MAZIC
Claro CAD

Lithium Disilicate Glass Ceramic
for CAD/CAM

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Lithium Disilicate Glass Ceramic
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Fundamentals of Fabricating CAD/CAM Machinable **Reinforced Glass Restorations**

VERICOM

Contents

What is CAD/CAM machinable reinforced glass?

CAD/CAM machinable reinforced glass are dental restoration materials containing lithium disilicate(Li2Si2O5) crystallized ceramic. As high-quality materials with optimal properties for creating aesthetically pleasing and durable restorations, they meet the demands of today's dental market and patients. Their scope of application and technological advancements continue to expand and develop.

VERICOM's 'MAZIC Claro CAD' is an ideal CAD/CAM machinable glass ceramic restoration material that, based on excellent physical properties and aesthetics, has been widely applied in various restorations such as veneers, inlays, onlays, crowns, 3-unit anterior bridges backed by numerous successful clinical cases over time.

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Lithium Disilicate Glass Ceramic
for CAD/CAM

Indications & Contraindications

Indications

- Full ceramic crowns
- Inlays
- Onlays
- Full ceramic 3-unit anterior bridges

Contraindications

- Patients with substantially reduced residual dentition
- Bruxism
- If the patient is known to be allergic to any of the components of this product

Limitations of use

- Cantilever bridges and Maryland bridges
- Pontic width: anterior region > 11 mm, premolar region > 9 mm
- Temporary cementation of MAZIC Claro CAD restorations
- Complete veneering of molar crowns
- Very deep sub-gingival preparations
- Any other uses not included in the indicated applications

Additional limitations of use for minimally invasive crowns

- Layer thickness below 1 mm (except margin areas)
- Preparations with sharp edges
- Preparations that are not anatomically supported and feature varying layer thicknesses
- Conventional and self-adhesive cementation
- Build-up materials other than composite resin
- Absence of canine guidance
- Crowns on implants

PRECAUTIONS!

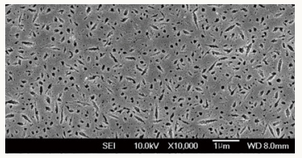
1. It should be used by a dentist and dental professional.
2. Keep out of reach of non-dental users (including children and seniors).
3. If the following recommendations are not followed, optimal results may not be achieved.
   - The framework must not be thinner than the required minimum thickness.
   - Mill the block by compatible CAD/CAM system.
   - Crystallize using a ceramic furnace that has been approved and/or recommended.
   - Crystallization shouldn't be conducted in a high temperature furnace.
   - For build-up process, use layering ceramic only.
   - Crystallize using a ceramic furnace that has been calibrated.
   - If the product becomes contaminated, do not use it.

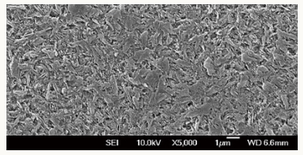
   4. Pack and store the product properly to ensure that it is not damaged. Handle with care to prevent dropping or impact damage.
5. For a single use only. Do not reuse.

Material

MAZIC Claro CAD is a lithium silicate glass-ceramic block for the CAD/CAM Technology. It is manufactured in an innovative process, which results in the exceptional homogeneity of the material.

In its crystalline intermediate state of blue or purple color, the block can be easily milled with CAD/CAM equipment. The striking color that is characteristic for the pre-crystallized MAZIC Claro CAD blocks ranges between white, blue or purple. This color is created by the composition and microstructure of the glass-ceramic. The strength of the material at this machinable intermediary stage is around 190 MPa. It is, therefore, comparable to other commercially available glass-ceramic blocks. After the MAZIC Claro CAD blocks have been milled, the material is crystallized in one of the ceramic furnaces. The crystallization process is easy to conduct and takes around 13 minutes. In contrast to some other CAD/CAM ceramics, the blocks do not shrink significantly and they do not require complicated infiltration processes. During the crystallization process up to 840°C, the microstructure changes through controlled growth of lithium disilicate crystals.



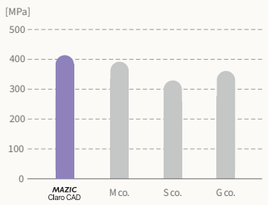


The milling software takes the resulting shrinkage due to densification of around 0.2% into account in the milling process. The transformation of the microstructure produces the final physical properties including around 350 MPa flexural strength and the suitable optical characteristics, such as shade, translucency and brightness. The MAZIC Claro CAD blocks demonstrate a true-to-nature brightness. The translucency and shade variety permit the fabrication of fully anatomic restorations from this glass-ceramic without any problems.

Excellent Physical Properties

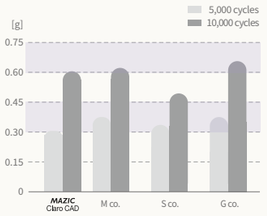
Flexural strength

The higher the flexural strength, the higher the resistance to fracture, allowing long-term use.



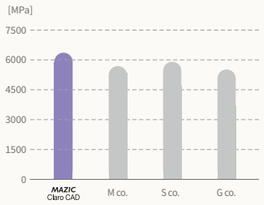
Wear resistance

The higher the abrasion resistance, the higher the resistance of surface abrasion caused by food, toothpaste, etc., allowing long-term use.



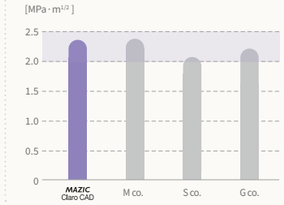
Surface hardness

The higher the surface hardness, the higher the resistance to microabrasion.



Fracture strength

The increase in fracture strength lowers the fracture risk due to shock.



Block Concept

The shade and opacity control of the MAZIC Claro CAD blocks is based on a unique translucency/opacity concept.
MAZIC Claro CAD is available in four translucencies: HT, LT, MO and Impulse Opal. The individual levels of the concept are determined by processing techniques and indications. Consequently, maximum flexibility and application variety can be achieved.

HT
High Translucency

MAZIC Claro CAD HT blocks are available in a variety of shades: A, B, C, D, and Bleach. They have a high translucency, featuring a transparent appearance similar to natural tooth enamel, and are ideal primarily for Inlays, Onlays, Veneers, and thin anterior prosthetics. They are also effective in harmonizing with the color boundaries of surrounding natural teeth, as they naturally reflect the color of adjacent teeth, known as the chameleon effect.

- Possesses color characteristics and translucency similar to natural enamel.
- Suitable for fabricating relatively small restorations such as inlays and onlays.
- Primarily suited for the staining technique, but also compatible with the cut-back technique
- Excellent adaptability to natural tooth structure.

Shade: A~D series (16 colors) and BL series (4 colors), totaling 20 shades.

LT
Low Translucency

MAZIC Claro CAD LT blocks are available in a variety of shades: A, B, C, D, and Bleach. They have a low translucency, allowing them to reproduce an appearance similar to the dentin layer of natural teeth, and they are excellent for color coordination with surrounding teeth, making them more suitable for posterior prosthetics such as crowns and bridges than anterior prosthetics. They also have a masking effect that is advantageous in covering discolored base teeth or metal cores.

- Possesses color characteristics similar to natural dentin.
- Suitable for fabricating large restorations such as posterior crowns.
- Restorations made from LT block offer color and brightness similar to natural teeth.

Shade: A~D series (16 colors) and BL series (4 colors), totaling 20 shades.

MO
Medium Opacity

MAZIC Claro CAD MO blocks have a medium opacity, being more opaque than LT. It is mainly used for the production of frameworks for prosthetics that require porcelain layering on the core or upper part.

- With moderate translucency, it is suitable for fabricating restorations for moderately discolored teeth.
- Suitable for the build-up technique, enabling additional ceramic layers for enhanced translucency and aesthetic contouring of the final restoration.

Shade: MO 0, MO 1, MO 2, MO 3, MO 4 total 5 shades.

Impulse Opal
Series Opalescent

MAZIC Claro CAD Impulse Opal blocks have a translucency with an emphasized opalescence effect. The opalescence effect is a phenomenon in which light is scattered and reflected in a similar way to the enamel of natural teeth, and the color appears differently depending on the light. This provides a more natural and lively appearance and is mainly suitable for areas with high aesthetic demands such as veneers or crowns of the anterior region.

- By scattering and reflecting light in a similar way to the enamel of natural teeth, an opalescence effect can be created, in which the color appears different depending on the light.
- It is mainly suitable for areas with high aesthetic demands such as veneers or crowns of the anterior teeth.

Shade: Impulse Opal 1, Impulse Opal 2 total 2 shades.

Wide Range of Indications

Inlays		Anterior Single Crowns	
Onlays		Posterior Single Crowns	
Veneers		3-Unit Bridge	

MAZIC Claro CAD Block Classification Table

• HT series

A-D shade	A1	A2	A3	A3.5	A4
	B1	B2	B3	B4	-
	C1	C2	C3	C4	-
	-	D2	D3	D4	-

BL shade	BL1	BL2	BL3	BL4

• LT series

A-D shade	A1	A2	A3	A3.5	A4
	B1	B2	B3	B4	-
	C1	C2	C3	C4	-
	-	D2	D3	D4	-

BL shade	BL1	BL2	BL3	BL4

• MO series

MO 0	MO 1	MO 2	MO 3	MO 4

• Impulse Opal series

Impulse Opal 1	Impulse Opal 2

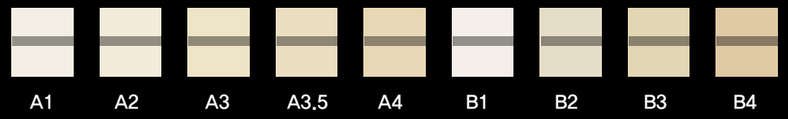
• MAZIC Claro CAD Block Specifications

Category	Size
C12	Width 12mm, Length 10mm, Height 15mm
C14	Width 14mm, Length 12mm, Height 18mm
B32	Width 14.5mm, Length 14.5mm, Height 32mm
B40	Width 15.2mm, Length 15.2mm, Height 38mm

Translucency level

HT High Translucency

A-D



Bleach (BL)

LT Low Translucency

A-D

Bleach (BL)

MO Medium Opacity

Impulse Opal Opalescent

Order of Translucency	Classification of Fabrication Methods			Types of Restorations					
	Stain Technique	Cut-Back Technique	Layering Technique	Inlay/ Onlay	Thin Veneer	Veneer	Partial crown	Crown	Anterior 3-Unit Bridge
HT High Translucency	✔	✔		✔	✔	✔	✔		
LT Low Translucency	✔	✔				✔	✔	✔	✔
MO Medium Opacity			✔					✔	✔
BL Bleach	✔	✔			✔	✔	✔	✔	

Stain Technique

A technique used to create a natural appearance for dental prosthetics. This technique uses special dyes or paints to more naturally reproduce the color, texture, and translucency of teeth.

Cut-back Technique

A technique used to preserve the aesthetic perfection of prosthetics (mainly ceramic crowns or bridges). It is a method of milling a ceramic block with CAD/CAM, then reducing a portion (cut-back), and layering (adding porcelain) that part.

Layered Technique

This aesthetic technique delicately reproduces the color, translucency, and texture of natural teeth by manually layering porcelain (ceramic). when making ceramic prosthetics (crowns, bridges, etc.).

Precautions for Proper Block Usage!

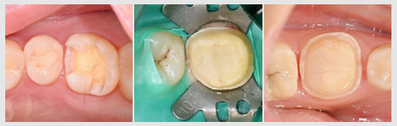
- The framework must not be thinner than the required minimum thickness for restoration.
- Mill the block by compatible CAD/CAM system.
- Crystallize using a ceramic furnace that has been approved and/or recommended.
- Crystallization shouldn't be conducted in a high-temperature furnace.
- For build-up process, use layering ceramic only.
- Crystallize using a ceramic furnace that has been calibrated.
- If contaminant occurs to the product, do not use.

Recommended Procedure

STEP 01

Prepare Abutment

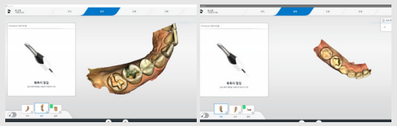
Prepare the abutment according to the preparation guidelines. If pulp exposure concerns, use a minimum amount of calcium hydroxide. If required, place a temporary restoration on tooth before permanent restoration. If required, take the impression using the scannable bite registration.



STEP 02

Image Scan (Tooth & Impression)

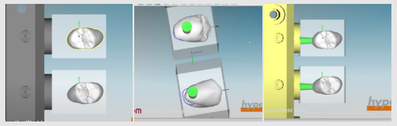
Scan the image of the prepared tooth and impression by a scanner.



STEP 03

Select Shade & Block Size

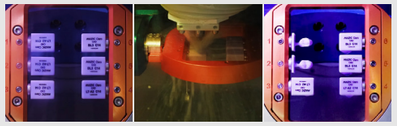
Select the suitable shade, translucency and size of the CAD block on the basis of the adaption of the restoration and shade of abutment.



STEP 04

Milling (CAD/CAM)

Mill the block according to CAD/CAM system manufacturer's recommendation.



STEP 05

Remove Sprue Adjustment Surface

Crystallize in a furnace, after removal of restorations' sprue and adjustment of the surface with proper grinder.

STEP 06

Crystallization & Annealing

Perform the annealing the crystallized restoration out of furnace in the draft-free area. If required, perform the plasticity of restoration after build-up with the layering ceramic powder.

STEP 07

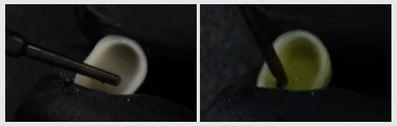
Check Compatibility

Check the compatibility between the restoration and model, if necessary, adjust the shape by grinding. If required, remove temporary restoration and clean tooth completely.

STEP 08

HF Etching and Cleaning

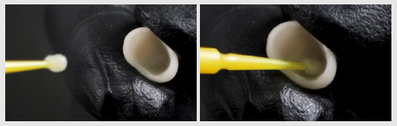
Etch the internal surface of the restoration with hydrofluoric acid and clean it with a suitable neutralizing agent.



STEP 09

Apply Silane Primer

Apply the silane primer on the inside surface of restoration.



STEP 10

Cementation

Cement the restoration using an appropriate resin cement. [U-cem Premium]

Shade Determination

Optimum integration in the oral cavity of the patient is the prerequisite for a true-to-nature all-ceramic restoration.
To achieve this, the following guidelines and notes must be observed by both the dentist and the laboratory.
The overall esthetic result of an all-ceramic restoration is influenced by the following factors:

- Shade of prepared tooth (natural preparation, core build-up, abutment, implant)
- Shade of the restoration (framework shade, veneer, characterization)
- Shade of the cementation material

The visual effect of the preparation shade must not be underestimated during the fabrication of highly esthetic restorations. For that reason, the shade of the preparation should be determined together with the desired tooth shade in order to select the suitable block. This is of utmost importance in particular with severely discolored preparations or non tooth-colored abutments. Only if the dentist determines the shade of the preparation and then shares this information with the laboratory may the desired esthetic appearance be achieved as necessary.

Shade determination of the natural tooth

After tooth cleaning, the tooth shade of the non-prepared tooth and/or the adjacent teeth is determined with the help of a shade guide. Individual characteristics have to be considered when determining the tooth shade. If a crown preparation is planned, for example, the cervical shade should also be determined. In order to achieve the best possible true-to-nature results, shade determination should be carried out at daylight. Furthermore, the patient should not wear clothes of intensive colors and/or lipstick.

Die shade determination

In order to facilitate the reproduction of the desired tooth shade, the shade of the preparation is determined with the help shade guide.

Crystallization Schedule

MAZIC Claro CAD Crystallization Schedule

Entry Temp. (℃)	Closing Time (min.)	Heating Rate t_1 (℃ /min.)	Final Temp T_1 (℃)	Holding Time. H_1 (min.)	Heating Rate t_2 (℃ /min.)	Final Temp T_2 (℃)	Holding Time. H_2 (min.)	Vacuum 1 1_1 (℃) 1_2 (℃)	Vacuum 2 2_1 (℃) 2_2 (℃)
400	06:00	90	820	00:10	30	840	07:00	550 820	820 840

※ Since the above heat-treatment profile is recommended to achieve optimal properties, it should be adjusted as appropriate depending on the model type and performance characteristics of the heat-treatment equipment in use.

Note on the crystallization firing

Keep the joined and cleaned restoration away from liquids and do not steam.
The Crystallization Tray and the corresponding Crystallization Pins must be used for the Crystallization firing.
Place the MAZIC Claro CAD-on restoration in the center of the Crystallization Tray.
For this purpose, place the Crystallization Pins as close as possible to the center of the Crystallization Tray.
The MAZIC Claro CAD-on restoration may be placed on Crystallization Pins by means of Object Fix Putty of Flow material. Apply a small amount of Object Fix Putty or Flow into the cavity of the restoration and place it on the pins.
Carry out the Crystallization firing with the indicated Crystallization schedule. Check the furnace model.
At the beginning of the firing procedure, open the furnace and wait for the acoustic signal. Subsequently, place the firing tray with the objects in the center of the firing table and start the program.
Remove restoration on the Crystallization Tray from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
Allow the restoration to cool to room temperature in a place protected from draft.
Do not touch the hot restoration with metal tongs.

Tooth Preparation

Key Considerations for Tooth Preparation

Mechanical Factors

- Resistance to functional stress
- Resistance to restoration dislodgement
- Maintaining the dental arch between abutments

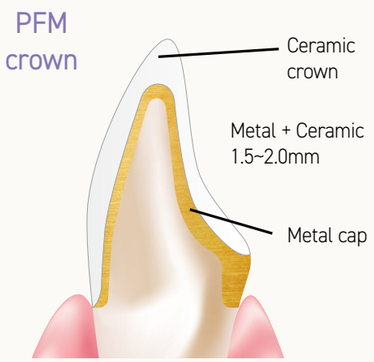
Aesthetic Factors

- Restoration size and shape, ease of restoration
- Ease of shade application
- Stability of translucency and color retention

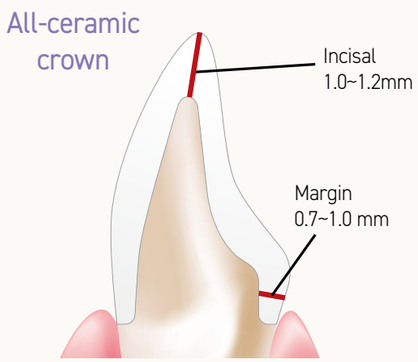
Biological Factors

- Protection of pulp and periodontal health
- Providing proper occlusal relationships
- Maintaining proper tooth position
- Preventing fracture of remaining abutment teeth

Cross-sectional CAD/CAM Machinable Ceramic Restoration

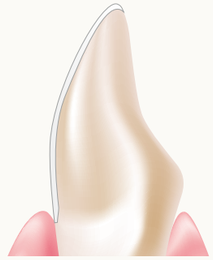


Tooth preparation of PFM crowns

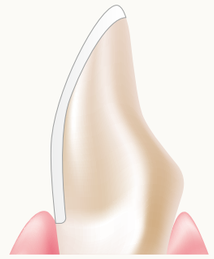


Tooth preparation of All-ceramic crowns

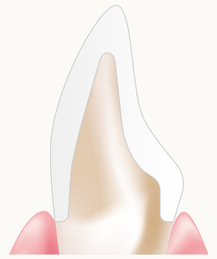
Type of CAD/CAM Machinable Ceramic Restoration



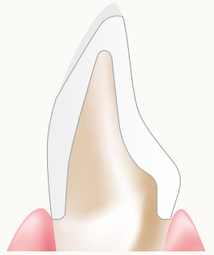
Thin veneer



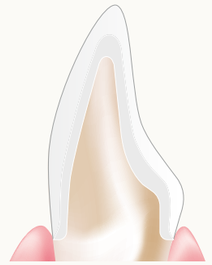
Normal veneer



Stain technique crown



Cut-Back technique crown



Layering technique crown

Inlay/Onlay

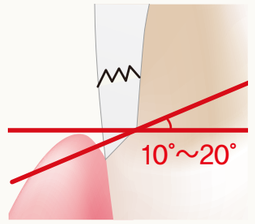
Tooth Preparation Guidelines for All-Ceramic Restorations

1) Incisal Edge

2) Occlusal Surface

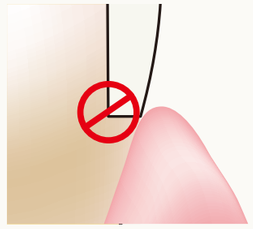
Avoid "Overtapered" morphology on the incisal edge and occlusal surface.

3) Margin Area



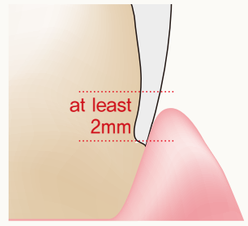
Margin Design: Shoulder or Sloped Shoulder For optimal adaptation, the margin inclination should not exceed 20°.

4) Cervical Support Area



Avoid sharp internal line angles

5) Lingual Retentive Surface



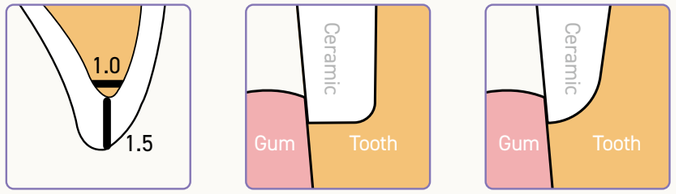
For anterior teeth, the lingual vertical retention surface height should be at least 2 mm.

Removal Guidelines

The clinician and technician must follow the preparation guidelines
and specified framework dimensions when using MAZIC Claro CAD.

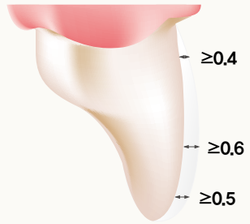
Removal guidelines for all-ceramic restorations

- Eliminate angles or sharp edges
- Reduce shoulders that interfere with rounded inner edges or chamfers
- Uniform tooth reduction ensures optimal milling and minimizes fabrication errors in MAZIC Claro CAD restorations.
- The cut-off of the abutment (part anterior) can be made using a minimum of 1.0 mm (milling tool geometry) to optimize milling during CAD/CAM processing.



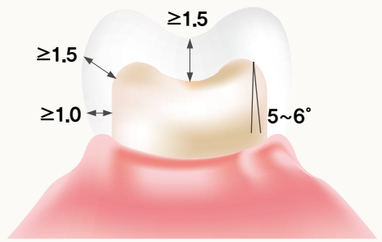
Veneer

- If possible, the reduction should be within the enamel.
- The incisal reduction margin should not be in the position of static/dynamic occlusion of the enamel.
- Reduce at least 0.4 mm in the cervical and labial areas, the middle area at least 0.6 mm, and at least 0.5 mm in the incisal edge.



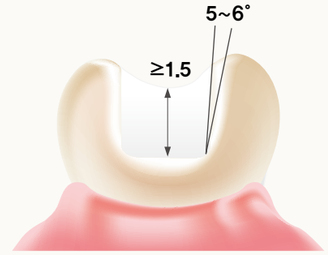
Crown

- Reduce anatomically, respecting the prescribed minimum thickness.
- To ensure durability and sufficient space for proper occlusion, the occlusal is reduced by at least 1.5 mm.
- Static/dynamic occlusion of the opposing teeth must be considered.
- For esthetic thickness and durability, the axial wall (buccal/labial) is reduced by at least 1.5 mm.
- For durability and smooth fit, the cervical area is reduced by at least 1.0 mm.
- To prevent stress concentration and potential breakage of the ceramic, all edges should be rounded and sharp angles should be avoided.
- Prep tooth with 5~6° taper, rounded edge and shoulder margin.



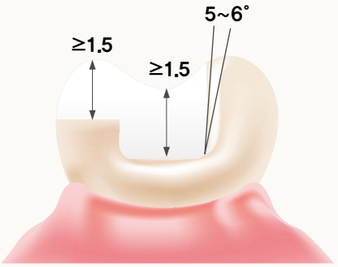
Inlay

- Prep tooth with 5~6° taper, rounded edge and shoulder margin.
- The static/dynamic occlusion of the opposing teeth must be taken into account.
- The prepared margin must not be in the center of the opposing teeth.
- A minimum occlusal depth of 1.5 mm must be maintained in the fissure area.
- Inlays in convex cavities without adequate support by the proximal shoulder should avoid contact with the marginal ridge.
- To prevent stress concentration and potential breakage of the ceramic, all edges should be rounded and sharp angles should be avoided.



Onlay

- Prep tooth with 5~6° taper, rounded edge and shoulder margin.
- The static/dynamic occlusion of the opposing teeth must be taken into account.
- The prepared margin must not be in the center of the opposing teeth.
- A minimum occlusal or proximal box depth of 1.5 mm must be maintained in the fissure area.
- Inlays in convex cavities without adequate support by the proximal shoulder should avoid contact with the marginal ridge.
- To prevent stress concentration and potential breakage of the ceramic, all edges should be rounded and sharp angles should be avoided.



Precautions for Removal All-Ceramic Dental Restorations!

Do

- In case of crown, prep tooth with 5~6° taper, rounded edges and shoulder margin.
- Remove residues (temporary cement, tooth-debris and scanning spray) by a brush or soft pumice.
- Gently clean with water and blow dry by air. (Do not dry completely)

Do not

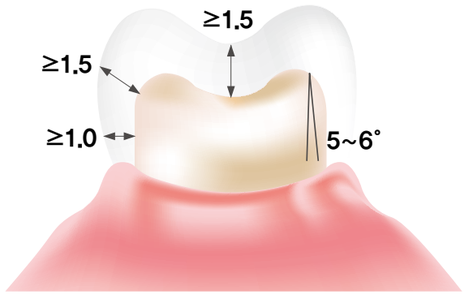
- Do not use chemicals after prep. (Example: EDTA, CHX, Bicarbonate, Hydrogen peroxide, Hyper-esthetic agent)
- Do not use laser etching.
- Do not use temporary cement in types of eugenol affiliation.

Stain Techniques

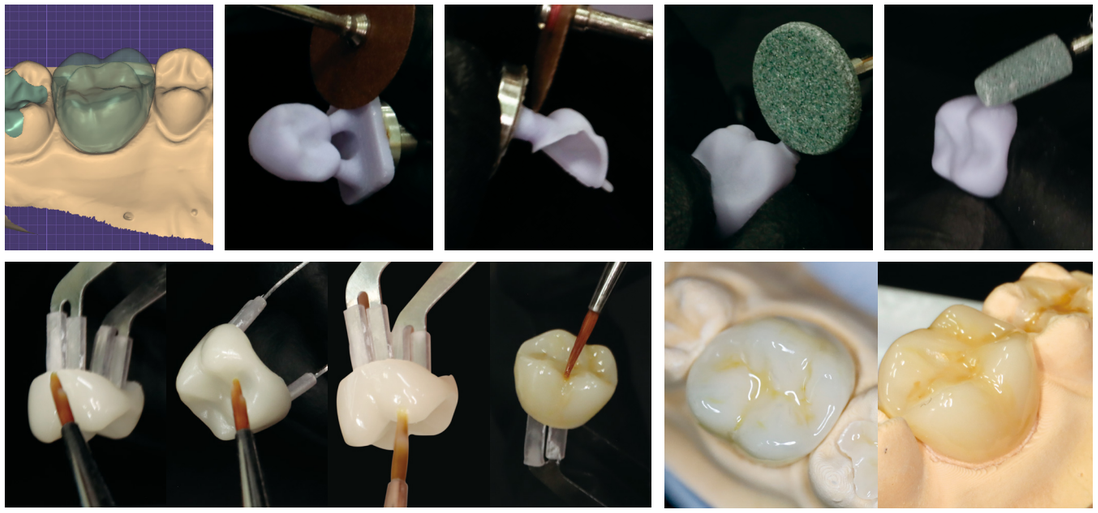
A method of fabricating the restoration by milling a fully contoured pattern, followed by staining and glazing, without additional ceramic buildup. When fabricating bridge restorations, carefully design the pattern to ensure sufficient framework thickness and connector strength.

Crown Preparation Guide

Posterior crown



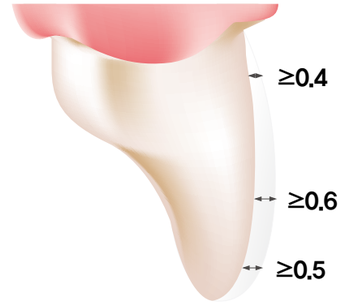
Fabrication Process



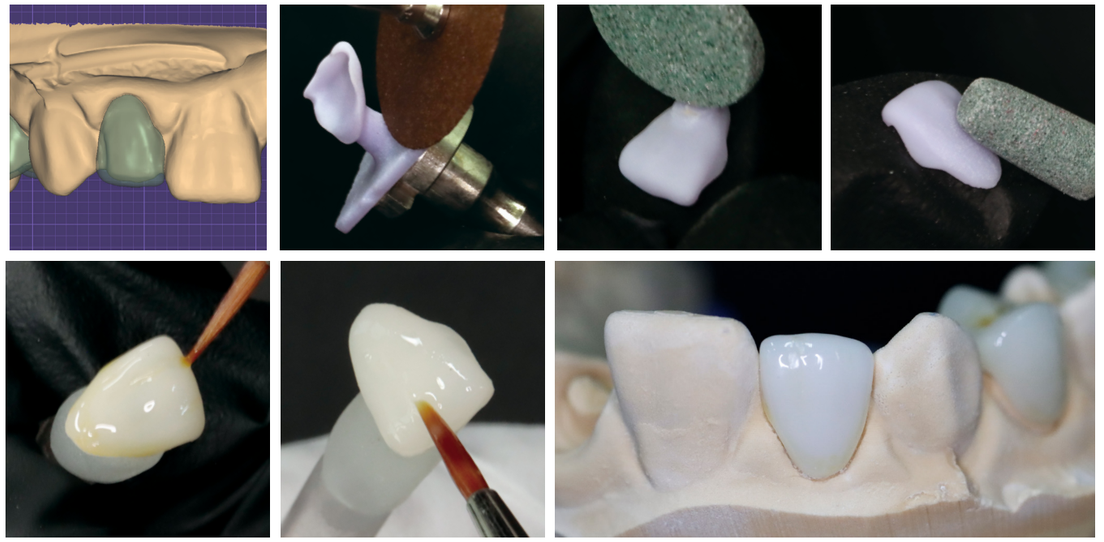
Veneer Preparation Guide

6 Anterior Veneer Aesthetic Prosthetics

- It is recommended to proceed tooth removal preparation only on the enamel layer.
- Do not mark margin lines on the occlusal area.
- Parts with the proper minimum thickness can be fabricated without tooth preparation.

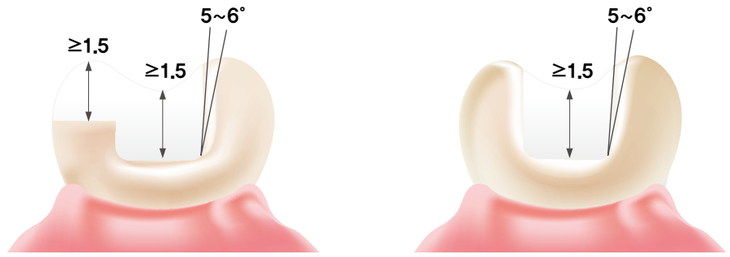


Fabrication Process

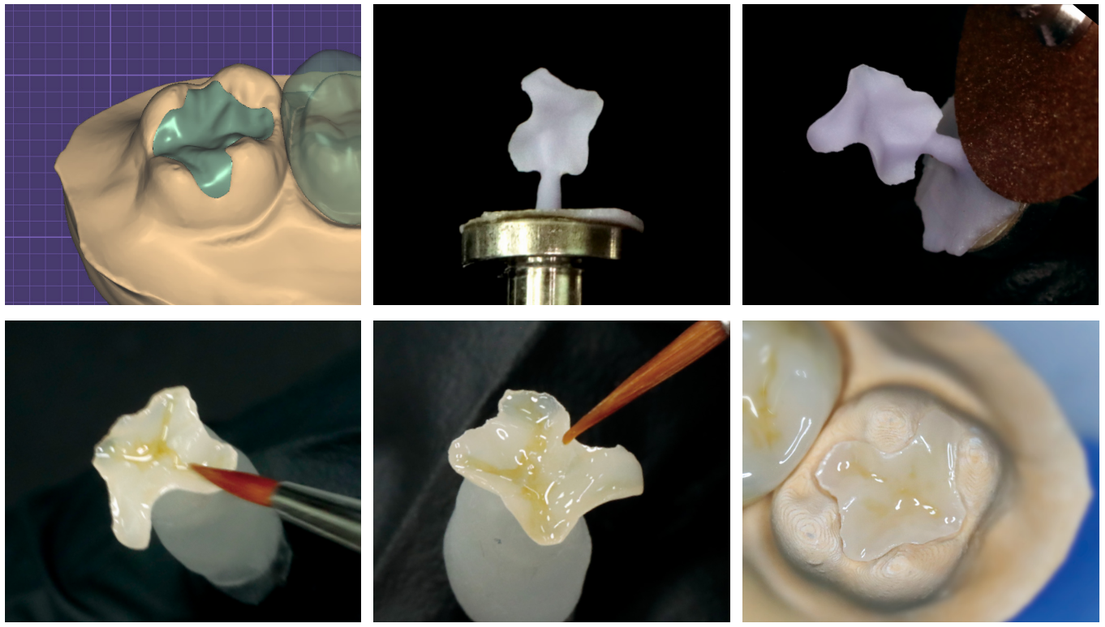


Inlay, Onlay Preparation Guide

Inlay · Onlay



Fabrication Process

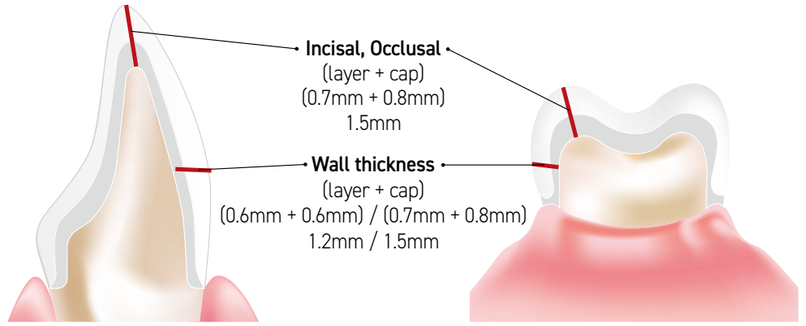


Layering Technique

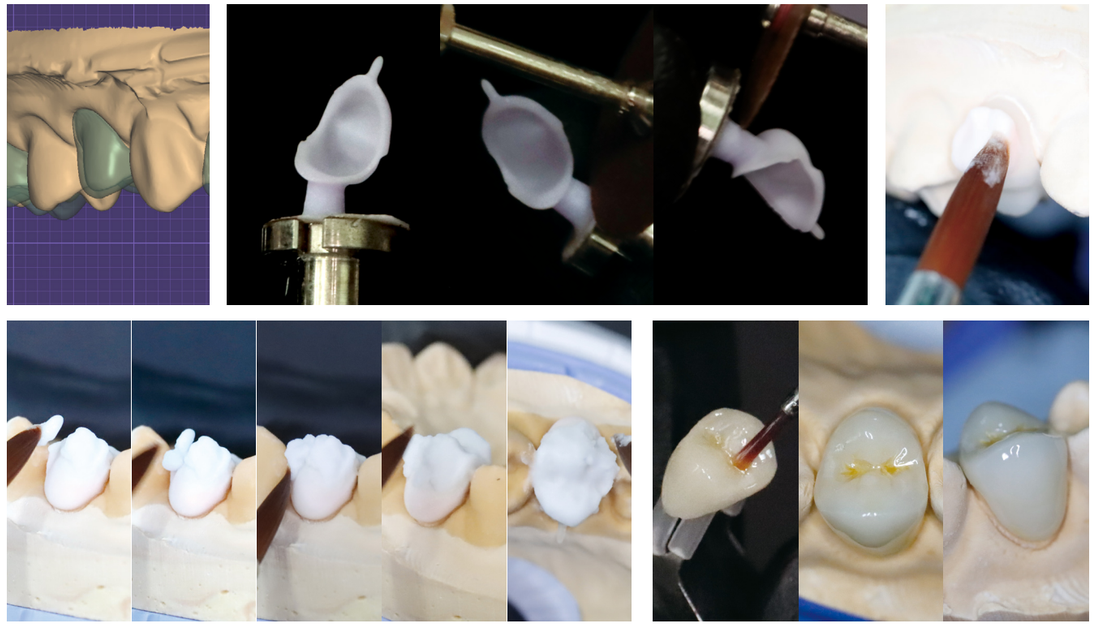
A method of fabricating the restoration by creating an inner frame with reduced tooth shape, followed by milling and full ceramic build-up to complete the restoration. This technique provides the highest level of translucency and aesthetics among all-ceramic restoration methods.

Layering Technique Preparation guide

Anterior · Posterior



Fabrication Process



Troubleshooting

Caution

- The ceramic furnace should be calibrated every six months to correct potential temperature deviations.
- Allow the object to cool to room temperature in a well-ventilated area to prevent thermal shock.

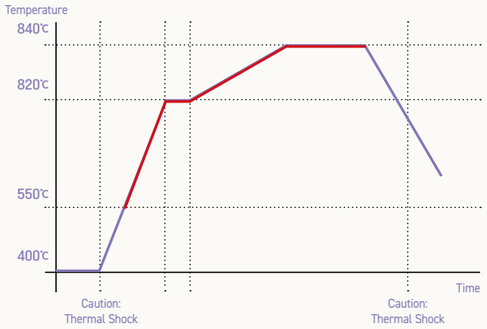
Deviations may occur

- Differences in furnace models, regional differences in power supply, or the simultaneous use of multiple electrical devices on the same circuit may affect furnace performance. For example, when using the crystallization tray, the firing temperature may vary depending on the furnace used.

Note

- It may vary significantly depending on the thickness of the restoration.
- After the firing cycle, as the object cools, internal stresses may develop due to differences in cooling rates across areas of varying thickness.
- In the worst case, such stresses may lead to cracks in the ceramic object.
- Using slow cooling can help minimize these tensile stresses.
- When the layer thickness exceeds 2 mm, slow cooling is required.

*Depending on the condition of the furnace, the firing temperature may be adjusted by ±5 ℃/9 ℉, up to a maximum of ±10 ℃/18 ℉.



MAZIC Claro CAD Crystallization Schedule

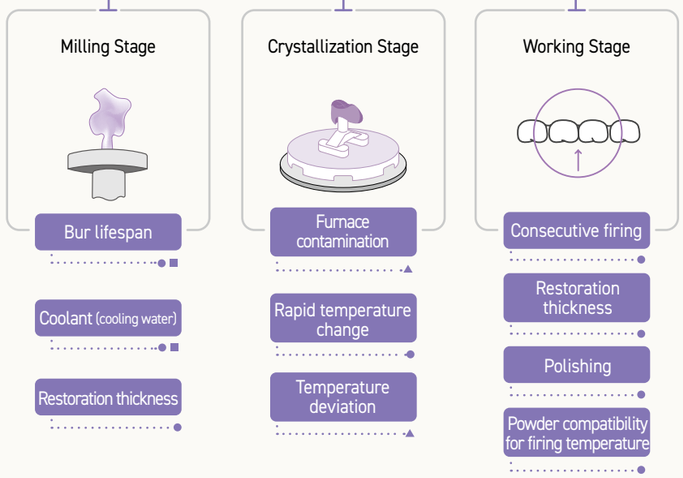
Entry Temp. (℃)	Closing Time (min.)	Heating Rate t¹ (℃/min.)	Final Temp T¹ (℃)	Holding Time. H¹ (min.)
400	06:00	90	820	00:10

Heating Rate t² (℃/min.)	Final Temp T² (℃)	Holding Time. H² (min.)	Vacuum 1 1¹ (℃) 1² (℃)	Vacuum 2 2¹ (℃) 2² (℃)
30	840	07:00	550 820	820 840

※ Since the above heat-treatment profile is recommended to achieve optimal properties, it should be adjusted as appropriate depending on the model type and performance characteristics of the heat-treatment equipment in use.

Trouble shooting

MAZIC Claro CAD



● Crack
- Metal Pin=> Ceramic pin
- Do not cool rapidly
- Do not handle the restoration with metal tweezers.
- Room temperature variation
- Cleaning (powder, heating elements, etc.)
- Repeated firing
- Powder compatibility
- Polishing

■ FIT
- Bur usage and management
- Design (preparation verification)
- Coolant (cooling water)
- Calibration

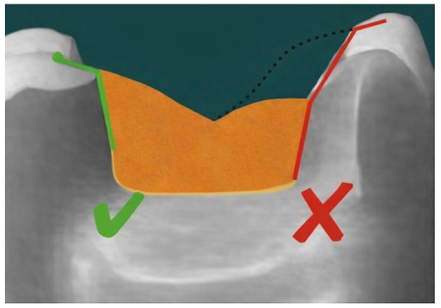
▲ Shade deviation
- Furnace cleaning
- Crystallization

Milling Stage

Problem
- Surface defect

Cause
- Using a worn milling bur
- Insufficient coolant

Solution
- The milling bur should be replaced at regular intervals, and its condition must be carefully checked, particularly during fine milling procedures.
- Avoid setting the milling speed excessively high; use an appropriate speed to obtain a smooth surface finish.
- Make sure the cooling system is operating properly, with adequate coolant and airflow to ensure smooth milling and avoid potential damage.



Problem
- Adaptation issue

Cause
- Scanning error
- Preparation defect, milling undercut compensation
- Equipment calibration

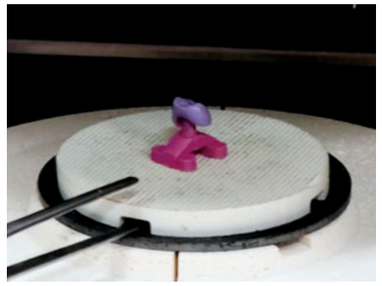
Solution
- Regular calibration provides precise scan data, leading to highly accurate milling results.
- During the design stage, any milling undercuts must be blocked out. This ensures accurate milling and prevents misfit of the restoration.
- Perform regular equipment maintenance and precision checks to minimize unnecessary errors.
- The preparation guide should be checked to confirm sufficient reduction and accurate design.

Problem
Chipping issue after milling

Cause
- Using a worn milling bur
- When the restoration is thinner than the block thickness
- Check coolant application

Solution
- Maintain the minimum thickness in design and adjust milling speed to avoid excessive pressure.
- Adjust pressure and speed appropriately for each system to maintain smooth and stable milling.
- Check the replacement interval and surface wear of the bur during use.

Crystallization Stage



Problem
- Shade discrepancy.

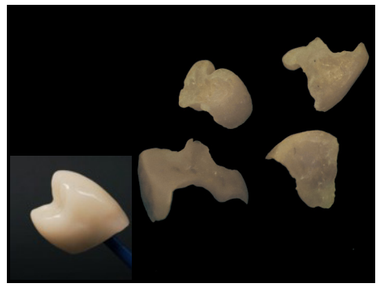
Cause
- Abnormal crystallization temperature and furnace contamination.

Solution
- For optimal properties and esthetics, set the crystallization temperature to about 840 °C and follow the recommended holding time in the product instructions.
- Regularly clean the crystallization tray and furnace interior to prevent shade changes caused by impurities and to ensure consistent esthetic results.

Problem
- Occurrence of cracks immediately after crystallization

Cause
- Uneven heat distribution or sudden temperature changes during crystallization

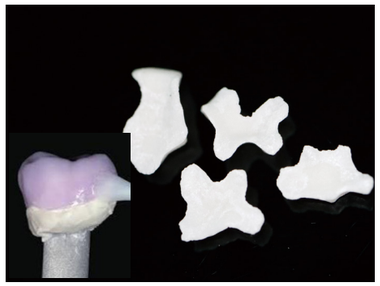
Solution
- Gradually increase and decrease the tray temperature, and control the furnace temperature change rate to prevent sudden thermal fluctuations.
- Place the block in the center of the crystallization tray and leave sufficient space from other materials to ensure even heat distribution.
- Allow sufficient crystallization time to ensure uniform heat distribution throughout the interior.
- Always use a fixation material during crystallization.
- For crystallization, use only ceramic pins. Metal pins are not recommended as they may affect stability and esthetics.
- Avoid rapid cooling of the restoration after crystallization to prevent thermal shock and fractures.
- Avoid handling hot restorations with metal tweezers, as this may cause surface damage or cracks.



Problem
- Excessively dark or intense shade : High-temperature crystallization may darken the shade compared to the planned color, reducing harmony with adjacent teeth. To ensure natural esthetic results, always follow the recommended firing schedule.
- Unnecessary decrease translucency : Excessively high firing temperatures can decrease translucency due to excessive growth of the crystal, causing unnatural transparency or gloss. Follow the recommended firing schedule for optimal esthetic results.
- Shape deformation of the prosthesis: High crystallization temperatures may cause shape deformation due to preferential softening of the glass matrix. Always follow the recommended firing schedule for reliable shape results.

Cause
- High crystallization temperature

Solution
- Temperature control.



Problem
- Dull or incomplete shade appearance : Low firing temperatures can cause incomplete crystallization, resulting in a dull shade. Ensure the correct firing schedule is applied for reliable esthetic outcomes.
- Grayish hue of the raw material : Low crystallization temperatures may result in a grayish block, caused by incomplete internal crystal formation. Use the appropriate firing schedule to maintain consistent shade quality.
- Insufficient gloss surface : Low firing temperatures can reduce gloss and low surface light reflection, giving the surface a rough appearance. Proper adherence to the firing schedule helps achieve consistent esthetic results.

Cause
- Low crystallization temperature

Solution
- Temperature control.

Working Stage

Problem
- Cracks occurring after applying Cut-back or Layering Technique.

Cause
- Insufficient core thickness during powder buildup.
- Fracture caused by thermal shock and improper coefficient of thermal expansion (CTE) mismatch between the framework and veneer.
- When thermal shock occurs during the polishing process.
- Compatibility issues with the porcelain powder used.
- Core degeneration caused by repeated excessive firing above 800°C.

Solution
- For the cut-back and layering techniques, the recommended layer thickness must be observed to ensure esthetics and minimize the risk of fractures.
- Glass ceramic products should be protected from rapid temperature changes. Minimizing thermal shock helps preserve strength and prevent fractures.

Problem
- Cracks occurring during polishing procedure.

Cause
- Polishing performed with a conventional bur.
- Improper polishing may cause fractures due to thermal shock.

Solution
- Always use diamond-coated burs specifically designed for glass ceramics to ensure effective polishing and prevent surface damage.
- Operate the handpiece at low speed and use adequate water cooling to protect the restoration from heat and thermal shock.
- Use high-performance polishing tools and avoid continuous polishing in one spot to minimize heat generation.
- Ensure the restoration maintains the recommended minimum thickness during polishing to protect strength and avoid fractures.
- Avoid excessive grinding of the framework connector with a disk. Preserving the designed connector dimensions ensures strength and reduces the risk of fracture.