

ALD Vacuum Technologies

High Tech is our Business

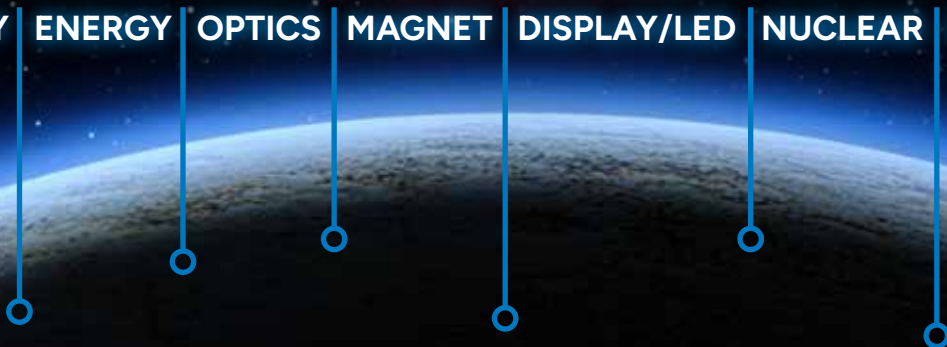
RARE EARTH PROCESSING TECHNOLOGIES

NEXT-GENERATION SOLUTIONS FOR HIGH-TECH MATERIALS



OUR CONTRIBUTION TO A RESILIENT SUPPLY CHAIN

MOBILITY | ENERGY | OPTICS | MAGNET | DISPLAY/LED | NUCLEAR | MEDICINE





From Intermediate to High Purity Metal – controlled, efficient, reproducible with innovation ALD Vacuum Furnaces

Rare earths are an essential ingredient of modern technologies such as electric motors, wind power systems & sophisticated electronics. Independent, controlled processing is vital for ensuring reliable supply chains, reducing dependencies & maintaining the highest quality standards.

Following ALD Production Processes enable Efficient Material Utilization & Sustainable Value Creation:

► VIM-Vacuum Induction Melting for Calciothermic Reduction & Refining

The tailored VIM-system offers calciothermic reduction with reduced calcium loss & refining with controlled vapor flow to ensure maximum efficiency, availability & process safety. Both processes can be carried out within a system to reduce CAPEX or two dedicated furnaces to maximize productivity.

► EB – Electron Beam Melting for Purification of Rare Earth Metals

Remelting process for maximum ceramic-free purity through high-energy electron beam melting under vacuum.

► IWQ – Induction Melting & Distillation in Quartz Tube

Specialized, high-purity high-temperature processes for reactive metals. The water-free interior without electrical feedthroughs increases process reliability, while the external induction coil & vessel made of a quartz tube prevent internal cold zones & ensure homogeneous heating. Controlled condensation keeps cleaning effort to a minimum & reproducibility high.



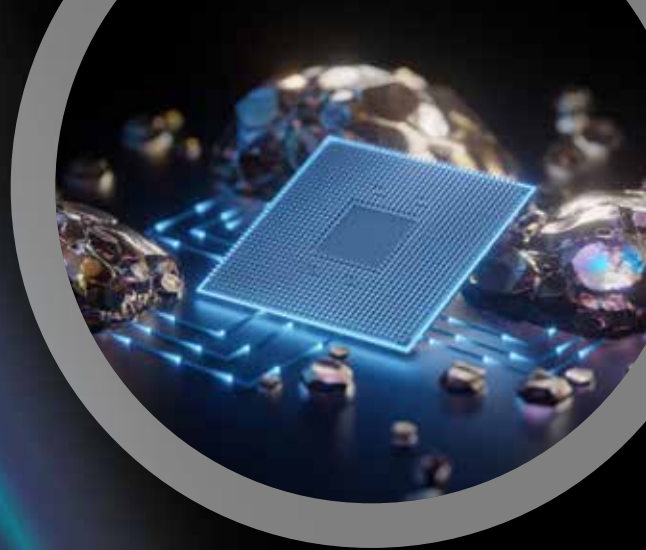
ALD – Delivering Technology & Engineering Solutions for Reactive Rare Earth Metals

TYPICAL SYSTEM DIMENSIONS

VACUUM INDUCTION MELTING – TECHNICAL DATA		VIM 12 RE
Melt Power Supply	[kW]	175
Pumping Capacity	[m³/hr]	500
approximately Melt Volume	(l)	12
approximately Melt Temperature	[°C]	1.700
Min. Process Pressure (Vacuum)	[mbar]	<2*10 ⁻³
Max. Process Pressure (Argon)	[mbar]	1.400
Max. Ingot Diameter	[mm]	350
Max. Ingot Length	[mm]	500

EB REMELTING - TECHNICAL DATA		EB LAB System
Installed EB Power		60 kW / 30 kV
Pumping Capacity of Diffusion Pump	[l/s]	5000
Electrode Length for Remelting	[mm]	available
Bar Dimension	[mm]	approx. 80 x 80
Ingot Diameter Max.	[mm]	100
Ingot Length	[mm]	480 max.
BARFEEDER WITH SEPARATION VALVE for reloading of additional bar melting		optional

IWQ - TECHNICAL DATA		IWQ 500	IWQ 700
Equipment Area	[mm]	3.000 x 2.000	5.000 x 3.700
Equipment Height	[m]	2.1	3.0
Total Power	[kVA]	70	120
Cooling Water	[l/min]	65	130
possible Working Space	[mm]	Ø 330 x 650	Ø 480 x 1.500
Max. Temperature	[°C]	1.800	1.800
MF-Power	[kW]	40	80
Ultimate Vacuum	[mbar]	2 x 10 ⁻⁵	2 x 10 ⁻⁵





ALD offers a wide spectrum
of equipment for rare earth
production & decades of
experience in the market.

Misch- metal

59
Pr
Praseodymium
140,90765

2
8
18
21
8
2

60
Nd
Neodymium
144,24

2
8
18
22
8
2

62
Sm
Samarium
150,36

2
8
18
24
8
2

63
Eu
Europium
151,954

2
8
18
25
8
2

64
Gd
Gadolinium
157,25

2
8
18
25
9
2

65
Tb
Terbium
158,92634

2
8
18
27
8
2

66
Dy
Dysprosium
162,500

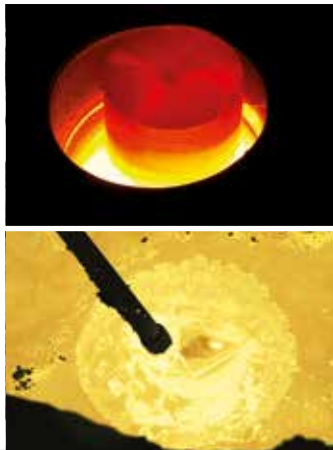
2
8
18
28
8
2

69
Tm
Thulium
168,93421

2
8
18
31
8
2

70
Yb
Ytterbium
173,04

2
8
18
32
8
2



VIM – Precise Process Control for Rare Earth Metals

Reduction & Refining of Rare Earth Metals in metallic crucible

- ▶ Metallurgical reactions without oxygen
- ▶ Controlled vapour flow
- ▶ Removal of volatile impurities
- ▶ High product purity



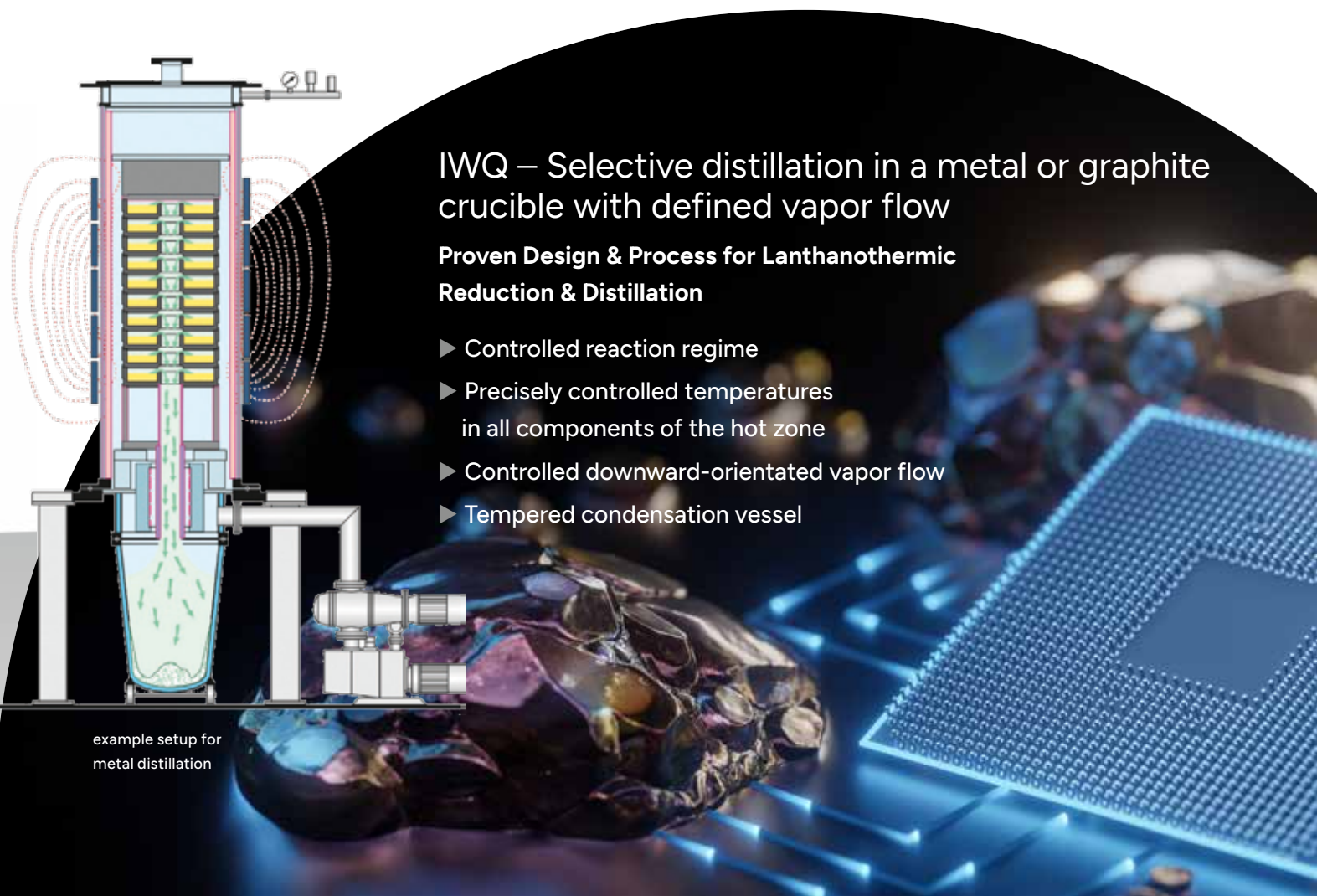
21
Sc
Scandium
44,955910

39
Y
Yttrium
88,90585

Electron Beam Melting – Recycling & Purification of Rare Earth Metals

High-Temperature Melting & Cleaning of Metals in water-cooled crucibles design

- ▶ Highly flexible, precise energy source
- ▶ High melting point & highly reactive metals can be processed reliably
- ▶ Selective evaporation of unwanted elements & excellent degassing
- ▶ Production of ultra-pure materials, electronic alloys, & recycling reactive metals



IWQ – Selective distillation in a metal or graphite crucible with defined vapor flow

Proven Design & Process for Lanthanothemic Reduction & Distillation

- ▶ Controlled reaction regime
- ▶ Precisely controlled temperatures in all components of the hot zone
- ▶ Controlled downward-orientated vapor flow
- ▶ Tempered condensation vessel

example setup for
metal distillation



ALD – Leading Supplier for Advanced Vacuum Furnaces

Being one of the leading suppliers of vacuum plants and process technology we supply the entire vacuum metallurgy and vacuum heat treatment sector with our high-tech products and processes. ALD offers individual solutions for the best economic performance. We offer worldwide support and maintenance service for our high-quality plants during their entire lifecycle. Each newly delivered ALD plant meets the latest digital standards and is characterized by a particularly high level of environmental compatibility.

150+ YEARS EXPERIENCE – A Young Company with History



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