Topcast Engineering

PRECIOUS METALS

PRECIOUS METALS

This catalogue introduces furnaces and machinery that TOPCAST develops for the Precious Metal Industry. To orient properly the customer among the large offer, the equipment are divided into different activities like Casting, Melting, Granulating, Atomizing and Recovery.

VACUUM MELTING & CASTING

Vacuum investment casting is the process used in lost-wax technique to get a metal replica from wax or resin patterns. The pattern is designed and then built in wax or resin materials by different equipment as CNC, 3D printers, wax injectors and rubber moulds or even carving manually the wax part. Molten metal can be poured in vacuum either in investment molds or in metal or graphite permanent molds. Furnaces and complete foundries setup for casting of Au, Ag, Pt or Pd alloys can be supplied for any application. In detail, for precious metals, TOPCAST offers the following systems:

TVC Vacuum casting machines (dual and single chamber systems) designed to meet the more severe needs in lost wax casting production;

TCE Centrifugal vacuum casting machines, robust and versatile machines especially suited for high metal compactness, thin and large surfaces casting, ferrous, Titanium and PGM alloys;

TVM Vacuum Induction Melting Furnace (VIM) pouring by gravity, to pour large ingots of Au and PGM alloys with reduced porosity;

FCC Burnout furnaces for wax / resin removal and refractory mould firing.

INDUCTION MELTING, TILTING CRUCIBLE OR MANUAL HANDLING

A large choice of induction melting furnaces for many different uses, from graining to ingots production, is offered. Capacities up to 1000 kg Au / 600 kg Ag and up to 60 kg Pt are available with different tilting systems, from electrical to hydraulic. Today, hundreds of TOPCAST induction furnaces are proudly installed in the biggest precious metal refineries worldwide.

METAL ATOMIZER

TOPCAST manufactures a family of gas and water atomization plants designed to produce metal powders, working in vacuum and protective gas and using a new revolutionary double chamber concept for a better flow consistency and control.

INGOTS, SHEETS, RODS

TOPCAST designs and manufactures vacuum and inert-gas furnaces for precious metal ingots, sheets, rods and grains production.

GRANULATION PLANT

Induction plants to produce precious metal grains, either in air or in vacuum/inert gases are produced, for refining and alloying purposes. Plants are usually sold key-in-hands, including equipment for grains drying, sieving, dosing, weighting and final packaging. The high level of automation minimizes the operator work and ensures reliability and safety in precious metal handling and storing.

RECOVERY, ASSAY & REFINING

A part from the granulation plants and water-atomizers to feed aqua-regia reactors for refinery purposes, TOPCAST also offers an interesting induction cupellation furnace for quick and on the spot karat testing. Ancillary equipment can be provided for a key-in-hand solution. For what concerns ashes and general scraps recovery, High Temperature Induction Melting tilting furnaces are offered for a safer and more efficient alternative to the noisy gas furnaces.

TVCd

Double Chamber
Pressure over Vacuum
Casting Machine

TVCd is the pressure over vacuum casting machine designed to meet the more severe needs in lost wax casting production.
This machine works with a new, revolutionary double chamber concept. This innovative system gives several advantages compared with the traditional single chamber suction system currently available in the market. In TVCd melting chamber and flask chamber are completely independent and at the moment of casting the machine controls the metal injection into the mold by applying a differential pressure during pouring.

This yields to a faster injection compared to the simply gravity pouring with the benefit to cast items at lower temperature. This will result in better surface finishing of the cast parts.

The casting cycle takes only few minutes and, while the previous charge can be loaded into the crucible and melted, thus overlapping two cycles for no time waste.
The machine is fully automatic having also a PC based monitoring system for process parameters acquisition and production data management with easy editing of casting programs suitable for many kind of alloy (optional).

This revolutionary machine is the synthesis of the most advanced engineering and years of experience in casting that only TOPCAST will bring in your factory.

TECHNOLOGY & FEATURES

GAS WASH PROCEDURE

- *Crucible loading operation introduces oxygen*
- *The Gas Wash Purge procedure removes the oxygen (1) in a very fast and efficient way and then refills back the chambers with Argon or Helium gas (2)*
- *Compared with the traditional crucible protection with flow-meter regulation the consumption of gas is dramatically reduced and the alloys oxidation is minimized*
- *Moreover the crucible life is increased: TVC series crucible last up to 250 – 400 casting cycles according to the graphite quality*

MELTING

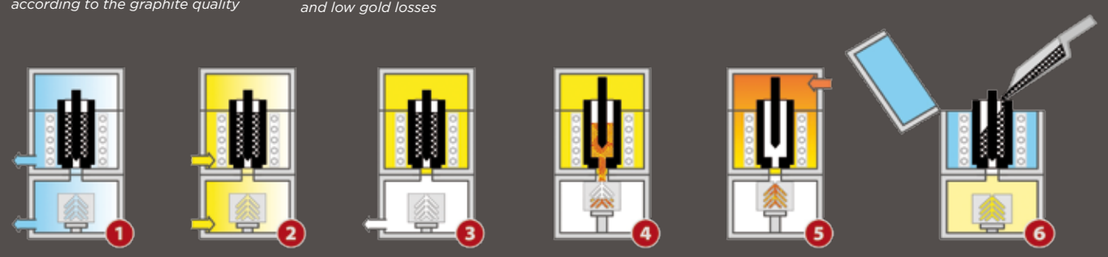
- *Advanced Self Tuning thermoregulation (AST™) with exact temperature control of the melted alloys*
- *Two Set-Points available: Homogenization and Casting Temperature*
- *Medium frequency induction heating stirs the melted alloy and leads to a perfect homogeneity*
- *Pulse Stirring Management (PSM™) for an extremely low frequency stirring*
- *Highest power density in the market features strongest stirring and low gold losses*

INJECTION AND COMPRESSION

- *When the stopper lifts up. it is very important to control the injection rate to avoid turbulences*
- *TVC has the unique feature to have the injection rate controllable and programmable (IRC™)*
- *The metal enters smoothly inside the mould (4). Then, after filling and during the solidification phase, a strong compression takes place on the tree (5)*
- *No turbulences in filling and high compression rate lead to a large reduction of shrinkage porosity phenomena*

TREE PROTECTION AFTER CASTING

- *Thanks to the double chamber concept, after the solidification phase, the flask cools down in a protective atmosphere while at the same time you can load your alloy in the melting chamber for the next melting.*
- *This operation will allows an overlapping of the casting cycles which will give you the ability to protect longer the tree before removing it without loosing time and productivity*



TECHNICAL DATA

	TVC3d	TVC5d	TVC10d	TVC12d
Number of casting programs	100	100	100	100
Crucible Volume	50 cc	100 cc	280 cc	380-500 cc
Crucible working capacity	200g Bronze / 250g Silver 500g Gold	400g Bronze 500g Silver / 1000g Gold	1500g Bronze 1500g Silver / 3000g Gold	2300g Bronze 2500g Silver / 5000g Gold
Flask max. diameter (mm)	90	● 150 / ○ 200	● 150 / ○ 200	● 150 / ○ 200
Flask max. height (mm)	120	● 300 / ○ 400	● 300 / ○ 400	● 300 / ○ 400
Induction heating power	2.5 kW	4.9 kW	10 kW	12 kW
Vacuum pump	Ext. 4 m3/h	Built-in 25 m3/h	Built-in 25 m3/h	Built-in 25 m3/h
Pressure over vacuum	3 bar	3 bar	3 bar	3 bar
Max. temperature	1250°C	● 1250 °C / ○ 1600 °C	● 1250 °C / ○ 1600 °C	● 1250 °C / ○ 1600 °C
Granulation unit		○	○	○
Autotest with data report	●	●	●	●
Monitoring system for data acquisition	○	○	○	○
Flask check before casting	●	●	●	●
Vacuum leakage detector	●	●	●	●
Oxygen Analyzer	○	○	○	○
RS232 remote interface	○	○	○	○
Main alloys	● Gold (Au), Silver (Ag), Copper (Cu), Brass, Bronze, Aluminium (Al) and their alloys, ○ Magnesium			
Provided ● / ○ Available on request				

TVC3d

Double Chamber
Pressure over Vacuum
Casting Machine

TVC3d is the tabletop pressure over vacuum casting machine designed to meet the more severe needs in lost wax casting production.
This machine works with a new, revolutionary double chamber concept providing outstanding performances:

- Flexible performances in all karats, silver, brass and bronze
- Stone-in-wax casting
- 3D printed resin direct casting
- Filigree and very difficult design casting with fantastic and consistent results easily achieved

The machine is fully automatic, having more than 100 programs suitable for every kind ofalloy and a casting cycle that takes only 5 minute.

What you need to do to cast extraordinary jewels is just loading the crucible with your alloy, insert the flask and press the START button. The machine will make easy to cast whatever difficult design.

This amazing machine is the synthesis of the most advanced engineering and years of experience in casting that only TOPCAST can bring to your factory.

TVCs

Single Chamber
Pressure over Vacuum
Casting Machine

TVCs are fully automatic, robust, easy to use pressure over vacuum casting machines designed for small and medium casting laboratories.
This family of machines work with the well-known pressure over vacuum concept, thus preferring the perforated flask against the solid ones.

Melting is achieved in protective atmosphere (Nitrogen, Argon or Helium) while a strong vacuum pump is provided in order to boost the suction effect into the mould. As soon as the metal has entered the mould a strong compression takes place on top of the tree to reduce shrinkage porosity.

Crucible graphite consumption is greatly reduced thanks to the gas wash procedure which removes the oxygen in few seconds from the charge loading operation.

The machine is fully automatic making the operator's job very easy (you simply have to load the alloy and flask and then press the START button). This will give you the most consistent result flask to flask which is the key factor for a reliable casting production

TECHNICAL DATA

	TVC3s	TVC4s	TVC10s
Crucible Volume	100 cc	280 cc	380 cc
Working Capacity of graphite crucible	1 kg Au 0.5 kg Ag	2 kg Au 1 kg Ag	3 kg Au 1.5 kg Ag
Flask maximum diameter (mm)	Ø150	Ø150	Ø150
Flask maximum height (mm)	280	280	280
Induction power	3 kW	4 kW	10 kW
Vacuum pump	External	External	External
Pressure over vacuum	3 bar	3 bar	3 bar
Shot maker	○	○	○
Autotest with data report	●	●	●
Flask check before casting	●	●	●
Vacuum leakage detector	●	●	●
RS232 remote interface	○	○	○
Main alloys	Gold (Au), Silver (Ag), Copper (Cu), Bronze, Aluminium (Al) and their alloys		
Provided ● / ○ Available on request			

TCE

Vacuum Centrifugal Casting Machine

TCE are consistent, robust and easy to use vacuum centrifugal casting machines designed for small and medium casting laboratories.
The casting cycle begins with alloys melting under vacuum or protective gas and continues with casting into the mould by centrifugal force. After casting and during the solidification phase a strong compression takes place in the cast tree.

An advanced induction heating system guarantees a fast and homogeneous mixing of the alloy before casting, while temperature measurement is achieved by a precise infrared optical pyrometer TCE in Class B are particularly suited for Platinum, Palladium and Steel while TCE in Class A has been especially designed to cast Titanium and other reactive metals. All models can also melt nonferrous and precious metals.

TECHNOLOGY & FEATURES

PROCEDURE
- *Crucible and mould loading operation introduces oxygen*
- *The Gas Wash Purge procedure removes the oxygen (1) in a very fast and efficient way and then refills back the chambers with Argon, Nitrogen or Helium gas (2)*

MELTING
- *Advanced Self Tuning thermoregulation (AST™) with exact temperature control of the molten alloys*
- *Accurate control of the temperature with a proprietary narrow band optical pyrometer or with rotating thermocouple*
- *Medium frequency induction heating stirs the melted alloy and leads to a perfect homogeneity*
- *Magnetic field frequency has been studied for best coupling and energy transfer*

INJECTION AND COMPRESSION
- *When the charge is molten, the coil is retracted and the arm starts to spin.*
- *During the spinning the exits the crucible by centrifugal force and enters the flask.*
- *Rotational speed profile, which controls the injection rate, can be regulated digitally for a consistent and reliable mould filling.*
- *The final speed is strictly related to the compression on top of the tree during solidification phase, which in turns reduces shrinkage porosity.*

TREE PROTECTION AFTER CASTING
- *After the solidification phase, the cast tree cools down in a protective atmosphere to avoid oxidation.*
- *A blinking lamp will signal the operator that the cycle has ended and the flask can be removed*

TECHNICAL DATA

(CUSTOMIZED MODELS ARE AVAILABLE ON REQUEST WITH SPECIAL FEATURES)

	TCE5	TCE10	TCE8-Ti	TCE12-Ti
Class	B	B	A	A
Working capacity	500 g Pt 250 g Steel	1500 g Pt 1000 g Steel	100 g Ti	400 g Ti
Flask maximum diameter (mm)	Ø110	Ø130	Ø110	Ø130
Flask maximum height (mm)	120	180	120	200
Induction power	8 kW	10 kW	8 kW	12 kW
Max. spinning speed	500 rpm	450 rpm	450 rpm	450 rpm
Vacuum pump	External	External	External	External
Max. temperature	2000 °C	2000 °C	2000 °C	2000 °C
Titanium, Mg and reactive metals			●	●
Monitoring system for data acquisition	○	○	●	●
Vacuum leakage detector	●	●	●	●
Oxygen Analyzer	○	○	●	●
Remote assystance	○	○	●	●
Optical pyrometer	●	●	●	●
Rotating Thermocouple	○	○	○	○
Standard ● / ○ Available on request				

TMF-R

Induction Tilting Furnaces

TMF-R is a family of coreless induction melting furnaces capable of melting ferrous, non-ferrous, precious and PGM alloys. The crucible can be tilted for a more accurate and safer dosing. The driving mechanism can be by hand-wheel, electrical or hydraulic.

The frequency converter design approach uses parallel resonant typology adopting the latest and most advanced IGBTs modules available worldwide. Galvanic insulation between coil and power mains gives the maximum safety for the user, while digital technology makes our furnaces soundless, versatile and reliable.
Fiber optics connections give the highest immunity to electrical noise also in harsh environment.
An accurate study of the coil guarantees a very high heating efficiency while medium frequency magnetic field stirs the molten metal and leads to high homogeneity of the alloys.
Temperature control can be chosen between IR optical pyrometer and thermocouple while the electronic board implements an advanced self-tuning thermoregulation algorithm with exact temperature stabilization.

Induction Generators can be provided with one or more melting stations using a power switch to drive one station or the other. Optionally, we offer a master-slave configuration featuring contemporary power-sharing between two or more power stations.

Maintenance of the furnace is very easy and it allows for rapid changing of the crucible and the safety refractory shell. Inert gas or gas-flame are foreseen to protect the melt from oxidation.
A touch screen display is provided for a fast and user-friendly interface. A water cooling plant is needed to cool the induction heating coils and the power supply.

For more information and customized solution please contact us.

TECHNICAL DATA

POWER AND CRUCIBLE CAPACITY RELATED TO SPECIFIC METALS

FURNACE MODEL	TMF 10-R	TMF 15-R	TMF 25-R	TMF 35-R	TMF 45-R	TMF 60-R	TMF 100-R	TMF 150-R	TMF 200-R
Power (kW)	10	15	25	35	45	60	100	150	200
Crucible working capacity (kg)									
Platinum	1	2	8	12	22	30	40	60	60
Steel	2	5	10	15	25	50	100	150	200
Brass	6	9	30	30	30	80	80	200	500
Silver	7	11	35	35	35	66	110	110	600
Gold	12	20	60	60	60	120	200	200	1200

TMF

Induction Furnaces
Manual Crucible Extraction

Topcast TMF are induction furnaces of small size capable of melting any type of metal: from precious metals to ferrous and non-ferrous. The crucible can be lifted-up and tilted by means of special pliers, therefore its usage and capacity is limited to small workshops. The frequency converter design approach uses parallel resonant typology adopting the latest and most advanced IGBTs and SCRs modules available worldwide. Induction coil is electrically insulated from AC power mains, in order to ensure maximum safety to the user, while digital technology makes these furnaces soundless, versatile and reliable.

Temperature control can be chosen between IR optical pyrometer and thermocouple while the electronic board implements an advanced self-tuning thermoregulation algorithm with exact temperature control.

Inert gas or gas-flame are foreseen to protect the melt from oxidation. Touch screen display in provided for a fast and user-friendly interface. A water cooling plant is needed to cool the induction heating coils and the power supply.

TECHNICAL DATA

	TMF5	TMF7	TMF10	TMF12	TMF10P	TMF12P
Crucible Volume	317 cc	390 cc	778 cc	1000 cc	270 cc	888 cc
Crucible capacity	6 kg Gold 3 kg Silver 2.4 kg Brass	8.5 kg Gold 4.2 kg Silver 3.4 kg Brass	13.5 kg Gold 7.7 kg Silver 5.4 kg Brass	17 kg Gold 8.5 kg Silver 6.8 kg Brass	1 kg Steel	3 kg Steel
SiC crucible on request	√	√	√	√	-	-
Power	5 kW	7 kW	10 kW	12 kW	10 kW	12 kW
Max. temperature	1350°C	1350°C	1400°C	1450°C	1800°C	1800°C
Melting time	15 min	15 min	15 min	20 min	4 min	10 min

TMF-G

Open System
Metal Granulator

Topcast TMF-G induction melting plants are designed for metal grains production. The tilting crucible pours the metal in a multihole tundish which acts as a flow-breaker and from which the metal droplets drip down in a cooling tank. All this is done with protection from oxidation by means of gas burners.

Additional modules perform the grains removal, drying, weighing and packing.

TOPCAST develops ovens of this class under customer specifications, in particular as regards the type of metal, the capacity of the crucible, the required productivity. In case you're interested in receiving a quote please send us your techical specifications.

TVCd-G

Vacuum / Argon
Closed System
Metal Granulator

Topcast TVCd-G furnaces are used to produce high quality and homogenous master alloys grains, starting from raw material melted by induction heating in a protective atmosphere, and then poured into a water / alcohol tank passing through a multi-hollowed crucible that acts as flow breaker. Melting and pouring phases are protected by inert gas, which can be chosen between Argon, Nitrogen or Forming Gas.
The induction generator is designed to allow the complete homogenization of the alloy thanks to the pulsed stirring effect of the magnetic field which works during the melting phase.

Water in the tank is continuously circulating and it is cooled by a powerful chiller to keep the process variables under control and obtaining consistency and quality in the produced grains. The granulator is provided with an heat-exchanger, filters and water pump to separate the process water from the cooling water. After granulation, a two valves interlock system allows for grains recovery while the process water remains in the process chamber.

These grains will be finally placed in a drying system (for example a resistors heated centrifugal drier) to remove moisture. The machine is fully automatic having a countless number of programs for every kind of alloy. The control logic is provided with a PC based data acquisition system with reporting function after every casting cycle.

Data can be display in graphic format or exported to external PC for analysis. The furnace can be provided with an Oxygen analyser to control and monitor the oxygen content present in the melting chamber during the cycle.

An highly automated plant can be provided for granulation, including automatic drying, sieving, dosing, weighting and grains packaging in a key-in-hands philosophy commissioning.

TECHNOLOGY & FEATURES

GAS PURGING PROCEDURE
- *Crucible loading operation introduces oxygen*
- *The Gas Purging procedure removes the oxygen with Argon, Nitrogen or Helium gas.*

MELTING
- *Advanced Self Tuning thermoregulation (AST™) with exact temperature control of the melted alloys*
- *Two Thermocouples Temperature Measurement: N-type. (up to 1250°C)*
  -One Thermocouple in the stopper
  -One Thermocouple inside the crucible wall
- *On request the machine can be supplied with S-Type thermocouple (up to 1600°C)*
- *Medium frequency induction heating stirs the melted alloy and leads to a perfect homogeneity*
- *Pulse Stirring Management (PSM™) for an extremely low frequency stirring*

INJECTION AND FLOW CONTROL
- *When the stopper lifts up, it is very important to control the injection rate to increase consistency in grains dimensions*
- *TVC has the unique feature to have the injection rate controllable and programmable (IRC™)*
- *The metal exits the crucible with a narrow, constant and straight beam. Turbulences can be controlled and minimized acting on the program's parameters.*

TECHNICAL DATA

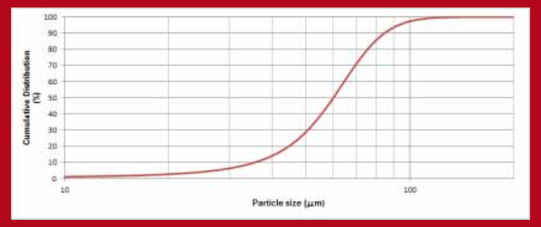
(CUSTOMIZED MODELS ARE AVAILABLE ON REQUEST WITH SPECIAL FEATURES)

	TVC12d-G	TVC25d-G	TVC35d-G	TVC45d-G
Crucible volume	500 cc	2-3 liter	4 liter	7 liter
Crucible working capacity	3 kg Ag 6 kg Gold	15-22 kg Ag 30-44 kg Gold	30 kg Ag 60 kg Gold	50 kg Ag 100 kg Gold
Induction Power	12 kW	25 kW	35 kW	45 kW
Vacuum pump	Internal	Internal	Internal	Internal
Differential Pressure	3 bar	3 bar	3 bar	3 bar
Maximum temperature	● 1250°C / ○ 1600°C	● 1250°C / ○ 1600°C	● 1250°C / ○ 1600°C	● 1250°C / ○ 1600°C
Autotest with data report	●	●	●	●
Monitoring system	○	●	●	●
Water tank check before pouring	●	●	●	●
Vacuum leakage detector	●	●	●	●
Oxygen Analyzer	○	○	○	○
Remote assistance	●	●	●	●
Main alloys	Based on Gold (Au), Silver (Ag), Copper (Cu); Brass, Bronze			
Provided ● / ○ Available on request				

TMA-G

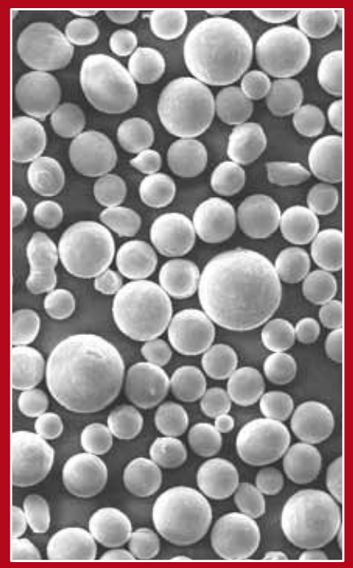
Vacuum / Argon
Matal Gas Atomizer

TMA-G is a family of gas atomizers designed to produce metal powders of rounded and regular shape, to be used in many industrial, chemical, electronics and rapid prototyping application (additive manufacturing) as SLM (Selective Laser Melting) and EBM (Electron Beam Melting).
The atomizer is based on an induction furnace, working in a closed chamber under protective atmosphere, where the molten metal is poured and hit by a jet of high pressure inert gas, producing fine and deoxidized powders.
Induction heating ensures a very good homogenization of the melt thanks to the action of magnetic stirring during the molten phase.
Following the steps of melting and homogenization, the metal is poured vertically through an injection system positioned on the lower base of the crucible (nozzle).
The type of nozzle used in TMA-G is the so-called close-coupled nozzle.
Multiple streams of high pressure inert gas are aimed and focused on the metal beam in order to ensure a fast alloy solidification in the form of fine powder.
TMA-G works with a new revolutionary dual-chamber concept that provides numerous advantages compared to the traditional gravity casting system. In our gas-atomizer the melting chamber and the atomizing chamber are completely independent and, at the time of casting, the injection system controls the metal flow through the nozzle by controlling the pressure difference between the two chambers.
This leads to an improved flow control respect to the simple gravity pouring systems and consequently ensures a more uniform size of the powders, reducing the distribution sigma.
The real-time process variables such as temperature, gas pressure, induction power, oxygen ppm content in the chamber and many others, are displayed in both numerical and graphical format on a monitoring system for an intuitive understanding of the working cycle.
The system can be operated manually or in fully automatic mode, thanks to the programmability of the entire set of the process parameters via a user-friendly touch-screen interface.
The monitoring system can be easily connected via Ethernet to the factory network.



Metals and Field of Application

- Atomized Metals: Cu, Al, Zn, Sn, Au, Ag and their alloys like Bronze and Brass.
- Field of Applications: industrial, chemical, electronics and rapid prototyping applications (additive manufacturing) as SLM (Selective Laser Melting) and EBM (Electron Beam Melting)



TMA-W

Metal Water Atomizer

TMA-W is a family of water atomizers designed to produce metal powders of irregular shape, to be used in industrial, chemical, soldering paste, resin filters, MIM and sintering applications. The atomizer is based on an induction furnace, working in a closed chamber under protective atmosphere, where the molten metal is poured and hit by a jet of high pressure water, producing fine and deoxidized powders. Induction heating ensures a very good homogenization of the melt thanks to the action of magnetic stirring during the molten phase.Following the steps of melting and homogenization, the metal is poured vertically through an injection system positioned on the lower base of the crucible (nozzle). Multiple streams of high pressure water are aimed and focused on the metal beam in order to ensure a fast alloy solidification in the form of fine powder.

TMA-W works with a new revolutionary dual-chamber concept that provides numerous advantages compared to the traditional gravity casting system. In our atomizers the melting chamber and the atomizing chamber are completely independent and, at the time of casting, the injection system controls the metal flow through the nozzle by controlling the pressure difference between the two chambers. This leads to an improved flow control respect to the simple gravity pouring systems and consequently ensures a more uniform size of the powders, reducing the distribution sigma. Real-time process variables such as temperature, gas pressure, induction power, oxygen ppm content in the chamber and many others, are displayed in both numerical and graphical format on a monitoring system for an intuitive understanding of the working cycle.The system can be operated manually or in fully automatic mode, thanks to the programmability of the entire set of the process parameters via a user-friendly touch-screen interface. The monitoring system can be easily connected via Ethernet to the factory network.

Metals and Field of Application

- Atomized Metals: Cu, Zn, Au, Ag and their alloys like Bronze and Brass.
- Field of Applications: industrial, chemical, soldering paste, resin filters, MIM and sintering applications

TECHNICAL DATA

	TMA12g	TMA40g	TMA12w	TMA40w
Crucible working capacity	3 kg Bronze 4 kg Silver 7 kg Gold	13 kg Aluminium 40 kg Bronze 50 kg Silver	3 kg Bronze 4 kg Silver 7 kg Gold	40 kg Bronze 50 kg Silver 90 kg Gold
Atomizing gas	air, nitrogen, argon	air nitrogen, argon	water	water
Crucible volume	up to 500 cc	up to 7000 cc	up to 500 cc	up to 7000 cc
Induction power	12 kW	40 kW	12 kW	40 kW
Recovering system	cyclone, bag filter	cyclone, bag filter	Built-in	Built-in
Particles Size	Min D90% < 100 um	Min D90% < 100 um	Min D90% < 200 um	Min D90% < 200 um
Max. temperature	1600 °C	1600 °C	1600 °C	1600 °C
Maximum Pressure	50 bar	50 bar	150 bar	150 bar
Process time	20 minutes	40 minutes	20 minutes	40 minutes
Autotest with data report	●	●	●	●
Monitoring system for data acquisition	○	○	○	○
Vacuum leakage detector	●	●	●	●
Oxygen Analyzer	○	○	○	○
Remote assistance	●	●	●	●
Main alloys	Gold (Au), Silver (Ag), Copper (Cu), Brass, Bronze, Aluminium (Al) and their alloys			
Provided ● / ○ Available on request				

TIP

Precious Metal Ingots

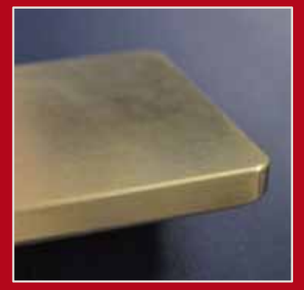
TIP furnaces are designed to manufacture any size of ingots, from 50 g to kilo-bar either in gold or silver. Ingots are obtained by melting pre-weighted grains in a graphite mould placed inside the vacuum chamber and then by cooling appropriately the ingot during the solidification phase.

The machine is fully automatic having more than 100 programs for different ingot sizes. The operator only has to load the graphite mould with pre-weighted grains into the holding disk, close the loading chamber and press the START button to launch the automatic cycle. At the end of the cycle the furnace will return the gold or silver bar ready for the market stamp. In order to increase productivity, the system has been conceived with 2 loading chambers and one melting chamber.

This configuration allows for melting the next ingot while the previous one is cooling. This overlapped working mode is also important to decrease the running cost of the process because they are mainly related to the graphite mould consumption. A colder graphite mould in output increases the life of the same.

The heart of the machine is the induction generator and its coil, designed to maximize the heat transfer during the cycle. After loading the graphite mould, a pneumatic jack will lift the part up perfectly into the center of the magnetic field and the melting step will begin.

Both melting and cooling processes occur in a closed chamber in which vacuum and inert gases guarantee no metal or graphite oxidation. Gas can be chosen between Argon or Nitrogen.



TECHNICAL DATA

	TIP12	TIP40	TIP100
Max ingot weight	500g Silver / 1000g Gold	500g Silver / 1000g Gold	400 oz Gold
Pieces per Mould	1 x 1 kg Au 1 x 500 g Au 2 x 250 g Au 4 x 100 g 6 x 50 g	1 x 1kg Au 1 x 500g Au 2 x 250g Au 4 x 100 g 6 x 50 g	1 x 400 oz Au
Max ingot footprint	115,5 x 52,5 mm	115,5 x 52,5 mm	200 x 80 x 45 mm
Productivity	10 kilo-bars 24kt gold per hour or 25 x 100g ingots per hour	25 kilo-bars 24kt gold per hour or 100 x 100g ingots per hour	6 x 400 oz gold ingot per hour
Induction power	12 kW	40 kW	100 kW
Vacuum pump	Built-in	Built-in	Built-in
Gas consumption	20 liter / cycle	20 liter / cycle	20 liter / cycle
Max. temperature	1600 °C	1600 °C	1350 °C
Autotest with data report	●	●	●
Mold check before melting	●	●	●
Vacuum leakage detector	●	●	●
Remote assistance	○	○	●
Provided ● / ○ Available on request			

TCE-L

Vacuum Furnaces for Sheets and Rods

This family of furnaces are used to produce high quality semi-finished product, like sheets or rods, starting by raw materials melted by induction heating in a protective atmosphere and then poured in vacuum into an ingot mould, that can be in copper, in graphite or other materials.

Melting and pouring phases are protected by inert gas, which can be chosen between Argon, Nitrogen or Helium.

Pouring can be by gravity or differential pressure like in TVCd-L, or by centrifugal force like in TCE-L

The induction field is designed to guarantee a strong homogenization of the alloy thanks to the stirring effect of the magnetic field which works while the metal is being melted in the crucible.

The machine is fully automatic having a countless number of programs for every kind of alloy.

The control logic is provided with a PC based data acquisition system aimed to sample the process variables with reporting function after every casting cycle. Data can be display in graphic format or exported to external PC for analysis.

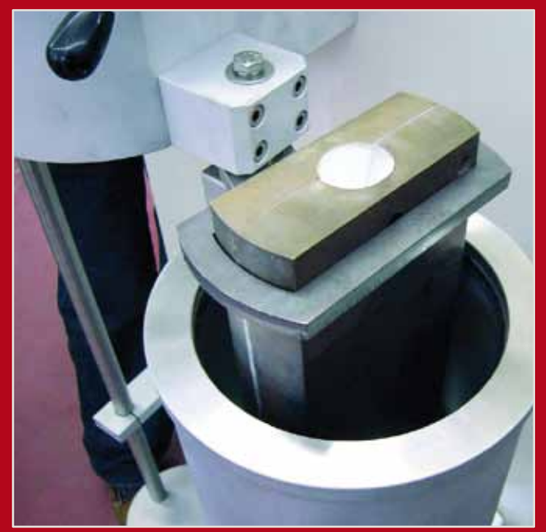
The furnace can be provided with an Oxygen analyser to control and monitor the ppm of oxygen present in the melting chamber during the cycle.

TECHNICAL DATA

	TCE5	TCE10
Class	B	B
Working capacity	500 g Pt 300 g Pd	1500 g Pt 1000 g Pd
Mould maximum diameter (mm)	Ø110	Ø130
Mould maximum height (mm)	120	180
Induction power	8 kW	10 kW
Max. spinning speed	500 rpm	350 rpm
Vacuum pump	External	External
Max. temperature	2000 °C	2000 °C
Vacuum leakage detector	●	●
Oxygen Analyzer	○	●
Remote assystance	○	○
Optical pyrometer	●	●
Rotating Thermocouple	○	○
Standard ● / ○ Available on request		

TVCd-L

Vacuum Furnaces for Sheets and Rods



TECHNICAL DATA

	TVC12d-L	TVC25d-L	TVC35d-L	TVC45d-L
Crucible volume	500 cc	2-3 liter	4 liter	7 liter
Crucible capacity	7 kg Gold 4 kg Silver	42 kg Gold 24 kg Silver	56 kg Gold 32 kg Silver	90 kg Gold 50 kg Silver
Mould max diameter (mm)	● 150 / ○ 200	350	350	350
Mould max height (mm)	● 300 / ○ 400	600	600	600
Induction heating power	12 kW	25 kW	35 kW	45 kW
Vacuum pump	Internal	Internal	Internal	Internal
Pressure over vacuum	1 bar	1 bar	1 bar	1 bar
Max temperature	● 1250°C / ○ 1600°C	● 1250°C / ○ 1600°C	● 1250°C / ○ 1600°C	● 1250°C / ○ 1600°C
Metal granulation	○	○	○	○
Autotest	●	●	●	●
Monitoring system for data acquisition	○	○	○	○
Mould check before casting	●	●	●	●
Vacuum leakage detector	●	●	●	●
Oxygen Analyzer	○	○	○	○
Remote assistance	○	●	●	●
Main alloys	Gold (Au), Silver (Ag), Copper (Cu), Brass, Bronze, Aluminium (Al) and their alloys			
Standard ● / ○ Available on request				

TVM

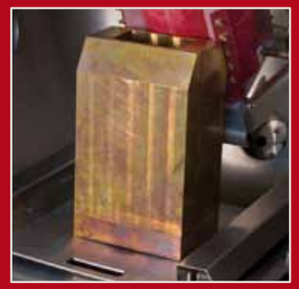
VIM Furnaces

Vacuum Induction Melting (VIM) furnaces allow to obtain results unattainable by conventional furnaces, since they allow to melt and cast high temperature metal like Pt, PtPd, PtRh, PtRu or PGM in general, using high level of vacuum to de-gas the alloy being melted in order to produce first class semi-finished products likes sheets and rods.

The plant is conceptually divided into several sub-systems:

- Vacuum Melting Chamber
- Induction Power Supply
- Tilting Coil and Crucible Assembly
- Casting Mold
- Vacuum Pump
- Monitoring System

TOPCAST develops this class of furnaces also under customized specifications for what concerns crucible capacity, mould size, vacuum level. In case you are interested in getting a quotation do not hesitate to send us your technical specifications.



A part from the granulation plants and water-atomizers to feed aqua-regia reactors for refinery purposes, TOPCAST also offers an interesting induction cupellation furnace for quick and on the spot karat testing. Ancillary equipment can be provided for a key-in-hand solution.For what concerns ashes and general scraps recovery, High Temperature Induction Melting tilting furnaces are offered for a safer and more efficient alternative to the noisy gas furnaces.

Cupellation furnaces series TCF are used in the assay process of precious metals alloys. Cupellation is a procedure with the purpose to remove all non noble metal from the alloy to test.
Topcast TCF cupellation furnaces are provided with a built-in induction generator for the heating of the muffle. This leads to ultra fast work cycles and high energy efficiency.

Main advantages of induction heating are:

- Fast heating: the muffle is directly heated by induction.
- Self-regulating: no more need to regulate power manually, with respect to furnace with silicon carbide resistance rods.
- Electrical energy consumption optimization: you don't need to leave the furnace in operation to prevent thermal shocks to the resistor rods: when work is finished, the furnace may be turned off.
- Coppelle

TOPCAST may also supply all tools and accessories for cupellation labs.

TECHNICAL DATA

	TCF5
Number of Cupels	20 (size 2 = diam.25 mm)
SiC Muffle (LxWxH)	170x222x75 mm
Max Temperature	1200 °C
Supply	Threephase - 50/60 Hz
Power	6 kW
Overall dimensions (LxWxH)	500 x 770 x 1580 mm
Weight	250 kg

www.topcast.it