DENTAURUM

rema® CC kompendium

Precision castings with rema® CC

www.dentaurum.de

Foreword

Dear colleagues,

The demands for investment materials are grown in the past few years. If a product should cover a wide range of applications, as in the case of rema® CC investment material, some advices for processing are certainly of help.

With this booklet we give you some information, which are useful for the processing with regard to top results.

These hints are particularly important to achieve precision castings also for long-span frameworks specially made of non-precious alloys.

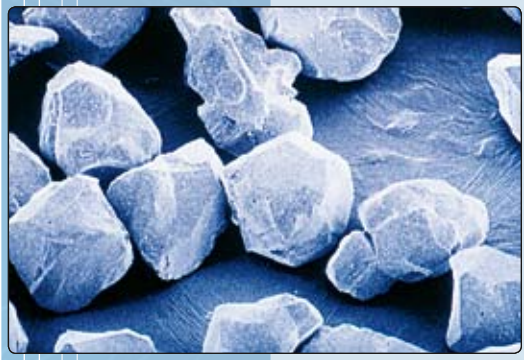
In order to make this possible, this completely redesigned investment material was developed. Convince yourself of the qualities, however, when rema® CC is used with precious alloys or press ceramic.

Dentaurum wishes you a lot of success with this quality product!

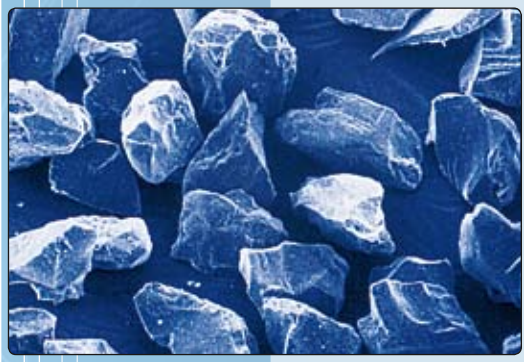
Thomas Schneiderbanger
Dental Technician, Product Manager – Dental Technology

rema® CC
kompendium

round



rounded corners



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1. Investment materials in general

1.1 Preliminary examinations of the raw materials (grain sizes, etc.)

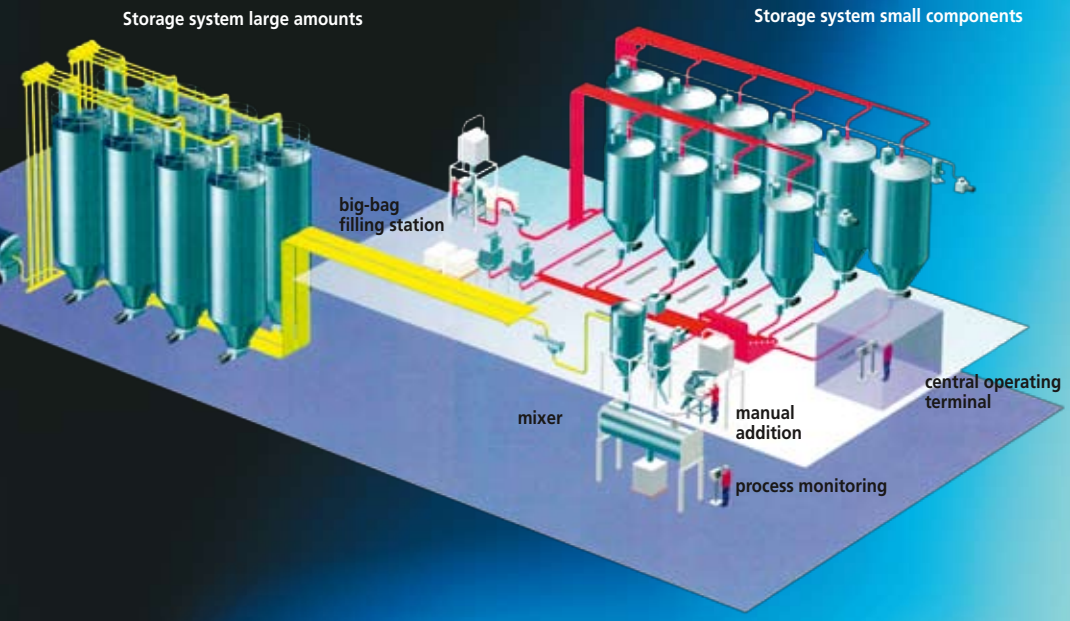
The fabrication of high grade dentures includes such things as the quality of the investment materials. The basics are:

- the recipe of the investment material
- the used raw materials
- the reproducibility in the manufacture

For quality assurance, each delivery of raw material is checked by the in-house chemistry lab. Specifications were negotiated with the raw materials suppliers in order to reduce fluctuations of the finished investment materials to a minimum.

1.2 Storage

The Dentaurum production plant provides ideal conditions for these requirements. The complex equipment operates as a closed system with low dust and contamination. The silos have been installed inside the building for the protection of the partially hygroscopic raw materials and equipped with filters, vibration base, feeder worm screws and dosing screws with coarse and fine switching for a uniform dosing.



1.3 Mixture

The required components for the investment materials are transported with high weighing accuracy and dosing precision by way of a special conveyor scales into the mixer. Processor controlled automated systems ensure highest accuracy in adhering to recipes within very close tolerances for a reproducible quality.

1.4 Examination of the expansion

A dilatometer serves for the examination of the thermal expansion.

1.5 Batch tests

No batch of investment material leaves the factory unless it passes the entire set of demanding tests by the chemistry lab and the prosthetic department. The technical examination according to the standard EN ISO 15912 includes characteristic values such as flowability, initial setting, compressive strength and thermal expansion. In addition, a batch test follows by the dental technicians with a practical casting object according to the current instructions. The following aspects are evaluated: processing consistency, thermal stability, accuracy of fit and surface smoothness of the cast.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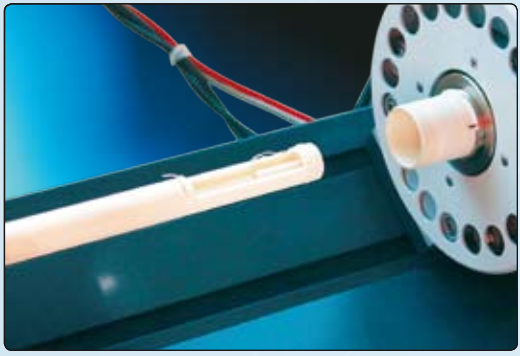
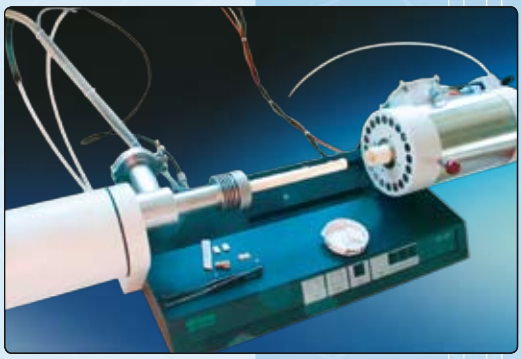




1.6 Test specimen

A test specimen helps with the batch test to check the fit of the single crowns as well as the total fit of the bridge.

A special specimen for bridges (REF 319-741-00) is available at Dentaurum by which the expansion values can be calculated under the terms of the respective lab.

1.7 Packing and shipping

Till all results correspond with the demands on quality, the investment materials are released for sale and packed for the worldwide shipment.

2. Influences on the expansion

2.1 Thermoformed copings or wax copings

Coping foils result in a stable and uniform wall thickness of the crowns. However, the setting expansion of the investment dies is decreased due to the hardness of the plastic copings. When using wax copings, the crowns are a bit wider after casting.

2.2 Investing with metal ring

When investing with a metal ring, a liner of thickness 1 mm or 2 mm (from ring size 6) must be used depending on the ring size. Metal rings keep the total expansion under control.
With rema® CC, always use the 2 mm liner.

2.3 Investing without metal ring

The use of silicone rings avoids the dirty metal chips, which are generated by used metal rings. Acrylic rings or silicone rings must be early removed during the setting process for an unhindered expansion of the mould.

2.4 Storage temperature

Phosphate-bonded investment materials should be stored in a climatic cabinet at approx. 18 – 20 °C / 64 – 68 °F. The mixing liquid contains silica sol, which is damaged under frosty terms.

2.5 Working temperature

The ideal temperature for processing is at 18 – 22 °C / 64 – 72 °F depending on the investment material.

2.6 Mixing concentration

The expansion can be controlled amongst other things by the concentration of the mixing liquid. The higher the concentration of the latter, the bigger is the expansion of the investment material.

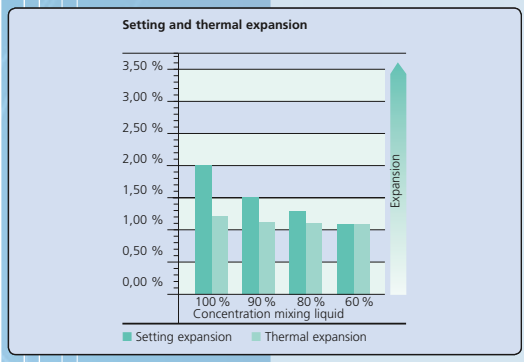
Liquid	(100 g : 25 ml)
	Concentration : Distilled water
60 %	15 ml : 10 ml
70 %	17.5 ml : 7.5 ml
80 %	20 ml : 5 ml
90 %	22.5 ml : 2.5 ml

2.7 Mixing time and vacuum stirring

Extended mixing times can result in an improved surface of the cast and an increased expansion. Indeed, two minutes should not be exceeded. Stirring too long can have the opposite effect in view of the expansion.

2.8 Investing

The mould should be filled by means of a vibrator using low vibration to avoid a segregation of the investment material and the rise of bubbles. Investing under pressure prevents formation of bubbles on the surface of the casting object. Working with too high pressure will cause a lower permeability and a decreased setting expansion.



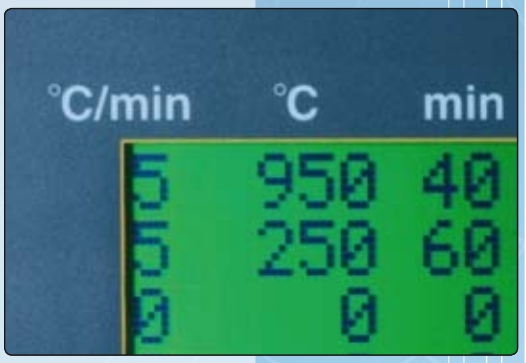
2.9 Chemical and thermal expansion

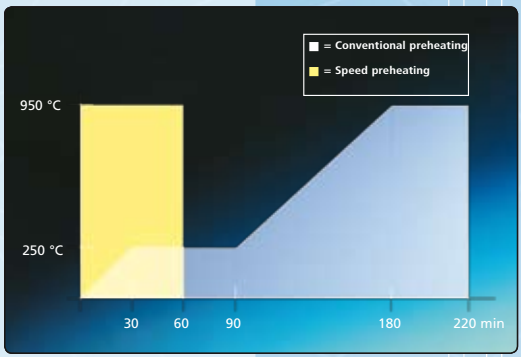
All phosphate bonded investment materials have a chemical or setting expansion during the setting phase and a thermal expansion when they are preheated.

2.10 Preheating

Conventional preheating: After the setting time according to the instructions for use, the muffle is put into the furnace at room temperature. Usually a holding time of 60 minutes is programmed at 250 °C / 482 °F for the cristobalite transformation. A second holding time of 30 minutes can be adjusted at 560 °C / 1040 °F for the quartz transformation to increase the thermal expansion in case of need.

Speed preheating: The muffle is put into the furnace before the setting time is completely finished at final temperature 700 – 950 °C / 1292 – 1742 °F depending on the type of alloy. For safety reasons, the furnace door must be kept closed for the first 15 minutes!





2.11 Preheating furnace

A furnace, which is equipped with circulating air, multilateral heating and a ribbed base plate such as the Protherm oven from Dentaurum provides constant casting results.


READY
GOLD
HEATING
ERROR
HEATING
START

compact
megapuls

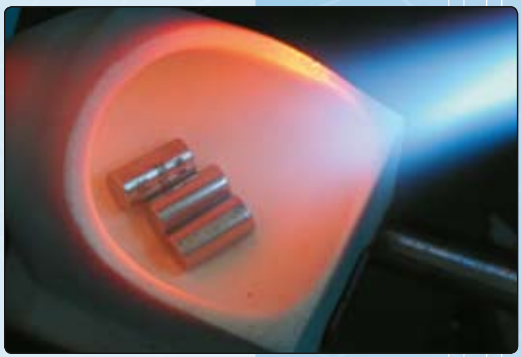
3. The cast

3.1 General hints

The three dimensional expansion of the investment material must compensate the thermal contraction of the alloy after the cast, which is 2.2% of the total volume for CoCr based alloys. The casting parameters must be considered in view of the alloy properties. An overheated metal causes a changed metal structure, rough surfaces and tension inside the cast.

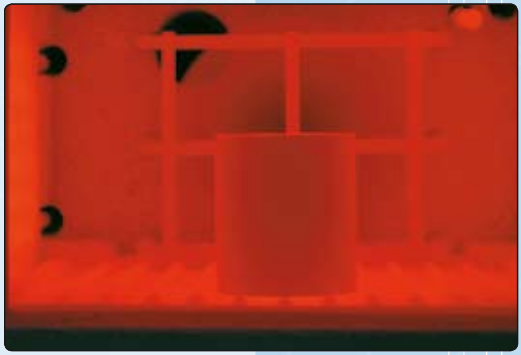
3.2 Casting methods

Usually the alloys are cast with:
- gas burner
- high frequency centrifugal casting
- vacuum pressure unit



3.3 Cooling

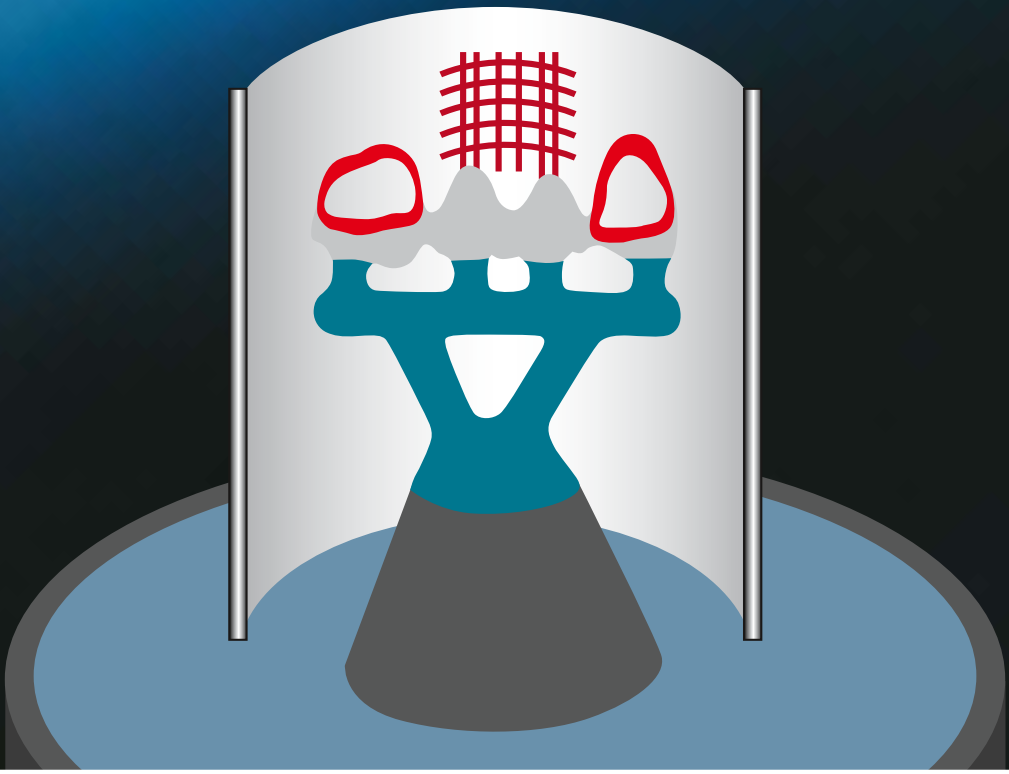
If the muffle is put back into the furnace chamber directly after the cast, the tension inside the cast of long span bridges, implant supra-structures or one-piece casts will be reduced. The oven is switched off and the door slightly opened. After one hour, the temperature decreases to 600 °C / 1112 °F. Take the ring out of the chamber and let it cool down to room temperature. In general, never quench the muffle in cold water!



3.4 Spruing system and cooling fins

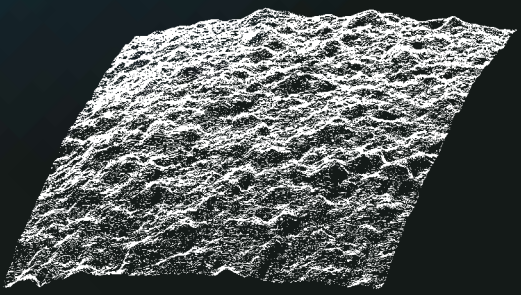
It depends on the geometry of the casting object which kind of spruing system is used, or whether one works with direct feeder sprues or runner bars. When casting CoCr based alloys, the casting reservoir should not be attached too close to the casting object because of the short solidification phase of these types of alloys. Consequently, the reservoir should be placed in the heat centre of the muffle to avoid shrinkage porosities.

Cooling fins should effect a controlled solidification of the melt for implant supra-structures, large bridges with bulky pontics and casting objects with very different volumes. Wax grids can be attached at the thickest part of the wax frame.

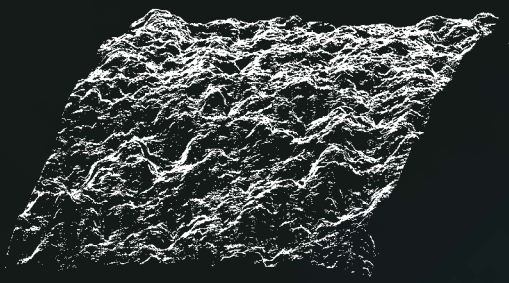


3.5 Influences on the surface quality

When casting CoCr based alloys, a prolonged stirring time (120 seconds) and the reduction of the preheating temperature to 800 °C / 1472 °F induces very smooth surfaces of massive casting objects such as customised bars in addition to the fine graininess of the investment material. However, this procedure depends on the casting method of the respective lab.



Overheating the alloy causes always rough casting surfaces.



3.6 Fit of the crown

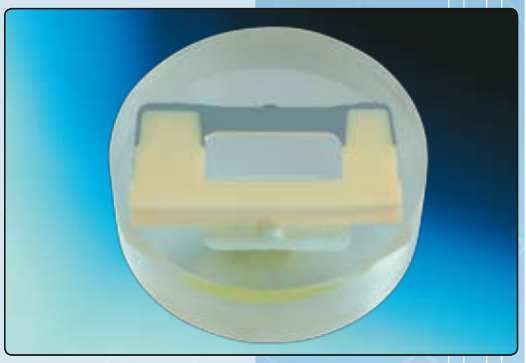
The required expansion is achieved by the concentration of the mixing liquid. Copings made by thermoforming have a tighter fit as those made of dipping wax. The hard plastic copings result in a decreased setting expansion of the investment dies (see 2.1).

3.7 Fit of the bridge

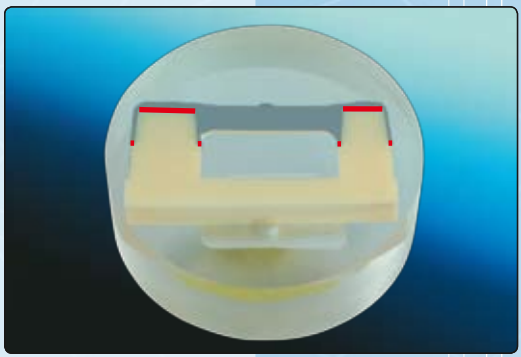
An average value between single fit and total fit must be found in order to compensate the contraction of different bridge spans. Crowns and pontics should be connected with a modeling wax of low shrinkage (see remanium® Kompendium 1/ crowns and bridges). Wax sticks of extra-hard quality provide for the stability of the wax frames. The runner bar can be separated in small segments to avoid tension inside the bridge. An optimal fit of the bridge is achieved by the "core investing procedure" (see chapter 4).

Microsection of a bridge for the control of the fit:

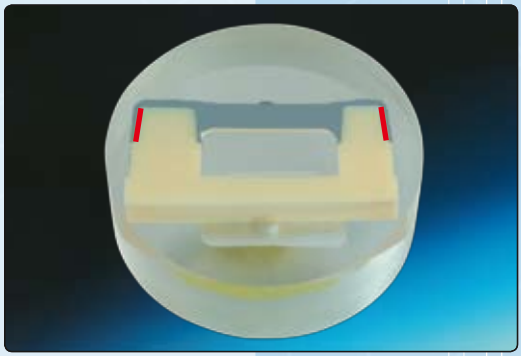
A perfect fit of the bridge.

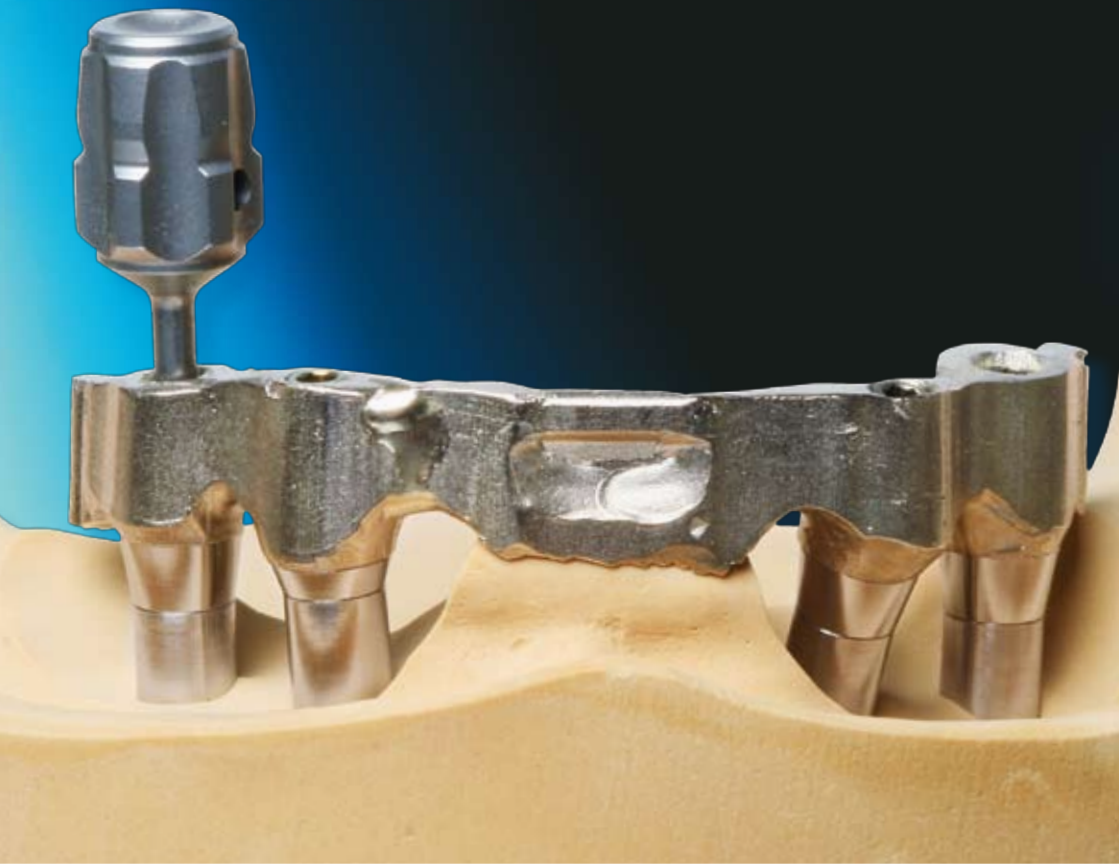


Fit of the bridge too tight: As a result, there is a gap at the crown margin and in the occlusal area between the die and the coping.



Fit of the bridge too wide: The bridge is often rocking.

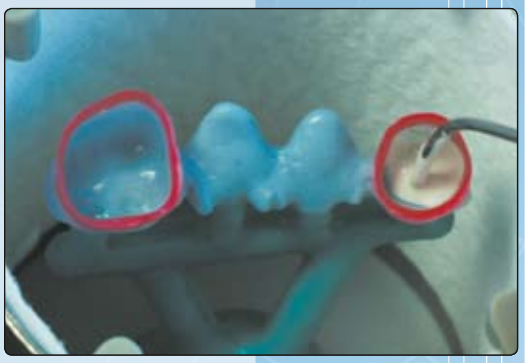




4. The „core investing procedure"

4.1 Why to use the „core investing procedure"

When casting CoCr based alloys, the casting contraction is approx. 2.2%. This results in an increased discrepancy between the single fit of the crowns and the total fit of the bridge. Therefore it is recommendable to fill the single crowns with a higher concentration of the investment material than the complete mould.



4.2 Operating range of the „core investing procedure"

Long span bridges and implant structures Implant retained supra constructions require especially precision castings because of the high precision of the industrially manufactured implant abutments.

4.3 A case study from real life

The initial situation:
Crowns connected from 14 to 24.

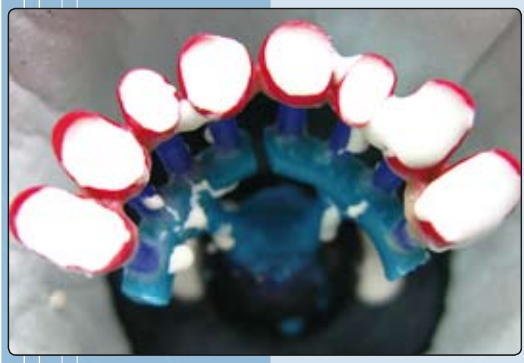
Fabrication of the copings with deep-drawing foil 1mm and spacer foil 0.1 mm.

Wax up of the cervical area.

The wax-up of the crowns with collars in anatomically reduced shape.

The spruing:
3 mm sprues, 4 mm runner bar,
3.5 mm feeder sprues

Positioning the casting object inside the ring.



Investing:
At first the crowns are filled with a concentration of 95%.

When the investment material inside the crowns begins to set, the ring is poured out with a concentration of 75%.
If both investment concentrations are processed too wetly, they can be mixed.

After casting, the crowns are trimmed inside.

The single fit is checked by means of a marking spray.

Then the total fit is controlled.

The finished bridge work with an excellent fit is prepared for ceramic veneering.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DEKEMA
press-i-dent

5. Press ceramic

5.1 Finish quality

The composition of rema® CC Universal ensures a reaction-free ceramic surface. The fine grain structure enables a precise detail reproduction and a very smooth surface of the press object.

5.2 Fit

Diluting the mixing liquid (60 % concentrate – 40 % H_2O) makes it possible to transform the wax pattern into ceramic. The compressive strength of the investment material must withstand all system-related press operations and temperatures. As a result, tension-free press objects are achieved without "fins", which are nevertheless easy to devest and simply to sandblast.

6. Abstract

Important factors, which have influence on the fit:

- Sprue design
- Storage temperature (inside a climatic cabinet 18 – 20 °C / 64 – 68 °F)
- Working temperature of powder and liquid (20 – 22 °C / 68 – 72 °F)
- Concentration of the mixing liquid
- Accurate measuring of powder and liquid
- Muffle system (with or without metal ring)
- Muffle size (size 3, 6 or 9)
- Observance of constant stirring times
- Investing under pressure (lower expansion)
- Preheating process (speed or conventional)
- Quality of the furnace
- Type of alloy


rema® CC
Anmischflüssigkeit
100% Konzentrat
Mixing fluid
100% Concentrate
Liquide de mélange
100% Concentré
Líquido de mezcla
100% Concentrado
Liquido di miscelazione
Concentrazione: 100%
REF 105-845-00
A
B
DENTAURUM
rema® CC
160 g e
DENTAURUM

7. Instructions for use

rema® CC

Dear Customer,

Thank you for purchasing this product from Dentaurum. You have chosen a product that will provide you with consistently high quality, reliability and service.

Optimum performance of our dental technology products is based on working precisely to the instructions issued by our Research and Development Department. We have therefore included a clear, detailed summary of each working stage in these instructions for use.

If you have any further questions, our team of dental technicians will be pleased to offer advice.

Simply call: Customer Support Hotline Tel. no. +49 72 31 / 803 - 410

Information, instructions for use and safety data sheets for Dentaurum products are also available on the internet under: www.dentaurum.de.

Warranty

Dentaurum guarantees faultless quality of the products manufactured by us. The information in these instructions for use is based upon our own experiences. The user himself is responsible for the correct processing or use of the products. We cannot be held responsible for failures as we have no influence on the processing. However, any claim for compensation only applies to the commercial value of our products.

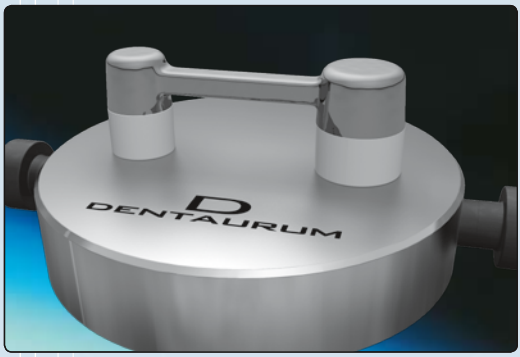


Fig. 1

Bridge-Test Specimen

The bridge-test specimen is used for determining an optimal fit (Fig. 1). Both a tight fit and a wide fit can be corrected by changing the concentration of the mixing liquid.

Note: Tighten the screws only by hand.

Application

A bridge pattern is waxed-up and invested with a concentration according to the instructions for use.

Check:

1. Fit of the single crown
2. Total fit of the bridge span

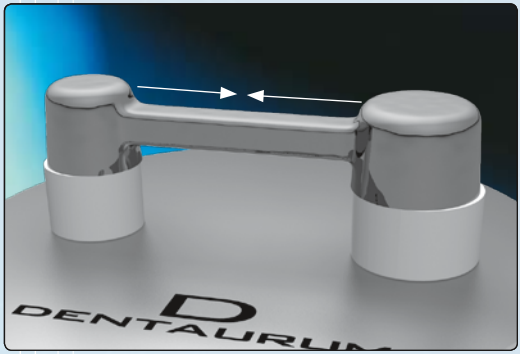


Fig. 2

Adjustments

Fit is too tight (Fig. 2):
Contact with the outside of the inner surface: The concentration of the mixing liquid is increased.

Fit is too wide (Fig. 3):
Contact with the inside of the inner surface: The concentration of the mixing liquid is decreased.

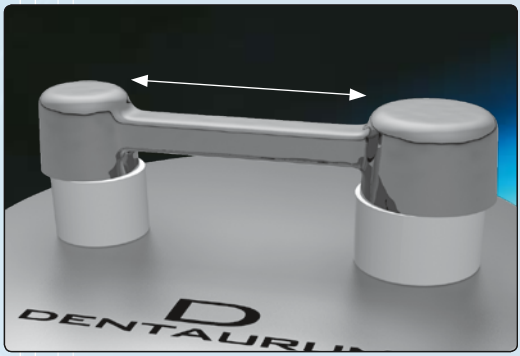


Fig. 3

rema® CC instructions for use

Phosphate bonded universal precision investment material applicable for speed preheating for crowns and bridges made of non precious alloys, precious alloys and for press ceramic.

The special advantages of this investment material are a high degree of material expansion, the freedom of choice concerning preheating methods, without having to forfeit the fitting accuracy, and consistently high surface smoothness. In order to benefit from the high quality casting and pressing results, it is necessary to observe the following instructions for use carefully.

Safety Instructions

When using the speed heating method, the furnace door must remain closed for at least 15 minutes after the casting ring has been inserted. (Danger of burning due to spurting flame).

Investment materials contain quartz. Do not inhale the dust! Risk of lung damage (silicosis/lung cancer). Recommendation: Wear protective mask type FFP 2 – EN 149:2001 Cut open the bag using a pair of scissors and avoid generating dust when emptying into the mixing beaker. Fill the empty bag with water before scrunching-up.

Remove dust at the work place using a damp cloth.

In order to avoid dust generation during devestment, soak the ring in water until it is completely moist.

When sandblasting, use an extractor with a fine filter dust bag.

Delivery

rema® CC Powder	6 kg (60 x 100 g) 6 kg (38 x 160 g)	**REF 105-840-00** **REF 105-841-00**
rema® CC Mixing Liquid	1000 ml	**REF 105-845-00**
rema® CC Bridge-Test Specimen	1 piece	**REF 319-741-00**

Service-Life

Powder – 36 months with dry storage
Liquid – 24 months (frost sensitive)

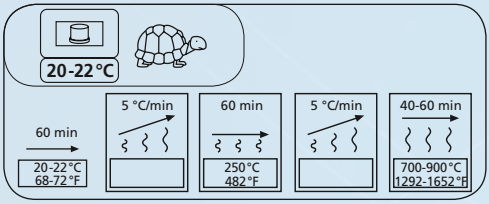
Material Properties

DIN EN ISO 15912
Type 1, class 1 2

Setting begin	8-9 min
Compressive strength	3 MPa
Flowing characteristics	160-170 mm
Thermal expansion	1.03 %

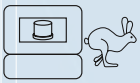
rema® CC instructions for use

Part A: Use of non precious alloys and precious alloys

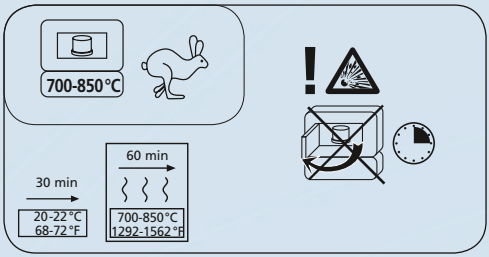
Storage	20 ° 22 °
Wax wetting agent	Only to be used on wax! Do not use on modelling acrylic!
Casting ring system	with ring (3, 6, 9) and ringless (3, 6)
Mixing ratio	**160 g : 40 ml**
Liquid concentration	**40 % – 100 %**
Mixing	**120 s** Mixing time under vacuum.
Working time	**6 – 7 min**
Investing	Vibrate gently.
Conventional heating method	

	Additional Information
Observe the ideal working temperature of 20 – 22 °C / 68 – 72 °F! Only cool the liquid in case of higher room temperatures! **Caution!** The total working temperature of powder and liquid is important. For best results, store in a climatic cabinet!	Temperature influences the rate of expansion. Protect the mixing liquid from frost! **Caution with deliveries in winter!**
When using a wax wetting agent, please use Lubrofilm® or Lubrofilm® plus! Please dry the pattern thoroughly! Without wax wetting agent, mix thoroughly under vacuum!	Avoid alcohol residues, apply thinly and blow dry.
For casting ring sizes 3, 6 and 9 please use a dry 2 mm ring liner (REF 127-251-00).	When using silicone or rubber casting rings, these must be soft and elastic. Line slightly with Vaseline!
The mixing ratio must be observed accurately!	Use a clean measuring beaker!
See separate mixing table!	**When using the speed heating method, increase the mixing liquid concentration!**
First put liquid, then powder in the mixing beaker. Mix by hand thoroughly first. Use a clean mixing beaker! No plaster residues!	Mixing speed and mixing blade geometry influence the mixture and therefore the expansion! The ideal mixing speed is approx 360 min^{-1}.
Measured at room temperature 20 – 22 °C / 68 – 72 °F.	Cool the liquid at higher temperatures.
Set the vibrator to a low frequency.	Place the ring liner so that it is flush with the top edge of the ring. Fill the ring completely up to the ring liner. Roughen the upper surface of the investment material after setting!
Setting time: 60 min Ideal heating speed: 5 °C / 4 °F / min Holding time at 250 °C / h End temperature: 700 – 900 °C / 1292 – 1652 °F (CoCr 800 – 900 °C / 1472 –1652 °F) Holding time for larger rings (6 – 9): 60 – 90 min	The base of the furnace should be corrugated. Place the ring into the furnace with the opening at the bottom! Protect the ring from drying out over the weekend! (seal the ring with wax)

rema® CC instructions for use

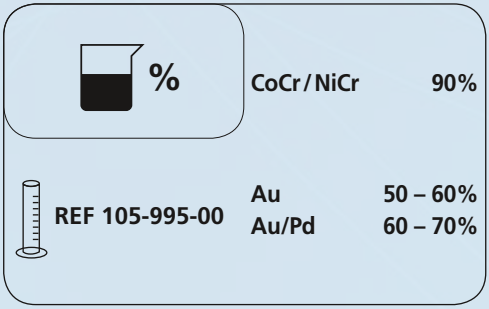


Speed heating



Cooling down / devesting Allow to cool down slowly to room temperature.

Recommended dilution of the mixing liquid



Tip: The above values represent the results attained in the Dentaurum test lab. In individual cases these results can be influenced by different working methods, modelling acrylics and temperatures.

Once the ring has been placed in the furnace, do not open until at least 15 min have elapsed – danger of instant combustion!

Pull the ring liner so that it is flush with the upper edge of the ring. Roughen the surface of the upper investment side with a knife. After 30 min place the ring immediately into the furnace at the end temperature!
(700 – 850 °C / 1292 – 1562 °F)
Holding time at end temperature: 40 – 60 min according to ring size

Moisten casting rings and carefully devest.
Sandblast with glass beads or aluminium oxide at 50 – 125 µm with 4 – 6 bar.

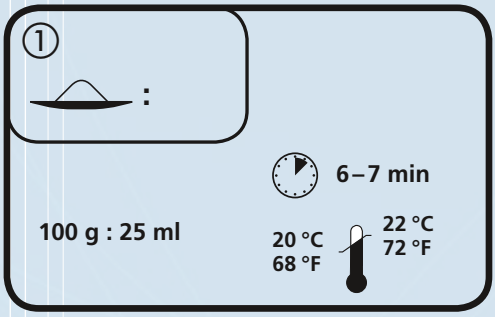
Do not use a hammer to devest!

Mixing table

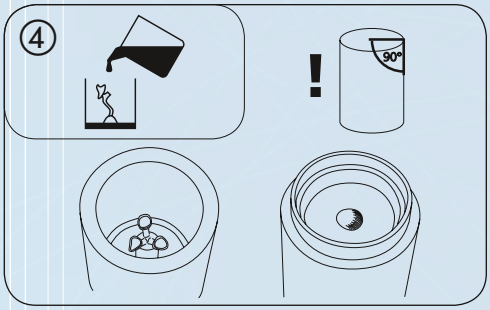
Liquid	(160 g : 40 ml)
	Concentration : Distilled water
40 %	16 ml : 24 ml
50 %	20 ml : 20 ml
60 %	24 ml : 16 ml
70 %	28 ml : 12 ml
80 %	32 ml : 8 ml
90 %	36 ml : 4 ml
100 %	40 ml : 0 ml

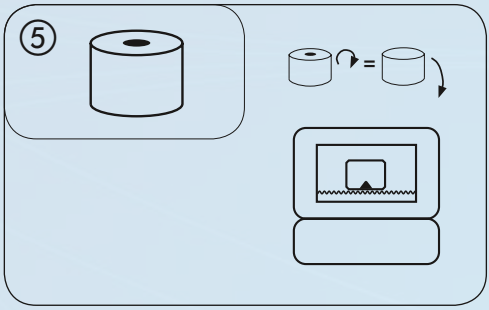
rema® CC instructions for use

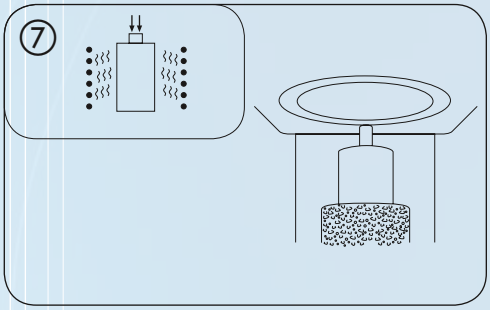
Part B: Pressing inlays, veneers, crowns and bridges

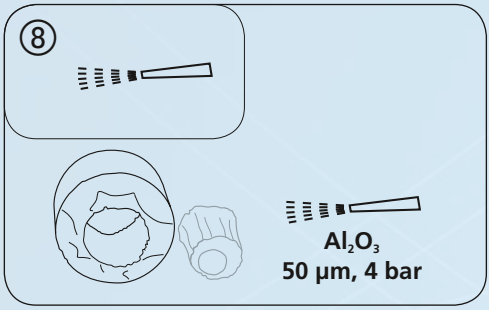


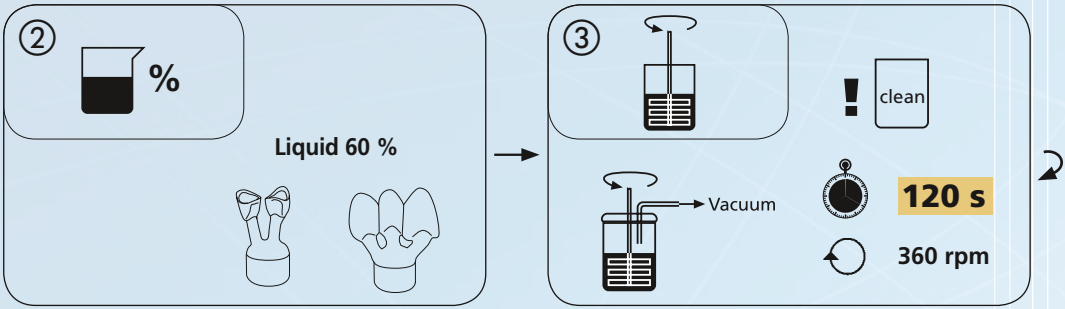
Liquid	(100 g : 25 ml)
	Concentration : Distilled water
60 %	15 ml : 10 ml
70 %	17.5 ml : 7.5 ml
80 %	20 ml : 5 ml
90 %	22.5 ml : 2.5 ml

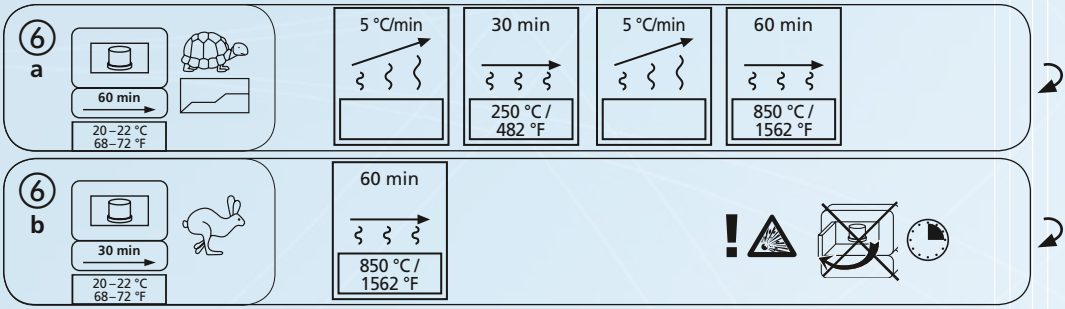


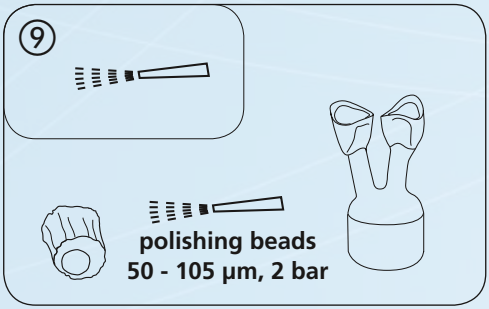







②
%
Liquid 60 %
③
clean
Vacuum
120 s
360 rpm


⑥
a
60 min
20 – 22 °C
68 – 72 °F
5 °C/min
30 min
250 °C /
482 °F
5 °C/min
60 min
850 °C /
1562 °F
⑥
b
30 min
20 – 22 °C
68 – 72 °F
60 min
850 °C /
1562 °F


⑨
polishing beads
50 - 105 µm, 2 bar

Notes

Notes:

Notes

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www.dentaurum.de

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Additional information regarding Dentaurum products can be found in the internet.

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