

CAST

PRODUCT INFORMATION

TI-RESEARCH



protected by US Pat. No. 6,880,615 and other international patents



December 2008



TABLE OF CONTENTS

LIST OF PARTS	4
Specifications	5
Used symbols and their meaning	5
PRINCIPLE OF OPERATION	6
SAFETY INSTRUCTIONS.....	7
Intended Use	7
Electrical Safety.....	7
Safe Operation.....	7
INSTALLATION AND FIRST OPERATION.....	8
Unpacking	8
Installation	8
First Operation	10
Conversion of the Device for large Moulds.....	11
PRODUCTION OF CASTINGS	12
Sprueing	12
Invest.....	13
Preheating.....	14
Casting.....	14
Devesting.....	16
MAINTENANCE AND SERVICING	17
Maintenance	17
Servicing and Cleaning	17
PROBLEMS AND SOLUTIONS	18
CONSUMABLES, SPARE PARTS AND ACCESSORIES.....	19

ANNEX I: CORRECT SPRUEING.....20

The Waxdisk 20

Fixing of Sprues to the Waxdisk.....20

Positioning of Models in the Mould21

ANNEX II: HINTS FOR PROPER MELTING.....23

List of Parts



- | | |
|----------------------------|-----------------------------------|
| 1 cabinet | 9 mould pliers |
| 2 top lid | 10 wax disks |
| 3 lever | 11 crucible |
| 4 power switch | 12 crucible holder |
| 5 power cord | 13 crucible holder handle |
| 6 metal ring, large | 14 mounting screw M4 x 6mm |
| 7 metal ring, small | 15 wrench 3mm, 5mm |
| 8 mould socket | 16 3 screws M6 x 10mm |

Specifications

Dimensions

diameter: 170 mm
 height: 270 / 320 mm
 weight: 8,5 kg

Power

	EU	US
voltage:	230 V	115 V
frequency:	50 Hz	60 Hz
power consumption:	30 W	40 W
rotation speed:	930 min ⁻¹	1,100 min ⁻¹

Environment

temperature range 5 °C - 40 °C
 rel. humidity 90 % @ 20 °C

Used symbols and their meaning



Attention!
 hot surface



Caution!
 dangerous electrical voltage



open lid



close lid

The type plate with serial number and CE-sign is on the rear side of the device.

Principle of Operation

CAST made by TI-RESEARCH is a centrifugal casting device for the production of precision castings. The device is suitable for all kinds of castable materials. The scope of usage reaches from technical products for further processing, jewelry and dental appliances.

For the production of castings made of metal, precious and non-precious alloys may be used. The device is designed for melting of metals by flame with a suitable torch which provides the best means for controlling the melting process.

With a small and a large metal ring for different sizes of moulds various sizes of parts or different numbers of castings may be produced. For the casting of dental parts, for example 40 and more crowns and/or bridge elements may be produced with a mould in the small ring and three or more partial frames may be casted with a mould in the large ring in one cast. For jewelry the amount of parts depends on their design and size and is limited by the crucible capacity.

The operation of CAST is based on a patented process where balancing of the rotating part is not necessary. Despite of the extraordinary small dimensions the device allows the production of more parts in one process than any other competitors' dental casting device today available on the market.

CAST is distinguished by ease of use and the extraordinary small size and is the first choice for locations with limited workspace.

The device comprises of a special safety mechanism to protect the user by activating a mechanical brake while opening the top lid and switching off the power to protect from accidental restart.

The device meets all applicable safety standards. Nevertheless care has to be taken to prevent dangerous situations during operation.

For safe operation of the device, this instruction manual is to be read prior to the first usage and the instructions given here are to be obeyed.

Safety Instructions

For safe operation the following instructions are mandatory:

Intended Use

The usage of CAST by TI-RESEARCH is intended for the production of castings with the centrifugal casting principle by qualified users only. Any other application is not intended use and not permitted.

TI-RESEARCH is not liable for damages resulting of not intended use. Not intended use is any use not mentioned in this instruction manual.

All local regulations for safety at work and accident prevention are to be obeyed for operation.

Electrical Safety

Prior to the connection it is to be verified that the local power supply, i. e. voltage and frequency meets the technical specifications of the device.

The device may be connected to a power outlet with protection earth contact and a leakage current safety switch with $F_1 < 30\text{mA}$ only. Care has to be taken for the power cord is not subject to mechanical tension.

For maintenance or repair purposes the device is to be disconnected from power supply by pulling the power plug out of the socket.

Repair of the device is to be carried out by the manufacturer or persons appointed by the manufacturer only.

TI-RESEARCH is not liable for damages resulting of improper work.

After repair-work on electrical parts of the device an insulation test and protection earth inspection is to be carried out by a certified electrician.

Safe Operation

During operation heat sensitive parts have to be kept in a sufficient distance from the device.

Combustible, inflammable and explosive substances are to be kept away from the device during operation.

Do not touch hot parts, i.e. the crucible, crucible holder, top lid, mould, etc..

Handling of preheated moulds while inserting into or removing from the mould holder may cause danger of burning. For the safe handling of moulds the specially shaped mould pliers has to be used.

For the usage of torches the local safety regulations and precautions are to be obeyed. In case of defects or damages resulting in dangerous conditions for use the device is to be disconnected from the power supply and to protect against accidental use.

Installation and first Operation

Unpacking

After unpacking check the content for damages of transportation and completeness according to the packing list.

Not complete deliveries are to be claimed with the invoice and the serial number of the device within three days after delivery at the retailer.

Damages of transportation are to be complained immediately at the transportation company.

Installation

The table-top device **1** is to be placed on top of a horizontal, flat and non-slippery surface with sufficient distance from heat sensitive objects. Care is to be taken to provide enough working space for the handling of hot parts.

The crucible holder **12** is to be mounted on the top lid **2** and to be fixed with the mounting screw M4 x 6mm **14**. The crucible holder **12** must be easily tipped over by moving the crucible holder handle **13**.



Lift the top lid **2** by turning the lever **13** upward and turn it to the side. The mould holder inside the device must not be able to rotate free by hand operation. In case the mould holder rotates free proceed as indicated in the troubleshooting section.



Check the mould rings for easy insertion and correct fit using the special shaped pliers. In any other case claim to your retailer.

Close the top lid **2** by turning it back over the device **1** and turning the lever **13** downward. The top lid **2** must close tight with the cabinet **1**.

First Operation

Before connecting to the power outlet check the specifications of your power supply with the specification of the device on the type plate.

In case the specifications of the device do not match to your local power supply, the device must not be connected.

Make sure the device is switched off by pushing the main switch button **4**:



button snapped out – device off,



button snapped in – device on.

Connect the power cord **5** of the device to a correctly installed and fuse protected power socket protected by a leakage current switch ($F_l < 30\text{mA}$).

In case the top lid **2** is open, turn it back over the cabinet **1** and close it firmly by turning the lever **13** downward. The top lid **2** must close tight with the cabinet **1**.

Snap in the power switch **4** by pushing it – device is running: the mould holder in the device starts rotating counter clockwise. Turning is visible through the central hole in the top lid.

NEVER put fingers or other parts through the central hole in the top lid. Danger of injuries may occur!

In case the device does not start rotation proceed as indicated in the troubleshooting section.

Snap out the power switch **4** by pushing it again – device is turned off: the rotation of the mould holder slows down. Turning is visible through the central hole in the top lid. For a quick stop of the mould holder turn the lever upward to activate the break mechanism.

Conversion of the Device for large Moulds



Unscrew the three mounting screws of the mould holder with the small key (part of delivery). Take the mould holder and the 3 cm high adapter-ring underneath out of the device.



Place the mould holder without the adapter-ring in the device and fix it by hand with the three short screws at equal torque.

Place the large metal ring **6** onto the mould holder and check for correct fit. The top lid **2** must close tight with the cabinet **1**.

For re-conversion to the small ring just follow the instructions in reverse order.

Incorrect mounting may cause damages to the device and/or of the user.

Production of castings

Depending on type and volume of objects to be casted three different types of mould rings may be used:

- small 30 mm high mould ring for small parts with low extent like rings and the like,
- small 30 mm high mould ring with reduced volume for a few or even single small parts (to be purchased separately),
- large 60 mm high mould ring for large and/or more extended parts like brooches or small series.

Sprueing

In contrast to conventional sprueing the wax modellations are mounted radially around the wax disks **10**.



To prevent air bubbles it is important that the parts are fixed with the open side on top or at least parallel to the mould socket base.

Hint:

For most alloys the remaining metal ring is suitable to replace the bar in conventional castings, thus there is no bar or other reservoir constructions necessary. This circumstance is time saving and advantageous for preparation of large castings like brooches or wide parts with high volume.

Depending on the density of the alloys used different distances from the metal ring are recommended:

non precious alloys	approx. 1 cm to the inner side of metal ring
precious alloys	approx. 1,5 cm to the inner side of metal ring
high precious alloys	approx. 2 cm to the inner side of metal ring

These recommendations may vary depending on the alloy, investment material and mould temperature.

Best values are to be determined individually at work with the materials used.

Invest

Prior to the investment an approx. 1 mm thick liner of 25 mm width for the small metal ring **7** or 55 mm width for the large metal ring **6** respectively are to be placed to the inner side of rings (Fleece 25 or Fleece 55 of TI-RESEARCH is recommended). A small contact zone of approx. 2 mm on top and bottom side remains to prevent the mould from sliding out of the hot metal ring.



Important!

While pouring the invest material into the ring the shaped edge of the ring must be on top.

Invest the modellation with a suitable investment (e.g. Invest C/P or Invest NP by TI-RESEARCH)

Important!

By filling the prepared metal ring placed on the mould socket **8 with invest-material care has to be taken that the invest material does not exceed the edge of the metal ring. Otherwise mounting**

of the mould into the mould holder is more difficult or not possible.



Warning!

The shaped edge of the metal rings must be free of investment.

Preheating

The mould and the crucible are to be preheated as usual according to the instructions of the invest material used.



Casting

After preheating the mould is to be taken out of the furnace and placed into the mould holder by turning the ring clockwise to the stop. A correctly placed ring may not be lifted off the holder. The lid is to be closed and the crucible is to be mounted into the crucible holder and filled with alloy. After these preparations melting of the metal may start.

The type and power of the torch used is crucial for the quality of the casting result – see annex II: hints for proper melting.

Prior to the melting process or at least 5 seconds before pouring the device is to be switched on to reach nominal speed for casting.



After reaching the liquidus point of the metal it may be poured into the mould by turning the crucible holder handle **13** in a smooth move to tip over the crucible **11**.

Depending on the alloy used and the preheating temperature of the mould the device must kept running for a sufficient time to allow cooling down the metal before switching off.

After solidification the top lid **2** may be opened by turning the lever **3** to access the mould with the mould pliers **9** for cooling down.

ATTENTION: **Danger of burning at hot parts**

Devesting



After sufficient time of cooling down the casting may be taken out of the mould as usual for further processing.



Maintenance and Servicing

Maintenance

The casting device requires no special maintenance. With respect to safe operation a visual check of the cabinet or other parts of the device and the power cord should be done before each use. The top lid **2** must close tight with the cabinet **1**.

Prior to any placement of moulds the three pins of the mould holder must be checked visually for damages. The pins must be firmly fixed, equally long (3 mm) and straight pointing towards the center.

Prior to any use the crucible **11** has to be checked for damages. Cracked, broken or damaged crucibles must not be used.

Usage of defective crucibles may cause danger of burning by splashed metal.

Defective parts are to be replaced by the manufacturer or a person appointed by the manufacturer. Unusable crucibles must be replaced by crucibles from TI-RESEARCH only. TI-RESEARCH is not liable for any damages caused by defective or third party replacements.

Servicing and Cleaning

Prior to each cleaning the device is to be disconnected from mains power by pulling the power plug out of the socket.

The drive assembly is dust protected. To prevent accumulation of invest material or others during usage cleaning of the device by compressed air on a weekly basis or more frequent if necessary is strongly recommended.

Keep off liquids from inside the device!

The cabinet may be cleaned by a moistened piece of cloth. For special care the usage of stainless steel detergents (e.g. CLEAN by TI-RESEARCH) is recommended.

Maintenance, servicing and cleaning is to be performed by qualified personnel only.

Problems and Solutions

problem	possible cause	solution
no spin up	device not connected	connect device to an appropriate mains socket.
	top lid not closed	close top lid by turning the lever.
	mould is stuck	open top lid and check mould for correct fit.
	defective electrical components	disconnect the device by pulling the power plug and protect from accidental use – inform customer service.
device does not stop within 5 seconds with opened top lid	brakes used up or misadjusted	inform customer service.
mould holder turns free by moving by hand, device runs free with top lid open	misadjusted brakes or defect in breaking appliance	disconnect the device by pulling the power plug and protect from accidental use – inform customer service.

Use original packing for transportation.

Consumables, Spare parts and Accessories

TI-RESEARCH

The items listed below may be ordered at your local retailer or at TI RESEARCH.

Accessories/consumables

Item No.	Item
3010-00	Mold pliers (Cast-System)
3020-00	Mold socket
3030-00	Metal ring 30 mm
3030-10	Metal ring, sectioned 30 mm
3040-00	Metal ring 60 mm
3040-10	Metal ring, sectioned 60 mm
3100-00	Melting set for propane
3110-10	Pressure regulator for oxygen
3110-20	Pressure regulator for propane
3110-30	Gas saving device with torch holder
3120-00	Torch handle with screw connections
3120-10	Melting torch, 27000 kJ/h
3120-20	Melting torch, 38000 kJ/h
3120-30	Micro-welding inserts with 3 exchangeable nozzles
3180-10	Flame arresting device for oxygen
3180-20	Flame arresting device for propane
3190-00	Twin feeding hose, propane/oxygen Ø 5mm, 1m
3190-10	Single feeding hose, oxygen Ø 5mm, 1m
3190-20	Single feeding hose, propane Ø 5mm, 1m
3190-30	Goggles
4010-00	Fleece 55R (40 m roll, 55 mm)
4020-00	Fleece 25R (40 m roll, 25 mm)
4030-00	Waxdisk (25 pieces)
4100-00	Invest C/P 5 kg, speed investment for ultra precision surfaces
4100-10	Invest C/P 20 kg, speed investment for ultra precision surfaces
4110-00	Invest NP 5 kg, speed investment for high precision surfaces
4110-10	Invest NP 20 kg, speed investment for high precision surfaces
4200-00	Invest Liquid 1l
4200-10	Invest Liquid 5l
4500-00	Clean (stainless steel detergent) 100 ml
5010-00	CrCoMo alloy 1kg
6000-00	Cast-crucibles M (150g gold) package of 5
6000-10	Cast-crucibles L (250g gold) package of 5
6000-20	Cast-crucibles XL (450g gold) package of 5

Annex I: Correct Sprueing

As common to any casting system some device dependent and physical properties have to be obeyed to obtain satisfactory results.

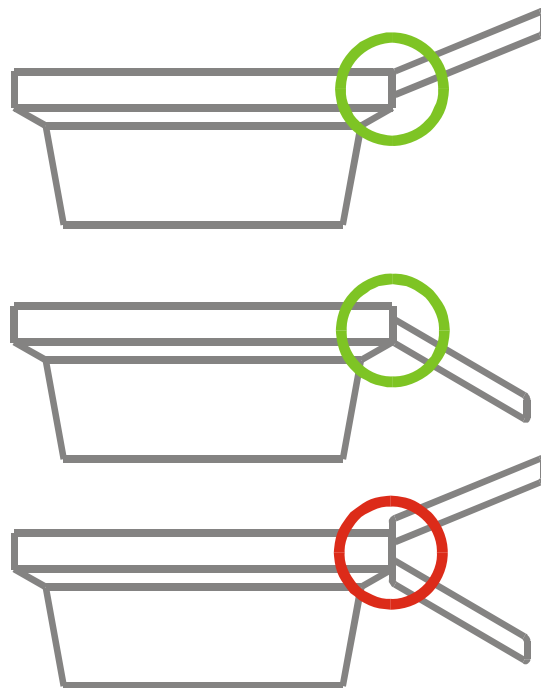
The Waxdisk

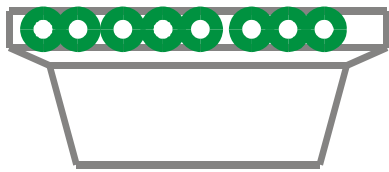
The waxdisk of the *CAST* – system replaces the sprue base known from other casting systems.

In common casting systems objects are sprued to a central sprue base acting as a bottleneck for the metal flow. Using the *CAST* – system objects are sprued radially to the waxdisk resulting in a higher flow rate for each single sprue.

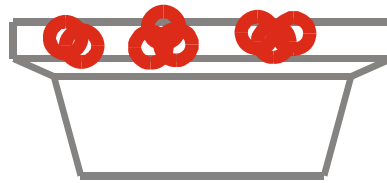
Fixing of Sprues to the Waxdisk

The sprues are to be fixed radially around the widest extent of the waxdisk with wax as depicted in the illustration below. Care has to be taken that the sprues are fixed with their full intersection along the waxdisk – otherwise the effective diameter for metal flow will be reduced resulting in a delayed or insufficient filling of the mould or miscasts.





correct



wrong

It is important to avoid sprueing to a center sprue base but to mount each sprue radially to the waxdisk. To avoid turbulences and insufficient flow the sprues should be fixed side by side without any overlap (see illustration above).

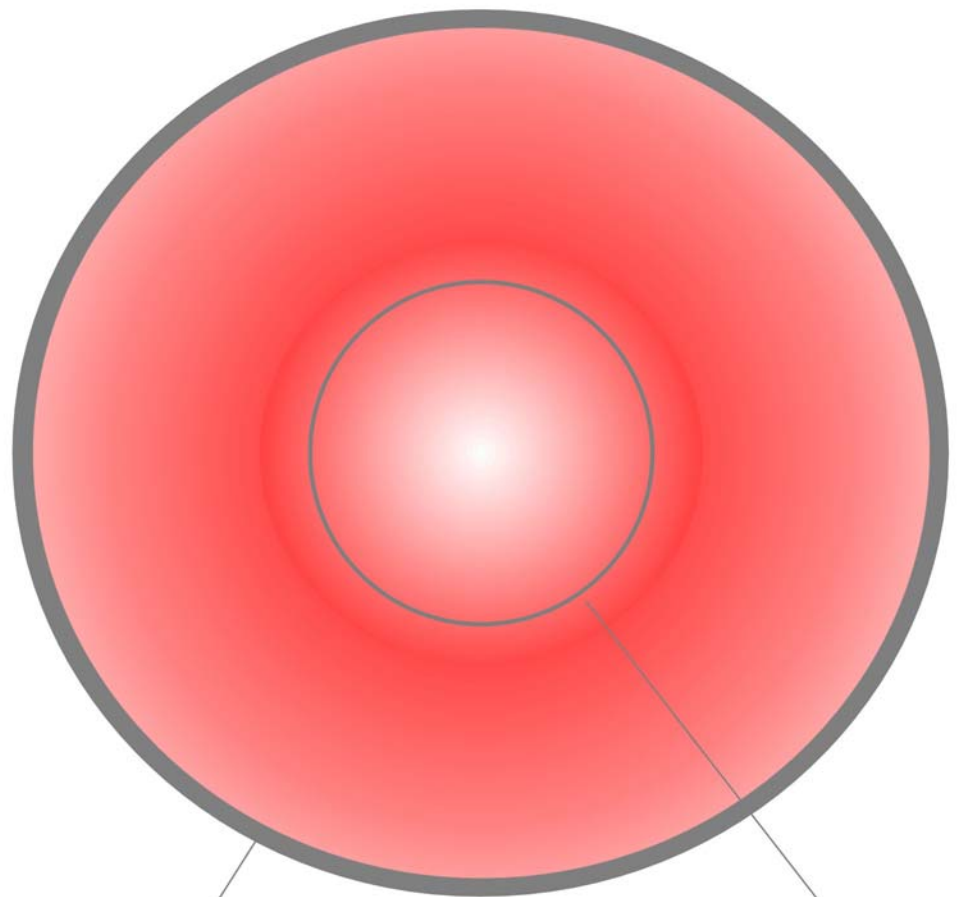
Positioning of Models in the Mould

In contrast to conventional systems the center of heat is NOT located along the mould axis but shaped like a ring around the axis (see illustration overleaf). This ring shaped heat distribution has to be taken into account by placing the models.

The objects may be placed in different layers within the mould. Their distribution should be about equal in distance to the borders of the mould (like in conventional systems to keep the objects out of the heat center).

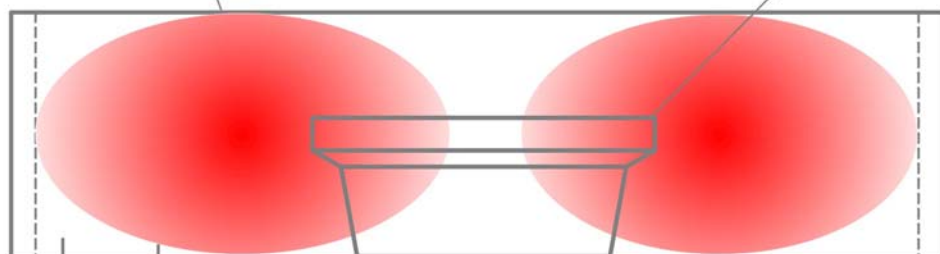
In any case objects have to be placed with open side up within the mould to avoid bubbles in hollow forms.

Heat distribution inside the mould (schematic)



mould

waxdisk



high density (18g/cm^3 and over)

low density (10 g/cm^3 and below)

Annex II: Hints for Proper Melting

With the *CAST* - system 450 g of gold, high precious alloys or equivalent volumes of other metals may be casted easily. The correct selection and use of a suitable torch is crucial for the success and quality of the results. The most important selection criteria are the following:

- quality and condition of torch,
- proper adjustment of the flame,
- sufficient power and
- volume of the flame.

The use of two different torches for the use with propane/oxygen turned out to be advantageous: one with a nominal power of 27000 kJ/h for small amounts of any alloy and another one with a nominal power of 38000 kJ/h for higher volumes of metals or alloys. The torches recommended by *TI-RESEARCH* meet the requirements for use with the *CAST* – system suitable for almost all alloys used for jewelry.

To achieve a perfect cast the alloy must be melted completely, i. e. brought above the liquidus point completely into the liquid state. Most alloys in the liquid state contract to a spheric shape like a drop of mercury and may be moved easily under the pressure of the flame.

It is very important to cover the metal with the flame during the entire melting process to avoid destruction by oxides and a homogenous warming up of the whole amount of metal – melting in sections may lead to destruction of compounds of the alloy and/or its structure.

After the metal is entirely in the liquid state the content of the crucible is tipped over through the central hole in the top lid with a smooth move into the rotating mould.

TI-RESEARCH

Manufacturer:

Ti-Research GbR
Am Oberen Bühl 13
D 97350 Mainbernheim
Germany

phone: +49 9323 80159

fax: +49 9323 80156

email: info@ti-research.com

home: www.ti-research.com

Member of  MJS

Retailer:

(stamp)