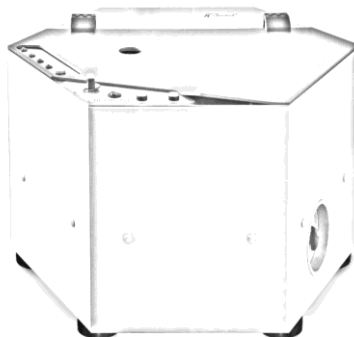


SILVERCAST



HEXACAST



Middle Frequency Centrifugal Casting Machine

Instructions for Use

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1. Safety instructions

1.1 Intended use



Caution: Before switching the machine on, read through these instructions!

The induction casting machine is intended solely for dental laboratory use, for melting and centrifugally casting all conventional dental alloys with the exception of titanium. This machine should only be used for the intended purpose. The producer refuses any liability for damages originating from any other use of the machine. Intended use also includes adhering to the instructions for use as well as servicing and carrying out maintenance work at regular intervals.

1.2 Explanation of symbols

Symbol	Text	Explanation
	Attention!	This symbol, when used alone or in conjunction with any of the following icons, indicates the need to consult the operating instructions provided with the product. WARNING: A potential risk exists if the operating instructions are not followed
	Hot surface!	This symbol indicates the presence of a hot surface or component. Touching this surface could result in bodily injury. WARNING: To reduce the risk of injury from a hot component, allow the surface to cool before touching.

1.3 Guarantee and liability

The manufacturer provides 2 years guarantee for the appliance with the serial number indicated on the last page of this document according to the General Conditions of Sale and Delivery. Guarantee and liability claims for damages to persons or equipment are invalid if the damage is found to have been resulted from any of the following cases:

- improper installation, operation, assembly or maintenance of the machine
- use of the machine other than for the purpose intended
- operation of the machine with faulty safety equipment or improperly installed or non-functioning safety and protective devices
- disregarding the Instructions for Use relating to transport, storage, assembly, operation and maintenance of the machine
- inadequate monitoring of the parts exposed to wear and tear
- unauthorized structural alterations to the machine
- repair carried out improperly

1.4 Obligations of the authorized user

The authorized user is obliged to make sure that all those who operate the machine

- are familiar with the safety regulations and accident prevention and have been instructed on how to operate the machine
- have signed having read and understood the safety precautions and instructions for use
- have been instructed on the current regulations for the accident prevention.

1.5 Obligations of the personnel

Before commencing any work, all those who operate the machine are obliged

- to adhere to the basic regulations regarding safety at work
- to sign having read and understood the safety instructions and instructions for use.

1.6 General information for the safe use of the equipment

- Do not modify the machine in any way.
- The machine should not be used if it is in any way faulty.
- Keep the working area clean. Untidiness at the workplace increases the risk of accidents.
- Do not reach into the machine while it is running. Do not open the machine until the casting arm is at rest. The casting chamber lid cannot be opened when the arm is rotating.
- For safety reasons, use only accessories and materials recommended by the instructions. Using materials other than those recommended in the instructions constitutes an accident risk for the operator and cannot therefore be regarded as intended use.
- Always disconnect the machine from the mains before commencing any maintenance work.

1.7 High risks



Warning: The machine operates generating middle frequency electromagnetic waves and should not be operated by anyone having a heart pacemaker.

Warning: Risk of burns on contact with the crucible or investment.
Always use tongs to remove the hot investment after casting.

Warning: Risk of fire! Do not place any flammable object in the casting chamber.

Warning: Always use protective goggles when observing the molten metal.

Warning: Only alloys mentioned under 1.1 should be melted.
Melting and casting light metals, such as aluminum, magnesium and titanium, can be particularly dangerous.

1.8 Packaging

The packaging protects the machine during transit, but provides only limited protection against wet, heat and any mechanical force. The packaging should be disposed of in the proper manner observing the local environmental regulations.

1.9 Package contents

For Silvercast casting machine with container centrifugal system:

- 1 pc. Silvercast induction casting machine
- 1 pc. Instructions for Use with CE Conformity Declaration
- 1 pc. 3/4" end fittings, inner Ø 8 mm
- 3 pcs. clips
- 1 set mould container (4 sizes: size 1-4)
- 1 set mould ring (4 sizes: 4 conical plastic ring with plastic plate).
- 1 pc. crucible for non-precious alloys

For Hexacast casting machine with adjustable centrifugal system:

- 1 pc. Hexacast induction casting machine
- 1 pc. Instructions for Use with CE Conformity Declaration
- 1 pc. 3/4" end fitting, inner Ø 8 mm
- 3 pcs. clips
- 1 pc. crucible for non-precious alloys

1.9.1 For metal framework casting can be ordered optionally:

Mould rings: 1 set order no. 10-9440
(incl.: 2 sizes of conical Dentaurem system + 1 pc. plastic base
+ 3 pc. plastic funnel)

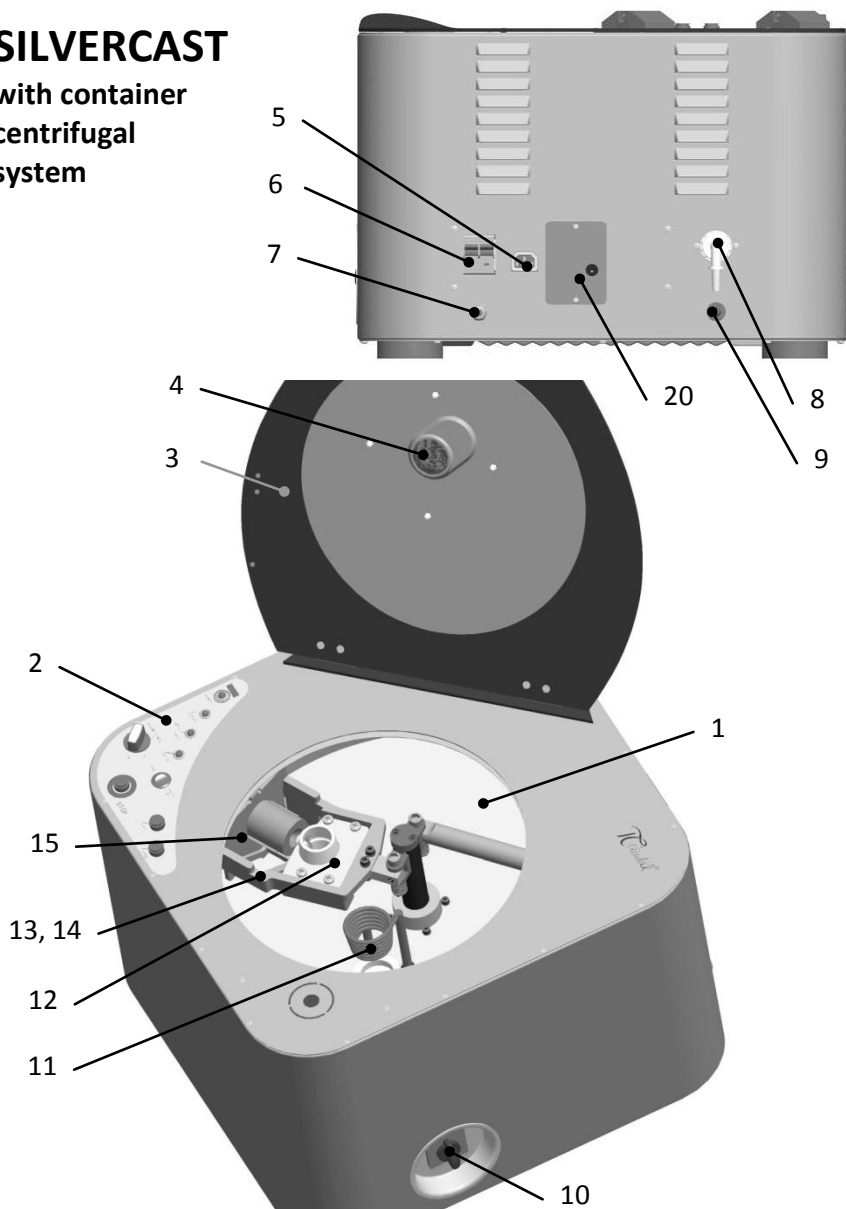
Mould containers: 1 set order no. 10-9600
(for container centrifugal system) (incl.: 2 sizes for Dentaurem mould rings)

2. Description of the machines

Picture (1.)

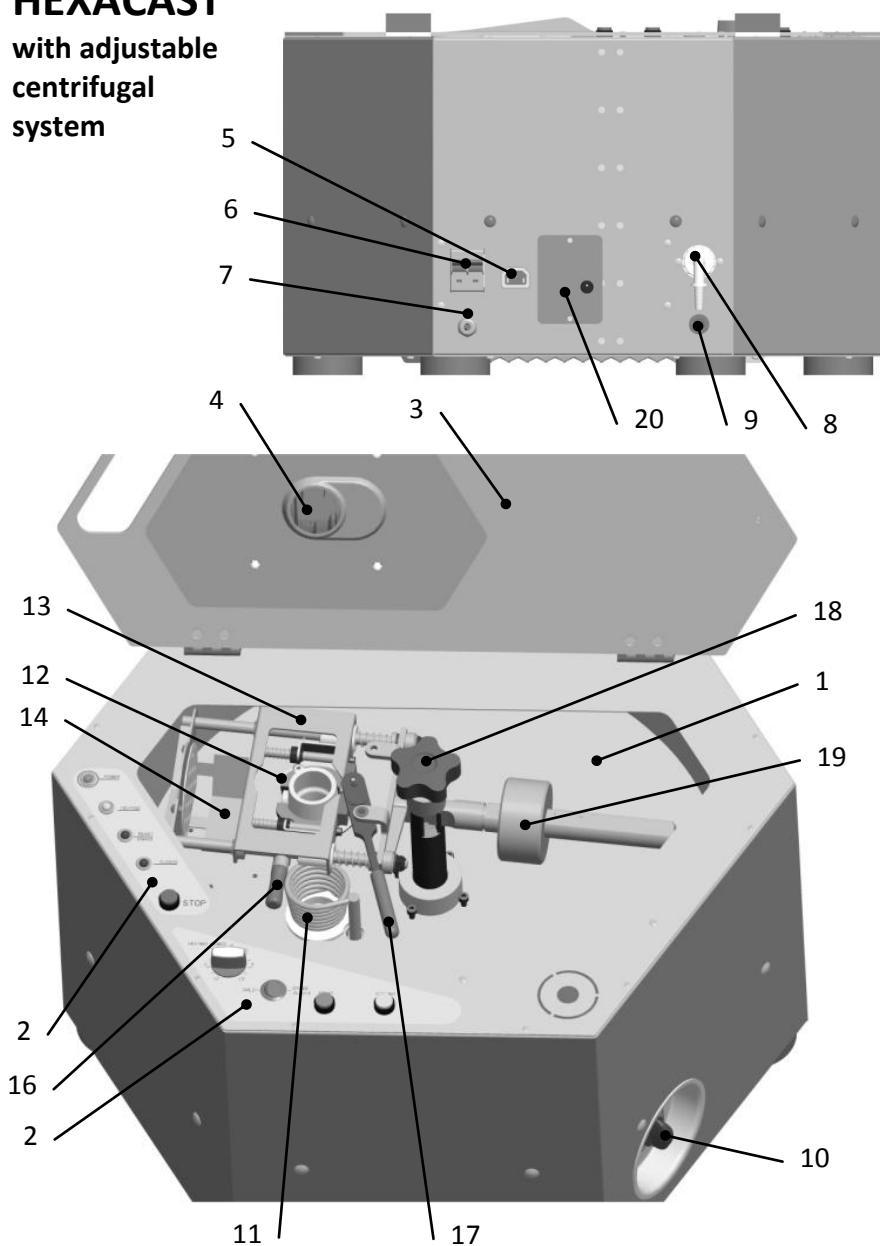
SILVERCAST

with container
centrifugal
system



Picture (1.)

HEXACAST with adjustable centrifugal system



Machine top and rear views [Picture (1)]:

- | | |
|---|--------------------------------|
| 1) Casting chamber | 11) Induction coil |
| 2) Operating panel | 12) Crucible holder |
| 3) Casting chamber cover | 13) Casting-frame |
| 4) View glass | 14) Investment holder (cradle) |
| 5) Power out for circulation unit | 15) Investment container |
| 6) Two-pole circuit breaker (2 x 16 A) | 16) Thumb-support arm |
| 7) Power cable | 17) Retraction-arm |
| 8) Water-in from circulation unit or water supply | 18) Centrifuge-arm fixing knob |
| 9) Water-out for water draining | 19) Adjustable counterweight |
| 10) Power switch | 20) Service window with socket |

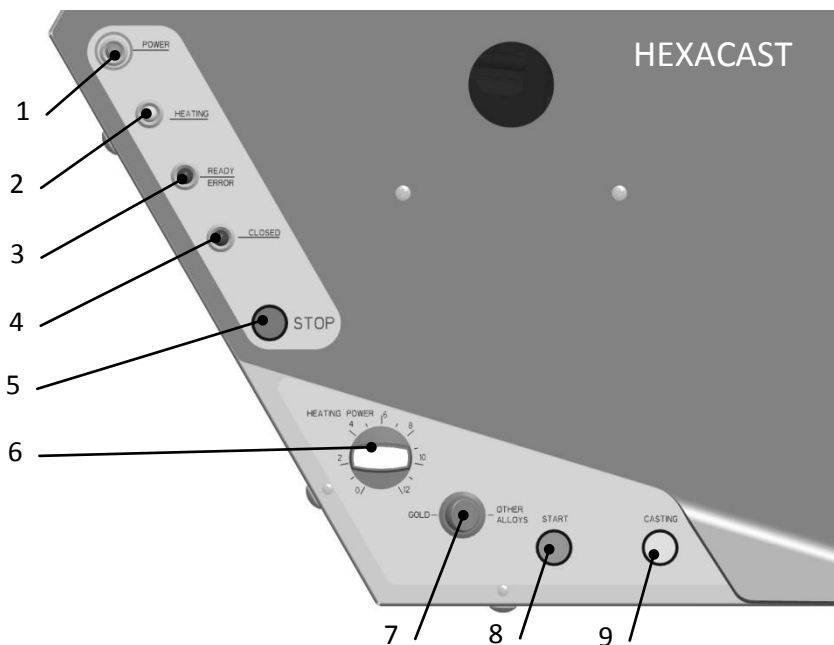
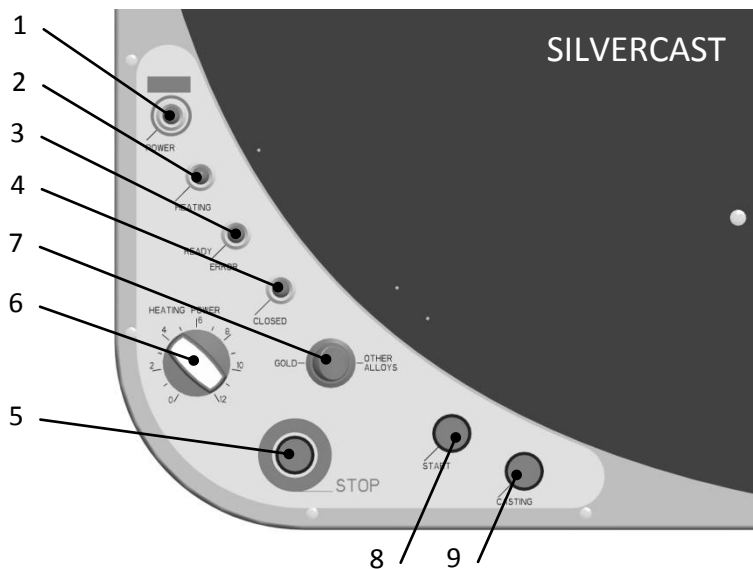
2.1. Operating panels

see on [Picture (1) / pos. 2]

Operating elements:

[Picture (2)]

- 1) Power lamp (green LED)
- 2) Heating indicator (yellow LED)
- 3) Ready (green) / Error (red) inducator (bicolor LED)
- 4) Cover status indicator (red LED)
- 5) STOP button (red button)
- 6) Heating power regulation
- 7) Alloy selection
- 8) Program START button (green button)
- 9) CASTING start button (yellow button)



Picture (2)

2.2 Function

Compact, easy to operate induction casting machine for melting and casting all dental alloys with the exception of titanium and titanium alloys.

It is ideal for use in smaller commercial laboratories as well as in private practice laboratories because it can be operated manually and has a variable heating control. On the other hand, large laboratories can make good use of it too, as its cooling system and capacity supports continuous operation.

The machine operates based on the principle of energy transfer used in transformers and known as induction.

By creating a middle-frequency magnetic field, a secondary current is produced through induction flows on the surface of the metal to be melted and this current is transformed into heat which then melts the metal.

The eddy currents created in the molten metal ensure that the metal is thoroughly mixed.

The subsequent centrifugal casting into an investment also helps to produce a homogeneous mould.

The main advantages of induction casting machine are:

- high melting capacity with low energy consumption
- homogeneous melting and casting
- minimum material loss
- less finishing required
- easy operation
- compactness
- easy maintenance.

2.2 Assembling the machine

The main part of the machine is a medium-frequency generator which is encased in a sheet-steel housing. The generator meets the requirements of the electromagnetic tolerance. The middle-frequency generator produces a 110 kHz electromagnetic field which heats and mixes the molten metal to a very

homogeneous consistency. The induction coil [Pict. (1) / pos. 11] is water-cooled and protected against overheating.

- The centrifugal arm [Pict. (1) / pos. 13] in the casting chamber holds the crucible and the investment. The centrifugal arm has a counterweight to ensure smooth, quiet running.
- The induction coil (heating element) in the lower section of the chamber rises automatically to encircle the crucible when the program is started. After the heating phase, when the Casting button is pressed, the induction coil is lowered and the casting cycle commences.
- The melting process can be observed through a protective glass [Pict. (1) / pos. 4] which is integrated in the cover lid.

3. Installation

3.1 Positioning the machine

Place the machine on a solid base, for example on a sturdy table, and set level. The installation place should be clean and as free from dust as possible.



Caution: A minimum gap of 20 cm should be left between the casting machine and any appliances on either side. This ensures that the machine is well ventilated. Furnaces or other equipment emitting heat should not be placed next to the casting machine.

3.2 Connecting the water supply of the laboratory

A fabric-reinforced water inlet pressure hose with $\frac{3}{4}$ " threaded end fitting is used to supply water from the stopcock to the Water-in connection on the back of the machine [Pict. (1) / pos. 8].

A hose with an inner diameter of 8 mm is used to drain the water from the hose nipple Water-out [Pict. (1) / pos. 9] on the back of the machine into a siphon or directly into the domestic water drainage system. Ensure that there is no back pressure when the water is being drained.

Caution: Check the water supply pressure if necessary before connecting the machine. Ensure that the water pressure does not fall below 3 bars and does not exceed 8 bars, even in summer. A water coolant pump unit should be fitted if the water pressure is too low. If the water pressure exceeds 8 bars, a pressure reduction valve should be fitted to the Water in connection of the machine.





Caution: If the water supply system is known to build up deposits or collect dirt, a filter must be fitted to prevent the water sensor malfunctioning.

3.3 Electrical installation in the laboratory

The casting machine should be connected exclusively into a 230 V **earthed** socket which is equipped with a 16 Amp circuit breaker or a 16 Amp slow-blow fuse.



Warning: All electrical work on the socket or electricity supply and fuses may only be carried out by a qualified electrician.



Prior to operating, check whether the nominal voltage corresponds to the value indicated on the type plate the unit. The unit must be connected to an earthed contact socket!

4. Setting up and operation

4.1 Container centrifugal system

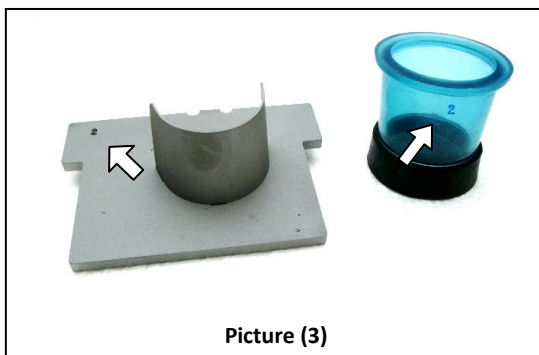
4.1.1 Inserting the investment and the crucible

After it has been correctly installed, the machine can be set up for casting.

Before each casting cycle the mould container matching by size with the mould ring and the crucible should be inserted in its place.

1. First open the stopcock of the water supply.
2. Switch the machine on with the Power switch [Pict. (1) / pos. 10]. An audible signal is heard when the machine is switched on and all the indicators light up briefly as a check that the LEDs are functioning properly. The green POWER indicator [Pict. (2) / pos. 1] lights up.
3. The green READY indicator [Pict. (2) / pos. 3] lights up when the water is circulating properly.
4. Place the mould container matching by size with the investment into the cradle [Pict. (1) / pos. 14].

Note: Each ring belongs to its container. The matching pairs are numbered. [Pict. (3)]



5. Place the crucible with the ingots into the crucible holder [Pict. (1) / pos. 12] in the centrifugal arm with the casting spout pointing towards the investment.



If the heating cycle is not to be carried out immediately, the machine can be switched off with the Power switch.

4.2 Adjustable centrifugal system

4.2.1 Inserting the investment and the crucible

After it has been correctly installed, the machine can be set up for casting. Insert the investment and the crucible before each casting cycle.

1. First open the stopcock of the water supply.
2. Switch the machine on with the Power switch [Pict. (1) / pos. 10]. An audible signal is heard when the machine is switched on and all the indicators light up briefly as a check that the LEDs are functioning properly. The green POWER indicator [Pict. (2) / pos. 1] lights up.
3. The green READY indicator [Pict. (2) / pos. 3] lights up when the water is circulating properly.
4. Pull back the casting frame [Pict. (1) / pos. 13] by pulling the retraction arm [Pict. (1) / pos. 17] by clamping your thumb around the thumb support [Pict. (1) / pos. 16], insert the hot investment into the investment holder [Pict. (1) / pos. 14] using tongs, and release the retraction arm. In this position the investment is fixed automatically. Position the investment so, that the flow is at the same height as the crucible spout.
5. Place the crucible with the ingots into the crucible holder [Pict. (1) / pos. 12] in the centrifugal arm with the casting spout pointing towards the investment.
6. The centrifugal arm should now be balanced by loosening the arm fixing screw [Pict. (1) / pos. 18] and turning the counterweight [Pict. (1) / pos. 19] on the spindle. Then tighten the star screw and remove the investment, placing it back to the preheat furnace.



Caution: The arm fixing screw must securely be tightened. The centrifugal arm or machine could otherwise be damaged during casting.



If the heating cycle is not to be carried out immediately, the machine can be switched off with the Power switch.

4.3 Heating cycle

The actual casting procedure can be carried out after the investment has been removed and the wax has been burnt out.



Note: The hot investment can either be placed in the mould container just before starting the melting procedure or after the ingots have been preheated in the crucible using the preheating function. This prevents the investment cooling down too much.



Caution: Danger of burn when touching the crucible or the investment.

Always use tongs to remove the investment after the casting cycle.



Note: Use a graphite insert in the crucible when melting precious metals with the exception of palladium alloys.

Heating procedure:

1. Check the water coolant supply before starting the heating cycle.
2. Switch the machine on at the Power switch [Pict. (1) / pos. 10]. The green POWER indicator [Pict. (2) / pos. 1] lights up.
3. The green READY indicator [Pict. (2) / pos. 3] lights up when the water is circulating properly.

Note: Use a graphite insert in the crucible when melting precious metals with the exception of palladium alloys.

4. Preset the heat using the HEATING POWER regulator [Pict. (2) / pos. 6].

Note: The HEATING POWER regulator should be set for each type of alloy and according to the amount of metal required so that during the 30 second preheat program the metal is still not fully melted.

5. Set the centrifugal force using the ALLOY SELECTION switch [Pict. (2) / pos. 7]. The setting depends on the type of alloy (precious or non-precious).
6. Turn the centrifugal arm so, that the crucible is just above the induction coil. At this position you hear a continuous audible tone.
7. Press the PROGRAM START button [Pict. (2) / pos. 8]. The induction coil rises automatically to encircle the crucible for melting.
8. Close the chamber cover. The red CLOSED sign [Pict. (2) / pos. 4] lights up and the yellow HEATING sign [Pict. (2) / pos. 2] shows that the heating function is automatically activated.
9. The metal begins getting melted after approx. 25 seconds. The melting procedure should only be observed through the protective glass [Pict. (1) / pos. 4]. The HEATING POWER regulator [Pict. (2) / pos. 6] is used to regulate the heat during melting.
10. When the metal is pre-molten, the casting chamber cover can be opened and the hot investment can be placed in the cradle (depends on container or adjustable system).
11. Then close the casting chamber cover [Pict. (1) / pos. 3]. The red CLOSED indicator [Pict. (2) / pos. 4] lights up when the cover is closed and the heating resumes automatically showed by the yellow HEATING indicator [Pict. (2) / pos. 2]. Keep the casting chamber cover closed until the metal is molten and is ready for casting.



Caution: Risk of burns. The heating cycle can produce high temperatures in the casting chamber.



Note: Press the red STOP button [Pict. (2) / pos. 5] or open the cover to interrupt the heating cycle (refer to section 4.7)

4.4 Casting procedure

After the casting chamber cover has been closed, the heating cycle resumes automatically. The yellow HEATING indicator [Pict. (2) / pos. 2] lights up again.

1. Continue to observe the melting metal through the protective glass. When the metal is completely molten, press the CASTING button [Pict. (2) / pos. 9]. Casting will start only if the cover is safely closed.
2. The centrifugal arm is rotated by the force of an electric motor. The centrifugal force casts the molten metal into the hot investment. The yellow HEATING indicator [Pict. (2) / pos. 2] goes out.

4.5 Opening the casting chamber cover and removing the casting ring

1. The centrifugal arm must be at a complete standstill before the green READY indicator [Pict. (2) / pos. 3] lights up.
2. The casting chamber cover can now be opened and the investment removed.



Caution: Risk of burns when removing the hot investment. Always wear protective gloves and use the proper tongs to remove the investment and the crucible.



Caution: Do not use force to open the casting chamber cover.

A cover-locking mechanism prevents the casting chamber cover being opened during casting until the centrifugal arm is coming to a complete stop.

4.6 Switching off the casting machine

You can switch the machine off using the Power switch [Pict. (1) / pos. 10].

Note: For the faster cooling the casting machine should not be switched off between castings. It should not be switched off by the Power switch until the final casting cycle has been completed.

Note: The casting machine automatically cuts off the water supply after casting. The water tap therefore does not have to be closed after each casting procedure, but it should be turned off, if the casting machine is not being used for a longer period, e.g. over the weekend.

4.7 Using the STOP button

The STOP button [Pict. (2) / pos. 5] is not used normally, when the casting machine is used properly. It should only be used when the program cycle has to be interrupted because of an error or fault. Pressing the STOP button immediately stops the work in progress, e.g. melting the metal.

5. Maintenance



Caution: Always disconnect all plugs of the casting machine from the mains during any servicing, cleaning or maintenance work and in case of any problem of operation. There should always be two people with electrical experience present when servicing and repairs are being carried out. All work on the electrical components of the casting machine should only be carried out by a qualified electrician or by Pi dental experts.

5.1 Cleaning the water inflow

The water filter in the Water-in connection [Pict. (1) / pos. 8] should be cleaned in every six months.

1. First close the stopcock in the laboratory with the casting machine switched on. This prevents the water pressure still affecting the circulation of the water in the casting machine.
2. Then switch the casting machine off and disconnect from the mains.
3. After the water supply has been cut off and the casting machine has been disconnected from the mains, unscrew the water inlet pressure hose from the casting machine [Pict. (1) / pos. 8].
4. The fine particle filter, which is in the water inlet connection of the casting machine, can be removed with tweezers. Clean the filter with a brush under running water or in an ultrasonic cleaner.
5. Place the clean filter back into the opening at the water inlet connection and screw the water inlet pressure hose back on. Ensure that there is a washer between the water inlet connection and the end fitting on the water inlet pressure hose.
6. Check that the hose connection is watertight before switching the casting machine on and turning the stopcock back on.

Picture (4): Position of the water filter in the WATER-IN connection.



Picture (4)

Cleaning the casting machine

Wipe the casting machine occasionally with a damp cloth. Do not use abrasive cleaning agents or tools.

After each casting procedure, the centrifugal arm should be cleared from any debris and checked to ensure the free running.

Remove debris regularly from the casting chamber. It is important to ensure that no metal splinters get into the guiding mechanism of the induction coil.

5.3 Crucible care

To achieve an ideal casting the following points should be observed

- Crucibles (order no. 19-3000) should be stored in a dry, dust-free place where they are protected from any shock.
- The crucible should be checked after each melting cycle for any damage or wear. Crucibles with cracks should be discarded.
- All residues should be removed carefully from the crucible. Use tweezers to remove larger pieces of residue and then clean the crucible with compressed air.

- Mark the crucible on the outside with a pencil to indicate the alloy, which was used in it.

Note: Use a different crucible for each alloy.

- Due to the characteristics of the materials used for the production of the crucibles, the ceramics industry has to work with large tolerances. This can result in a crucible sometimes jamming in the holder. If this happens, the crucible can be made to fit by filing it.

In accordance with the ceramics industry's terms of supply, no guarantee can be given neither with regard to the life span of the crucibles nor against damages occurring in transit.

Crucibles for the Silvercast and Hexacast induction casting machines are normally available as follows:

Crucibles:	Packs of 6	order no. 19-3000
Graphite inserts:	1 Piece	order no. 19-4000

5.4 Error indicators

Two LEDs show the correct or incorrect operation of the machine, these are READY /green/ and ERROR /red/. In some versions it can be a single bicolor /red + green/ LED having the same operation [Pict. (2) / pos. 3].

5.4.1. After turning on the machine.

The highest priority test is the position of the inductor. If it is not in the low /base/ position, ERROR turns on for 10 seconds, and then inductor goes down automatically. If it is successful, ERROR goes dark, otherwise the inductor moving mechanism may be slow /dirty or dusty/, or may be damaged.

The second priority test is checking of the centrifuge switching relays. If any of them is damaged, ERROR blinks.

3. The lowest priority test is checking of the cooling water's flow and generator overheat. If OK, READY turns on.

5.4.2 Base position.

/READY on, no ERROR, inductor at low position, beep over the inductor/.

If ERROR turns on immediately after pressing the start button, security test of the cover locking mechanism fails. If ERROR turns on after about 3 seconds, inductor moves slowly, the linear-guidance may be dirty or damaged.

5.4.3. Smelting /inductor at high position/

If the generator doesn't turn on closing the cover, it may be the problem of the cover sensor or the generator. If the ERROR turns on, the generator is overheated, wait some minutes.

5.4.4. Casting /after pressing the cast button/

If ERROR turns on immediately after pressing the cast button, the cover locking sensor fails.

If the inductor goes down, but the centrifuge doesn't start or it stops early, and after about a half minute READY turns on as if the casting had been correct, it is a security stop operation caused by a security sensor, it stops the centrifuge without the controller's interaction.

If faults cannot be remedied using this troubleshooting chart, call your service technician or your dealer's customer service and disconnect all plugs of the machine from the mains!

6. Technical data

	SILVERCAST	HEXACAST
Mains voltage	230 V~	
Mains frequency	50/60 Hz	
Max. current	16 A	
Max. power consumption	2400 W	
Electric shock protection class	I.	
Starting torque	0 – 21 Nm	
Max. weight of metal to be melted	100 g	
Ventilation cooling of chamber	YES	NO
Number of non-stop castings	∞	10
Max. melting temperature	1750 °C	
Water requirement	1 liter/ min	
Width	660 mm	645 mm
Depth	400 mm	390 mm
Height	600 mm	645 mm
Weight of the unit	65 kg	55.5 kg
Ambient temperature	15 – 40 °C	
Storage temperature	5 – 40 °C	
Relative ambient humidity	max. 70 %	

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC rules.

EC CONFORMITY DECLARATION

We, **PIDENTAL Fogászati Gyártó Kft., 83-85 Szugló Street, 1141 Budapest, Hungary** hereby declare that, according to its design and structure and in the implementation we released it for trade, the machine described below meets the relevant safety and health requirements of the EC Directives. Should the machine be subject to any modification without our written consent, this declaration shall be null and void.

Machine description: **Silvercast**

Machine type: **Middle-frequency casting machine for dental alloys**

Serial number:

EC Directives: **2006/95/EC Low Voltage Directive**
2004/108/EC Electromagnetic Compatibility Directive

Applicable harmonized rules:

EN 61010-1:2001

EN 61010-2-010:2003

EN 61010-2-020:2006

ZEK 01.2-08/12.08

EN 61326-1:2006

Budapest,

Tibor Hegedűs

EC CONFORMITY DECLARATION

We, **PiDental Fogászati Gyártó Kft., 83-85 Szugló Street, 1141 Budapest, Hungary** hereby declare that, according to its design and structure and in the implementation we released it for trade, the machine described below meets the relevant safety and health requirements of the EC Directives. Should the machine be subject to any modification without our written consent, this declaration shall be null and void.

Machine description: **Hexacast**

Machine type: **Middle-frequency casting machine for dental alloys**

Serial number:

EC Directives: **2006/95/EC Low Voltage Directive**
2004/108/EC Electromagnetic Compatibility Directive

Applicable harmonized rules:

EN 61010-1:2001

EN 61010-2-010:2003

EN 61010-2-020:2006

ZEK 01.2-08/12.08

EN 61326-1:2006

Budapest,

Tibor Hegedűs