Blue Power.

25 MORE THAN YEARS OF ADVANCED CASTING & METAL POWDER TECHNOLOGY

METAL CASTING AND POWDER PRODUCTION SYSTEMS

INDUTHERM
ERWÄRMUNGSANLAGEN

VACUUM PRESSURE CASTING SYSTEMS · CONTINUOUS CASTING SYSTEMS · MELTING MACHINES · POWDER ATOMIZATION PLANTS

INDUTHERM.
YOUR PARTNER FOR INNOVATIVE METAL CASTING AND METAL POWDER PRODUCTION SOLUTIONS

Indutherm is a family-run company based in Walzbachtal – close to the technology region of Karlsruhe and Pforzheim, the Golden City, center of the German jewelery and watch industry.

Indutherm – the name says it all

The **INDU**ctively generated **THERM**al treatment of metals, the inductive melting, is the basic principle on which all our machines and production solutions have been based since the company was founded. We originally developed our induction technology specifically for the investment casting of precious metals. Today, on this basis, we can offer you a wide range of systems for very different purposes. Our portfolio is divided into two main areas:

Metal casting and metal atomization

In the field of casting technology, we provide you with innovative solutions for vacuum/pressure investment casting, for melting and casting into open moulds, for the production of semi-finished products or granulating. We did not see the development of additive manufacturing technologies based on metal powders as a competitor to investment casting, but as an additional opportunity. More than ten years ago we started developing and manufacturing systems for the production and classification of metal powders.

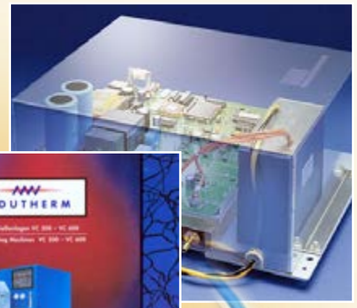
INDUTHERM and BLUE POWER

Our systems are used in many different industries that require in-depth industry-specific know-how from our employees. That is why our machines are sold under two different brands, which are backed by appropriately specialized employees in the areas of advice and sales:
Under the **INDUTHERM** name, we supply the watch, jewelry and precious metals sectors.
Our subsidiary **BLUE POWER CASTING SYSTEMS** is responsible for all other applications such as in the automotive and supplier sector, medical technology, machine and device construction. In North America, all sectors are supplied under the Blue Power label.

Every product is only as good as the customer service supporting it.

Our sales and service partners provide professional support around the world. You can find the dealer for your country on our website www.indutherm.de, in the "Company" section.

The first Indutherm production facility



1996: The three founders Eckhard Scheer, Klaus Schmidt and Peter Hofmann celebrate the foundation of the company

The first Indutherm booth at the Baselworld Jewellery &Watch Fair

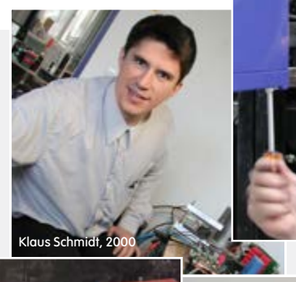
1996

The story begins

The three young casting machine specialists, Peter Hofmann, Klaus Schmidt and Eckhard Scheer, together found Indutherm Erwärmungsanlagen GmbH to develop casting machines mainly for the jewellery industry. The company's head office is based at the home of the Hofmann family and the garages and former agricultural store rooms are converted into production workshops.

The three founders have a clear concept. As opposed to machines built by the majority of competitors, they develop all the main components themselves and produce them in-house – tailor-made to the application and the requirements of the target group. Above all, the development of proprietary induction generators – the core of each machine – secures a technological lead right from the start.

Peter Hofmann is responsible for the overall concept and takes on the sales and acquisition of international sales partners. Klaus Schmidt is responsible for electronics development and Eckhard Scheer is the right man for mechanical design and production.



Klaus Schmidt, 2000

Eckhard Scheer, 2000

Jan Hofmann with a CC 3000, 2000

Advertisement 2001

Company building, 2001

VC series brochure, 1999

Presentation of the VC 600 V featuring the new vibration system, 2006

Creating a solid base

1997

The first appearances at international trade fairs: Indutherm shows its machines at the Basel trade fair.

1998

For the first time, Indutherm joins research projects such as the European CRAFT project which is backed by the EU. Focus of the CRAFT projects is quality and process improvement in gold and silver casting.

1999

The airplane becomes Peter Hofmann's second place of work to make Indutherm known around the world - the international dealer network begins to grow.

2000

The Indutherm team is launching the first company homepage under the domain www.indutherm.de

2001

The original company premises have long become too small. The new company building is built in Walzbachtal-Wössingen and inaugurated on 1 December 2001 in the presence of customers, suppliers and business partners.

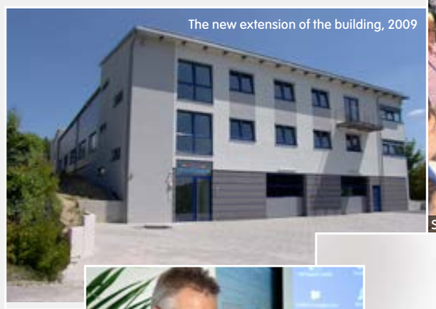
2002

The sales division is expanded to cater for other branches of industry. Indutherm attends an industrial trade fair for the first time, Euromold in Frankfurt.

2005

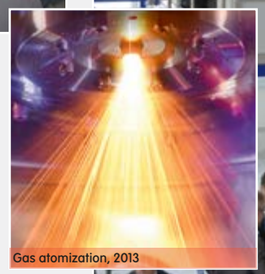
Indutherm develops a vibration system for vacuum pressure casting. It considerably improves mould filling as well as overall casting quality – an absolute novelty in this machine category. The new top-of-the-range model, the VC 600 V with vibration, not only wins awards but also becomes an international market success.

In the same year Indutherm joins a very interesting new CRAFT project: the development of metal printing technology using molten droplets / microgranulation – the first step into the world of Additive Manufacturing.


The new extension of the building, 2009


Sales and Service partners conference, 2012


Presentation of the new atomizer, 2014


Gas atomization, 2013


Peter Hofmann giving a lecture on casting technology, 2008

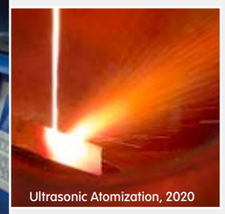

The new MC 15 tabletop casting machine, 2006


Celebrating 25 years:
Peter, Jutta and Jan Hofmann

The Indutherm R&D team: Dr. Ing. Julius Ficht, Peter Hofmann, Dr. Jörg Fischer-Bühner, Jan Hofmann, Steffen Kley, Klaus Wiesner


Peter and Jan Hofmann, 2019


Fit for future requirements: casting machine VC 650 R in automated casting process, 2019


Ultrasonic Atomization, 2020

Diversification

2006

The MC 15 is the first compact bench-top casting machine comprising complex technology to be launched onto the market. Its function is based on the tilting casting principle and quickly finds numerous convinced users in the jewellery industry, in R&D, in rapid prototyping and in dental labs. The MC 15 forms the cornerstone of an entire family of MC machines.

On the other end of the Indutherm portfolio the large Vacuum Pressure Casting Machine VC 12000 creates new options for the high precision casting of large objects.

2008

At the Basel Show Indutherm presents two important innovations: the first Vacuum Continuous Casting Machine VCC 400 and the Quattro Drive drawing unit for the large continuous casting machines

Also in 2008 Indutherm starts a new R&D project in collaboration with the TU Freiberg: the development of a horizontal continuous casting technology.

2009

The existing company building is extended by an additional building providing almost double the surface area.

2010

New processes and machines, such as a tilting casting machine for highly reactive metals are developped in several research projects in collaboration with a number of universities.

2011

The VTC series Tilting Casting Machines for casting of steel, platinum, titanium is launched.

New large melting units, equipped with a motor driven tilting system are presented.They are developped especially for recycling melting processes.

2013

A new era begins: in a new research project (in collaboration with the University of Bremen), a powder atomization plant is developed for the production of small metal powder batches.

2014

The first Atomizer, the AU 1000, is brought to production maturity and is presented to the specialist audience at the end of 2014.

2015

In the meantime, Indutherm is represented by sales and service partners in 65 countries.

On the way to future

2016

BluePower Casting Systems GmbH is founded as a subsidiary to enhance our services to the specific requirements of the industrial casting and additive manufacturing segments.

As an additional tool for the metal powder production, Indutherm develops an Air Classifier for the classification of metal powders into fine and coarse fractions.

2017

Klaus Schmidt, one of the founders, is leaving Indutherm.
With Jan Hofmann, the son of Jutta and Peter Hofmann, the next generation joins the company.

The compact MC series tabletop casting machines are completely renewed and equipped with a digital control system.

2018

As next of the three founders Eckhard Scheer is retiring at the end of the year.

2019

An important step to the Industry 4.0 standard: the new DMS solutions for process optimization, remote access and remote control.
A new large granulating unit, the GU 12000, is launched.

2020

Eckhard Scheer dies suddenly and unexpectedly, only one year and a half after leaving the company.

The corona pandemic and its effects on the global economy are also being felt by Indutherm, its sales partners and customers. The team uses the free capacities for intensive development work. At the end the year, a completely new Ultrasonic Atomizer for smaller productions of high quality metal powder can be presented, as well as high temperature versions of the Gas Atomizer.

2021

25 years after it was founded, the family-run company is better positioned than ever before: with over 45 employees, with a comprehensive product portfolio in the different fields of technology, with strong development partners and a global network of competent and committed sales partners - and of course with a steadily growing customer base.

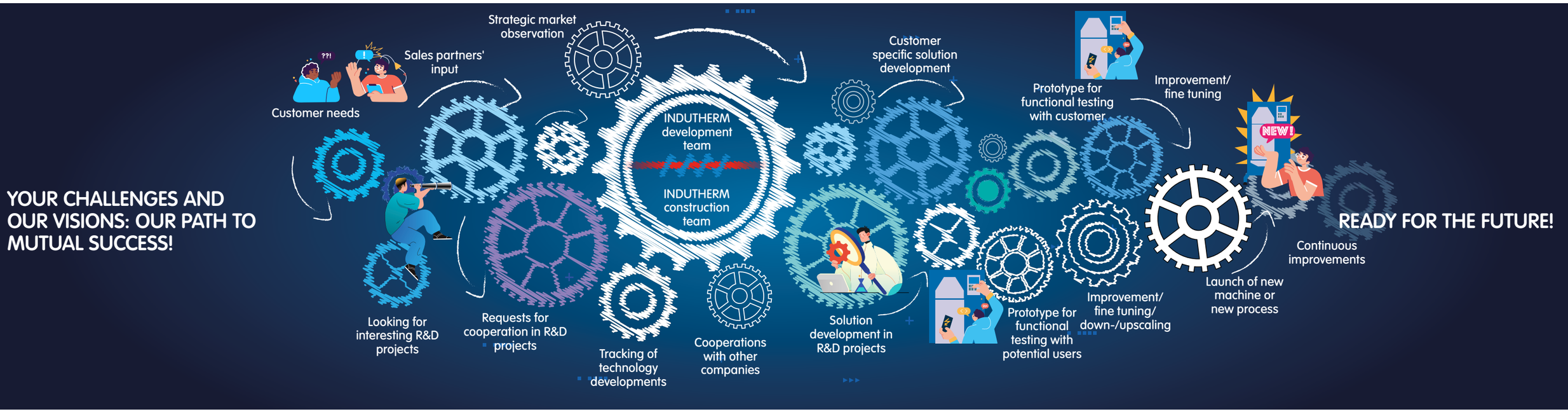
THANK YOU!

to everyone who contributed to this wonderful story!

2023...

The story goes on!

OUR PHILOSOPHY: ALWAYS BEING RECEPTIVE FOR CUSTOMER NEEDS, ALWAYS LOOKING FORWARD



First listening, then engineering

For us, a fundamental issue is always being optimally receptive. Talking with users, understanding their needs, discussing ideas and visions is the best basis for creating sustainable solutions. That's why we develop and test our machines from the very beginning in close cooperation with customers from different sectors, e.g. jewellery designers, gold smiths, foundry men and dental technicians. The different requirements led to the wide range of solutions that we can offer our customers today. Most of our systems can be highly tuned to your processes – with several tooling and sizing choices as well as numerous optional accessories. Even individual machine set-ups are possible, thanks to our own software development.

Complete engineering and design in-house at Indutherm

The core competence of Indutherm is the development of the machines from R&D until marketability. Electronics, software, control system, mechanics, everything is designed in-house and made in Germany.

Continuously engaged in R&D projects

Over many years, the Indutherm development team has been engaging in national and international research projects. We cooperate with well-known research institutes and universities.

Sharing our know-how

Our customers benefit from the experience we have gained in these projects through high consulting competence and innovative products that constantly set new benchmarks in their segments.
You are welcome to ask us for consulting e.g. in process optimization or to take part in one of our casting seminars. And who knows, maybe we'll meet at one of the international symposiums we regularly attend.

Our latest R&D projects

ZIM and BMBF projects
ZIM projects are cooperative R&D projects funded by the Federal Ministry for Economic Affairs and Energy specifically for small and medium-sized companies. The Federal Ministry of Education and Research, on the other hand, is behind BMBF projects. Within the scope of these research initiatives, we develop new processes, alloys and plants and cooperate with research partners such as the University Bremen, the Technical University Bergakademie Freiberg and several other research institutes and partners.

– **Atomizer StaVari**
The BMBF StaVari (Stahl-Varianz) project deals with the development of a consistent process chain for additive manufacturing of complex, varied and highly functional products made of innovative steel materials. (project time 2016-2019, project number 02P15B056).

– **Atomizer Lhasa**
Development of an explosion-proof powder atomization plant for aluminum alloy powder

IGF projects (industrial collective research)

– **LeichtbauBW**
An economic development corporation from Baden-Wuerttemberg, the largest lightweight network in the world

– **Frigesco**
Powder atomization and laser additive manufacturing of magnetocaloric materials

– **Amorphous metal powders**
Manufacture and use of amorphous metal powders (Bulk Metallic Glass)

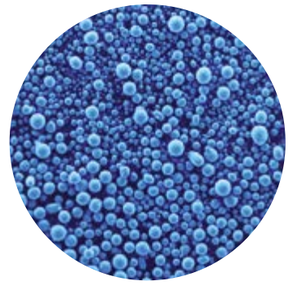
– **IDAK**
"Isothermal Digital Single Cell Amplification for the Detection of Antibiotic-resistant Pathogens in Hospitals" (Ag powder development for antibacterial applications among others)

– **OpP3DP**
"Optimized Powders for 3D-Printing": powder development and manufacture of innovative Cu base powders for laser additive manufacturing of high-strength, high-conductivity components

– **Gold powder**
Powder development and powder atomization technology for gold powder

– **CuBe alternative**
"Alloy Development and Characterization of Materials to Replace Copper-beryllium Alloys"

– **Titanium casting**
Development of precision casting technologies for titanium components (jewelry, medical technology etc.)



ALWAYS IN FOCUS: THE MOST ECONOMICAL SOLUTION FOR YOUR DEMANDS

OUR DIGITAL PROCESS MANAGEMENT	
FEATURES	**BENEFITS**
Process data output and visualization	Analytics, live views, evaluation
Report output	Documentation, quality assurance
Script control Remote control	Production control, process control, process monitoring
Statistics	Evaluations, efficiency analysis, optimizations
Flexible data access / cloud communication	Process monitoring, process statistics, process documentation
Software updating	Maintenance, service

Cost-effective through quality

The perfect result in the least time and for the least cost

Four factors are critical to cost-effective casting:

- Speed and, ideally, no costly testing for high quality casting results
- Casting processes that can be replicated at any time
- The higher the casting quality, the less post-production work there is and the lower the costs are
- Minimum material loss

This is why our motto is "Cost-effectiveness through quality" – and this is reflected in every detail in the construction of our machines.

DMS-software: remote service via modem

Durable and reliable

It's important that your production equipment runs perfectly for many years from day one. Our internal quality management ensures high standards from the first screw to the last. In the event of revisions, updates or any kind of problem, we create detailed documentation for each machine, with pictures, software backups and more.

Easy to service

Easy to service: replacing the generator by opening only two screws

Simple replacement of all major components guarantees fast and easy servicing, minimises the risk of lengthy production interruptions and ensures long term reliability. All INDUTHERM machines with an induction generator may be equipped with a GSM modem for remote service.

Energy efficient

Our own developed Power Generators with integrated PLC (Programmable Logic Controller) are specially developed for high efficiency reliable induction heating and melting of various metals. The oscillation circuit is available in different designs and concepts:

Indirect induction heating: The eddy current is primary transferred into a susceptor (e.g. graphite crucible). The metal is being heated in this crucible via thermoconductivity and irradiation from the crucible wall. Due to the low/medium frequency a significant amount of the electromagnetic field is creating a strong mixing effect which ensure a homogenous alloy. This mixing effect can be increased by our special pulsing modulation (skin effect, a stirring effect of the melt is ensured).
This concept is used for metals which does not have a reaction with carbon / a reaction with carbon is tolerated.

Direct induction heating: It excludes Carbon completely from the melt. The eddy currents are generated in the metal directly. This concept demands certain soundness of the workpiece to allow its electromagnetic coupling with the induction coil (material, quantity, shape, position). However, in case of more or less sound metal in the crucible, it improves thermal efficiency of the process and allows melting of materials with higher melting point or affine to Carbon in a very efficient, economic and safe way.

Both concepts guarantee for the user the maximum efficiency and also flexibility, reduces the electrical consumption, increases the maximum temperature, increases heating speed and reduces the electromagnetic emission in terms of EMC.

Efficient insulation ensures that the induction generated loses as little energy as possible for fast melting of the metal. The thermal insulation around the inductor and crucible effectively reduces heat radiation.
Efficient energy use also reduces energy consumption for water re-cooling in the machine and the potential need for air-conditioning in the foundry.

Energy saving also with peripheral devices
Thanks to the mold lift you can use flange-less molds. These are much cheaper and require less space in your oven. In other words: with the same energy consumption you can burn ~50% more molds – or you can work with a smaller oven.

Digital process management for more safety, more control, higher productivity:

The remote control functions allow the operator to watch and control the process conveniently from the office or any other location in safe distance. We use complex control electronics as well as the existing sensors on our machines for data acquisition. This allows numerous parameters to be recorded and processed via sensors, such as power output, temperatures, compression ratios and many more. Every individual process can be precisely analyzed and saved.
The system consists of individual modules that can be configured according to customer-specific requirements.

Depending on the application, the user has various user interfaces available for control and management.

Original Indutherm consumables: Quality pays off!

Our own high quality consumables, such as crucibles, dies or sealing rods, are specially developed for Indutherm machines. Each machine is equipped with a free starter consumable set to start the operation. For larger consumable sets to ramp up your production, please do not hesitate to get in contact with us and benefit from attractive quantity discounts. Only using original Indutherm consumables makes sense for a number of reasons:

- Compact graphite ensures greater durability for crucibles and sealing rods
- Higher quality casting results
- Less contamination from extraneous material like lead etc
- Less graphite contamination in alloys and castings
- Less gas porosity => reduced post-production costs, less material loss
- Less stress for the casting machines
- Less power consumption
- Our crucibles have lower electrical resistance, meaning that there is less stress on the inductor, condenser assembly, transformer and generator – resulting in greater durability for these components
- **An extra two years of warranty for free if you only use original Indutherm consumables and if you have a valid maintenance contract***

** Please contact for this offer your responsible Indutherm contact*

YOUR PROJECT...

OUR SOLUTION...

Gold, silver, copper, brass, zinc, aluminium casting

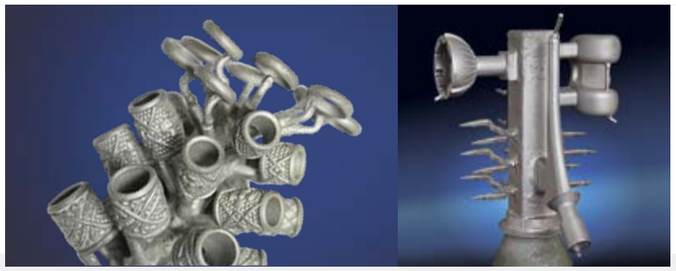
- Jewellery, electronical industry, ...
- From filigree to large parts
- Rapid prototyping
- Arts, handicraft, models

Vacuum Pressure Casting Machines
MC series and VC series

- One or two chamber differential pressure systems
- Casting into investment molds, also suited for shell casting
- Up to 25,000 ccm crucible volume

Steel, titanium, platinum, palladium casting

- Jewellery
- From filigree to large parts
- Dental and medical technology
- Metallurgic R & D
- Moulds



Vacuum Pressure Casting Machines
MC series and VTC series

- One or two chamber differential pressure systems
- Tilting casting principle
- Casting into investment molds or into ingot molds, also suited for shell casting

High Temperature Melting Machines with ceramic crucibles

- MU/MUV/MUVV (C series) for hand pouring into molds

Melting and pouring of different metals

- For metals developing a lot of smoke and oxides during melting
- For large quantities of metal (recycling or own alloys)
- For casting large, heavy components

Open Melting Machines and Tilting Furnaces
MU and TF series

- MU/MUV/MUVV series for hand pouring into molds, shell molds or ingot molds
- TF series for tilting pouring into molds, shell molds or ingot molds, up to 28,000 ccm crucible volume

Production of semi-finished material

- Multi-coloured rings
- Wires and tubes
- Strips, sheet and bars
- Granules
- Micro granules

Continuous Casting Machines CC series
Granulating Units GU series
Sintering Unit SU series

- CC series continuous casting machines also available as VCC versions with vacuum function for de-gassing of the metal
- GU units for the productions of granules or micro granules
- SU sintering unit for the productions of multi-coloured rings and bangles

Production of metal powders

- Metal powders for SLM, MIM and other Additive Manufacturing process
- Metal powders for recycling/refining process, press & sinter process and others

Metal Powder Production Plants AUG / AUW / AUS series
Metal Powder Air Classifiers AC series

- AUG series (gas atomization) for production of metal powders for Additive Manufacturing process
- AUW series (water atomization) for production of metal powders for recycling/refining process, press & sinter process
- AUS series (ultrasonic atomization), very compact solution for fast metal powder production
- AC series for metal powder classification and separation

MC SERIES PROGRAM CONTROLLED TABLETOP CASTING MACHINES

From model to casting within 1 hour!

The compact MC series was developed to provide jewellery designers, goldsmiths, development departments and dental laboratories with a cheap yet highly professional casting machine. Our most important aims were: extremely short processing time from mould manufacturing to completed casting; simple, safe operation; high quality and, above all, reproducible casting results; and low operating costs. The overwhelming global success of the MC series in numerous industries – including some not originally envisaged – emphatically confirms the MC concept.

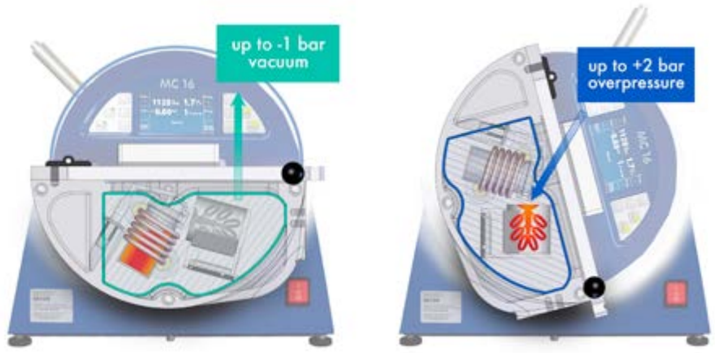
For even more than just for lost wax casting

The MC series machines are also used

- for analytic purposes where material samples needs to be molten down, homogenized and cast into a defined shape (also possible for powder)
- for the production of small quantities of cast semi-finished material like rods or sheet

Ingeniously simple = simply ingenious

With the MC machines, you can easily cast by hand from the crucible to your mould and feel what you are doing – just as it has been done for thousands of years. So that this works consistently and safely, the entire melting/casting unit is tilted together through a 90° angle. For perfect balance and to make do with as few moving parts as possible, almost the whole machine moves during tilting: being cylindrical in design, the whole moving section rotates as if in a halfpipe – ingeniously simple and stylishly designed on high-quality rollers. However, unlike manual casting, the process takes place in an enclosed chamber under a vacuum or inert gas atmosphere, to prevent air pockets and oxidation. You can check the melting and pouring-off process through the sight glass.



After pouring, the MC series automatically switch to overpressure in order to optimise the mould filling even for delicate parts. Alternatively it is also possible to keep the vacuum.

Full text LCD display for fine adjustment and serial programming

The new operating system features individual setting of parameters to achieve maximum performance from every pattern mould and every alloy. Thanks to the transparent layout of the menu structure and full text display, all settings are quick and easy to program. Of course all process parameters can be saved for repeated castings.

Vibration technology for excellent casting quality

The MC machines with the "V" suffix are equipped with the Indutherm vibration system (see page 20). Vibration switched on directly after casting is a decisive factor in enhancing mould filling with very filigree parts. It prevents porosity, ensures a finer grain structure and allows greater and more constant density. Parts have measurably higher elasticity and this increases the scope for further processing significantly.

Vibration technology is a compelling alternative to the frequently used and relatively delicate centrifugal systems, especially when casting platinum or palladium.

Handling the mini casting system is extremely simple:

1| Fill in the material and heat up.

2| Define your considered process parameters e.g. atmosphere: vacuum, inert gas atmosphere, overpressure

3| Take the mold from oven and insert into the machine. The device itself looks after all additional functions – until we get to the stroke of genius:

4| Pouring off takes place using a 90° rotation of the casting unit. After pouring, the MC machine automatically switches to overpressure in order to optimise the mould filling even for delicate parts.

MC SERIES – CHOOSE THE VERSION PERFECTLY FITTING TO YOUR NEEDS

MC 16, the basic model

- Up to 2,000° C
- Run of process with controller
- LCD-display with all program data (20 programs)
- For graphite and for ceramic crucibles, temperature up to 2000° C
- Very easy to use, short training period
- Perfectly suited for small castings and small series
- 3.5 KW induction generator for fast heating
- Even for the casting of steel and platinum

MC 20 V with vibration technology

- Up to 2,000° C
- Systematically designed for intricate casting projects and for continuous operation
- Equipped with our vibration system – for better form filling, creating casts with greater, more consistent densities, higher elasticity and greatly reduced porosity
- Overpressure of up to 3 bars (casting under vacuum also possible)
- Optical pyrometer for temperature measurement up to 2000° C

MC 60 V for gold, silver, copper ...

- Up to 1,300° C
- Basing on the same technology as the MC 16, but larger melting/casting unit with much higher capacity
- Hence reduced maximum temperature (1300° C), perfect for gold and silver casting
- LCD-display with all program data
- Vibration technology
- Excellent ratio machine size to capacity: molds up to Ø 100 mm x 120 mm h

Perfectly suited for a fast workflow from 3D design > 3D print > casting

MC 100 V – high temperature plus capacity

- 8 kW (3x400 V) power generator for maximum temperature up to 2000° C
- High capacity: crucibles with casting volume of up to 450 g Au 18ct or 500g Pt, for use of molds up to Ø 100 mm x 120 mm h
- Vibration system
- Overpressure of up to 3 bars (casting under vacuum also possible)
- Optical pyrometer for temperature measurement up to 2000° C

Optical pyrometer

Main benefits of all MC machines

- Very simple and safe to operate, short training periods
- All process parameters can be set individually and saved for repeated castings
- Excellent mould filling thanks to high overpressure and vibration system

A complete casting system covering just a few square fee

1. Vacuum investment machine INDU MIX for bubble-free mixing of the investment compound and filling of the mold. The integrated vibrator eliminates any possible air bubbles.

   Indumix 2+ for 1 mold 100 x 120mm (Ø x h)
   Indumix 3+ for up to 3 molds 100 x 120mm (Ø x h)
   Indumix 4+ for 1 mold 130 x 250 mm (Ø x h)

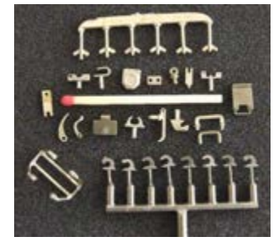
2. 1,000°C furnace AK 20 for melting out the wax and burning out the form. Temperature pre-selection, high-quality insulation.

AK 20 interior size:	~ 300 x 300 x 200 (h) mm
Also available AK 50:	~ 300 x 450 x 315 (h) mm
Also available AK 135:	~ 410 x 620 x 575 (h) mm

3. MC series casting machine

4. Sand blasting cabinet for easy removal of plaster: air pressure requirement: 270 l/min at 10 bar, 150 l/min at 5 bar, connection for suction system, foot switch for adjusting pressure.

A significant factor for the economic efficiency is the low quantity of metal that must be calculated for button.



Perfectly suited for casting of micro parts

When precision counts ...

MC SERIES SMALL HIGH TEMPERATURE CASTING MACHINES

MC FOR GOLD AND SILVER

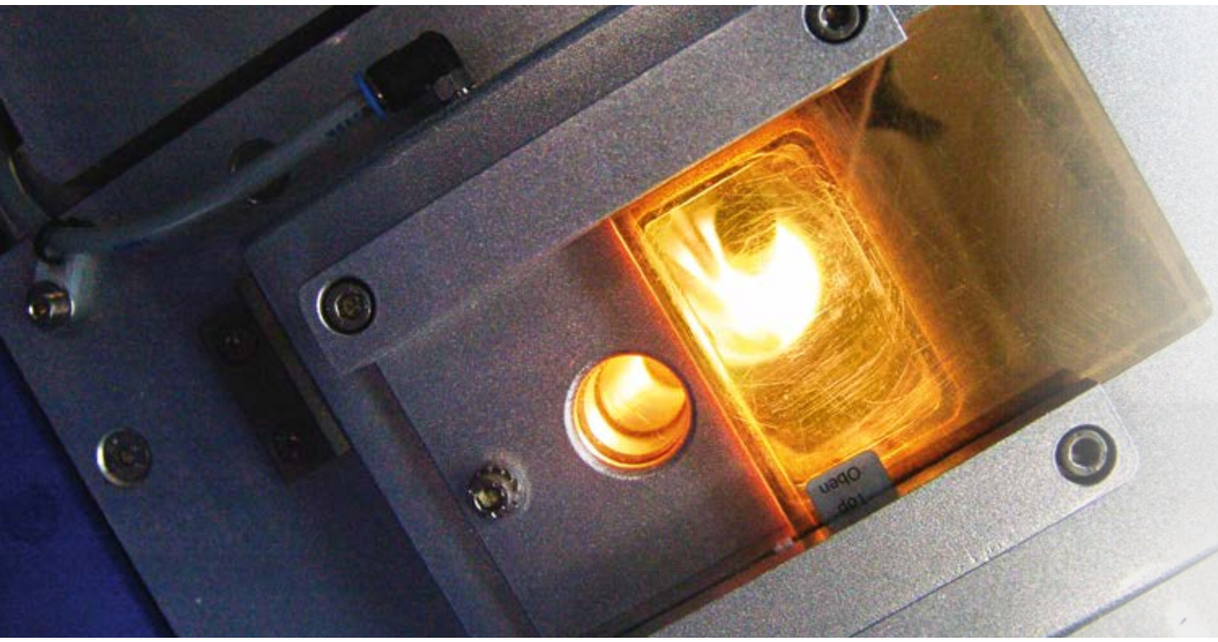
MC SERIES LARGE HIGH TEMPERATURE CASTING MACHINE

	MC 16	MC 20 V	MC 60 V	MC 100 V
performance				
power max. / electrical connection	3.5 kW 230 V single phase	3.5 kW 230 V single phase	3.5 kW 230 V single phase	8 kW 3x400 V
temperature max.	2000° C	2000° C	1300° C	2000° C
capacity				
casting volume	100 g Au 18 ct / 60 g Cu 110 g steel / 200 g Pt	100 g Au 18 ct / 60 g Cu 110 g steel / 200 g Pt	450 g Au 18 ct / 250 g Cu 300 g Ag 935	450 g Au 18 ct / 250 g Cu 250 g steel / 500 g Pt
for use of molds	up to ø 30/50/65/80 mm x 80 mm h	up to ø 30/50/65/80 mm x 80 mm h	up to ø 80/100 mm x 120 mm h	up to ø 80/100 mm x 120 mm h
handling+control				
control panel	by LCD-Display, full text readout	by LCD-Display, full text readout	by LCD-Display, full text readout	by LCD-Display, full text readout
automatic vacuum function	■	■	■	■
automatic overpressure function	■	■	■	■
casting also under vacuum only	■	■	■	■
vacuum or overpressure after casting	■ –1 up to +2 bar	■ –1 up to +3 bar	■ –1 up to +2 bar	■ –1 up to +3 bar
function washing by inert gas	■	■	■	■
vibration system	–	■	■	■
supply: cooling water, inert gas argon or nitrogen	■	■	■	■
temperature measurement/control	■ up to 1,300°C ○ up to 1,600°C	■ up to 2,000°C	■ up to 1,300°C	■ up to 2,000°C
equipped with an optical pyrometer/dual wave pyrometer	–	■ / ○	–	■ / ○
quality management				
RS 232, Ethernet, USB interface, diagnostic system	■	■	■	■
GSM-modem for remote service	○	○	○	○
DMS / InduthermCloud / iThermControl	■ / ○ / ○	■ / ○ / ○	■ / ○ / ○	■ / ○ / ○
accessories				
vacuum investment mixer Indumix 2+/Indumix 3+	○	○	○	○
furnace AK 20/AK 50	○	○	○	○
sand blasting cabinet	○	○	○	○
vacuum pump, up to 8 m³/h / up to 21 m³/h	○ / –	○ / –	○ / ○	– / ○
floor unit	–	–	–	○
water chiller	○	○	○	○

■ = standard equipment ○ = optional

The MC 100 V as standalone version. The floor base offers enough space to accommodate accessories, for example the vacuum pump.

THE VTC SERIES:
FOR EVERY METAL OR ALLOY YOU WANT TO CAST



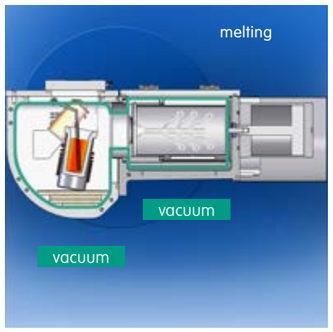
Casting trees in steel and in gold

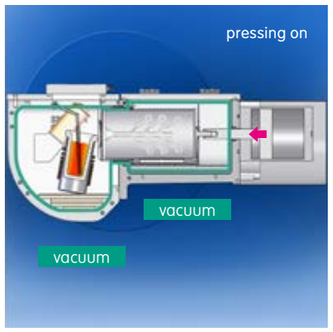
VTC vacuum/pressure casting machines

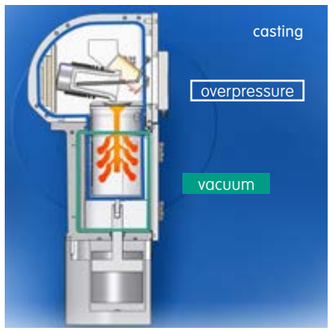
The VTC 100 V – VTC 800 V are extremely versatile casting machines suitable for a wide range of applications. While the VTC series was originally designed as a high-temperature casting machine for casting steel, palladium, platinum etc. (max. 2,100°C), large molds also make it suitable for economically producing castings in gold, silver and other materials.
As well as casting with molds, casting into ingot molds is also possible.

The machine combines a dual-chamber differential pressure system with a tilting mechanism. The casting process is achieved by rotating the entire melting-casting unit by 90°. One benefit of the tilting system is the use of economically priced graphite or ceramic crucibles instead of crucibles with holes and sealing rods; these tend to have a longer service life. Some alloys, such as copper beryllium, quickly cause crucibles with holes and sealing rods to become untight and therefore useless, and for this reason, many users have so far processed such alloys only in open systems – which means they can't choose to optimise the process with overpressure or vacuum. With the VTC series, these handicaps don't apply.

A vacuum can be produced in the melting chamber and the casting chamber to avoid oxidation processes during melting and air pockets in the casting mould.







The mold is automatically pressed against the melting chamber for casting, making it possible to switch to overpressure during casting for better mould filling; in addition, the vibration technology optimises the process even further.

Sweep mode vibration system for perfect results even in Pt and Pd

Due to the vibration technology (see page 26) and the sophisticated vacuum/pressure system, this machine is perfectly suited to casting platinum and palladium – and all without an elaborate and sensitive centrifugal mechanism. The VTC machines are equipped with the advanced sweep mode vibration system. It considers that each casting tree and even each item of a tree has a different resonance frequency, depending on its shape and size. Generating variable frequencies the sweep mode vibration ensures that the optimum frequency is covered.

Handling and control

Operation is simple and safe thanks to a clearly arranged and easy-to-use LCD display. All parameters, right down to the variable tilting speed, can be individually set and saved to ensure that recurring castings always produce consistent results.

The high vacuum casting systems VTC 100 V Ti - VTC 800 V Ti

The VTC Ti series is a cost-effective solution for casting highly reactive metals such as titanium, copper beryllium, amorphous steel etc.
Following numerous modifications, such as completely reconstructed valves and hose connections, special seals and an evacuation and inert gas flushing process tailored to the machine, the prerequisites for the required vacuum of 10^{-3} mbar were met. Furthermore, special crucibles and inductors were developed, as the ceramic crucibles that are normally used also react with titanium. They also reduce melting times – and the shorter the melting time, the less time there is for a possible reaction.

Graphite crucible and ceramic crucible

THE VTC SERIES
VACUUM PRESSURE CASTING MACHINES

The new control system with LCD Display

The casting process is achieved by rotating the entire melting-casting unit by 90°.

Mold size
Ø125 mm x 220 mm

	VTC 100 V / Ti	VTC 200 V / Ti
performance		
power max. / electrical connection	12 kW 3x400 V	15 kW 3x400 V
temperature max.	2100° C	2100° C
capacity		
volume graphite crucible	25 ccm = 450 g Au 18 ct / 250g Cu	145 ccm = 2.0 kg Au 18 ct / 1.2 kg Cu
volume ceramic crucible	30 ccm = 600 g Pt / 250 g steel	180 ccm = 2.5 kg Pt / 1 kg steel
for use of molds up to	■ 125 mm / 220 mm h	■ 125 mm / 220 mm h
	O 125 mm / 350 mm h	O 125 mm / 350 mm h
handling+control		
vibration technology	■ sweep mode	■ sweep mode
automatic tilting with motor drive	■	■
automatic mold fixing	■	■
casting programs	100	100
temperature measurement	thermocouple up to 1,300°C	thermocouple up to 1,300°C
	optical pyrometer up to 2,000°C	optical pyrometer up to 2,000°C
quality management		
RS 232, Ethernet, USB interface, diagnostic system	■	■
data printer	■	■
GSM-modem for remote service	■	■
DMS / InduthermCloud / iThermControl	■ / O / O	■ / O / O
accessories/peripheral equipment		
pyrometer with video output	O	O
vacuum investment mixer Indumix 4+	O	O
furnace AK 135	O	O
water chiller, vacuum pump ...	O	O

	VTC 400 V / Ti	VTC 800 V / Ti
performance		
power max. / electrical connection	20 kW 3x400 V	20 kW 3x400 V
temperature max.	2100° C	2100° C
capacity		
volume graphite crucible	300 ccm = 2.5 kg Cu	600 ccm = 4.0 kg Cu
volume ceramic crucible	300 ccm = 2.0 kg steel	600 ccm = 4.0 kg steel
for use of molds up to	■ 125 mm / 220 mm h	■ 125 mm / 220 mm h
	O 125 mm / 350 mm h	O 125 mm / 350 mm h
handling+control		
vibration technology	■ sweep mode	■ sweep mode
automatic tilting with motor drive	■	■
automatic mold fixing	■	■
casting programs	100	100
temperature measurement	thermocouple up to 1,300°C	thermocouple up to 1,300°C
	optical pyrometer up to 2,000°C	optical pyrometer up to 2,000°C
quality management		
RS 232, Ethernet, USB interface, diagnostic system	■	■
data printer	■	■
GSM-modem for remote service	■	■
DMS / InduthermCloud / iThermControl	■ / O / O	■ / O / O
accessories/peripheral equipment		
pyrometer with video output	O	O
vacuum investment mixer Indumix 4+	O	O
furnace AK 135	O	O
water chiller, vacuum pump ...	O	O

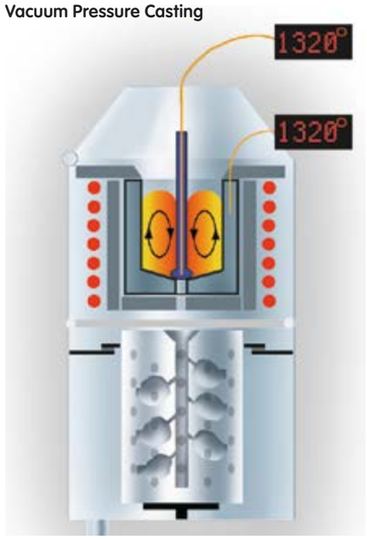
■ = standard equipment O = optional

Find the casting solution perfectly fitting to your requirements

The range of our VC series machines reach from small to very large capacities, from semi-automatic systems to solutions for a fully automated casting production. A lot special features are enabling you to optimize each casting according to its individual characteristics.

Melting by induction technology: The crucible with the material is located in the core of the induction coil. By generating a strong alternating magnetic field, the result is a strong alternating current in the graphite crucible and in the metal. This leads to fast heating up and thorough mixing of the material.

Vacuum Pressure Casting



Efficient process handling

Separate lock systems for Overlapping Casting
All Indutherm VC machines have separate lock systems for the melting chamber and mold chamber. This allows time to be saved by "overlapping" casting: while the mold remains in the vaccuum chamber for several minutes after the casting, you may fill in and heat up the next charge.

Pneumatic bell lock and closing system
The melting chambers of all VC machines are locked by a pneumatic system. VC 650 V and VC 680 V are additionally equipped with an automatic closing system.

Automatic mold and chamber lift
The mold lift facilitates the handling of the molds. When swivelling-in the vacuum chamber, the inserted mold is lowered and then the chamber is automatically docked. When opening the chamber, the mold is lifted for easy take out. This way you can use of economic molds without flange.

Program control system for fast and certified casting processes
Thanks to the control panel with full text LCD display, all programs and parameters are very easy and convenient to set. The semi-automatic machines offer temperature programs. The fully automatic machines have a program control system involving all parameters. Up to 100 casting programs guarantee fast operation and consistent casting results. Parameters are pre-programmed for all major alloys, e.g. for AGS, Alpha Plus, Heraeus, Legor and Pandora alloys. In practice this means: from the first mold, you can expect good casting results without carrying out expensive pre-tests.
The program control and the integrated data printer ensure a high level of safety and the possibility of precise process documentation (important for certified casting processes).

Industry 4.0 ready
As all our systems the VC series machines are equipped with a software and interface management that allows remote service and support and forms the base for future networking with other systems.

Pressure conditions and control – essential for your perfect casting result

Automatic vacuum and overpressure in the melting and mold chambers
Vacuum in the melting chamber provides the degassing of the alloy and avoids undesired oxidation during melting (a low oxygen content is particularly important when casting silver or red gold). Vacuum in the mold chamber during casting improves the form filling when casting filigree parts and avoids air inclusions. In addition, the system switches to overpressure in the melting chamber and increases the pressure difference.

Oxidation-reduced Casting system
This special feature eliminates the danger of oxidation while the mold is cooling down.

Turbulence Reduction Software
TRS ensures a faster and more laminar metal flow. It improves form filling and avoids that investment particles are broken off at critical areas of the form.

Turbo Pressure / Turbo Pressure PLUS
It optimises the casting of very small and filigree objects and guarantees perfect results when casting with stones. Turbo Pressure allows a precisely defined pressure to be achieved rapidly. For all program-controlled VC models, depending on the selected program the Turbo Pressure will start automatically exactly at the required time.
The **Turbo Pressure PLUS system** allows an even higher and faster pressurizing.

HSC – High Speed Casting
HSC improves even more the filling and surface quality of filigree designs or those with large and flat surfaces. With HSC it's possible to cast treated colour stones with low mold temperature.

Precise temperature control

Dual temperature control
Temperature measurements in both the crucible wall and the crucible center (integrated into the sealing rod) mean the temperature limits are strictly adhered to.

Mold temperature measurement
Until recently molds with incorrect or different temperatures were a safety risk. During casting of very small or delicate parts the temperature of the mold is of utmost importance. The measurement of the mold temperature (standard for the machines VC 650 V and VC 680V) is an important feature with regards to safety. The temperature of the mold can be monitored to within one degree.

THE INDUTHERM VIBRATION TECHNOLOGY

Vibration technology for enhanced casting results

The Indutherm Vibration System

- Vibration during casting generally improves material flow and mould filling
- Castings exhibit a higher and more consistent density
- Porosity is substantially reduced
- 50% smaller grain size
- Risk of hot cracks is reduced.
- Castings have greater stress and elasticity properties, making them easier to process further.

In practice this means: higher and more consistent quality, less waste, less post-processing, better deformability.

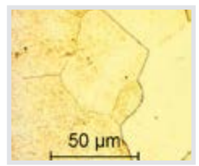
A customer in USA has discovered that by using Indutherm vibration technology the total production time including post-processing has been reduced by 25% (compared with a machine without vibration).

Sweep Mode Vibration System

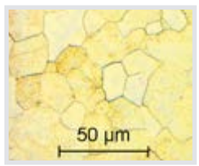
The new sweep mode vibration system can do even more: it considers that each casting tree and even each item of a tree has a different resonance frequency, depending on its shape and size. The sweep mode vibration generating variable frequencies covers all natural resonances.

porosity without vibration

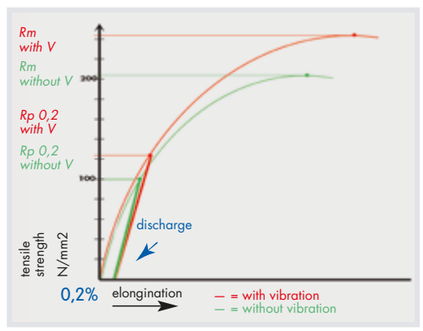
porosity with vibration



*grain structure without vibration**



*grain structure with vibration**



elongation limit ~12% better with vibration
tensile strength ~25% better with vibration

**Au 18 ct: 750 Au,128 Ag, 122 Cu*

THE SEMI-AUTOMATIC VC VERSIONS

VC 400

VC 500 with an optional granulating tank

VC 400

The ideal machine for smaller companies producing moderate quantities but needing considerably more capacity than that offered by the MC machines. Often, experienced casters are not particularly interested in automated functions or program control, and they can achieve the same quality with the VC 400 machine as with more advanced ones. Its induction generator guarantees fast heat-up and thorough mixing of the molten metal by inductive bath movement. VC 400 and VC 500 do not only provide the Turbo Pressure function, in addition they also switch to overpressure automatically after casting.

VC 500

For larger production quantities with continuous casting operation, greater performance (shorter casting times) with even larger crucibles and mold capacities (molds up to 160 mm ø/400 mm H) is important. The high maximum temperature of 1,600°C extends the possible range of alloys. Temperature measurements in both the crucible and the mold mean the best possible repeat accuracy in the process. If alloys are changed frequently, 20 different temperature programs simplify working procedures.

	VC 400	VC 500
performance		
power max. / electrical connection	3.5 kW 230 V or 4.5 kW 3x400 V	10 kW 3x400 V / 3x208 V
temperature max.	1400° C	1600° C
capacity		
crucible volume	■ 170 ccm = 2.5 kg Au 18 ct / 1,5 kg Cu*	■ 245 ccm = 3.6 kg Au 18 ct / 2 kg Cu*
		O 386 ccm = 5.8 kg Au 18 ct / 3.3 kg Cu*
for use of molds up to	ø 130 mm / 240 mm h	■ ø 130 mm / 240 mm h
		O ø 160 mm / 400 mm h
handling+control		
maximum pressure	■ 1.5 bar/O 3.0 bar	■ 1.5 bar/O 3.0 bar
automatic bell lock	■	■
program control/programs	by LCD-display, full text readout/20	
dual temperature control	O	O
mold and chamber lift	■	■
variable vacuum in mold chamber	■	■
turbo pressure system	■	■
turbulence reduction software	■	■
quality management		
RS 232, Ethernet, USB interface,		
diagnostic system	■	■
data printer	–	–
GSM-modem for remote service	O	O
DMS / InduthermCloud / iThermControl	■ / O / O	■ / O / O
accessories/peripheral equipment		
sintering kit (for diffusion bonding)	O	O
granulation tank/flake option	O / O	O / O
water chiller, vacuum pump ...	O	O
other versions		
also available as granulating unit	–	GU 500

* Liquid metal up to top level of the crucible
■ = standard equipment O = optional

THE FULLY AUTOMATIC VC MACHINES

picture: VC 450

picture: VC 480 V with optional vacuum chamber for large molds

picture: VC 650 V

picture: VC 680 V

VC 450

The VC 450 is equipped with a program control system with full text read out LCD display. 20 different casting cycles may be stored for reproducible and consistent casting results. Optionally this machine is also available with INDUTHERM vibration system (VC 450 V).

VC 480 V

In addition to the technical equipment of the VC 450, the VC 480 V comes with an 8 kW generator, an advanced program control with 100 casting programs, automatic mold and chamber lift, variable vacuum in the flask chamber and the INDUTHERM vibration system.

VC 650 V

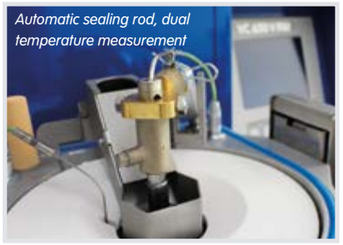
The fully equipped VC 650 V is convincing by very high speed and casting quality. High crucible capacities, sweep mode vibration system and up to 3 bar overpressure are the essential advantages predestining this machine for large productions.

VC 680 V

The VC 680 V is based on the VC 650 V. However, the filling device provided as standard means there is no need to open the melting chamber for refilling. This way, the melting chamber temperature remains high and unnecessary loss of energy is avoided. Most importantly: No oxygen enters the melting chamber so the chamber does not need to be evacuated again and refilled with inert gas.

The advantages:

- lower personnel costs
- more consistent casting quality
- better process stability, less waste
- optimised overlapping casting
- up to 20 casting cycles per hour
- high energy efficiency
- longer service lives for consumables
- minimised metal loss
- replenishment without loss of pressure



Automatic sealing rod, dual temperature measurement

* Liquid metal up to top level of the crucible
** with additional gas tank for Turbo pressure PLUS
■ = standard equipment ○ = optional

	VC 450 / VC 450 V	VC 480 V	VC 650 V (HTC)	VC 680 V (HTC)
performance				
power max. / electrical connection	4.5 kW 3x400 V	8 kW 3x400 V	12 kW 3x400 V	12 kW 3x400 V
temperature max. indirect inductive heating	1400° C	1600° C	1700° C	1700° C
direct inductive heating/HTC			1850° C / 2000° C	1850° C / 2000° C
capacity				
crucible volume	■ 170 ccm = 2.5 kg Au 18 ct / 1,5 kg Cu*	■ 170 ccm = 2.5 kg Au 18 ct / 1,5 kg Cu*	■ 245 ccm = 3.6 kg Au 18 ct / 2 kg Cu*	■ 245 ccm = 3.6 kg Au 18 ct / 2 kg Cu*
		○ 245 ccm = 3.6 kg Au 18 ct / 2 kg Cu*	○ 386 ccm = 5.8 kg Au 18 ct / 3.3 kg Cu*	○ 386 ccm = 5.8 kg Au 18 ct / 3.3 kg Cu*
			○ 700 ccm =10.5 kg Au 18 ct / 6 kg Cu*	○ 700 ccm =10.5 kg Au 18 ct / 6 kg Cu*
for use of molds up to	ø 130 mm / 240 mm h	■ ø 130 mm / 240 mm h	■ ø 130 mm / 240 mm h	■ ø 130 mm / 240 mm h
		○ ø 160 mm / 400 mm h	○ ø 160 mm / 400 mm h	○ ø 160 mm / 400 mm h
handling+control				
vibration technology	– / ■ VC 450 V	■	■ in sweep mode	■ in sweep mode
automatic bell lock/automatic closing system	■/–	■/–	■/■	■/■
maximum pressure	■ 1.5 bar/○ 3.0 bar	■ 1.5 bar/○ 3.0 bar	3 bar	3 bar
program control/number of programs	■ by LCD-display, full text readout/20	■ by LCD-display, full text readout/100	■ by LCD-display, full text readout/100	■ by LCD-display, full text readout/100
dual temperature control	○	○	○	○
mold temperature measurement	–	–	■	■
automatic feeding system w/ autom. sealing rod	–	–	–	■
automatic mold and chamber lift	■	■	■	■
variable vacuum in mold chamber	–	■	■	■
Turbo Pressure/Turbo Pressure PLUS system	■/–	■/○	■/■	■/■ **
turbulence reduction software	■	■	■	■
HSC feature	○	○	○	○
quality management				
RS 232, Ethernet, USB interface, diagnostic system	■	■	■	■
data printer	○	○	■	■
GSM-modem for remote service	○	○	■	■
DMS / InduthermCloud / iThermControl	■ / ○ / ○	■ / ○ / ○	■ / ○ / ○	■ / ■ / ■
accessories/peripheral equipment				
sintering kit (for diffusion bonding)	○	○	○	○
granulation tank/flake option	○ / ○	○ / ○	○ / ○	○ / ○
water chiller, vacuum pump ...	○	○	○	○

THE VACUUM PRESSURE CASTING MACHINES FOR LARGE CASTING PARTS

picture: VC 1000 V with feeding system and window door

VC 3000 V with large mold chamber

VC 12000 V

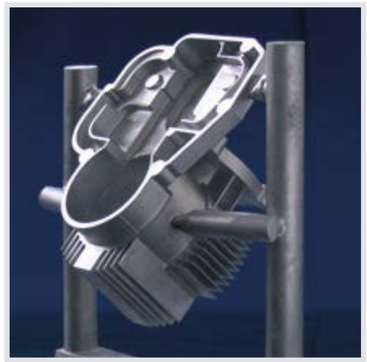
Capacity and power for large scale projects

Our large vacuum pressure casting machines are mostly used for precise castings in aluminium alloys or for art and crafts objects in brass or bronze. They are always the first choice for parts with complicated geometry or when the number of pieces is not large enough for die-cast production.

Our large VC machines offer the best pre-conditions for high quality castings in aluminium: the hydrogen content of aluminium alloys may be adjusted by regulating the vacuum during melting. This way, foaming of molten metal can be avoided without any melt additives. Overpressure in the melting chamber during and after casting and simultaneous vacuum in the mold chamber optimise form filling especially in filigree or thin-walled areas.

The new standard

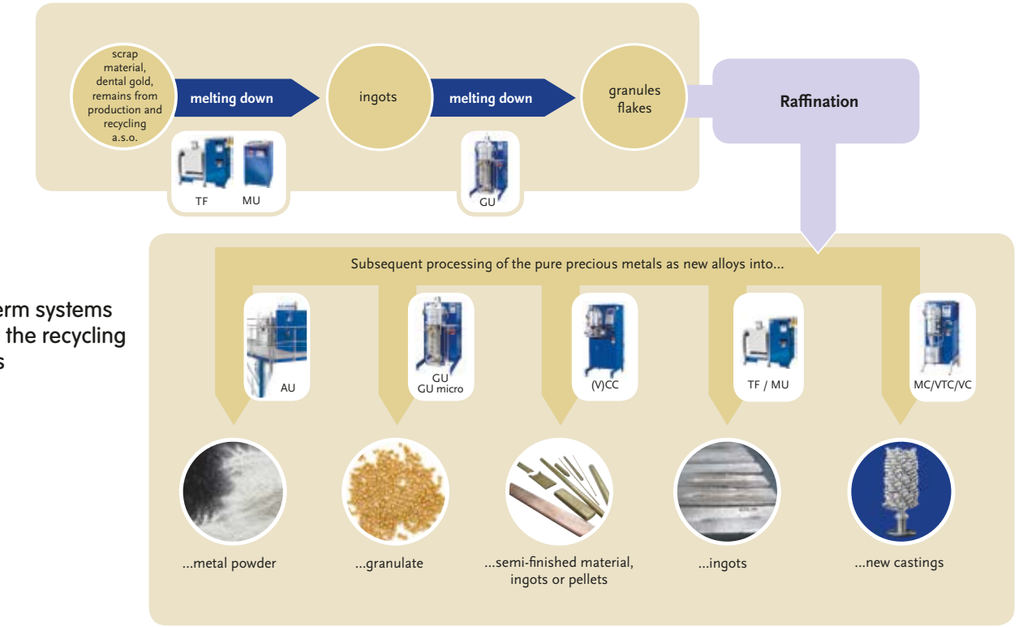
All VC machines are equipped with a program control system with 100 programs. The control panel with full text LCD display enables the user to set all programs and parameters very easy and convenient. VC 1000 V - VC 12000 V use the vibration technology for improved casting results especially concerning form filling and further processing properties.



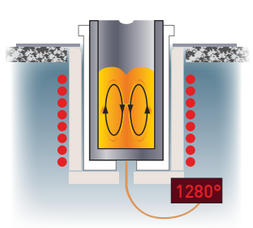
	VC 1000 V (HTC)	VC 3000 V (HTC)	VC 12000 V (HTC)	VC 25000 V
performance				
power max. / electrical connection	20 kW 3x400 V	30 kW 3x400 V	40-60 kW 3x400 V	60 kW 3x400 V
temperature max. indirect inductive heating	1500° C	1500° C	1300° C	1300° C
direct inductive heating/HTC	1850° C / 2000° C	1850° C / 2000° C	1850° C	
capacity				
crucible volume in liters* (HTC)	1.5 l (1.7) = 4 kg Al / 12 kg Cu / 12 kg steel*	3.4 l (3.9) = 8.5 kg Al / 25 kg Cu / 25 kg steel*	12 l (14) = 30 kg Al / 90 kg Cu / 90 kg steel*	25 l = 65 kg Al / 200 kg Cu*
for use of molds up to	ø 250 mm / 500 mm h	ø 450 mm / 600 mm h	ø 600 mm / 800 mm h	ø 600 mm / 800 mm h
handling+control				
vibration technology	■	■	■	–
automatic bell lock	■	■	■	■
maximum pressure	0.5 bar	0.3 bar	0.3 bar	0.3 bar
program control (100 programs)	■ by LCD-display, full text readout	■ by LCD-display, full text readout	■ by LCD-display, full text readout	■ by LCD-display, full text readout
dual temperature control	■	■	■	■
automatic mold and chamber lift	■	■	–	–
variable vacuum in mold chamber	■	■	■	■
turbulence reduction software	■	■	■	■
quality management				
RS 232, Ethernet, USB interface, diagnostic system	■	■	■	■
data printer	■	■	■	■
GSM-modem for remote service	■	■	■	■
DMS / InduthermCloud / iThermControl	■ / ○ / ○	■ / ○ / ○	■ / ○ / ○	■ / ○ / ○
accessories/peripheral equipment				
granulation tank/flake option	○ / ○	○ / ○	○ / ○	○ / ○
water chiller, vacuum pump ...	○	○	○	○

* Liquid metal up to top level of the crucible – other volumes on request. ■ = standard equipment ○ = optional

MELTING UNITS FOR HANDPOURING AND RECYCLING



Indutherm systems used in the recycling process



Melting by induction technology: The crucible with the material is located in the core of the induction coil. By generating a strong alternating magnetic field, the result is a strong alternating current in the graphite crucible and in the metal. This leads to fast heating up and thorough mixing of the material.

With the MU- and MUV-series we offer melting machines for many different needs and with crucible capacities from 155 ccm up to 1,200 ccm. The material is molten in open crucibles and poured by hand into the casting mould or ingot mould.

Melting Units MU Series

These melting furnaces are designed to melt gold and silver alloys and as well as aluminium, bronze, brass.
Due to the strong induction generator (15 kW) and the low induction frequency the stirring effect of the metal is excellent.

The MU as vacuum casting machine: MUV/MUVV Series

The V-versions include one or two additional extra large capacity vacuum chambers. Evacuating the mold immediately after pouring improves the form filling, reduces porosity and avoids oxidation of the hot metal.

The melting machine MU 200 C

The MU 200 C is designed for melting metals with a high melting point, such as steel, palladium, platinum, chrome-cobalt etc. by the direct inductive heating system.

MU / MUV / MUVV series

MU / MUV / MUVV 200 C

high temperature melting machine for steel, platinum, palladium, chrome-cobalt…

	MU 200 MUV/MUVV 200	MU 400-1200 MUV/MUVV 400-1200	MU 200 C MUV/MUVV 200 C
performance			
power max. / electrical connection	3.5 kW 230 V or 6 kW 3x400 V	10-15 kW 3x400 V	12 kW 3x400 V
temperature max.	1300° C / or 1500° C	1500° C 1850° C **	2000° C
		MU/MUV/MUVV 400: 10 kW MU/MUV/MUVV 700: 12 kW MU/MUV/MUVV 900: 15 kW MU/MUV/MUVV 1200: 15 kW	
capacity			
crucible volume	155 ccm = 2.0 kg Au 18ct / 1.2 kg Cu *	MU/MUV/MUVV 400: 400 ccm** = 5.0 kg Au 18ct/3.2 kg Cu*	155 ccm = 2.5 kg Pt / 1 kg steel *
	–	MU/MUV/MUVV 700: 700 ccm** = 8.5 kg Au 18ct/5.5 kg Cu*	–
	–	MU/MUV/MUVV 900: 900 ccm** = 11 kg Au 18ct/7.2 Kg Cu*	–
	–	MU/MUV/MUVV 1200: 1200 ccm** = 14.5 kg Au 18ct/10kg Cu*	–
(non-)perforated molds with/without flange	■ up to ø160 mm/400 mm h (MUV/MUVV)		■ ø 160 mm / 400 mm h (MUV/MUVV 200 C)
handling+control			
temp. measurement by thermocouple		■	–
temp. measurement by optical pyrometer		O	O
temperature control		■	■
temperature programs		20	–
DMS / InduthermCloud / iThermControl		■ / O / O	■ / O / O
quality management			
RS 232, Ethernet, USB interface, diagnostic system		■	■
GSM-modem for remote service		O	O
accessories/peripheral equipment			
water chiller, vacuum pump ...		O	O

* real capacity for casting / useful volume ** high temperature versions with reduced crucible volume ■ = standard equipment O = optional

TF SERIES TILTING FURNACES FOR MELTING AND POURING LARGE QUANTITIES

TF 4000 *TF 12000*

Power, efficiency and safety

TF 6000, TF 12000 and TF 28000 – the giants among the tilting furnaces

The TF series tilting furnaces are equipped with 32-bit induction generators providing 25 - 60 kW output power (depending on version). Low-frequency tuning means excellent through-mixing of the molten material. All versions are controlled via a console with an LCD display with full text readout.
Efficient thermal insulation and electro-magnetic shielding ensure a high level of effectiveness. Comparison tests carried out by a customer proved that the TF 12000 has a higher level of productivity than a competitor model with twice the performance and correspondingly twice the energy costs.

The large crucible volumes of 6,000, 12,000 or 28,000 ccm gives these machines an enormous capacity. Because of the potentially large weight, the inductor/crucible unit is not tilted manually – it uses a motor drive with a stable shaft. Use of a joystick enables the tilting process to be controlled easily and sensitively.

Some metals develop a lot of smoke and oxides during melting. It is better to melt them in open systems, with use of an air absorber.

No limitation in the material size.

Ideal for melting large parts: no sealing rod construction reduces the available space.

The cost-effective tilting furnaces TF 2000 and TF 4000

The „small" TF machines have been developed with the focus on least possible energy consumption and on safe and ergonomic handling.
The melting unit and crucible can be tilted and locked in position by the user at multiple angles for gentler filling. Such "soft pouring" also prevents damage to the crucible. Pouring off is continuous and gradual, using a pivot lever. The operator is forced to stand to the side of the machine – away from the dangers of the pouring area. In the rare event of a crucible breaking, the machine is not damaged – all of the assemblies are covered by a separate protective housing, and every model has a large collecting tray under the smelting unit to prevent potential loss of metal.

	TF 2000 / 4000 (HTC)	TF 6000 / 12000 (HTC)	TF 28000
performance			
power max. / electrical connection	20-30 kW 3x400 V	40-60 kW 3x400 V	60 kW 3x400 V
temperature max.	1500° C	1500° C	1500° C
temperature max. HTC version	1850° C	1850° C	
	TF 2000: 25 kW TF 4000: 30 kW	TF 6000: 40 kW TF 12000: 40 kW / 60 kW	
temperature measurement by thermocouple	■	■	■
capacity			
crucible volume	2 l = 30 kg Au 18 ct / 16 kg Cu / 15 kg steel* 4 l = 60 kg Au 18 ct / 32 kg Cu / 30 kg steel*	6 l = 90 kg Au 18 ct / 50 kg Cu / 50 kg steel* 12 l = 180 kg Au 18 ct / 100 kg Cu / 100 kg steel*	28 l = 70 kg Al / 200 kg Cu*
handling+control			
tilting by lever	■	–	–
tilting with motor drive (remote control)	–	■	■
temperature control	■ by LCD-Display, full text readout		
temperature programs	20	100	100
temp. measurement by optical pyrometer	○	○	○
quality management			
RS 232, Ethernet, USB interface, diagnostic system	■	■	■
GSM-modem for remote service	○	■	■
DMS / InduthermCloud / iThermControl	■ / ○ / ○	■ / ○ / ○	■ / ○ / ○
accessories/peripheral equipment			
protective gas flush to avoid oxidation	○	○	○
hood for smoke vent	○	○	○
moveable table (with customized molds)	○	○	○
water chiller	○	○	○

* real capacity for casting / useful volume ■ = standard equipment ○ = optional

CC/VCC SERIES CONTINUOUS CASTING MACHINES – OUR 5 IN 1 MULTITOOLS

5in1

CHANGE FUNCTIONS WITHIN 5 MINUTES!

(VACUUM) CONTINUOUS CASTING OF WIRES, SHEET AND TUBES

with numerous options for cutting or sawing into sections during casting, for bending or coiling. VCC series with inert gas/vacuum system for the melting chamber

PRODUCTION OF GRANULES

with the easy to install granulation tank

PRODUCTION OF FLAKES

for sintering/diffusion bonding or refining applications

PRODUCTION OF MULTI-LAYER RINGS AND BRACELETS

with the optional sintering/diffusion bonding kit

CASTING INTO INGOT MOLDS

or any other molds

More flexibility, lower costs

With an Indutherm continuous casting machine, you can produce your own alloys or semi-finished products in different shapes and sizes in the shortest time:

- **Wires or bars up to ø 90 mm**
- **Sheet and strips, e.g. ring production, for stamping and pressing**
- **Tubes, perfect as basic material for cutting in sections for wedding ring production**
- **Granules and flakes**

The use of a continuous casting machine can reduce your investment for material in storage considerably. Your processes will get faster, more flexible and more efficient.

Our continuous casting machines are equipped with a number of unique details which substantially improve the quality of the semi-finished material, e.g. the unique vacuum system or the QUATTRO DRIVE drawing system. For details see next page.

With a wide range of optionally available equipment the versatility of these machines may be enhanced even more.

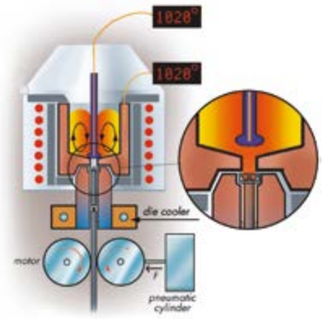
Maximum versatility

Granulation tank and flake kit
The easy to install granulation tank and the flake kit make each CC machine even more versatile. For details about granulation/flake production and about available tank sizes see page 42.

Sintering kit
Sintering/diffusion bonding is the optimum process for producing multi-coloured rings, mostly sold as wedding rings, or bracelets. Metals are processed under pressure and at temperatures below the solidification point. The pressure is generated pneumatically and not mechanically via a threaded spindle. This means that there is no risk of graphite parts breaking as a result of heat expansion. The fusion between layers has the same durability as the metal itself.
The sintering kit is ideal for the occasional diffusion bonding job and for smaller series production.

Bar casting kit
The bar casting kit is developed for casting defined quantities of your alloy into ingot molds or into any other molds. The program control recognizes the applicated equipment and provides the suited parameter settings on the display.

VCC VACUUM CONTINUOUS CASTING MACHINES – THE ONLY ONES WITH VACUUM AND QUATTRO DRIVE



Unique vacuum system

For highest quality of semi-finished material:
To reduce the risk of oxidation during melting and during drawing, we focus on avoiding oxygen contact and on fast reduction of the temperature of the drawn material.

Features for fast temperature reduction:
- Cooling water temperature measurement and automatic flow control
- Optical temperature measurement in the center of the die
- Die cooler
- Additional secondary cooling system at the outlet

Features to avoid oxygen contact:
- Vacuum system for the melting chamber – uniquely available for Indutherm continuous casting machines (VCC versions)
- Feeding system for re-charging without oxygen contact and with constant vacuum in the melting chamber
- Inert gas system for the melting chamber
- Inert gas flushing at the die
- Optical die temperature measurement

All these measures are ideal especially for alloys containing copper such as red gold or for silver as these materials tend to oxidise easily.

Secondary cooler at the outlet

Feeding system for re-charging with constant vacuum in the melting chamber

Quattro Drive System

On each of our continuous casting machines, the material is drawn off by motor driven and pneumatically pressed-on feed rolls.
A bar end control sensor stops automatically when the molten material is spent.

The optional **Quattro Drive** drawing unit with four instead of two motor driven feed rolls produces smoother tubes and sheeting with reduced marks of transportation.

The Quattro Drive System with four feeding rolls. On left side in the foreground the additional secondary cooling system, on the right side the movable LED spotlight for easier feeding control.

Numerous options for targeted production of semi-finished parts

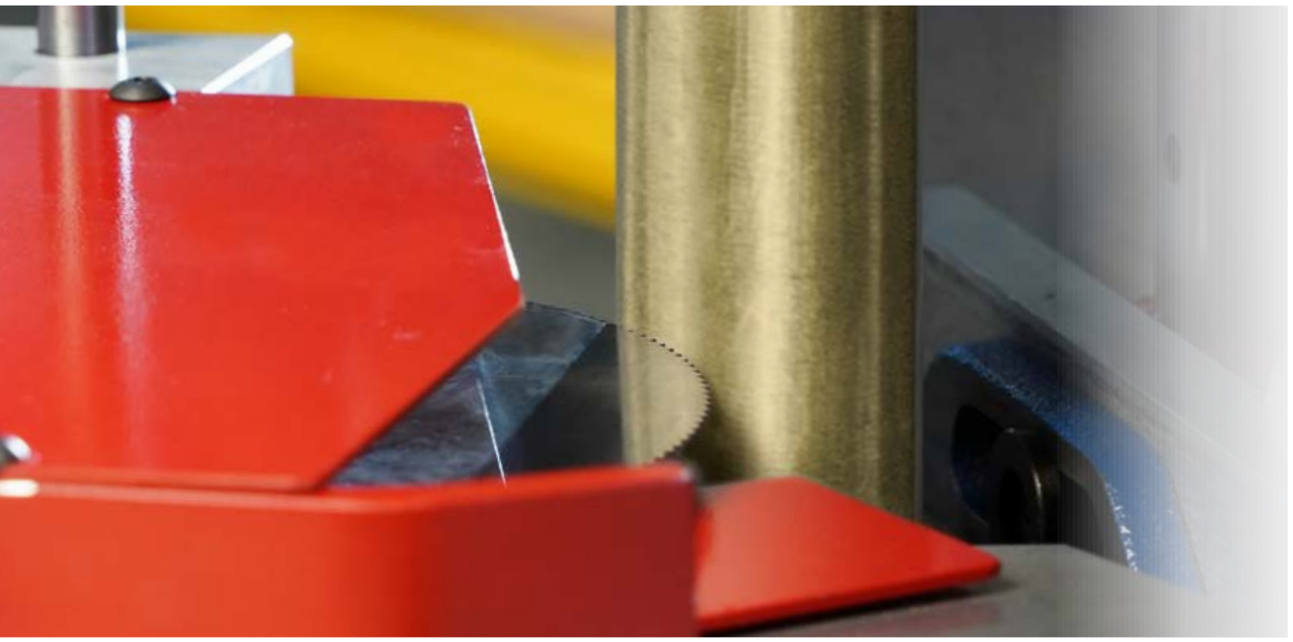
Bending unit
Using the bending unit attached to the bottom drawer, the material can be bent without mechanical force on the die.

Hydraulic cutter
The hydraulic cutter is suited for cutting wires into pre-defined sections.

Bending unit

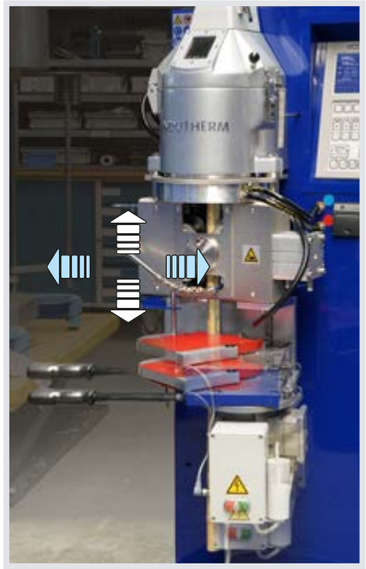
Pneumatic cutter

THE CONTINUOUS CASTING MACHINES



Continuous casting and cutting to size in one operation!

Flying saw for shorting during drawing
The swiveling electric saw (large picture above) moves synchronously with the drawn bar or tube. This way you can cut your material into defined sections during drawing. You don't need to stop the continuous casting process when maximum length is reached.



picture: VCC 400 with optional Quattro Drive

picture: VCC 1000 with Dual Drive

picture: CC 3000 with feeding device, Quattro Drive and flying saw

	CC 400 / VCC 400	CC 1000 / VCC 1000	CC 3000 / VCC 3000	CC 12000 / VCC 12000
performance				
power max. / electrical connection	15 kW 3x400 V / 3x208 V	20 kW 3x400 V	30 kW 3x400 V	40-60 kW 3x400 V
temperature max.	1500° C	1500° C	1500° C	1500° C
capacity				
crucible volume	■ 245 ccm = 3.6 kg Au 18 ct / 2 kg Cu*	■ 1.5 l = 4 kg Al / 12 kg Cu *	■ 3.4 l = 8.5 kg Al / 25 kg Cu *	■ 12 l = 30 kg Al / 90 kg Cu *
	○ 386 ccm = 5.8 kg Au 18 ct / 3.3 kg Cu*			
	○ 700 ccm =10.5 kg Au 18 ct / 6 kg Cu*			
wire / tube production up to	■ ø 20 mm** / ■ ø 45 mm**	■ ø 40 mm** / ■ ø 65 mm**	■ ø 70 mm** / ■ ø 90 mm**	■ ø 70 mm** / ■ ø 90 mm**
sheet production	■ 50 x 8 mm / ○ 60 x 8 mm	■ 100 x 10 mm	■ 130 x 40 mm	■ 130 x 40 mm
handling+control				
100 programs	by LCD-display, full text readout	by LCD-display, full text readout	by LCD-display, full text readout	by LCD-display, full text readout
vacuum/inert gas overpressure	– CC 400 / ■ VCC 400	– CC 1000 / ■ VCC 1000	– CC 3000 / ■ VCC 3000	– CC 12000 / ■ VCC 12000
neutral inert gas atmosphere	■	■	■	■
optical die temperature measurement	■	■	■	■
die cooler with protective gas flushing	■	■	■	■
secondary cooler / water collection system	■ / ○	■ / ○	■ / ○	■ / ○
end bar sensor	■	■	■	■
quality management				
RS 232, Ethernet, USB interface, diagnostic system	■	■	■	■
data printer	■	■	■	■
GSM-modem for remote service	■	■	■	■
DMS / InduthermCloud / iThermControl	■ / ○ / ○	■ / ○ / ○	■ / ○ / ○	■ / ○ / ○
accessories/peripheral equipment				
Quattro drive drawing unit	○	○	○	○
sintering / diffusion bonding kit	○	–	–	–
granulation tank / flake option	○ / ○	○ / ○	○ / ○	○ / ○
bending-unit / coiling equipment	○ / –	○ / ○	○ / ○	○ / ○
simultaneous casting of several wires	–	○ 3 wires***	○ 5 wires***	○ 5 wires***
flying saw / pneumatic cutter	○ / ○	○ / ○	○ / ○	○ / ○
water chiller, vacuum pump ...	○	○	○	○

* Liquid metal up to top level of the crucible – other volumes on request.

** Special dimensions or profiles on demand

*** not in combination with Quattro Drive

SOLUTIONS FOR GRANULATING

For the production of granules we can offer you three different systems.

- **If you only want to produce granules occasionally, the addition of a granulating tank to an existing vacuum pressure or continuous casting machine is a good alternative.**
- **For the production of micro granules we recommend our GU 500 micro.**
- **For frequent or permanent production of granules our GU series Granulating Machines will be the first choice.**

The Granulating Tank for VC series and CC series casting machines

Granulating tanks are available for all machines in the VC series from VC 400 up to the VC 12000 V and for all (V)CC machines.

The main advantages:

- Easy installation of the granulating tank
- Fast changing between casting process and granulating
- Ergonomically and perfectly balanced design for safe and easy handling
- Optimised streaming behaviour of the cooling water
- Reliable separation of water and granules

VCC 400 with granulating tank

The Micro Shot Systems GU 500 micro - GU 3000 micro

The GU micro series was designed for the production of micro granules with a grain size of between 0.1 and 1 mm. The systems are based on the Indutherm granulation units as shown on the left but all key components, particularly the jet system, are special developments. The main areas of application for the micro-granules are in metal laser sintering processes, in jewellery surface design and in soldering technology.

GU 500 micro

Simple handling of the granulation tanks

Granulation tanks in different sizes:
left: GU 500, option for VC 400 - VC 680 V and (V)CC 400
middle: GU 1000, option for VC 1000 V and (V)CC 1000
right: GU 3000, option for VC 3000 V and (V)CC 3000

Micro granules in different alloys with a grain size of between 0.1 and 1 mm.

GU 500

GU 3000 with vacuum feeding system

GU 12000

The Granulating Machines GU 500 - GU 25000

These shotmakers are developed especially for granulating bullions, sheet metal or casting residues into proper grains. The granulating tanks are very easy to remove for clearing. The GU machines are available with crucible sizes from 245 ccm up to 12,000 ccm.

The major applications are

- Preparation of alloys or alloy components
- Preparation of alloys from components
- Cleaning up of already casted metal
- each under inert gas atmosphere or vacuum.

Optionally you can also produce thin flakes instead of granules.

	GU 500 (HTC)	GU 1000 (HTC)	GU 3000 (HTC)	GU 12000 (HTC)	GU 25000
temperature max.	1,600° C	1,600° C	1,500° C	1,500° C	1,500° C
crucible volume in l*	0.245-0.386	1.5	3.4	12.0	25.0
temperature max. HTC	2,000° C	2,000° C	2,000° C	1,850° C	–
crucible volume in l* HTC	0.4	1.7	3.9	14.0	
volume in kg Au 18ct	3.6-5.7	22.0	51.0	180.0	–
volume in kg Ag	2.4-3.8	14.0	34.0	120.0	250.0
volume in kg Cu	2.1-3.3	12.0	30.0	105.0	215.0
volume in kg Pt	6.5	25.0	65.0	-	-
volume in kg steel	2.5	10.0	25.0	90.0	-
generator kw (400 V)	10	20	30	40-60	40-60

** Liquid metal up to top level of the crucible – other volumes on request.*

GU 12000 for granulation of Aluminium

SU 450, OUR EFFICIENT SOLUTION FOR RING AND BANGLE PRODUCTION

Sintering/diffusion bonding is the optimum process for producing multi-coloured rings, mostly sold as wedding rings, or bangles. Metals are processed under pressure and at temperatures below the solidification point. The pressure is generated pneumatically and not mechanically via a threaded spindle. This means that there is no risk of graphite parts breaking as a result of heat expansion. The fusion between layers has the same durability as the metal itself.
Pre-manufactured rings can be easily resized (7 sizes and more).

Benefits of the Indutherm sintering process:

- With the sintering unit processes can take place under a vacuum, which is important for alloys with a manganese component
- Processes can take place under inert gas
- Straightforward installation/removal of the rings
- Approximate duration of process: 5 min.
- Depending on the thickness of the rings, up to 6 rings or bangles can be processed simultaneously

Two different methods of sintering

Special **sintering machines SU 450/SU 450 XL** or the **sintering kit** for installation into existing casting or continuous casting machines.

Sintering Machines SU 450/SU 450 XL

The SU 450 machines are equipped with a highly sensitive sensor system, which permanently controls the reduction of the rings and provides real-time information about the reduction values on the display. The temperature may be regulated very precisely close to the solidus temperature, right until the reduction begins. As soon as the pre-defined reduction value has been reached, the process stops automatically thus preventing too much deformation (depending on the composition and alloy the pre-defined reduction value varies between 0.1 mm and 0.3 mm). The "Sensor-Control-System" considerably reduces the time and material required for production for two major reasons: firstly because the process parameters can be defined quickly and without making lots of test rings; and secondly because the quality of the sintering process is constantly very high. Therefore the finishing effort is reduced, as well as the loss of material, which occurs during subsequent diamond dressing or turning.

The Sintering Kit

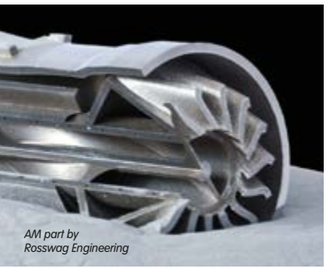
The sintering kit can be installed into existing VC 400 to VC 680 V type casting machines and in the continuous casting machines. The kit is ideal for the occasional diffusion bonding job and for smaller series production. Only a few minutes are needed to install/remove the sintering kit.
For larger production quantities we recommend our sintering machine SU 450.

For sintering the single layers are centered on a spindle. For simultaneous processing of several rings, the rings are isolated from each other by grafite shims.

	SU 450	SU 450 XL
performance		
power max. / electrical connection	4.5 kW 3x400 V	4.5 kW 3x400 V
temperature max.	1300° C	1300° C
capacity		
sintering processes per hour	≈ 10	≈ 10
diffusion bonding up to Ø mm	35	70
handling+control		
reduction control	■	■
electronic fix stop	■	■
automatic process stop	■	■
program control	■ LCD display, full text readout	■ LCD display, full text readout
programs	100	100
data printer	■	■
quality management		
RS 232, Ethernet, USB interface, diagnostic system	■	■
data printer	■	■
GSM-modem for remote service	o	o
DMS, InduthermCloud, iThermControl	o	o
peripheral equipment		
water chiller, vacuum pump...	o	o

■ = standard equipment o = optional

MACHINE SOLUTIONS FOR METAL POWDER PRODUCTION AND PROCESSING



AM part by Rosswag Engineering

Our vision is to making the metal powder production and processing technology accessible for everybody

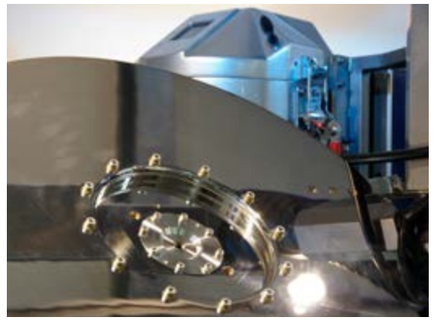
Therefore we have developed different machine solutions which could be customized according the unique needs of every customer.

The current product portfolio includes

- **Gas Atomizers** for the production of spherical metal powder in small to medium size batches (1,5l-28l crucible volume)
- **Water Atomizers** for the production of more irregular metal powder as it is ideal for recycling/refining process, press & sinter process and others
- **Ultrasonic Atomizers** for the production of highly spherical metal powder in small or very small batches
- **Air Classifiers** for the precise separation of metal powders.

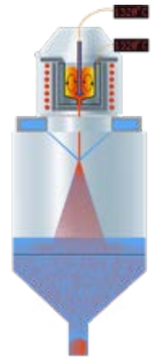
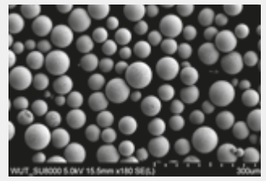
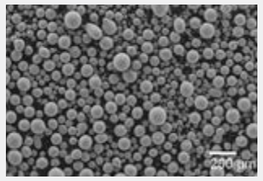
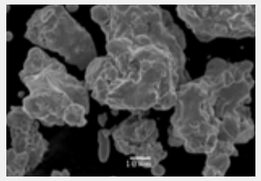
Advantages of all our systems for powder production and processing:

- **Oxidation free processing**
  Possibility of oxidation-free processing by means of de-gassing, vacuum and protective gas features.
- **Easy handling and cleaning**
  The user-oriented and modular structure of the systems ensures optimum accessibility for all work as well as for inspection and maintenance. Short installation and training periods.
- **Quick alloy change with minimum cross contamination**
  Polished stainless steel surfaces prevent powder adhesions – all parts are easy to clean without any residues. The risk of metal loss and cross-contamination is reduced to minimum.



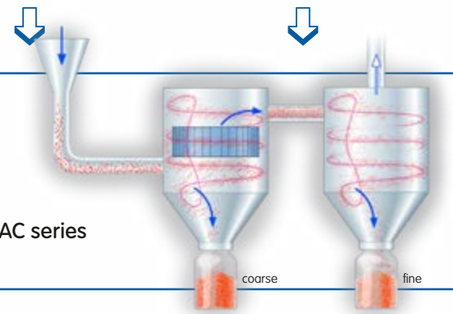
For detailed information about our solutions for the production and processing of metal powders, please request our special brochure!

Specific advantages of our different systems

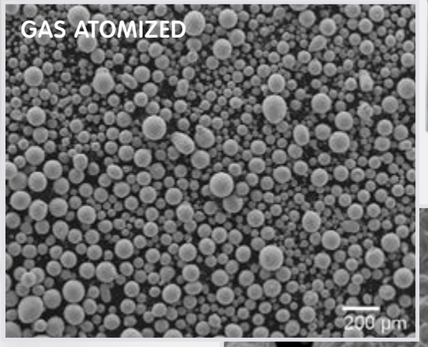
	Ultrasonic Atomization AUS 500	Gas Atomization AUG 1000-25000	Water Atomization AUW 500-1000
Solutions for metal powder production (VIM systems)			
Shape of the powder	 **Maximum spherical** Ideal for SLM, MIM, and other Additive Manufacturing processes	 **Highly spherical** Ideal for SLM, MIM, and other Additive Manufacturing processes	 **More irregular** Ideal for recycling/refining processes, press & sinter processes, and others
Purity	**Very high purity** (oxidation-free processing in the closed-chamber machine by means of degassing, vacuum and protective gas features)	**Very high purity** (oxidation-free processing in the closed-chamber machine by means of degassing, vacuum and protective gas features)	**High purity** (oxidation-free melting by means of degassing, vacuum and protective gas features)
Batch size	**Very small batch sizes** Down to ~ 100 g bronze or steel technically and financially viable	**Small to medium amounts** Up to 180 kg bronze or steel per cycle (depending on version)	**Small to medium amounts** Up to 9 kg bronze or steel per cycle (depending on version). Larger versions in development.
Other characteristics	**From alloy creation to powder within 1 hour**	**Numerous variations of process parameters** allow very wide range of particle size distribution within one machine	**Production of almost spherical powder is also possible**

Solutions for metal powder separation

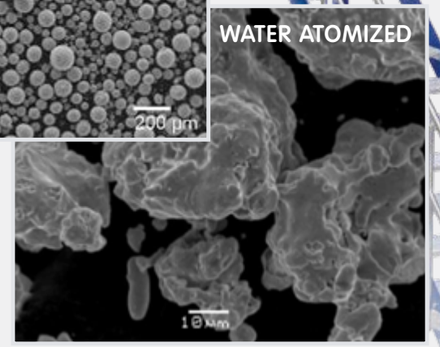
Air Classifier AC series



AUG SERIES – GAS ATOMIZERS
AUW SERIES – WATER ATOMIZERS



Ag-based solder alloy powder with an average particle size of ~60 µm

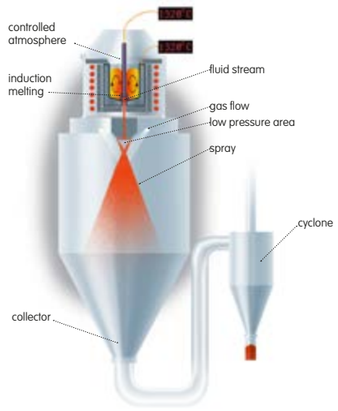


Ag-based solder alloy powder with an average particle size of ~50 µm

AUG Gas Atomizers: for numerous applications and a wide spectrum of alloys

The AUG machines are designed for numerous applications in the most diversity thanks to narrow size distribution with high yield and possibility of flexible usage by different nozzle systems. They are generally suitable for gas atomization of a wide spectrum of alloys; such as for example those based on Cu, Au, Ag, Sn or Zn (standard versions) as well as Fe, Co, Ni, Pd or Pt (high temperature versions HT, HTC and HTC+). The inductive heating takes place in graphite crucibles (up to 1.600° C) or in ceramic crucibles: HT up to 1750° C, HTC up to 1850° C, HTC+ up to 2000° C. The crucible volumes reach from ~1,5 l to ~28 l. For the production of reactive materials like Al or Mg, please ask us for our solutions.

Close coupled atomization

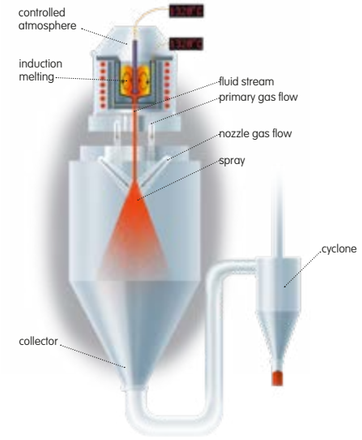


Powder characteristics and particle sizes for every request

To obtain specific metal powder characteristics and particle sizes, the AUG machines work with different easy-to-change nozzle systems: free fall and close coupled atomization nozzles. Optionally an anti-satellite system for highest sphericity is available.

Our gas atomizers produce spherical, flowable metal powders with mean particle sizes between ~1 and 200 µm for e.g. additive manufacturing, soldering or foam sintering processes, as well as MIM and other powder metallurgy procedures.

Free fall atomization



Oxidation-free processing for maximum cleanliness

The AUG and as well the AUW machines offer the possibility of oxidation-free processing in the closed-chamber machine by means of de-gassing, vacuum and protective gas features to realize highest cleanliness. Oxygen sensor values below 0.5 ppm can be achieved reproducibly.

The Gas Atomizer – at a glance:

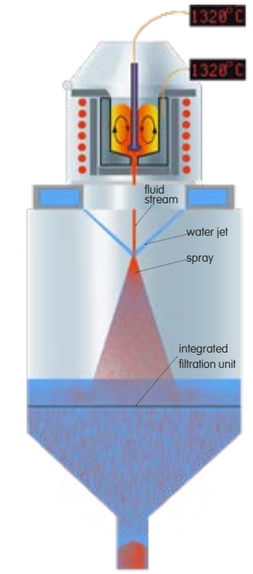
- Very simple handling via LCD-Display and neatly arranged control panel
- Flexible and economic production of small to medium metal powder batches
- Easy-to-clean concept: minimum metal loss and cross-contamination
- High powder yield over a particularly wide particle size range
- Particularly high process stability due to optimized nozzle systems
- Anti-oxidation features

AUW Water Atomizers

While the gas as well as ultra-sonic atomizer solutions are designed for the production of spherical powders by avoiding any contact to fast quenching media during particle formation, water atomized powder typically have a more irregular shape which is an advantage for some applications like recycling/refining process, press & sinter process and others.

However, it is also possible to produce almost spherical, fine powder by water atomization with appropriate process parameters, which makes the powder potentially suitable for AM applications.

Compared to gas atomization the running costs are signficantly lower.



	AUG/AUW 500	AUG/AUW 1000	AUG 3000	AUG 12000	AUG 25000
temperature max.	2,000° C	2,000° C	2,000° C	1,850° C	1,500° C
crucible volume in l *	0.25 - 0.7	1.5 - 1.7	3.4 - 3,9	12.0 - 14.0	25.0
volume in kg bronze**	1 (optional 1.5 or 4)	9	22	80	180
volume in kg steel ** (HTC)	2.5	8	22	90	on request
single cycle time	1-1.5 h	1.5-2 h	3-4 h	4-5 h	5-6 h
generator kw	12	20	30	40-60	60+

* *Liquid metal up to top level of the crucible – other volumes on request.*
** *Average capacities. Quantity may be increased by optimizing metal load using feeding systems.*

AUS SERIES – ULTRASONIC ATOMIZERS

AUS 500, the new Atomizer solution – from alloy creation to powder within 1 hour

The Ultrasonic Atomizer Unit enables almost anybody to produce small batches of high-quality, spherical powder for the same target application as gas atomized powder at an affordable price and without having a complex infrastructure.

The AUS 500 is available in different batch sizes from 0.25-0.7l. The melting and alloying of the material in the crucible takes place with an indirect induction system (e.g. graphite crucible) or a direct induction system for high temperatures (ceramic crucible).

Compact AUS 500:
Footprint of just a few square meters including infrastructure

	AUS 500
temperature max.	1800° C
crucible volume*	0,245 - 0,7 l
volume in kg gold (up to)	10 kg Au 18 ct*
volume in kg bronze**	5.6 kg
single cycle time	1 h
generator kw	10

**Liquid metal up to top level of the crucible*

PERFECT POWDER IN 4 EASY STEPS

PREPARE YOUR MATERIAL
IN ANY SHAPE OR FORM – IT ONLY NEEDS TO FIT YOUR ALLOY OR ALLOY COMPONENETS INTO CRUCIBLE

HEAT IT
UP TO 1800°C ALLOWING TO WORK WITH MOST NON-FERROUS METALS

ATOMIZE
WITH PRODUCTION CAPACITY UP TO SEVERAL KG/H FOR BRONZE

ENJOY
YOUR OWN EXTREMELY SPHERICAL POWDER WITHOUT ANY SATELLITES

For detailed information about our solutions for the production and processing of metal powders, please request our special brochure!

THE AIR CLASSIFIERS

The AC series Air Classifiers

1 or 2 Stage Air Classifier systems for the precise separation of metal powders

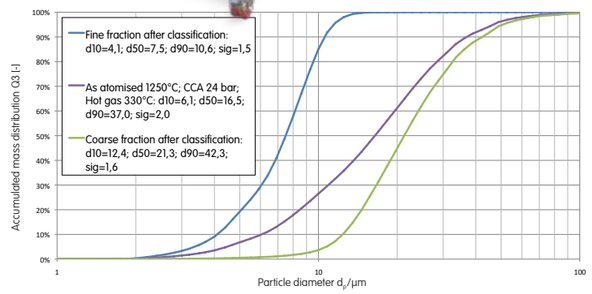
The AC series Air Classifiers are designed for the precise separation of metal powders into fine and coarse powder fractions especially in the range < 25 µm, where conventional sieving operations fail.

For processing of small to medium size powder batches

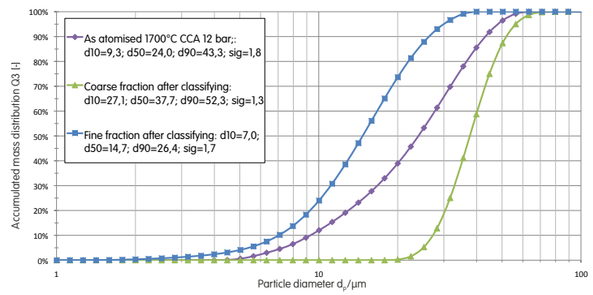
Due to the Easy-to-Clean concept our Air Classifiers are ideally suited for any production with the need for frequent alloy or desired particle size changes, and especially for precious and other specialty metals. These characteristics qualify the AC series machines for applications in research and development and also for large systems with a throughput of up to 200 kg / h (bronze or steel) and with double stage classification.

Classification under protective gas atmosphere: the G versions AC 1000 G / 3000 G

We particularly recommend the AC G-series for the separation of metals or alloys where the uptake of oxygen, moisture, or contamination from the room air must be avoided. An oxygen measuring system controls the process according to the set values. For example, a defined target O_2 value can be programmed for the process start. For the classification of reactive metals, please contact us for more information.

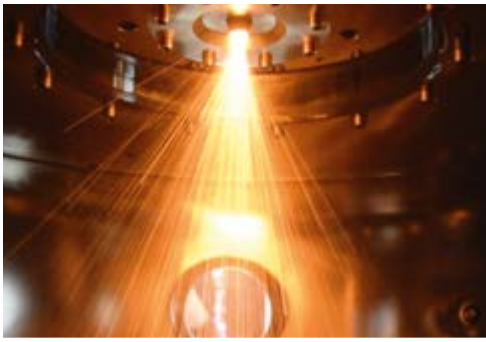


*Particle size distribution of gas-atomized 18ct **gold powder** separated into coarse and fine powder fractions with the AC 1000 Air Classifier. Cut point in this example ~10 µm.*



*Particle size distribution of gas-atomized **steel powder** separated into coarse and fine powder fractions with the AC 1000 Air Classifier. Cut point in this example ~25 µm.*

	AC 1000	AC 1000 G	AC 3000 G
Throughput (steel)	75 kg / h	75 kg / h	200 kg / h
Classifier range (steel)	4 - 120 µm	4 - 120 µm	4 - 120 µm
Number of cut points	Single stage	Single stage	Single/double stage
Process atmosphere	Air	Inert gas	Inert gas



25 MORE THAN YEARS OF ADVANCED CASTING & METAL POWDER TECHNOLOGY

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