150	350	500	1200
Hydraulic assisted tilting						X	X	X	X	X	X
Max. Size/Mold Setup											
Diameter	(mm)	100	180	180	220	320	380	500	550	1000	1500
Height	(mm)	180	220	360	400	440	480	750	1000	1100	1100
Vacuum Equipment											
Medium-vacuum pumping system	(mbar)	2x10 ⁻³	2x10 ⁻³	2x10 ⁻³	2x10 ⁻³	2x10 ⁻³	2x10 ⁻³	2x10 ⁻³	2x10 ⁻³	2x10 ⁻³	2x10 ⁻³
Nominal pumping speed	(m ³ /h)	150	150	500	500	1000	1000	2050	5500	5500	7000
High-vacuum pumping system	(mbar)	1x10 ⁻⁵	1x10 ⁻⁵	1x10 ⁻⁵	1x10 ⁻⁵	1x10 ⁻⁵	1x10 ⁻⁵	1x10 ⁻⁵	1x10 ⁻⁵	1x10 ⁻⁵	1x10 ⁻⁵
Nominal pumping speed	(lxs ⁻¹)	1100	1010	3000	3000	6000	6000	12000	12000	17000	17000
Recommended Power Supply for Melting											
MF power at 250 V	(kW)	6	20	40	60	80	120	180	250	450	530
Frequency	(KHz)	20	10	4	4	4	4	2	1	1	0.5
Coil voltage	(V)	250	250	250	250	250	250	250	400	400	400
Electr. connected Loads incl. High-Vacuum Pumping Unit											
	(kVA)	20	40	60	100	120	190	320	460	650	800
Line-voltage data	(V/Hz)	3x400/50	3x400/50	3x400/50	3x400/50	3x400/50	3x400/50	3x400/50	3x400/50	3x400/50	3x400/50
Cooling-Water Consumption											
	(l/min)	20	60	80	120	150	200	290	400	700	1200
Cooling-water pressure, min.	(bar)	4	4	4	4	4	4	4	4	4	4
Compressed Air Pressure											
	(bar)	6	6	6	6	6	6	6	6	6	6
Space Requirement											
System height, with options	(mxm)	1.1x1.1	1x2.7	1x2.9	1.4x3	2.7x3.4	3.4x3.7	4.8x4.8	5.6x6.7	8.0x9.0	8.0x9.0
	(m)	2.0	3.0	3.1	3.2	3.5	3.9	5.3	5.9	6.4	6.4
Total Weights (approx.)											
Weight of furnace	(kg)	475	1500	1750	1900	3150	4000	7000	11500	15200	39000
Weight of furnace (approx.)	(kg)	450	900	1050	1200	2400	2800	5200	9500	13000	35000
Weight of MF power supply (approx.)	(kg)	25	600	700	700	750	1200	1800	2000	2200	4000

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