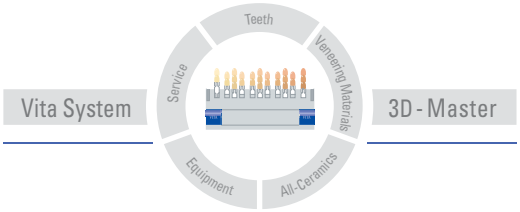
VITA All-Ceramics

VITA In-Ceram® AL for inLab®

Aluminium oxide blocks for high-temperature sintering

Working Instructions
Fabrication of crown/bridge frameworks

Date of issue: 12-07



VITA In-Ceram® AL for inLab® Table of contents

VITA In-Ceram® / indication table

	Oxide ceramic				
	Infiltration ceramics			Sintering ceramics	
	VITA In-Ceram SPINELL	VITA In-Ceram ALUMINA	VITA In-Ceram ZIRCONIA	VITA In-Ceram AL	VITA In-Ceram YZ
	–	–	–	●	●
	○	–	–	–	–
	○	–	–	–	–
	–	–	–	–	–
	–	–	–	–	–
	●	●	○	●	●
	–	●	●	●	●
*	–	–	–	–	●
	○	●	●	●	●
	–	–	●	–	●
*	–	–	–	–	●
Veneering material	VITA VM 7	VITA VM 7	VITA VM 7	VITA VM 7	VITA VM 9

● recommended ○ possible * max. 2 pontics

3-unit anterior bridge framework made from VITA In-Ceram AL
Photo: F.-J. Noll

Primary elements of telescopic crowns made from VITA In-Ceram AL immediately after the integration
Photo: Dr. Chr. Ellerbrock

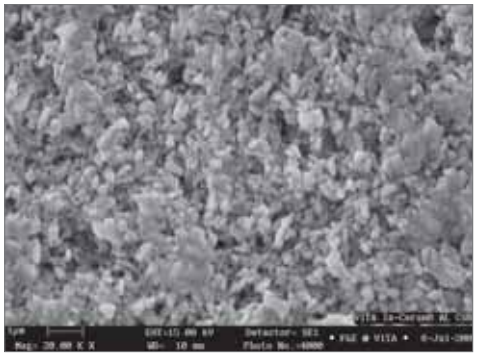
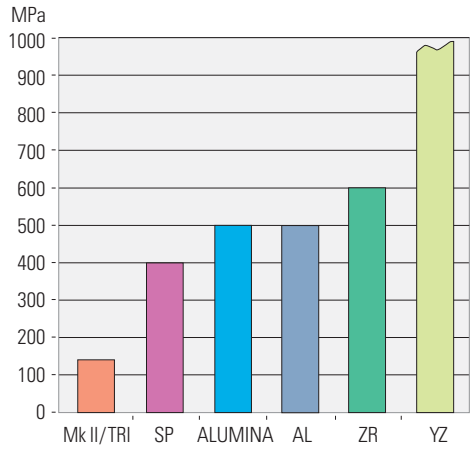
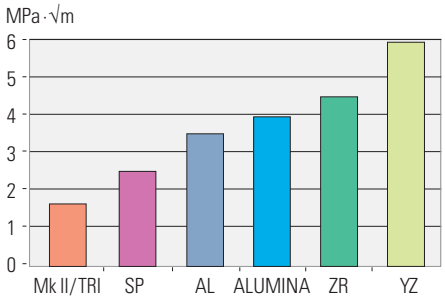


Fig.1: SEM-photo of the microstructure of unsintered VITA In-Ceram AL (Magnification x 20,000).

Fig.2: SEM-photo of the microstructure of a sintered VITA In-Ceram AL (Magnification x 20,000).



Flexural strength



Fracture toughness (SEVNB method)

Aluminium oxide (Al_2O_3) is an oxide ceramic material with numerous fascinating properties – from its translucency in case of thin walls and its bright color up to its exceptional biocompatibility. Aluminium oxide exhibits the highest resistance to hydrolysis of all ceramic materials and hence offers considerably extended durability.

VITA In-Ceram AL for inLab are presintered (see fig. 1) blocks consisting of pure aluminium oxide. In this condition, which allows easy processing, they are used to grind enlarged bridge and crown frameworks in the inLab system.

Shrinkage which occurs during the subsequent dense sintering process (see fig. 2) in a high-temperature furnace (VITA ZYrcomat) can be exactly calculated. As a result highly stable and precision-fit structures are obtained which offer all physical benefits of aluminium oxide.

⚠ ***Important information:***

Frameworks made from VITA In-Ceram AL must be veneered with the VITA VM 7 fine-structure ceramic.

VITA materials for inLab®

VITABLOCS Mark II / TriLuxe	Fine-structure feldspar ceramic
VITA In-Ceram SPINELL	Oxide ceramic, glass infiltrated
VITA In-Ceram ALUMINA	Oxide ceramic, glass infiltrated
VITA In-Ceram ZIRCONIA	Oxide ceramic, glass infiltrated
VITA In-Ceram YZ	Oxide ceramic, densely sintered
VITA In-Ceram AL	Oxide ceramic, densely sintered

Technical data of VITA In-Ceram® AL for inLab®

CTE (25 °C - 500 °C)	$7.3 \cdot 10^{-6} \cdot K^{-1}$
Flexural strength	> 500 MPa
Fracture toughness (K_{IC})	3.5 $MPa \cdot m^{1/2}$
Modulus of elasticity (E)	380 GPa
Composition	100% Al_2O_3

Fabrication of the VITA In-Ceram® AL restoration using the FrameWork or WaxUp software

- Produce master model
- Produce scan model or – *alternatively* – *wax model*
- Fix scan model on scan holder or – *alternatively* – *fix wax model on special WaxUp holder*
- Scanning
- Design framework (CAD, only with FrameWork software)
- Insert VITA In-Ceram AL and scan bar code
- Grinding (CAM)
- Reworking, cleaning the framework
- Sintering firing
- Fitting on the framework
- **Veneering with VITA VM 7**

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Sintered crown framework made from VITA In-Ceram AL

Minutes of working time*

*Working time: approx. 0.5 h
Waiting time: approx. 9 h

Calculation is based on framework fabrication for a three-unit VITA In-Ceram AL bridge which was produced using the inLab FrameWork software.
Working steps to be carried out in the WaxUp method are printed in *italics*.

☞ ***Note:***
We strongly recommend participation in an inLab/VITA In-Ceram course.
Further information is available from VITA or Sirona.

What are the advantages offered by VITA In-Ceram® AL in conjunction with the inLab® system?
All-ceramic restorations produced from VITA In-Ceram AL for inLab
provide the following advantages:

Advantages for the patient
Exceptional esthetics and biocompatibility:

Aluminium oxide has been used in the field of hip-joint prosthetics for roughly 30 years. It exhibits very high functional toughness, high corrosion resistance, favorable translucency and low thermal conductivity.
The framework and the veneering material are both biocompatible and do not have any allergic potential.
Consequently

- retraction of gingiva is avoided and
- excellent insulating behavior against cold/warm influences is provided.

Advantages for the dentist
- High clinical reliability
- Possibility of adhesive and non-adhesive cementation

Advantages for the dental technician
- Restorations made from VITA In-Ceram AL do not necessarily require wet grinding but can also be ground dry in the sintered condition while exerting little pressure.
- Since grinding does not cause phase transformation in the structure, regeneration firing prior to veneering is not required either.
- Thanks to the use of VITA VM 7, a latest generation fine-structure veneering material, a new layering technique allows results exhibiting outstanding esthetics.
- Use of a highly compact, space-saving and fully developed CAD/CAM system with comparatively low investment costs. The inLab system of Sirona provides the option to design frameworks (CAD FrameWork 3D software) or to wax up models and to scan them (CAD WaxUp 3D software). 8 different VITA materials can already be processed with this system and it offers further potential for future development of materials and application areas.
- Framework thickness can be precisely defined and reproduced at any time using the inLab CAD/CAM software
- Documentation of the framework designs thanks to saving data records.
- Minimizing the processing risk for indications requiring a wax-up with the inLab WaxUp 3D software since the corresponding software automatically detects areas in the framework which were waxed up inadequately and adjusts these areas prior to the grinding process.
- Excellent quality of fit thanks to precise grinding and exact calculation of sintering shrinkage with the inLab 3D high-performance software.
- Full value-added process in the laboratory since no processing steps need to be carried out outside the laboratory.

Indication table

Indication										
VITA In-Ceram® **AL**	–	–	–	•	•	•	•	–	–	–

• recommended

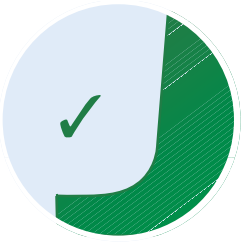
- Primary elements of conical and telescopic crowns
- Crowns in the anterior and posterior area
- Bridges in the anterior area with no more than 1 unit

Contraindication

- if sufficient oral hygiene is not present
- in case of inadequate tooth preparation
- in case of insufficient hard tooth substance
- bruxism

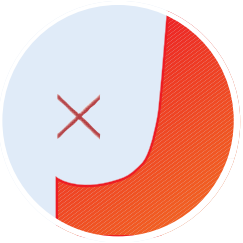
General preparation information

- The preparation can be carried out either using a chamfer or shoulder preparation with rounded inner angle. A circular cutting depth of one millimeter is required. The vertical preparation angle should be at least 3°. All transitions from the axial towards the occlusal/incisal surfaces must be rounded. Uniform and smooth surfaces provide perfect preconditions.



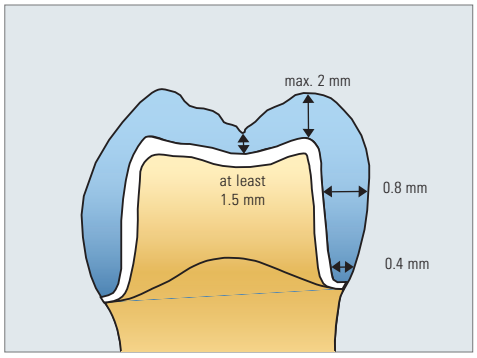
Shoulder preparation

Chamfer preparation



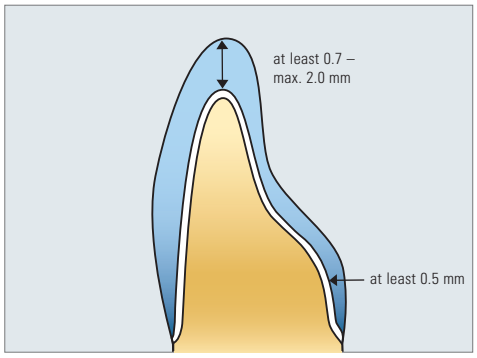
Incorrect chamfer preparation

Tangential preparation is contraindicated



Preparation of premolars and molars

- In the case of posterior teeth a simplified occlusal relief should be prepared to provide sufficient space for the veneering material. In the occlusal area at least 1.5 mm of substance should be removed.

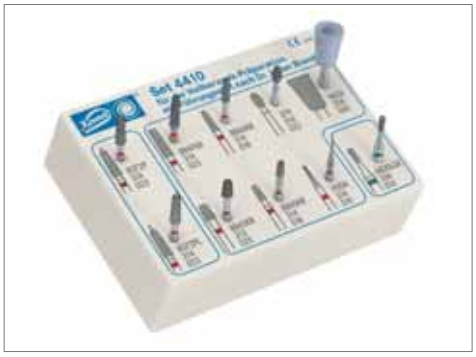


Preparation of anterior teeth

- The incisal area of anterior teeth should be reduced by 2 mm.

- Preparation set according to Baltzer and Kaufmann with abrasive tools with axial guide pin for predefined shoulder and chamfer preparation.
  (Hager & Meisinger, Prod. No. 2560)

- Preparation set according to Küpper for crown and bridge restorations.
  (Hager & Meisinger, Prod. No. 2560)



- Preparation set for all-ceramics with guide pin instruments according to Dr. Julian Brandes.
  (Komet/Gebr. Brasseler, Prod.-No. 4410)

Cementation information

- Restorations made from VITA In-Ceram AL for inLab are suitable for non-adhesive cementation using glass ionomer or zinc phosphate cements or adhesive cementation using the self-hardening composite PANAVIA 21 TC or the dual-hardening composite PANAVIA F (Kuraray). Both products contain a special MDP monomer which forms a permanent chemical bond with the surface of the Al_2O_3 frameworks without the need to apply a silicate or silane coating. It is not recommended to use resin-reinforced or modified glass ionomer cements since no sufficient clinical data on these materials are available.

- Etching with hydrofluoric acid does not create a retentive surface. Silanizing is not required. *

Please observe the instructions for use of the manufacturers of the cementation materials.

Removal of integrated restorations

To remove a fixed aluminium oxide restoration it is recommended to use cylindrical diamond instruments while ensuring **maximum cooling with water** and a speed of 120,000 rpm to separate the restoration.

Trepanation

The veneering material is removed with a diamond instrument. Then the framework can be trepaned with a coarse-grit, spherical diamond whilst ensuring maximum cooling with water and working at a speed of 120,000 rpm. It is recommended to hold the instrument at an angle of 45° against the framework when drilling through the framework.

* Further details are included in the brochure “Clinical Aspects”, Prod. No. 808E.

AL blanks for crown frameworks
Dimensions prior to sintering: 15.5 x 19 x 20 mm
Dimensions after sintering:
approx. 13 x 16 x 17 mm
Designation: AL-20

Pack cont. 4 pieces

Prod. No.
ECAL204*
EC4AL204**

Large pack cont. 24 pieces

ECAL2024*
EC4AL2024**

AL blanks for anterior bridge frameworks
with max. 1 pontic
Dimensions prior to sintering: 15.5 x 19 x 39 mm
Dimensions after sintering:
approx.: 13 x 16 x 33 mm
Designation: AL-40

Pack cont. 2 pieces

ECAL402*
EC4AL402**

Large pack cont. 10 pieces

ECAL4010*
EC4AL4010**

* blocks exclusively for inLab
** blocks for inLab and inLab MC XL

COLORING LIQUID for VITA In-Ceram AL
Special liquid for coloring frameworks made from VITA In-Ceram AL in five lightness levels (LL1-LL5) matched with the VITA SYSTEM 3D-MASTER.

Complete assortment

ECALKIT

COLORING LIQUID for VITA In-Ceram AL — **Prod.-No.**
One color assortment — ECACL1KIT
ECACL5KIT

VITA**VM®7 veneering material**
Fine-structure veneering material for all-ceramic framework materials in the CTE range of approx. 7-8 such as VITA In-Ceram AL for inLab

VITA ZYrcomat — DZY220
High-temperature sintering furnace for sintering firing VITA In-Ceram AL.
4 molybdenum di-silicide heating elements ensure uniform distribution of temperature.
Temperature in the firing chamber: max. 1600°C

Sinter accessories
Pack cont. 150 g ZrO_2 spheres to support the restorations during the sintering process — E38002

All-in-one pack cont. sintering tray and sintering crucible for VITA ZYrcomat — E38011

Single pack cont. sintering crucible for VITA ZYrcomat, 30 mm x 80 mm — E38010

Single pack cont. sintering tray for VITA ZYrcomat, 10 mm x 74 mm — E38006

Fabrication of a framework made from VITA In-Ceram® AL using the inLab® FrameWork software

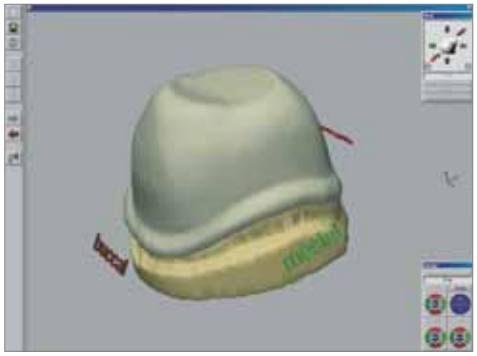
☞ ***Note:***
When using the WaxUp design technique, please observe the information contained in the inLab 3D Manual from version 2.1X (11.2003) resp. the CD CEREC 3D Manual from version V2.10 R1500.

Producing the scan model

- Produce a model from a high-quality, dimensionally stable plaster suitable for scanning (e.g. CAM-base, Dentona).
- Fix the model on the scan holder.

Scanning

Scanning of the model in the inEos scanner or with the inLab.



Designing

The design in the inLab system.

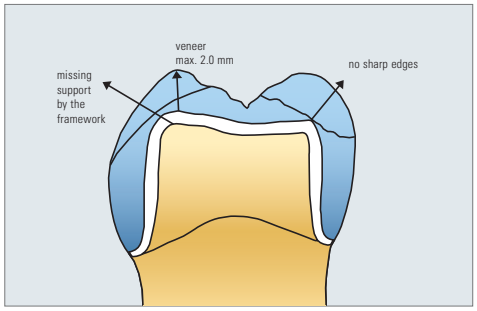
Minimum wall thickness in mm and minimum connector areas in mm²

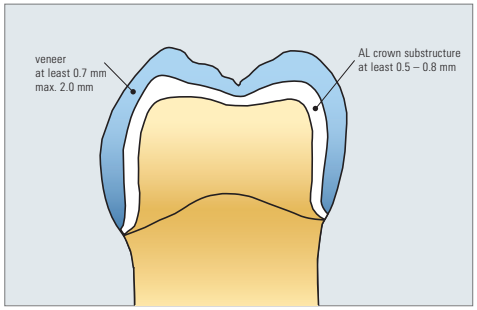
VITA In-Ceram® AL – Indication		mm/mm²
Incisal/occlusal wall thickness Primary elements – double crowns		0.7
Incisal/occlusal wall thickness Single crown framework		0.7
Incisal wall thickness Abutment crowns of three-unit anterior bridge framework		0.7
Circular wall thickness Primarly elements – double crowns		0.5
Circular wall thickness Single crown framework		0.5
Circular wall thickness Abutment crowns of three-unit anterior bridge framework		0.5
Connector area[1] Anterior bridge framework, three-unit		9

[1] Connector area: Juncture area of abutment crown – bridge unit

☞ ***Note:***

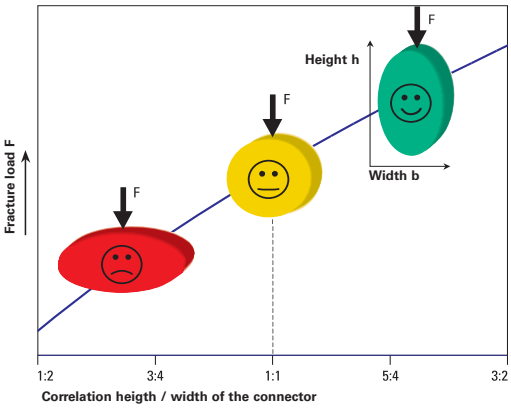
The WaxUp 3D software automatically detects the areas of the model with insufficient minimum layer thicknesses and adjusts them automatically prior to the grinding process.





⚠ ***Important note:***

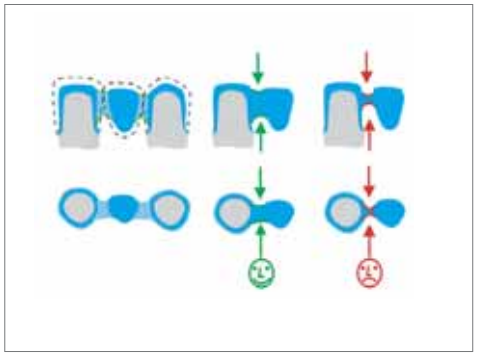
In order to guarantee the lasting clinical success of restorations made from VITA In-Ceram AL, it is urgently recommended to design the frameworks in such a way that they correspond in reduced tooth size to the tooth form to be replaced. Only then is a uniform layer thickness of the veneering ceramics guaranteed. Sharp edges on the framework should generally be avoided.



Aspects of the design of connectors of bridge frameworks:

1. Maximum value for height h must be selected.
2. Height h should be equal to or larger than width b.

Stability and function take priority over esthetics!



The connector surfaces of bridge frameworks must be concavely rounded. Sharp corners and edges are to be avoided.

Inserting the VITA In-Ceram® AL and reading the printed bar code

- The VITA In-Ceram AL for inLab blocks bear a bar code which can be read by a scanner. In this way the shrinkage factor of the batch number in use is scanned automatically and considered during grinding to obtain a final result with high precision of fit.

☞ ***Note:***
If the bar code can not be scanned, it must be entered manually using the PC keyboard.

Grinding the restoration

☞ ***Important information:***
*Please use the corresponding grinding instruments for VITA In-Ceram AL for inLab (cone-shaped Diamod XL).**

Reworking the ground restoration

- After completing the grinding process and prior to sintering the restoration is cut off, the cut-off area must be ground smooth and it may be required to reduce the thickness of the margin to avoid chipping.

☞ ***Important information:***
For reworking we recommend ceramic grinding instruments (K+B 671) SiC, green, (Hager & Meisinger). Work at a speed of 8000 rpm and exert little pressure. Diamond grinding instruments (90-120µm) can also be used. Work at a speed of 15000 rpm and exert little pressure.

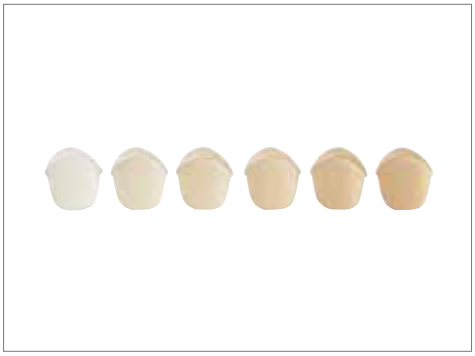
- **The following must be observed when reducing the margins:**

Abrasive instruments must always be placed perpendicular to the framework margin. Non-perpendicular placement may cause chipping.

- **Any contour corrections after sintering firing must be avoided.**

Important information:
Since dust is formed when grinding dental ceramic products, always wear a face mask or grind when wet. Additionally, it is recommended to work behind a safety shield and use an extraction system.

* Sirona, Prod. No. 593 566 8, Cone-shaped Diamond XL



Coloring of the frameworks with AL COLORING LIQUID for VITA In-Ceram® AL

Areas of application

- Liquid for complete or partial coloring of milled VITA In-Ceram AL frameworks prior to sintering. **AL COLORING LIQUID is exclusively suitable for coloring VITA In-Ceram® AL frameworks.** AL COLORING LIQUID is available in 5 lightness levels (LL1-LL5) which are matched to the VITA SYSTEM 3D-MASTER. This coloring supports the accurate shade reproduction of VITA VM 7. Please read the information on page 19.

⚠ **Important note:**
AL COLORING LIQUID has no adverse effects on the physical properties of the material such as flexural strength, fracture toughness and the Weibull modulus of VITA In-Ceram AL.

Application

- Grinding dust should be removed from the restorations prior to the use. Cleaning firing in a ceramic furnace (e.g. VITA VACUMAT) should be carried out to remove the cooling and lubricating liquid DENTATEC from the porous structure.

Cleaning firing in the VITA VACUMAT®

Predr. °C	→ min.	↗ min.	↗ °C/min.	Temp. approx. °C	→ min.	VAC min.
600	3.00	3.00	33	700	5.00	0.00

- The restoration can be immersed in the AL COLORING LIQUID according to the desired lightness level of the shade LL1 (light) to LL5 (dark). The recommended immersion time is 2 minutes. When immersing the restoration, vacuum or pressure (2 bars) can be used additionally.

⚠ **Important:**
Use only acrylic tweezers for immersion.

- Subsequently remove excess AL COLORING LIQUID with a paper tissue and allow to dry. Do not sinter in a wet condition.
- AL COLORING LIQUID can also be sprayed on using the VITA SPRAY-ON system or applied in a thin, homogeneous layer with a brush onto the areas of the restoration to be colored. Avoid the formation of puddles. The liquid is absorbed rapidly.
- The substructure can be colored from without and from within at the margins in order to ensure complete penetration of the color.

⚠ ***Important:***
The application brush should only be used for the application of AL COLORING LIQUID. We recommend the flat brush for PASTE OPAQUE (VITA Prod. No. B297). Do not use for layering the ceramic – risk of discoloration! Clean the brush only with distilled water.

- Restorations colored with AL COLORING LIQUID must be sintered only in a sintering crucible with an air vent (Prod. No. E38011, sintering crucible with air vent). As an alternative, the lid can be omitted. This way organic residues will burn out completely.
- Further processing according to the working instructions for VITA In-Ceram AL for CEREC (No. 1128).

- VITA In-Ceram YZ framework colored with AL COLORING LIQUID.

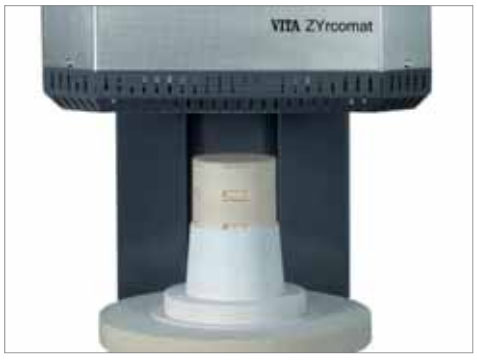
Sintering in the high-temperature furnace VITA ZYrcomat

⚠ ***Important:***
Sintering firing may only be performed in the special VITA high-temperature furnace. Perfect sintering with the resulting physical properties of the frameworks is only guaranteed if firing is performed in this furnace.
Sintering firing of AL (aluminium oxide) is identical with that of YZ (zirconium oxide). The default program must be used for both materials.

- Switch on the VITA ZYrcomat furnace and the control element (keyboard).
- Lower the lift entirely with lift key ↓ .
- It must be ensured that the furnace temperature is below 200 °C.
- Place anterior crown and anterior bridge framework into the sintering tray with the labial or lingual surface facing downward and posterior crown and bridge frameworks with the occlusal surface facing downward.

☞ ***Note:***
It is recommended to sinter bridge frameworks in the sintering tray (VITA Prod. No. E38003). It must be ensured that the framework fully rests on the sintering bed to prevent the object from lying hollow. Sintering spheres "clamped" in the connector areas during sintering shrinkage must be avoided.

- Sintering crucible with sintering tray must be placed in the center of the firing plate.
- Close lift with lift key ↑. Keep key pressed until the firing chamber has been completely closed.
- Start sintering firing with “START“ key.



- The sintering program runs automatically: duration of program cycle including time for cooling down to 200 °C: approx. 7.5 h

⚠ ***Important:***
The furnace may only be opened when the furnace temperature is below 200 °C! In this way longer service life of sintering tray and crucible is ensured.

- After sintering the framework can be fitted on the die.

Reworking the sintered framework

- The surface condition of dental ceramic materials is crucial for the flexural strength of the material. Reworking of sintered VITA In-Ceram AL aluminium oxide frameworks with grinding tools, in particular in the area of the connectors (junctures), must be avoided.

Accordingly, reworking the ground framework should be carried out before sintering, if possible.

If reworking is required, the following basic rules must be observed:

- Reworking in the sintered condition should be performed while cooling with water. Rubber polishers (low speed) for example, for telescopic copings a grinding unit (if possible with water cooling) and gentle pressure should be used for reworking. Alternatively, reworking can be performed using soft, diamond-coated rubber polishers and a handpiece; work at low speed and exert little pressure. The instrument must be placed at a flat angle and chattering must be avoided.

- Use new fine-grit diamonds with red color coding (fine: 27-76 µm) or finer grit (extra-fine, yellow: 10-36 µm or ultra-fine, white; 4-14 µm).

- Regions exposed to tensile stress in the clinical use, i.e. above all connectors of bridge structures, should not be ground.

Veneering with VITA**VM®7**

- Frameworks made from VITA In-Ceram AL for inLab are veneered with VITA VM 7 fine-structure veneering material (CTE (25-500°C) $7.3 \cdot 10^{-6} \cdot K^{-1}$).

- AL COLORING LIQUID (one shade for each VITA SYSTEM 3D-MASTER lightness group) is used for coloring milled VITA In-Ceram AL frameworks in the desired lightness level. This coloring supports the accurate shade reproduction with VITA VM 7.

- To achieve proper bonding between VITA In-Ceram AL and VITA VM 7, we recommend to carry out a BASE DENTINE washbake based on the following firing parameters:

Predr. °C	→ min.	↗ min.	↗ °C/min.	Temp. approx. °C	→ min.	VAC min.
500	2.00	7.27	60	950	1.00	7.27

- In case of thin walls, CHROMA PLUS can also be used for the washbake to support the base shade.

- For additional information, also on veneering of non-colored VITA In-Ceram AL frameworks, please refer to the Working Instructions for VITA VM 7, No. 1110.

- **Modelling wax**
  - Scan Wax (Sirona)

- **Turbines with water cooling and accessories**
  - KaVo K-AIR plus (KaVo)
  - NSK Presto Aqua (Girrbach Amann)
  - Turbo-Jet (Acurata)
  - IMAGO Shelter System, protective units for wet processing of all-ceramic materials (Steco-System-Technik)

- **Abrasive instruments for processing with turbines with water cooling/with handpieces**
  - ZR set of cutters for the fabrication of 2° primary crowns (Komet/Gebr. Brasseler, Prod. No. 4432)
  - ZR cutters for reworking/processing zirconium oxide substructures, 7 different shapes (Komet/Brasseler)
  - IMAGO Grind System, abrasives for turbines with water cooling for reworking/processing and fabricating primary crowns (Steco-System-Technik)
  - Diamond polisher for handpiece, green-orange (Hager & Meisinger, Prod. No. HP 803 104 372 170)

- **Preparation sets**
  - Preparation set according to Küpper (Hager & Meisinger, Prod. No. 2560)
  - Preparation set according to Baltzer and Kaufmann (Hager & Meisinger, Prod. No. 2531)
  - All-Ceramics preparation set with guide pin instruments according to Brandes (Komet/Gebr. Brasseler, Prod. No. 4410)
  - Crown preparation set with guide pin instruments according to Günay (Komet/Gebr. Brasseler, Prod. No. 4384A)

- **Other**
  - Fit-checker, lipstick for checking the fit of substructures

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Preparation drawings on page 7 according to Dr. Andres Baltzer, Rheinfelden, Switzerland

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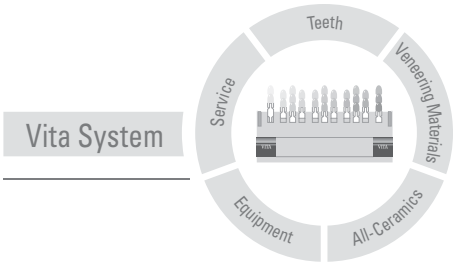

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