Topcast
Engineering

CATALOGUE

Company Profile

TOPCAST is a company specialised in casting machines design and manufacturing. Competence developed in the investment casting field, thermal processes, induction heating and power electronics set it as an ideal partner also for custom applications. A group of qualified engineers and designers, constantly updated and oriented to the research of enhanced technological solutions, grants a product range definitely at the state of the art.

Product versatility to meet different production needs, quality design, post-sales assistance and technical help to satisfy particular needs make **TOPCAST** the best company to count on in a global competition scenery.

Areas of application are:

- Casting
- Melting
- Heat treatment
- Welding
- Brazing
- Rapid prototyping






Fields of application		TVCd	TVCd-XL	TCE	TMF	TGEN	TSF-B
Medical and Dental	Precious Alloy and MoCrCo			●			
	Titanium casting			●			
	Zirconia Sintering						●
Industrial	Lost-wax casting of Al, Bronze, Brass and Mg	●	●				
	Lost-wax casting of Steel and Superalloys			●			
	Melting				●	●	
	Steel, Scraps and Iron assay				●		
	Hardening, Soldering and Brazing					●	
	Titanium casting			●			
Rapid prototyping	Metal Parts casting	●	●	●	●		
	Page	4 - 5	6 - 7	8 - 9	11	10	-

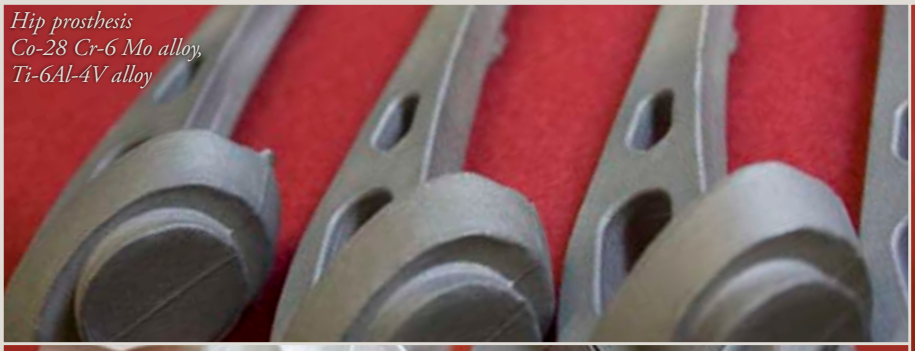




Alloys and Machines		TVCd	TVCd-XL	TCE-B	TCE-A	TMF
Ag	Silver	●	●	○	○	●
Al	Alluminium	●	●	○	○	●
Au	Gold	●	●	○	○	●
	Brass	●	●	○	○	●
	Bronze	●	●	○	○	●
Cu	Copper	●	●	○	○	●
Mg	Magnesium	●	●		●	
Pd	Palladium			●	○	●
Pt	Platinum			●	○	●
	Steel			●	○	●
	Super alloys				●	●
Ti	Titanium				●	
	Page	4 - 5	6 - 7	8 - 9	8 - 9	11

● *Suggested* - ○ *Possible*

Connecting rod
Ti-6Al-4V alloy



Hip prosthesis
Co-28 Cr-6 Mo alloy,
Ti-6Al-4V alloy

Compressor impeller
ZL-105, ZL201 alloy, Ti-6Al-4V alloy

Knee prosthesis
Co-28 Cr-6 Mo alloy,
Ti-6Al-4V alloy

Propeller
Alluminum alloy, Ti-6Al-4V alloy

Description

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 indipendent and at the moment of casting the machine can control 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 flask is cooling down in protective gas for no oxidation, the next 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.
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.

Double Chamber TVCd

Pressure Over Vacuum Casting Machine

	TVC5d	TVC10d	TVC12d	TVC12d-Mg
Application	Small labs and research departments	Medium laboratories	Large laboratories	Magnesium alloys
Number of casting programs	100	100	100	100
Working Capacity of graphite crucible	200 g Al 400 g Bronze	500 g Al 1500 g Bronze	750 g Al 2300 g Bronze	500g Mg (AZ91)
Flask maximum diameter (mm)	Ø150	Ø150	Ø150	Ø150
Flask maximum height (mm)	300 / 400	300 / 400	300 / 400	300 / 400
Induction power	5 kW	10 kW	12 kW	12 kW
Vacuum pump	Built-in 25 m^3/h	Built-in 25 m^3/h	Built-in 25 m^3/h	Built-in 25 m^3/h
Pressure over vacuum	3 bar	3 bar	3 bar	3 bar
Max. temperature	1600 °C	1600 °C	1600 °C	1600 °C
Shot maker	○	○	○	
Autotest with data report	●	●	●	●
Monitoring system for process and production data collection	○	○	○	○
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			

● *Provided* - ○ *Available on request*

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

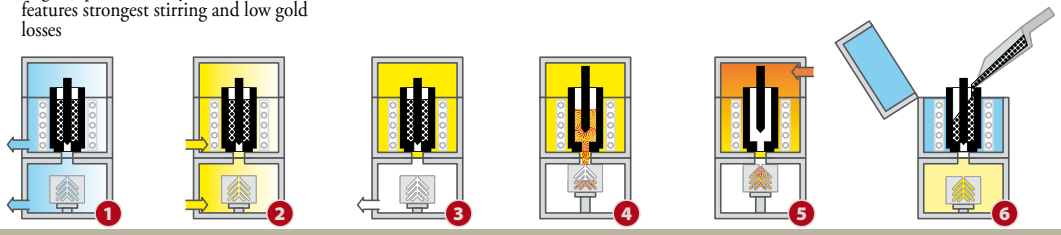
- Advanced Self Tuning thermoregulation (AST™) with exact temperature control of the melted alloys
- Two Set-Points available: Homogenization and Casting Temperature
- Two thermocouples temperature measurement with AVG function
- Medium frequency induction heating stirs the melted alloy and leads to 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

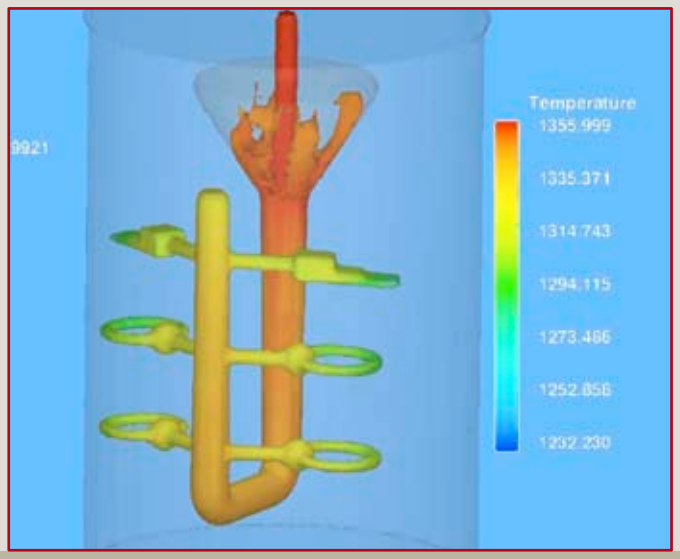
Injection and Compression

- 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





Double Chamber

TVCd-XL

Pressure Over Vacuum Casting Machine

	TVC15d	TVC25d	TVC35d	TVC45d
Application	Small Foundries	Small Foundries	Medium Foundries	Large Foundries
Number of casting programs	99	>100	>100	>100
Working Capacity of graphite crucible	5 kg Al 9 kg Bronze	5 kg Al 9 kg Bronze	10 kg Al 20 kg Bronze	30 kg Al 80 kg Bronze
Flask maximum diameter (mm)	Ø300	Ø300	Ø350	Ø600
Flask maximum height (mm)	600	600	600	800
Induction power	12kW	25kW	35kW	45kW
Vacuum pump	External	External	External	External
Pressure over vacuum	1 bar	1 bar	1 bar	1 bar
Max. temperature	1200°C	1400°C	1400°C	1400°C
Shot maker	○	○	○	○
Autotest	●	●	●	●
Monitoring system for process and production data collection		●	●	●
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			

● *Provided* - ○ *Available on request*

Description

TCE is a consistent, robust and easy to use vacuum centrifugal casting machine designed for small and medium casting laboratories.

TCE in Class B is particularly suited for Platinum, Palladium and Steel while TCE in Class A has been especially designed for Ti casting.

The casting process is fully programmable and consists of the following phases:

- *Gas washing to remove oxygen from the melting chamber*
- *Alloy Melting in Vacuum or protective atmosphere*
- *Induction melting and stirring of the alloy to get perfect homogenization*
- *Accurate control of the temperature with a proprietary narrow band optical pyrometer*
- *Vacuuming of the chamber before casting*
- *Centrifugal casting with speed and acceleration digitally controllable*
- *Cooling in inert atmosphere before removing the flask*

Casting is not only machines. For this reason TOPCAST invests in a deep and continuous research on crucible and investment materials to give to our customers always the state of the art casting solution for any alloy.

Class A and Class B

The main difference between TCE in Class A and TCE in Class B is the degree of vacuum, leak-back rate and ppm control of oxygen in the process chamber, that makes the TCE in Class A the best solution for casting reactive metals like Titanium.

Also the choice of the vacuum pumps station and the induction power generator is different and chosen to get the maximum result in Ti cast parts.

Hence, TCE machines conceived in Class A are suitable for fields that require high quality control and low interstitial pick-up on the Ti cast parts, like Aerospace, Medical and Automotive.

TCE10 in Class B can instead be used where the price of the machines is an important factor and where no high quality control of the metallurgy of the Ti cast part is required, like in Jewellery, Eye-Glass and Leisure Industry (Golf Clubs, etc ...).

Regarding the mold size and crucible capacity, today with TCE you can cast up to 1.7 kg Ti and use flasks up to 140mm in diameter and 380mm in length.

We are also developing larger machines under customized specifications for what concerns Ti crucible capacity and Flask mould size. In case you are interested in getting a quotation for non-standard casting machine do not hesitate to send us your technical specifications.

TOPCAST also supplies special crucibles and investment powder for Titanium casting particularly designed to avoid alpha-case structure in the cast parts.

Crucibles for Ti have been designed to avoid alloy contamination and to withstand the high chemical and thermal shocks involved in Ti melting

TECHNOLOGY & FEATURES

Gas Wash 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)

Class A

- Level of vacuum reached is extremely high
- Leak-back rate is carefully minimized
- Oxygen ppm in final atmosphere can be precisely controlled

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
- 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 metal gets out from the crucible and enters the flask.

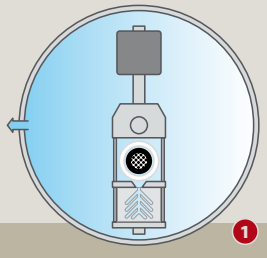
Rotational speed profile, which controls the injection rate, can be regulated digitally for a consistent and reliable mould filling.

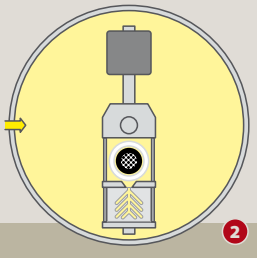
The final speed will compress the tree during the solidification phase to reduce shrinkage porosity.

Tree protection after casting

After the solidification phase, the flask 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





TCE

Vacuum Centrifugal Casting Machine

	TCE Class B				TCE Class A			
	TCE5	TCE10	TCE30	TCE50	TCE8-Ti	TCE12-Ti	TCE30-Ti	TCE50-Ti
Application	Small labs	Medium labs	Large labs	Large labs	Small labs	Medium labs	Large labs	Large labs
Working Capacity	500g Pt 250g Steel	1500g Pt 1000g Steel	5 kg Steel	8 kg Steel	100g Ti	350g Ti	1000g Ti	1700g Ti
Flask maximum diameter (mm)	Ø110	Ø130	Ø140	Ø140	Ø110	Ø130	Ø140	Ø140
Flask maximum height (mm)	120	180	300	380	120	180	300	380
Induction power	8 kW	10 kW	30 kW	50 kW	8 kW	10 kW	30 kW	50 kW
Speed	500 rpm	350 rpm	300 rpm	300 rpm	500 rpm	350 rpm	300 rpm	300 rpm
Vacuum pump	External	External	External	External	External [1]	External [1]	External [1]	External [1]
Max. temperature	2000 °C	2000 °C	2000 °C	2000 °C	2000 °C	2000 °C	2000 °C	2000 °C
Monitoring system for process and production data collection	○	○	●	●	○	○	●	●
Vacuum leakage detector	●	●	●	●	●	●	●	●
Oxygen Analyzer	○	○	●	●	○	○	●	●
RS232 remote interface	○	○	●	●	○	○	●	●

● *Provided* - ○ *Available on request*

[1] *Vacuum performance, leak rate and oxygen content are sensitive data and cannot be discolsed in this catalogue. Please contact TOPCAST for more information.*

TGEN

Induction Frequency Converters

TOPCAST designs state of the art generators for induction heating application.

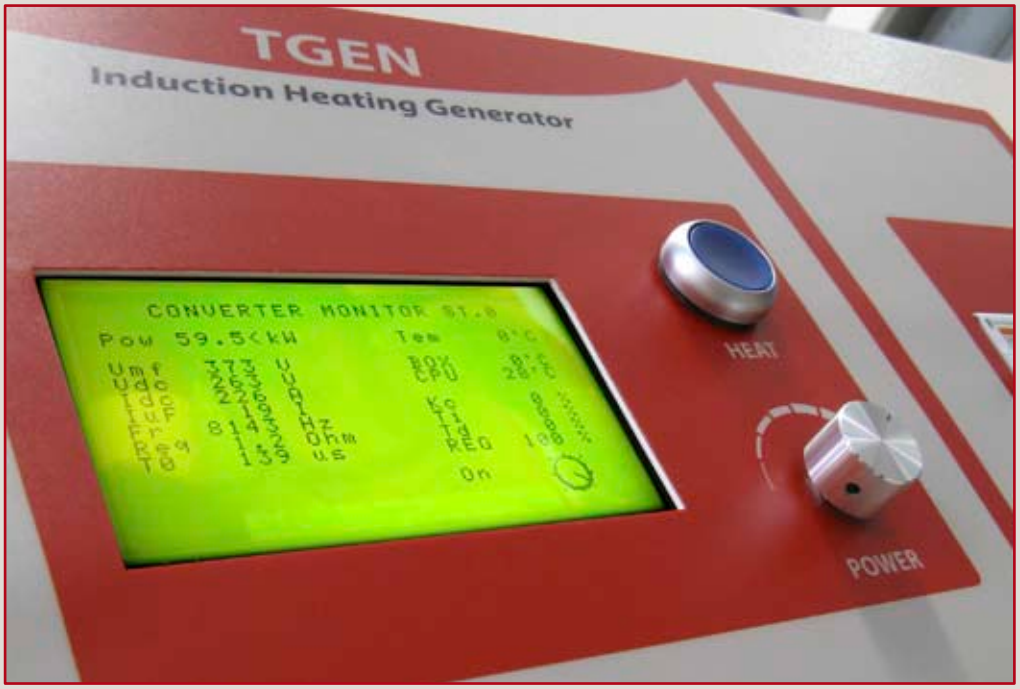
The design approach uses both configurations: parallel and series resonant typology adopting the latest and most advanced IGBTs and SCRs modules available worldwide.

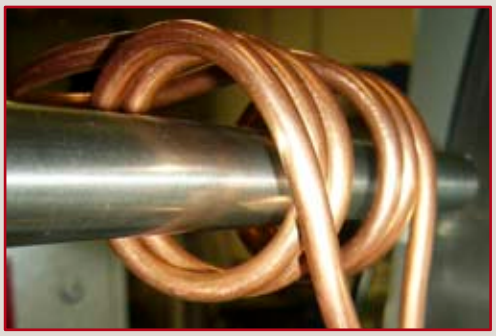
In our generators, galvanic insulation between coil and power mains gives the maximum safety for the user, while digital technology makes our furnaces soundless, versatile and reliable.

Fibre optics connections give to our electronics 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 control.





	TGEN5	TGEN15	TGEN50	TGEN100	TGEN150	TGEN200
Induction power	5 kW	15 kW	50 kW	100 kW	150 kW	200 kW
Frequency range	5 – 50 kHz	5 – 50 kHz	5 – 50 kHz	5 – 25 kHz	5 – 25 kHz	5 – 25 kHz
MF voltage	550 V	550 V	550 V	550 V	550 V	550 V
Monitoring system for process and production data collection	○	○	○	○	○	○
Remote control	○	○	○	○	○	○

● *Provided* - ○ *Available on request*

TMF

High Power Induction Melter

Melting plants can be provided with one or more melting stations using a power switch to drive one station or the other.

Maintenance of the furnace is very easy and allows rapid changing of the crucible and the safety refractory shell.

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 generator.

	TMF5	TMF7	TMF10	TMF12	TMF-10P
Crucible capacaity	2,4 kg Brass	3,4 kg Brass	5,4 kg Brass	6,8 kg Brass	1 kg Steel (*for steel assay purpose*)
Power	5 kW	7 kW	10 kW	12 kW	10 kW
Max. temperature	1300 °C	1350 °C	1400 °C	1450 °C	1800 °C
Melting time	15 min.	15 min.	15 min.	20 min.	3 min.

	TMF10-R	TMF15-R	TMF25-R	TMF35-R	TMF45-R	TMF60-R	TMF100-R	TMF150-R	TMF200-R
Power	10 kW	15 kW	25 kW	35 kW	45 kW	60 kW	100 kW	150 kW	200 kW
Zirconia crucible	1 kg Pt	2 kg Pt	8 kg Pt	12 kg Pt	22 kg Pt	30 kg Pt	40 kg Pt	80 kg steel	120 kg steel
Max. temperature	2000 °C	2000 °C	2000 °C	2000 °C	2000 °C	2000 °C	2000 °C	2000 °C	2000 °C
Alumina crucible	2 kg steel	5 kg steel	10 kg steel	15 kg steel	25 kg steel	50 kg steel	60 kg steel	80 kg steel	120 kg steel
Max. temperature	1700 °C	1700 °C	1700 °C	1700 °C	1700 °C	1700 °C	1700 °C	1700 °C	1700 °C
SiC crucible	8 kg Brass	20 kg Brass	30 kg Brass	30 kg Brass	30 kg Brass	80 kg Brass	80 kg Brass	200 kg Brass	320 kg Brass
Max. temperature	1450 °C	1450 °C	1450 °C	1450 °C	1450 °C	1350 °C	1350 °C	1350 °C	1350 °C

Topcast
Engineering

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