



ALD Vacuum Technologies

High Tech is our Business

Laboratory Remelting Systems

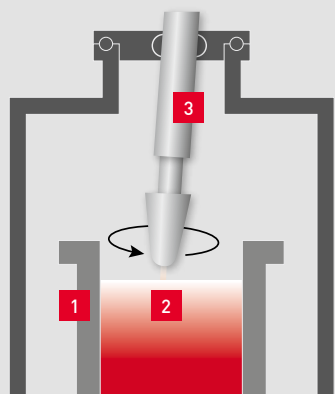
for Pilot Production and R&D



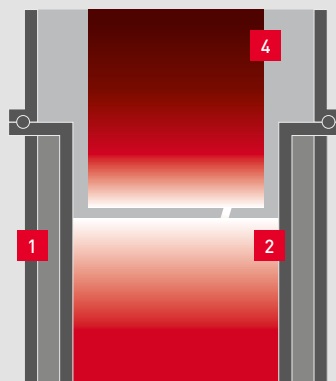
Vacuum Arc Remelting (VAR)

Improving the structure and uniformity of the cast ingot

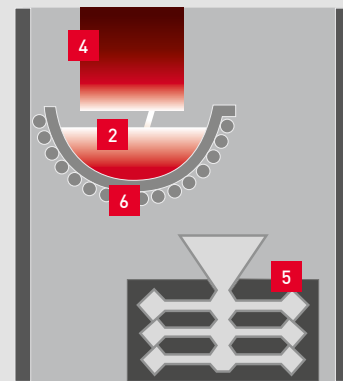
1. Copper mold
2. Melt bath
3. Non-consumable electrode
4. Consumable electrode
5. Casting mold
6. Water-cooled crucible



Non-consumable Electrode Technique



Consumable Electrode Technique



Skull Melting

The Laboratory Systems

ALD has continuously developed various laboratory systems that operate with non-consumable and consumable electrode techniques. Each of these product lines consist of modular systems designed for a wide variety of applications and can be implemented easily and economically.

The laboratory Vacuum Arc Remelting furnace is primarily used to produce button samples, small ingots and precision cast parts. These pieces are used for example: To examine the mechanical, physical and chemical properties of refractory and reactive metals and their alloys.

Accessories:

Accessories that increase flexibility and range of applications:

- Automatic gas-inlet system
- Material-feed mechanism
- Glove-box connection
- Automatic guidance of the electrode ram for melting by the non-consumable electrode technique
- Magnetic coil for electromagnetic stirring
- Video monitoring system
- Automatic melt control
- Helium ingot cooling
- Fully automated process
- Drip short control
- Oil booster pump

Vacuum Arc Remelting (VAR)

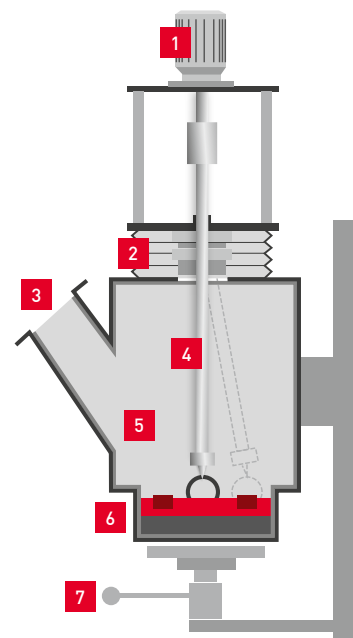
The Vacuum Arc Remelting process is using an arc between a massive source electrode (cathode) of the material to be remelted and a water cooled copper mold (anode). The material is transferred from the electrode on a drop by drop basis which improves the structure and uniformity of the cast ingot, while the vacuum environment removes the gases and volatile elements. Typical materials to be processed are: Ti, Ta, Zr, Fe- and Ni-based and Cu-alloys.

Vacuum Arc Remelting (VAR)

- LK Line for non-consumable electrode technique
- L200 Line for both non-consumable and consumable electrodes

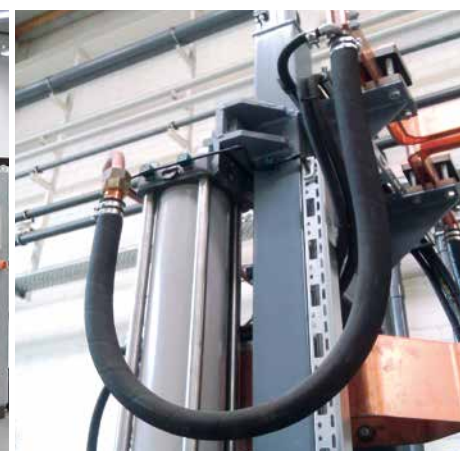
Schematic diagram of the VAR-model LK6:

1. Electrode drive motor
2. Vacuum seal
3. Viewing port
4. Movable electrode
5. Melt chamber
6. Melt dishes
7. Clamp for water jacket



◀ Vacuum Arc Furnace Model LK6

▶ Vacuum Arc Furnace Model L200



The LK Line

This furnace offers a single solution for all melting applications with the non-consumable electrode technique, under vacuum or inert gas atmosphere with overpressure of 1 bar and higher possible.

In the LK line the non-consumable electrode technique means the the arc ignites and burns between a cooled tungsten finger and the molten material in the crucible.

Various melting power packages and vacuum systems make it possible to operate with a melting current of up to 2000 A and evacuation pressure as low as 10^{-4} mbar.

The use of different crucibles with different melting dishes permits production of a wide variety of sample shapes.

The L200 Line

This furnace can operate both with non-consumable and consumable electrodes. The proven electrode feed control systems are used during remelting.

The maximum ingot weight with the consumable electrode technique is 200 kg.

For all its Vacuum Arc Remelting furnaces ALD supplies partially and fully automated control systems to ensure that the results of the remelting process can be monitored at all times and will be consistently reproducible.

Electro Slag Remelting (ESR)

Refining and
Solidification Control



Electro Slag
Remelting
Furnace
Model F240

Electro Slag Remelting (ESR)

The Electro Slag Remelting process in general is very similar to the VAR process. In ESR the ingot is formed under a superheated slag in which the electrode is immersed and melted off using an alternating current. Remelted ingots are free from porosity, macro-segregation and contain minimum content on non metallic inclusions.

ESR is the most flexible process in regard to material quality characteristics.

Accessories:

Accessories that increase flexibility and range of application:

- Automatic gas-inlet system
- Slag and material feed system
- Automatic guidance of the electrode ram
- Automatic melt control

The F240 Line

The F240 Line is using the consumable electrode technique with a maximum mold diameter of 240 mm for 340 kg ingot weight.

The furnace is designed to use different oxide slag types to produce primarily Fe- and Ni-based alloys.

Melt start can be performed in automatic mode by using an additional port to feed the slag into the crucible.

Remelting under a totally closed environment is possible.

Multiple Purpose Remelting

(VAR, ESR, PESR, IESR VESR)



VAR/ESR
Furnace
Model R240



Multiple Purpose Remelting (VAR, ESR, PESR, IESR, VESR)

Different remelting processes can be carried out in one chamber type furnace using alternating or direct current to remelt one consumable electrode into one ingot above or below atmospheric pressure.

Accessories:

Accessories that increase flexibility and range of application:

- Automatic gas inlet
- Automatic pressure control
- Slag and material feed system
- Automatic guidance of the electrode ram
- Magnetic coil for electromagnetic stirring
- Electrode welding function
- Automatic melt control
- Oil booster pump
- Drip short control

The R240 Line

The following processes can be carried out:

- Vacuum Arc Remelting using high vacuum level.
- Pressure Electro Slag Remelting up to 70 bar can be carried out to produce high nitrogen single ingots.
- Inertgas Electro Slag Remelting using different slag and gas types can be used to produce single ingots.
- Vacuum Electro Slag Remelting or Low Pressure Remelting can be carried out to avoid hydrogen pick up in the final ingots.

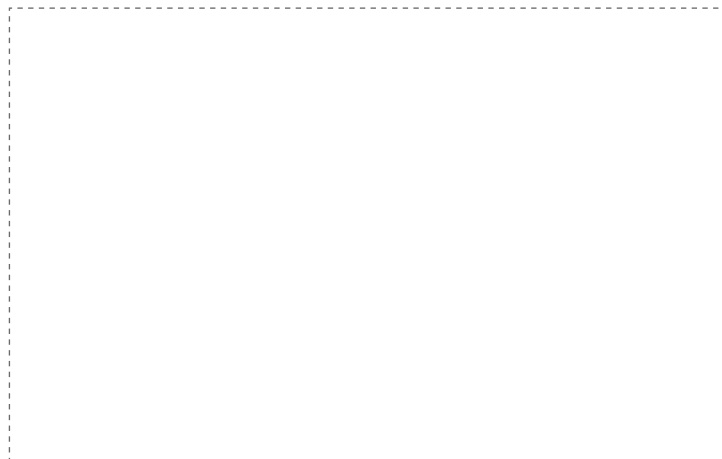


Technical Data Laboratory Remelting Systems	CRUCIBLE SHAPE			
	Disc LK 6	Round L 200	Round/Square F 240	Round/Square R 240
Non-consumable Electrode Technique	•	+	-	-
Melt Disc Geometry	Round, rectangular and ring-shaped. Equipment variable from 3 dishes (Ø 2.5 mm) up to 1 dish (Ø 150 mm). The height depends on the material and the melting power.			-
Skull Melting	+	+	•	•
Pouring Weight (Titanium) max.	[kg] 0.2	2	-	-
Melting Power Supply	[A] 500-2000	5000-7500	5000-7500	5000-7500
Consumable Electrode Technique		•		
Mold Sizes Ø min.	[mm]	-	70	170
Ø max.	[mm]	-	200	240
Length max.	[mm]	-	800	1300
Ingot Weight max.	[kg]	-	200	350
Vacuum/Pressure				
Standard	[mbar]	10 ⁻²	10 ⁻²	1 bar
With Diffusion Pump	[mbar]	10 ⁻⁴	10 ⁻⁴	-
Cooling Water Consumption	[l/min]	60-100	250	400

- Standard equipment
- + Extra equipment
- Not available

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