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ALD Vacuum Technologies

High Tech is our Business

VIGA METAL POWDER PRODUCTION

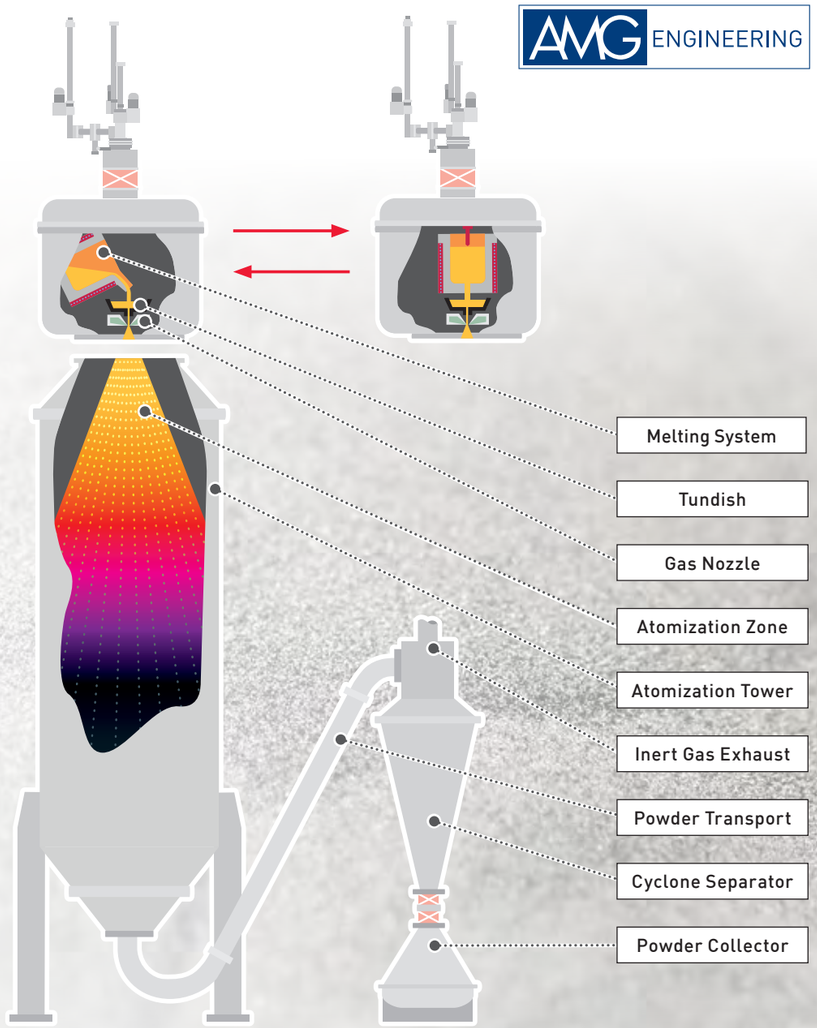
Vacuum Induction Melting Inert Gas Atomization

METAL
POWDER PRODUCTION

Vacuum Induction Melting Inert Gas Atomization

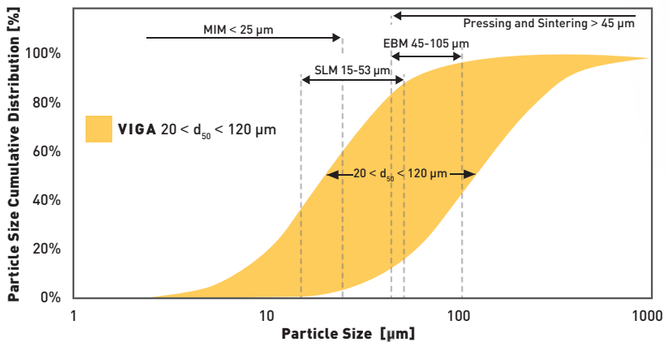
PROCESS CHARACTERISTICS & SEQUENCE

- Leading process for production of high-quality Fe / Co / Ni / Cr / Cu and other metal alloy powders with superb characteristics
- Excellent product quality repeatability due to precise control of all critical process parameters
- Melting of metallic raw materials under vacuum or inert conditions
- Controlled delivery of molten metal by top or bottom pouring via tundish and / or orifice towards close-coupled gas nozzle
- Atomization of metal stream into spray of micro-droplets by high-pressure inert gas jet
- Solidification of droplets and forming of powder particles in atomization tower
- Powder transport and collection under inert conditions

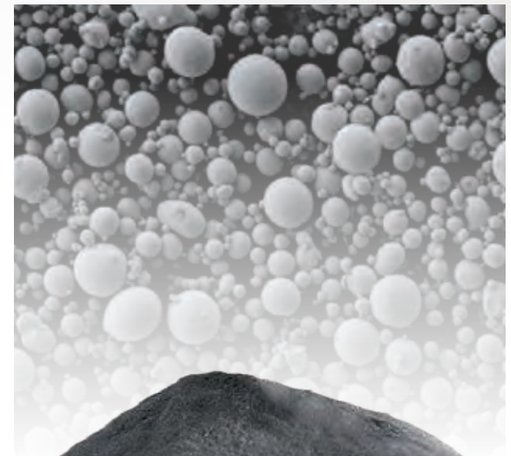


Powder Characteristics

PARTICLE SIZE



- Log normal Gaussian particle size distribution (PSD)
- d_{50} value of PSD adjustable between 20 – 120 µm for a variety of alloys
- PSD width / standard deviation $S = d_{84}/d_{50} = d_{50}/d_{16}$ ranges from 2.0 to 2.5
- d_{50} values less than 20 µm achievable for low melting alloys



MORPHOLOGY

- Spherical morphology
- High flowability and tap density

OTHER CHARACTERISTICS

- Overall powder / raw material yield > 95 %
- Low oxygen and nitrogen concentrations
- Uniform and homogeneous powder chemistry

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World Class VIGA Systems from the Market and Technology Leader for Inert Gas Atomizers

ALD's VIGA MODEL SERIES & DESIGN FEATURES

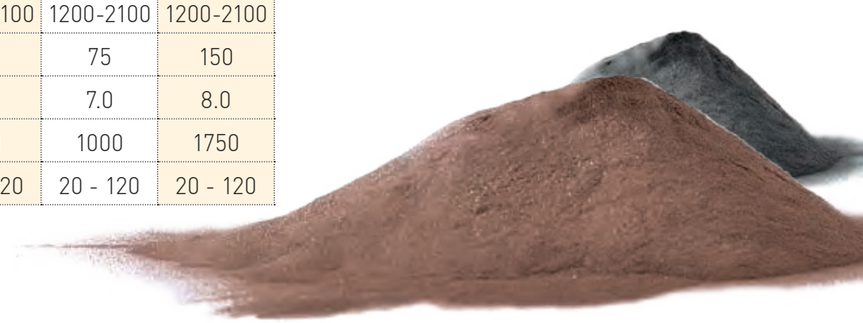
- Lab-scale systems with 5 – 15 kg batch size up to large-scale powder production plants with 2000 kg batch size
- Productivity of 20 t up to 2000 t per annum
- Double door melting chamber (large systems) with individual vacuum induction melting station for each door
- Quick-change induction furnace boxes with different capacities available for one specific VIGA model
- Bottom (small systems) and top pouring (medium and large systems)
- Redundant double tundish system to minimize risk of material losses and equipment downtime
- Suitable sized atomization tower, ascending powder conveying tube, cyclone and additional dust filter for high-efficient powder transport and collection

Excellent references with leading powder producers worldwide

TYPICAL PERFORMANCE DATA FOR DIFFERENT VIGA SIZES		VIGA2B	VIGA5	VIGA8	VIGA16	VIGA35	VIGA45	VIGA70	VIGA150	VIGA300
Overall Height	[m]	4.7	7.0	9.5	10.0	11.5	12.5	13.5	16.0	18.0
Typical Footprint	[m * m]	5.0 * 6.0	6.0 * 7.0	6.5 * 7.5	7.0 * 8.0	8.0 * 9.0	8.0 * 9.0	10.0 * 12.0	13.0 * 20.0	21.0 * 26.0
Max. Melt Volume	[l]	2	5	8	16	35	45	70	150	300
Max. Batch Weight*	[kg]	15	40	60	120	260	350	525	1125	2250
Typical Metal Flow Rate	[kg/min]	5-15	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10-20
Typical Atomization Gas Flow Rate	[m^3/h]	1000-1500	1200-2100	1200-2100	1200-2100	1200-2100	1200-2100	1200-2100	1200-2100	1200-2100
Typical Atomization Time	[min]	2	3	5	10	22	29	44	75	150
Typical Total Cycle Time	[h]	2.0	2.5	3.0	3.5	4.0	4.5	5.5	7.0	8.0
Max. Annual Powder Production**	[mt/yr]	45	100	125	210	400	480	600	1000	1750
Typical D_{50} Value Range	[µm]	20 - 120	20 - 120	20 - 120	20 - 120	20 - 120	20 - 120	20 - 120	20 - 120	20 - 120

*Based on IN718, based on **24/7 operation and 260 days of production / yr

More than 100 successfully commissioned inert gas atomization systems



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New Design Features & Specialized Furnace Concepts

POWER FOR POWDER - YOUR KEY TO SUCCESS

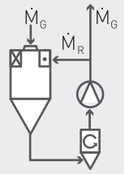
- Engineering and manufacturing of customer-specific VIGA type inert gas atomizers
- New design features Gas Recirculation and Hot Gas Atomization
- Specialized furnace concepts such as
  - VIGA2B-EIGA integrated inert gas atomization system
  - IGA systems
  - Spray forming systems

Every ALD VIGA system is custom designed to meet your requirements and applications

Antisatellite system VIGA35

NEW FEATURE

Gas Recirculation



- Recirulation of inert gas and supply into atomization tower beside fresh atomization gas
- Minimization of powder particle collisions and satellite formation
- Substantial improvement of overall powder morphology

NEW FEATURE

Hot Gas Atomization

- Atomization gas pre-heating up to 400 °C
- Reduction of atomization gas consumption
- Optimization of powder yield for specific applications

ALD VIGA Systems – World Class Equipment to produce your metal-powder feedstock for a bright world of different processes & applications.

Powder Applications & End Markets

- **POWDER PROCESSING**
  - MIM
  - Plasma Spraying
  - SLM / EBM 3D-Printing & other AM processes
  - Pressing and Sintering
- **ADDITIVE MANUFACTURED PARTS**
- **AVIATION**
  P/M rotor discs, turbine blades & structural components
- **AUTOMOTIVE**
  Near net shape MIM components
- **POWER ENGINEERING**
  Wear and oxidation protection coatings, MCrAlY plasma spray coatings
- **MEDICAL TECHNOLOGY**
  Co-Cr based dental and body implants
- **ELECTRONICS & CHEMICAL INDUSTRY**
  Sputtering processes and coatings for chemical reaction vessels
- **PRECIOUS METAL INDUSTRY**
  Jewelry and Catalysts
- **RESEARCH & DEVELOPMENT**

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ALD – A Leading Supplier for Advanced Vacuum Furnaces

As 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 care and maintenance service of our high-quality plants for their entire lifecycle. Each newly delivered ALD plant meets the latest digital standards and is characterized by a particularly high level of environmental compatibility.

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