



ALD Vacuum Technologies

High Tech is our Business

TITANIUM

Vacuum Precision Casting

The background of the lower half of the page is a close-up, high-temperature photograph of a molten metal surface, likely titanium, showing a bright orange and yellow glow with various textures and imperfections.

TiAlloys

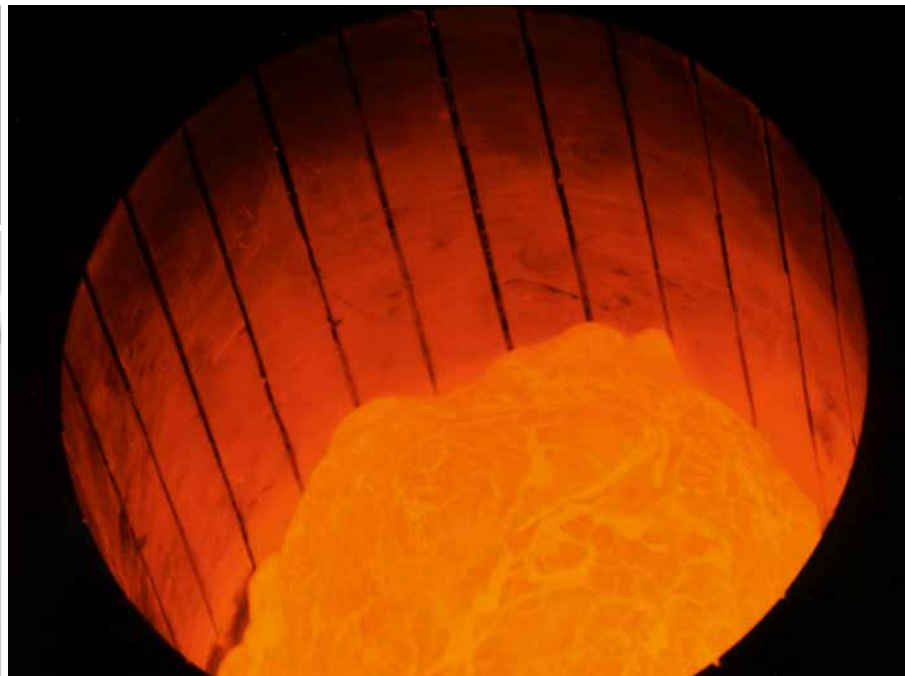
TITANIUM

Vacuum Precision Casting

VAR Skull Melting –
Cold Crucible Induction Melting

Benefits of Titanium

- Excellent mechanical properties
- Low density
- High corrosion resistance
- High bio-compatibility



- 1 Health: Implants
- 2 Leisure & Fun: Golf-clubs
- 3 Lightweight: Structural Ti parts

Requirements in Melting and Casting of Titanium:

- Ceramic free melting:
No contamination, no reaction with Oxygen
- Vacuum-purifying of the melt

Cold Crucible Induction Melting & VAR Skull Melting from ALD

- Are suitable for a wide range of alloys especially reactive metals
- Render a high homogeneity of alloying elements
- Work with highest security standards
- Prevent the evaporation of sensitive alloying elements

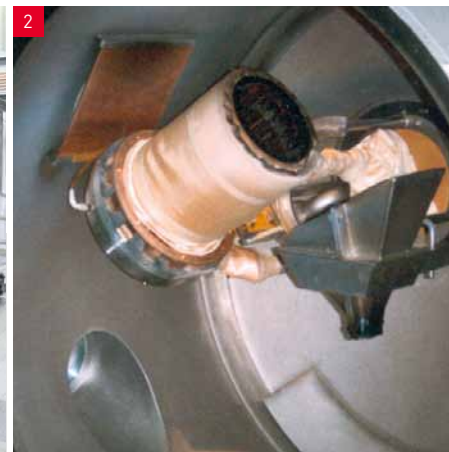
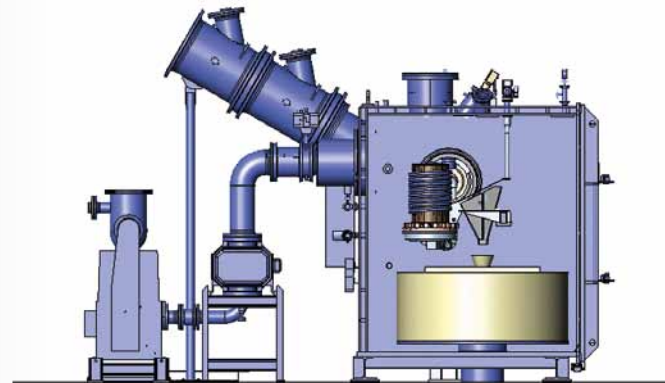
LEICOMELT

Cold Crucible Induction Melting

LEICOMELT –
Standard design
(rectangular
chamber with big
service door and
centrifuge)

Benefits of LEICOMELT

- Excellent chemical and thermal homogenization
- Melting of revert up to 100 %
- Recharging and alloying possible
- Better control of superheat
- Melting of reactive metals (e.g. Ti, Zr, Nb)
as well as Ni or Co base alloys



- 1 LEICOMELT 12 – Melt unit
installation and centrifuge
- 2 LEICOMELT 5 – Horizontal
chamber with two doors
for best accessibility of
crucible and mold table

General Furnace Design

- Single-chamber furnace with centrifugal casting unit
- Easy access to cold crucible and induction coil as well as to mold table by multi door design

Melting Process

The cold crucible consists of several water cooled copper segments which are separated from each other by an insulating material. The electromagnetic field is induced into the Cu-crucible and from there into the charge material.

VAR SKULL MELTER

From Laboratory to Production

Benefits of VAR Skull Melter

- Compact, space-saving and service-friendly furnace concept
- Reliable, easy to control process
- High productivity
- Melting of revert possible (up to 50 %)
- Suitable for high pouring weights



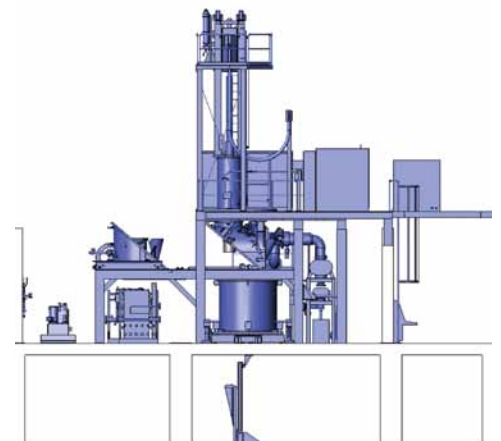
General Furnace Design

- Single-chamber design with a centrifugal casting unit
- Large charging door to provide easy accessibility for cleaning and maintenance

Melting Process

A consumable Titanium electrode melted by an arc into a water-cooled tiltable crucible. When the desired melt level is reached the electrode is automatically raised and the liquid titanium is poured into a mold. The consumable electrode can be dimensioned for multiple pours.

- 1 VAR L250SM
- 2 VAR L500SM



VAR Skull Melter – Typical Design

TiAl

Benefits of Titanium Aluminides

- Excellent mechanical properties at elevated temperatures
- Additional weight savings as compared to Titanium

Intermetallic TiAl alloys are gaining importance in high-tech applications, e.g. aviation and automotive engine technologies



- 1 Double-chamber LEICOMELT 2 for TiAl automotive valves
- 2 Double-chamber LEICOMELT 5 for TiAl turbine blades
- 3 Environment: Automotive valves
- 4 Energy Savings: Turbine blades
- 5 Better Performance: Turbowheels

TiAl Furnace Design

For industrial use either double-chamber or single-chamber furnaces with mold heater are available



Comparison

VAR Skull Melter

- Easy process control
- High reliability/reproducibility
- Electrode needn't be recharged prior each melt

- Feedstock: Electrodes and limited revert
- Energy consumption for melting: ~ 1 kWh/kg
- High melt rates and pouring capacities

LEICOMELT

- Excellent thermal and chemical homogenization
- Better control of superheat
- Recharging and alloying possible

- Feedstock: Ingots and up to 100 % revert
- Energy consumption for melting: ~ 3 - 5 kWh/kg
- Medium melt rates and capacities

Technical Data LEICOMELT

		LEICOMELT 2	LEICOMELT 5	LEICOMELT 12	LEICOMELT 26	TiAl Furnace
Crucible Volume	[l]	2	5	12	26	5
Max. Melt Weight (Ti6Al4V)	[kg]	8	20	48	104	20
Melt Power Supply	[kW]	400	600	900	1300	600
Max. Mold Dimensions (dxh)	[mm]	500 x 500	500 x 500	1000 x 800	1500 x 1000	1200 x 800
Typical Floor Space (LxWxH)	[m]	10 x 5 x 3.5	12 x 7 x 4	9.5 x 8 x 4	10 x 10 x 6	12.5 x 6.5 x 5

Technical Data VAR Skull Melter

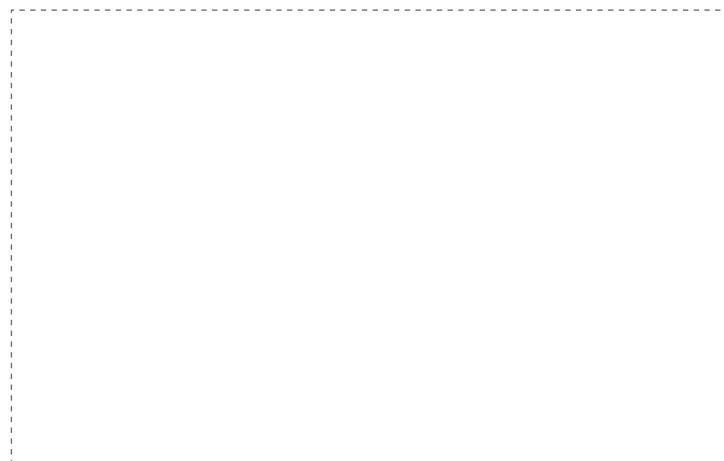
		L50SM	L150SM	L500SM	L1000SM
Max. Casting Weight (Ti6Al4V)	[kg]	50	150	500	1000
Melt Power Supply Current	[kA]	12	20	40	50
Max. Electrode Diameter	[mm]	200	250	350	450
Typical Floor Space (LxWxH)	[m]	10 x 8 x 7	13 x 11 x 12	14 x 11 x 11	16 x 15 x 12

ALD is a leader in developing and optimizing suitable Vacuum Melting and Casting Processes according to customer requirements.

ALD offers all relevant Vacuum Metallurgy Processes from Vacuum Induction, Electron Beam, Electro Slag and Vacuum Arc Melting through Vacuum Precision Casting and Powder Production.

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