Table of Contents

3 IPS e.max System
4 IPS e.max CAD
    Material
    Uses
    Scientific data
    CAD/CAM partners
    Block concept

10 Overview of the Clinical Working Steps, Fabrication Process
    Block selection using the IPS e.max® Shade Navigation App
    Preparation guidelines
    Minimum layer thicknesses
    Model and tooth preparation

18 Overview of the Processing Techniques

19 Preparation

20 Polishing Technique (Self-Glaze)
    Finishing
    Polishing
    Speed Crystallization or Crystallization

23 Staining Technique
    Finishing
    – Staining technique on the "blue" restoration
      • Variant A: Crystallization and Glaze Firing in one step with glazing spray
      • Variant B: Crystallization and Stain/Glaze Firing in one step with glazing paste
      • Variant C: Crystallization and Stain/Glaze Firing in one step with glazing spray

41 Cut-Back Technique

43 Frequently Asked Questions
    Cementation and Aftercare
    Shade Combination Table
    Crystallization and Firing Parameters

Symbols in the Instructions for Use

⚠️ Important  📘 Information  🌿 Tips & Tricks  🚫 Contraindication  🔴 Note on firing
IPS e.max® System

Given its versatility, its clinical long-term success and its wide range of indications, the IPS e.max® System is the more successful and most used all-ceramic system throughout the world.

With the highly esthetic high-strength IPS e.max materials, all indications for fixed restorations, ranging from thin veneers to multi-unit bridges, can be realized. Hybrid restorations are also possible.

The coordinated shade concept within the system and the individual products enable flexible working procedures from the shade determination up to the material selection.

The ideal restoration shade is optimally reproduced by means of the IPS e.max Shade Navigation App. It facilitates the material selection, leads to results that feature optimum shade match and thus provides efficiency and reliability.

IPS e.max is the comprehensive high-quality all-ceramic system for all indications, esthetic requirements and patient cases: it is all ceramic – all you need.
IPS e.max® CAD is the innovative lithium disilicate glass-ceramic (LS₂) for the CAD/CAM technology. It is unique and combines an outstanding esthetic appearance with high user friendliness. The digitally fabricated restoration is selected from a comprehensive range of indications, which is only offered by IPS e.max CAD. A multitude of translucency levels, shades and block sizes enables flexible working. Proven and coordinated cementation materials ideally supplement the range of products.

IPS e.max® ZirCAD permits processing the popular zirconium oxide material easily and quickly by means of the speed sintering procedure to lead to esthetically pleasing results. The IPS e.max ZirCAD LT blocks are pre-shaded and monochromatic and they are indicated for monolithic crowns and 3-unit bridges. The high strength of IPS e.max ZirCAD permits thin wall thicknesses (posterior crowns occlusal and/or central fissure 0.6 mm, anterior crowns 0.4 mm) and tooth structure-preserving preparation. Moreover, the restorations can be conventionally cemented, e.g. with self-adhesive resin cement SpeedCEM® Plus.

IPS e.max® CAD Crystall./Shades/Stains and Glaze is the universal system of stains and glazes for IPS e.max CAD, IPS e.max ZirCAD and IPS Empress CAD. The glazing material is available with or without fluorescent effect.

There are separate Instructions for Use for IPS e.max CAD Veneering Solutions, IPS e.max CAD Abutment Solutions and IPS e.max ZirCAD.
IPS e.max® CAD Monolithic Solutions

Material

IPS e.max® CAD

IPS e.max CAD is a lithium disilicate glass-ceramic block for the CAD/CAM technology. It is fabricated using an innovative process which provides an impressive homogeneity of the material. The block can be processed very easily in a CAD/CAM unit in this crystalline intermediate stage. The typical and striking colour of IPS e.max CAD ranges from whitish to blue and bluish-grey. This shade is a result of the composition and the microstructure of the glass-ceramic. The strength of the material in this processable intermediate phase is ≥130 MPa. After the IPS e.max CAD blocks are milled, the restoration is crystallized in an Ivoclar Vivadent ceramic furnace (e.g. Programat® CS3, CS4). Unlike with some other CAD/CAM ceramics, the easy-to-conduct crystallization process neither causes any major shrinkage, nor are any complicated infiltration processes required. The crystallization process leads to a change in the microstructure in the IPS e.max CAD material, during which lithium disilicate crystals grow. The densification of 0.2% is compensated for in the CAD software and taken into account upon milling. The final physical properties, such as the strength of 530 MPa (typical average value) and the corresponding optical properties, are achieved through the transformation of the microstructure.

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
<th>Typical average value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTE (25–500°C) [10^-6/K]</td>
<td>10.1 ± 0.5</td>
<td>–</td>
</tr>
<tr>
<td>Flexural strength (biaxial) [MPa]</td>
<td>≥360</td>
<td>530</td>
</tr>
<tr>
<td>Chemical solubility [μg/cm²]</td>
<td>&lt; 100</td>
<td>–</td>
</tr>
<tr>
<td>Type/Class</td>
<td>Type II / Class 3</td>
<td>–</td>
</tr>
</tbody>
</table>

according to 6872:2015
Uses

Indications
– Occlusal veneers (table top)
– Thin veneers
– Veneers
– Inlays
– Onlays
– Partial crowns
– Minimally invasive crowns in the anterior and posterior region
– Crowns in the anterior and posterior region
– 3-unit bridges in the anterior region
– 3-unit bridges in the premolar region up to the second premolar as the terminal abutment

Contraindications
– Inlay bridges
– Cantilever bridges
– Maryland bridges
– Pontic width anterior region > 11 mm
– Pontic width premolar region > 9 mm
– Temporary incorporation of IPS e.max CAD restorations
– Fully veneered molar crowns
– Very deep subgingival preparations
– Patients with severely reduced residual dentition
– Bruxism
– Any other use not listed in the indications

Further contraindications for minimally invasive anterior and/or posterior crowns:
– Layer thickness below 1 mm
– Preparations with sharp edges
– Preparations without anatomical support and with irregular layer thicknesses
– Conventional and self-adhesive cementation
– Build-up materials other than composite
– Lack of canine guidance
– Bridges
– Crowns on implants

Important processing restrictions
Failure to observe the following restrictions may compromise the results achieved with IPS e.max CAD:
– Falling short of the required minimum thickness.
– Milling the blocks in a non-compatible CAD/CAM system.
– Crystallization must not be conducted in a ceramic furnace that has not been approved and/or recommended
– Crystallization in a non-calibrated ceramic furnace
– Do not mix IPS e.max CAD Crystall./Glaze, Shades and Stains with other dental ceramics (e.g. IPS e.max Ivocolor Glaze, Shades and Essences).
– Veneering ceramics other than IPS e.max Ceram must not be used.

Warnings
– Do not inhale ceramic dust during finishing – use extraction equipment and wear a face mask.
– Observe the Safety Data Sheet (SDS).
Scientific data

Since the beginning of the development, the IPS e.max System has been monitored by the scientific community. Many renowned experts have contributed to an excellent data base with their studies. The worldwide success story, the ever growing demand, as well as over 100 million fabricated restorations are testament to the success and the reliability of the system. More than 20 clinical in-vivo studies to date and even more in-vitro studies, as well as the continuously rising number of clinical studies throughout the world show the impressive long-term success of the IPS e.max System in the oral cavities of the patients. The most important study results are compiled in the "IPS e.max Scientific Report Vol. 2". Further scientific data (i.e. strength, wear, biocompatibility) is contained in the Scientific Documentations about the IPS e.max products. They can be obtained from Ivoclar Vivadent.

For further information about all-ceramics and IPS e.max, please refer to the Ivoclar Vivadent Report No. 16 and 17. Detailed information about the luting composite Variolink® Esthetic can be found in the "Ivoclar Vivadent Report No. 22" and the "Variolink Esthetic Scientific Documentation", while Multilink® Automix is described in details in the "Multilink Automix Scientific Report 2/2016".

CAD/CAM partners

IPS e.max CAD has to be processed with an authorized CAD/CAM system. For questions regarding the different systems, please contact the respective cooperation partners.

Further information are available on the Internet from www.ivoclarvivadent.com.
**Block concept**

IPS e.max CAD blocks are available in **four translucency levels (MO, LT, MT, HT)** and **special Impulse shades** in different sizes. Basically, all blocks are made of the same material and feature the same outstanding properties. For reasons of esthetics, however, the following processing technique and indication are recommended for the individual blocks (translucency levels):

<table>
<thead>
<tr>
<th>Translucency Level</th>
<th>Processing Technique</th>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>MO Medium Opacity</td>
<td>Polishing technique</td>
<td>Hybrid Abutment Crown</td>
</tr>
<tr>
<td>LT Low Translucency</td>
<td>Polishing technique</td>
<td>Hybrid Abutment Crown</td>
</tr>
<tr>
<td>MT Medium Translucency</td>
<td>Polishing technique</td>
<td>Hybrid Abutment Crown</td>
</tr>
<tr>
<td>HT High Translucency</td>
<td>Polishing technique</td>
<td>Hybrid Abutment Crown</td>
</tr>
</tbody>
</table>

1) The cut-back technique must not be used for the fabrication of thin and occlusal veneers
2) Only up to the second premolar as the distal abutment
3) Up to the second premolar
IPS e.max CAD HT (High Translucency)
The HT blocks are available in A-D and Bleach BL shades and in different sizes. Given their high translucency that is similar to that of natural enamel, they are ideal for the fabrication of small restorations (e.g. inlays, onlays). Restorations made of HT blocks convince users with their true-to-nature chameleon effect and the exceptional adaption to the remaining tooth structure. Restorations made from HT blocks are ideally suitable for the “polishing technique”, “staining technique”, “cut-back technique”, but also for the “CAD-on technique”.

IPS e.max CAD MT (Medium Translucency)
The MT blocks are available in A-D and Bleach BL shades. They demonstrate medium translucency and are used for restorations that require more brightness than HT restorations and more translucency than LT restorations. Restorations made of MT blocks are ideally suitable for the “polishing technique”, “staining technique”, but also for the “cut-back technique”.

IPS e.max CAD LT (Low Translucency)
The LT blocks are available in A-D and Bleach BL shades and in different sizes. Given their low translucency that is similar to that of natural dentin, they are ideal for the fabrication of larger restorations (e.g. posterior crowns). Restorations made from LT blocks convince users with their lifelike brightness value and chroma. This prevents the incorporated restorations from greying. LT blocks are ideally suitable for processing in the “cut-back technique”, but they can also be used in the “polishing technique” and the “staining technique”.

IPS e.max CAD MO (Medium Opacity)
The MO blocks are available in group shades MO 0-MO 4. Given their opacity, they are ideally suitable for the fabrication of frameworks on slightly discoloured preparations. The anatomical shape is subsequently individually built-up using IPS e.max Ceram (“layering technique”).

IPS e.max CAD Impulse
The Impulse blocks enable the fabrication of restorations with pronounced opalescent properties. The opalescent blocks are available in two versions with different opalescence values (Opal 1, Opal 2). The blocks are suitable for veneers in light tooth shades, for which an opalescent effect is needed.

Detailed information on the available block sizes and shades can be found in the “CAD/CAM Block Overview” at www.ivoclarvivadent.com.
Practical Procedure
Overview of the Clinical Working Steps, Fabrication Process

**Ivoclar Vivadent Products**

- OptraGate®
  - IPS® Natural Die Material
- OptraGate®
  - Vitual® CADbite Registration
  - IPS e.max® CAD
  - PrograMill
- OptraFine®,
  - IPS e.max® CAD Crystall./Shades, Stains, Glaze Paste/FLUO, Glaze Liquid
  - IPS e.max® CAD Crystall./Glaze Spray
- IPS e.max® CAD Crystallization Tray and Pins
- IPS e.max® CAD Speed Crystallization Tray
- IPS® Object Fix Putty/Flow
- Programat® CS2/CS3/CS4
- IPS Ceramic Etching Gel
  - Monobond® Plus
  - Monobond Etch & Prime®
- OptraGate®, OptraDam®
  - Variolink® Esthetic, Multilink® Automix,
  - SpeedCEM® Plus, Vivaglass® CEM,
  - Bluephase®
- OptraFine®
- Proxyt®

The range of available products may vary from country to country.
Block selection using the IPS e.max® Shade Navigation App

Optimum shade and shape integration in the oral cavity of the patient is the prerequisite for a true-to-nature all-ceramic restoration. Shade differences between the restoration and the natural residual dentition in particular, disturb the esthetic appearance. To achieve optimum shade integration, the following guidelines and notes must be observed.

The overall esthetic appearance of an all-ceramic restoration is influenced by the following factors:

- **Shade of the prepared tooth** (natural tooth structure, die build-up, abutment, implant)
- **Shade, translucency and layer thickness of the restoration** (A1, A2, A3…, HT, MT, LT…, veneer, characterization)
- **Shade of the cementation material**.

<table>
<thead>
<tr>
<th>Factors influencing the overall shade effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation shade</td>
</tr>
</tbody>
</table>

Upon the fabrication of high-quality esthetic restorations, these influencing factors must be taken into consideration. After all, only their interplay results in the overall shade effect. As the shade of the preparation and the layer thickness are usually difficult of control, and the shade of the cementation material only minimally affects the overall shade effect, the selection of the suitable translucency and shade of the IPS e.max block is of critical important.

The **IPS e.max Shade Navigation App** is used to determine the suitable blocks.

The IPS e.max Shade Navigation App is the intelligent block/ingot/disc selection app for Android or iOS smartphones and tablets. The app takes all the important influential factors into account and thus enables a very precise translucency and shade recommendation.

5 steps to find the suitable IPS e.max block:

1. **Enter the tooth shade**
   
   (Determined/desired tooth shade according to the A-D Shade Guide)

   **Tips on shade determination:**
   
   The tooth shade is determined on the non-prepared tooth or adjacent teeth after cleaning. Individual characteristics have to be considered when determining the tooth shade. In order to achieve as lifelike results as possible, shade determination should be carried out at daylight. Furthermore, the patient should not wear clothes with intensive colours and/or lipstick. For a flawless reproduction of the determined tooth shade, taking an additional digital photograph of the starting situation is recommended.

   Another option for shade determination is provided by the Programat® furnaces equipped with DSA function (Digital Shade Assistant). The integrated image processing software compares three preselected shade guide teeth with the tooth to be analyzed and automatically indicates the closest matching tooth shade. You can find additional information about this topic in the corresponding Programat Operating Instructions.
Tips on selecting the indication:
Not all possible indications are listed in the app. However, the following alternative indications can be used to define a suitable block:

<table>
<thead>
<tr>
<th>Non-listed indications</th>
<th>Alternative indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridge</td>
<td>Crown</td>
</tr>
<tr>
<td>Partial crown</td>
<td>Onlay</td>
</tr>
<tr>
<td>Occlusal veneer (table top)</td>
<td>Onlay</td>
</tr>
</tbody>
</table>

There are no alternative indications available for hybrid abutment and hybrid abutment crown. The material to be selected can be found in the corresponding Instructions for Use.

Tips on determining the die shade:
The die shade is determined with the IPS Natural Die Material shade guide at the largest, most discoloured area of the tooth stump. If you are torn between two shades, always choose the darker one.

The IPS Natural Die Material enables the fabrication of a model die similar to the preparation of the patient, on the basis of which the correct shade and brightness values of the all-ceramic restorations may be selected.

Example of the die shade effect

Restoration: Veneer (0.5 mm, IPS e.max® CAD HT B1)
Cementation material: Variolink® Esthetic neutral
Preparation shade: IPS® Natural Die Material, ND 1 – ND 9
Practical Procedure – Block selection using the IPS e.max® Shade Navigation App

Tips on determining the layer thickness:
Determine the layer thickness either manually with calipers or digitally with of the CAD software. Crowns, veneers and copings are measured in the centre of the thinnest vestibular point. Inlays and onlays at the thinnest occlusal point.

Example - Influence of layer thickness and translucency:

Enter the layer thickness
(Preparation depth and/or wall thickness of the restoration to be fabricated)

Tips on material selection:
If a field is highlighted in grey in the material selection, the material is not suitable for the respective indication or layer thickness.

Result for the suitable block

Tips on the result:
The visual presentation of the result, permits the comparison of the restoration shade with the A–D shade guide to recognize any necessary shade adjustments well in advance.

More detailed information on the function and the procedure can be found under www.ipsemax.com/sna or directly in the app.
Preparation guidelines

Successful results can only be achieved with IPS e.max CAD if the guidelines and minimum layer thicknesses are strictly observed.

Basic preparation guidelines for all-ceramic restorations

– No angles or edges
– Shoulder preparation with rounded inner edges and/or pronounced chamfer preparation
– The indicated dimensions reflect the minimum layer thickness for IPS e.max CAD restorations.
– The thickness of the preparation edge, particularly for anterior teeth, should be at least 1.0 mm in order to permit optimum milling during CAD/CAM processing.

Occlusal veneer (table top)

– Reduce the anatomical shape and observe the stipulated minimum layer thickness.
– Circular shoulder preparation with rounded inner edges and/or chamfer preparation with an angle of approximately 10°-30°. Width of the circular shoulder/chamfer at least 1.0 mm.
– Reduce the occlusal crown third by at least 1.0 mm.

Thin veneer

– If possible, the preparation should be located in the enamel.
– The incisal preparation margins should not be located in the area of the abrasion surfaces or dynamic occlusal surfaces.
– The minimum layer thickness of the thin veneer in the cervical and labial area is 0.4 mm. A restoration thickness of 0.5 mm must be planned at the incisal edge.
– If there is enough space, preparation is not necessary.

Veneer

– If possible, the preparation should be located in the enamel.
– The incisal preparation margins should not be located in the area of the abrasion surfaces or dynamic occlusal surfaces.
– Reduce the cervical and/or labial area by at least 0.6 mm, and the incisal edge by at least 0.7 mm.
Inlay

- Static and dynamic antagonist contacts must be taken into consideration.
- The preparation margins must not be located on centric antagonist contacts.
- A preparation depth of at least 1.0 mm and an isthmus width of at least 1.0 mm must be observed in the fissure area.
- Prepare the proximal box with slightly diverging walls (preparation angle 6°) and observe an angle of 100° – 120° between the proximal cavity walls and the prospective proximal surfaces of the inlay. For inlays with pronounced convex cavity walls without adequate support by the proximal shoulder, marginal ridge contacts should be avoided.
- Round out internal edges and transitions in order to prevent stress concentration within the ceramic material.
- Do not prepare slice-cuts or feather edges.

Onlay

- Static and dynamic antagonist contacts must be taken into consideration.
- The preparation margins must not be located on centric antagonist contacts.
- A preparation depth of at least 1.0 mm and an isthmus width of at least 1.0 mm must be observed in the fissure area.
- Prepare the proximal box with slightly diverging walls (preparation angle 6°) and observe an angle of 100° – 120° between the proximal cavity walls and the prospective proximal surfaces of the onlay. For onlays with pronounced convex cavity walls without adequate support by the proximal shoulder, marginal ridge contacts should be avoided.
- Round out internal edges and transitions in order to prevent stress concentration within the ceramic material.
- Do not prepare slice-cuts or feather edges.
- Provide at least 1.0 mm of space in the cusp areas.

Partial crown

- Static and dynamic antagonist contacts must be taken into consideration.
- The preparation margins must not be located on centric antagonist contacts.
- Provide at least 1.0 mm of space in the cusp areas.
- Prepare a circular shoulder with rounded inner edges or a chamfer at an angle of approximately 10° – 30°. Width of the shoulder/chamfer at least 1.0 mm.

Minimally invasive anterior crown (adhesive cementation mandatory)

- Reduce the anatomical shape and observe the stipulated minimum layer thickness. Circular shoulder preparation with rounded inner edges and/or pronounced chamfer preparation. Width of the circular shoulder/chamfer at least 1.0 mm.
- Reduce the incisal crown third by at least 1.0 mm.
- Reduce the vestibular and/or oral area by at least 1.0 mm.
Minimally invasive posterior crown (adhesive cementation mandatory)

- Reduce the anatomical shape and observe the stipulated minimum layer thickness. Circular shoulder preparation with rounded inner edges and/or pronounced chamfer preparation. Width of the circular shoulder/chamfer at least 1.0 mm.
- Reduce the occlusal crown third by at least 1.0 mm.
- Reduce the vestibular and/or oral area by at least 1 mm.

Anterior crown / bridge abutment in the anterior region

- Reduce the anatomical shape and observe the stipulated minimum layering thickness. Prepare a circular shoulder with rounded inner edges or a pronounced chamfer at an angle of approximately 10° – 30°. Width of the circular shoulder/chamfer at least 1.0 mm.
- Reduce the incisal crown third by at least 1.5 mm.
- Reduce the vestibular and/or oral area by at least 1.2 mm.
- For conventional and/or self-adhesive cementation, the preparation must demonstrate retentive surfaces and sufficient preparation height.

Posterior crown / bridge abutment in the premolar region

- Reduce the anatomical shape and observe the stipulated minimum layering thickness. Prepare a circular shoulder with rounded inner edges or a pronounced chamfer at an angle of approximately 10° – 30°. Width of the circular shoulder/chamfer at least 1.0 mm. Preparation angle 6°
- Reduce the occlusal crown third by at least 1.5 mm.
- Reduce the vestibular and/or oral area by approx. 1.5 mm.
- For conventional and/or self-adhesive cementation, the preparation must demonstrate retentive surfaces and sufficient preparation height.

Maximum width of bridge pontics in the anterior and premolar region

Given the different masticatory forces, the maximum acceptable pontic width is different in the anterior and premolar region.
The pontic width is determined on the unprepared tooth.
- In the anterior region the bridge pontic width should not exceed 11 mm.
- In the premolar region (canine up to the second premolar), the bridge pontic width should not exceed 9 mm.
Minimum layer thicknesses

The restoration design is key to the success of durable all-ceramic restorations. The more attention given to the design, the better the final results and the clinical success will turn out to be.

The following minimum layer thicknesses for the polishing and staining technique must be observed to achieve the tooth shade of the shade guide and meet the requirements put forth in the preparation guidelines (page 14–16).

Polishing and staining technique

In the polishing and staining technique, no layering materials are applied to the IPS e.max CAD restoration. The minimum layer thicknesses thus refer to the layer thickness of IPS e.max CAD.

The connector design should be extended in the vertical direction, rather than in the horizontal direction. Especially in anterior bridges, it is not always possible to establish the necessary connector dimensions in the sagittal (lingual-vestibular) direction. In such cases, the connector dimensions must always be extended in the vertical (incisal-cervical) direction.

Failure to observe the stipulated framework design criteria and minimum thicknesses may result in clinical failures, such as cracks, delamination, and fracture of the restoration.

Minimum layer thicknesses for IPS e.max CAD restorations (depending on the indication) in the polishing and staining technique

<table>
<thead>
<tr>
<th>Indication</th>
<th>Mandatory adhesive cementation</th>
<th>Optional adhesive, self-adhesive or conventional cementation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Incisal/occlusal</td>
<td>Anterior Region</td>
</tr>
<tr>
<td></td>
<td>Fissure depth</td>
<td>Width</td>
</tr>
<tr>
<td>Occlusal veneer</td>
<td>1.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Thin veneer</td>
<td>1.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Veneer</td>
<td>1.0</td>
<td>0.4</td>
</tr>
<tr>
<td>Inlay</td>
<td>1.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Onlay</td>
<td>1.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Partial Crown</td>
<td>1.0</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Minimum layer thickness IPS e.max CAD – polishing technique

Minimum layer thickness IPS e.max CAD – staining technique

<table>
<thead>
<tr>
<th>Indication</th>
<th>Incisal/occlusal</th>
<th>Circular</th>
<th>Isthmus width</th>
<th>Connector dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>0.5</td>
<td>0.4</td>
<td>0.6</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>0.7</td>
<td>0.6</td>
<td>1.0</td>
<td>–</td>
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<tr>
<td></td>
<td>1.0</td>
<td>1.0</td>
<td>1.2</td>
<td>–</td>
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<td></td>
<td>1.0</td>
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<td></td>
<td>1.0</td>
<td>1.0</td>
<td>1.5</td>
<td>–</td>
</tr>
</tbody>
</table>

Example:

Minimum layer thicknesses for anterior and posterior crowns in the polishing and staining technique

Failure to observe the stipulated framework design criteria and minimum thicknesses may result in clinical failures, such as cracks, delamination, and fracture of the restoration.
### Practical Procedure

#### Overview of the Processing Techniques

<table>
<thead>
<tr>
<th>Technique</th>
<th>Polishing technique (self-glaze)</th>
<th>Staining technique Staining technique on the “blue” restoration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Polishing of the “blue” restoration, followed by crystallization without individual characterization and glaze.</td>
<td>Staining and glazing with IPS e.max CAD Crystall./Glaze Paste/FLUO on the blue restoration followed by Crystallization and the Stain/Glaze firing in one step.</td>
</tr>
<tr>
<td><strong>Variant A</strong></td>
<td>Glazing with IPS e.max CAD Crystall./Glaze Spray on the blue restoration followed by Speed Crystallization (Speed Crystallization and Glaze firing in one step).</td>
<td></td>
</tr>
<tr>
<td><strong>Variant B</strong></td>
<td>Staining and glazing with IPS e.max CAD Crystall./Glaze Paste/FLUO on the blue restoration followed by Crystallization and the Stain/Glaze firing in one step.</td>
<td></td>
</tr>
<tr>
<td><strong>Variant C</strong></td>
<td>Staining and glazing with IPS e.max CAD Crystall./Glaze Spray on the blue restoration followed by Speed Crystallization (Speed Crystallization and Glaze firing in one step).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Firing cycles and times</strong></th>
<th>Speed Crystallization without staining and glazing (max. 2 units) approx. 14:55 min or Crystallization without staining and glazing approx. 25 min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Speed Crystallization with IPS e.max CAD Crystall./Glaze Spray (max. 2 units) approx. 14:55 min</td>
</tr>
<tr>
<td></td>
<td>Crystallization with IPS e.max CAD Crystall./Shade, Stains and Glaze Paste/FLUO approx. 25 min</td>
</tr>
<tr>
<td></td>
<td>Crystallization with IPS e.max CAD Crystall./Shades, Stains and Glaze spray approx. 25 min</td>
</tr>
</tbody>
</table>

**Total firing time**
- 14:55 min or 25:00 min
- 14:55 min
- 25:00 min
- 25:00 min
- 25:00 min

*Page 20 Page 25 Page 27 Page 34*
Practical Procedure
Preparation

After the determination of the tooth shade, preparation is carried out according to the preparation guidelines.

**Onlay**

Starting situation: Restoration on tooth 26 is to be replaced.

Preparation: Occlusal view

**Crown**

Starting situation: The crown on tooth 37 has to be replaced.

Preparation: Occlusal view

For information on the CAD/CAM processing, please refer to the respective Instructions for Use and the manuals of the respective CAD/CAM system. The manufacturer’s instructions must be observed.
Practical Procedure
Polishing Technique (Self-Glaze)

If no staining and glazing is desired, there is the option to polish the "blue" restoration manually and then crystallize it. Please note that polishing causes slight wear.

Finishing
It is of critical importance to use the correct grinding instruments for finishing IPS e.max CAD. If unsuitable grinding instruments are used, chipping of the edges and local overheating may occur (observe the Ivoclar Vivadent flow chart "Recommended grinding instruments for IPS e.max glass-ceramic").

Observe the following procedure for finishing IPS e.max CAD restorations:
- If possible, carry out grinding adjustments of IPS e.max CAD restorations while they are still in their pre-crystallized (blue) state.
- Only use suitable grinding instruments, low speed and light pressure to prevent delamination and chipping at the margins in particular.
- Grinding adjustments are carried out with fine-grained diamond instruments (< 60 μm) and/or medium-fine diamond polishers.
- Overheating of the glass-ceramic must be avoided.
- Smooth out the attachment point of the holder and take proximal contact points into account.
- If necessary, carry out individual shape adjustments.
- Finish functional areas (occlusal contact surfaces) of the restoration with fine diamonds in order to smooth out the surface structure created by CAD/CAM processing.
- Carefully try-in the restoration in its blue state and adjust the occlusion/articulation.
- Design surface textures.
- Before the crystallization, always clean the restoration with ultrasound in a water bath and/or with the steam jet. Make sure that the restoration is entirely clean and that any milling additive residue from the CAD/CAM milling machine has been removed. Residue of the milling additive remaining on the surface may result in bonding problems and discolouration.
- Do not blast restorations with Al₂O₃ or glass polishing beads!

Polishing
Please observe the following procedure for polishing the pre-crystallized (blue) finished restoration:
- Clean the restoration with ultrasound in a water bath or a steam cleaner to remove any contaminations and grease residue.
- Any overheating of the glass-ceramic must be avoided during polishing. Observe the manufacturer’s recommendations for use of the grinding tools.
- Pre-polishing is performed with a diamond rubber polisher (e.g. OptraFine® F).
- Fine polishing is done with a high-gloss rubber polisher (e.g. OptraFine® P).
- Clean the restoration with ultrasound in a water bath or the steam jet.
**Speed crystallization or crystallization**

- Select the largest possible IPS e.max CAD Crystallization Pin (S, M, L) that best “fills” the inside of the restoration, but does not come into contact with the circular crown walls.
- Fill the inside of the restoration with IPS Object Fix Putty or Flow firing paste up to the restoration margin. **Immediately reseal the IPS Object Fix Putty/Flow syringe after extruding the material.** Once removed from the aluminium bag, the syringe is ideally stored in a re-sealable plastic bag or a container with a humid atmosphere.
- Press the selected IPS e.max CAD Crystallization Pin deeply into the IPS Object Fix Putty or Flow material so that it is adequately secured.
- Smooth out displaced firing paste using a plastic spatula so that the pin is securely in place and the restoration margins are optimally supported. They can be placed directly on the IPS e.max CAD Crystallization Pin with a small amount of IPS Object Fix Flow.
- Smaller restorations (veneers, inlays, onlays) do not need to be entirely supported.
- Prevent contamination of the outer restoration surface. Clean off any contamination with a brush dampened with water and dry.
- Place the restoration in the IPS e.max CAD (Speed) Crystallization Tray and position the tray in the centre of the firing chamber.
- Select the firing program suitable for the materials and the chosen firing tray.

![Select the largest possible IPS e.max CAD Crystallization Pin.](image1)

![Fill the inside of the crown with IPS Object Fix Putty or Flow.](image2)

![Press the selected IPS e.max CAD Crystallization Pin deeply into the IPS Object Fix Putty or Flow.](image3)

![Place the restoration in the centre of the IPS e.max CAD Speed Crystallization Tray and crystallize using the stipulated firing parameters.](image4)

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**Warning**

- Observe the firing parameters for IPS e.max CAD MO or Impulse and IPS e.max CAD HT, MT, LT.
- Speed Crystallization is to be exclusively conducted on an IPS e.max CAD Speed Crystallization Tray.

**Information**

- If a restoration made from IPS e.max CAD MO or Impulse and one made from IPS e.max CAD HT, MT or LT are to be crystallized in the same firing cycle, the firing parameters for IPS e.max CAD MO / Impulse must be used!
- If a maximum of 2 restorations (made from LT, MT or HT) are crystallized at the same time, Speed Crystallization can be used. Observe the requirements for Speed Crystallization on page 25.

**Note**

Conduct the **Speed Crystallization** or **Crystallization** on the IPS e.max CAD (Speed) Crystallization Tray using the stipulated firing parameters. **Firing parameters see page 50.**
– Remove restoration from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
– Allow the objects to cool to room temperature in a place protected from draft.
– Do not touch the hot objects with metal tongs.
– Remove the restoration from the set IPS Object Fix Putty/Flow.
– Remove any residue with ultrasound in a water bath and/or with the steam jet.
– Do not remove residue with Al₂O₃ or glass polishing beads.
– Final try-in of the restoration before cementation.
– **If grinding adjustments are required, make sure that no overheating of the ceramic occurs.**
– Finally, polish the adjusted areas to a high gloss.
– Thoroughly clean the restoration.
Practical Procedure

Staining Technique

In the staining technique, the milled full-contour restorations are completed by applying stains and glazing materials. Individualized characterizations or the glaze are applied before the Crystallization firing. By using translucent IPS e.max CAD blocks, highly esthetic restorations can be fabricated easily on only slightly or non-discoloured preparations.

Finishing

It is of critical importance to use the correct grinding instruments for finishing and adjusting IPS e.max CAD. If unsuitable grinding instruments are used, chipping of the edges and local overheating may occur (observe the Ivoclar Vivadent flow chart “Recommended grinding instruments for IPS e.max glass-ceramic”).

Observe the following procedure for finishing IPS e.max CAD restorations:
- If possible, carry out grinding adjustments of IPS e.max CAD restorations while they are still in their pre-crystallized (blue) state.
- Only use suitable grinding instruments, low speed and light pressure to prevent delamination and chipping at the margins in particular.
- Grinding adjustments are carried out with fine-grained diamond instruments (<60 μm) and/or medium-fine diamond polishers.
- Overheating of the glass-ceramic must be avoided.
- Smooth out the attachment point of the holder and take proximal contact points into account.
- If necessary, carry out individual shape adjustments.
- **Finish functional areas (occlusal contact surfaces) of the restoration with fine diamonds in order to smooth out the surface structure created by CAD/CAM processing.**
- Carefully try-in the restoration in its blue state and adjust the occlusion/articulation.
- Design surface textures.
- Before the crystallization, always clean the restoration with ultrasound in a water bath and/or with the steam jet. Make sure that the restoration is entirely clean and that any milling additive residue from the CAD/CAM milling machine has been removed. Residue of the milling additive remaining on the surface may result in bonding problems and discoloration.
- **Do not** blast restorations with Al₂O₃ or glass polishing beads!

**Inlays, onlays**

Smooth out the attachment point and take proximal contacts into account.

Finish restoration margins with medium-fine diamond polishers.

Adjusting the outer surface, particularly functional areas of the restoration with a fine diamond to smooth out the surface structure created by the CAD/CAM process.

Careful try-in of the IPS e.max CAD HT onlay in its pre-crystallized (“blue”) state. Check the fit as well as the proximal and occlusal contact points.
Thin veneers

Carefully separate the thin veneer from the block using a diamond-coated separating disc. Smooth out attachment point and finish the restoration. Finish margins with suitable instruments.

Crown

Smooth out the attachment point and take proximal contacts into account. Finish restoration margins with medium-fine diamond polishers. Adjusting the outer surface, particularly functional areas of the restoration with a fine diamond to smooth out the surface structure created by the CAD/CAM process.

Careful try-in of the IPS e.max CAD HT crown in its pre-crystallized (“blue”) state. Check the fit as well as the proximal and occlusal contact points.

Bridges

Bridge after the CAD/CAM process. Smooth out the attachment point and take proximal contacts into account. Do not use a diamond disc to finish the interdental areas, as this will initiate predetermined breaking points.

Finish interdental areas with fine diamond instruments (grain size 40–50 μm), pay attention to the connector dimensions. Check the occlusion, articulation and proximal contact points. Finish the outer surface, particularly the functional areas of the restoration with a fine diamond instrument to smooth out the surface structure created by the CAD/CAM process.
**Variant A**

**Speed Crystallization and Glaze firing in one step with glazing spray**

Glazing with IPS e.max CAD Crystall./Glaze Spray on the “blue” restoration followed by crystallization.

Only IPS e.max CAD Crystall./Glaze Spray must be used for this processing technique. Crystallization and Glaze firing are performed in one step. The requirements for Speed Crystallization must be observed.

**Required materials**

- IPS e.max CAD Crystall./Glaze Spray is a ready-to-use glazing spray.
- IPS e.max CAD Speed Crystallization Tray is a special firing tray for the Speed Crystallization of IPS e.max CAD.

**Requirements for Speed Crystallization**

Speed Crystallization is independent of the translucency and indication. The following table must be observed:

<table>
<thead>
<tr>
<th>IPS e.max CAD</th>
<th>Indication</th>
<th>max. 2 units with IPS e.max CAD Crystall./Glaze Spray</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HT</strong></td>
<td>High Translucency</td>
<td>Thin veneers, veneers, inlays, onlays, partial crowns, crowns</td>
</tr>
<tr>
<td><strong>MT</strong></td>
<td>Medium Translucency</td>
<td>Thin veneers, veneers, inlays, onlays, partial crowns, crowns</td>
</tr>
<tr>
<td><strong>LT</strong></td>
<td>Low Translucency</td>
<td>Veneers, inlays, onlays, partial crowns, crowns</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hybrid abutment crowns, 3-unit bridges</td>
</tr>
<tr>
<td><strong>MO</strong></td>
<td>Medium Opacity</td>
<td>Hybrid abutments, crowns (framework)</td>
</tr>
<tr>
<td><strong>I</strong></td>
<td>Impulse</td>
<td>Thin veneers, veneers</td>
</tr>
</tbody>
</table>

**Preparation for Speed Crystallization**

Procedure:

- Secure the restoration on a suitable IPS e.max CAD Crystallization Pin as described in Variant B (page 27–29).
- Make sure that the firing paste (IPS Object Fix Putty or Flow) is flush with the restoration margin.

⚠️ If veneers, inlays and onlays are glazed with Glaze Spray, they must also be enclosed with firing paste exactly up to the restoration margin.
Speed Crystallization (Speed Crystallization and Glaze firing in one step)
– Before glazing, make sure that the outer surface of the restoration is dry and free of firing paste.
– IPS e.max CAD Crystall./Glaze Spray is applied as described in Variant C (page 34–36).
– Place a maximum of 2 units in the centre of the IPS e.max CAD Speed Crystallization Tray.
– Conduct Speed Crystallization firing using the stipulated firing parameters (Speed Crystallization).

⚠️ Speed Crystallization is to be exclusively conducted on an IPS e.max CAD Speed Crystallization Tray.

Conduct the Speed Crystallization on the IPS e.max CAD Speed Crystallization Tray using the stipulated firing parameters. Firing parameters see page 50

– Remove restoration from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
– Allow the objects to cool to room temperature in a place protected from draft.
– Do not touch the hot objects with metal tongs.
– Remove the restoration from the set IPS Object Fix Putty/Flow.
– Remove any residue with ultrasound in a water bath and/or with the steam jet.
– Do not remove residue with Al₂O₃ or glass polishing beads.
– Final try-in of the restoration before cementation.
– If grinding adjustments are required, make sure that no overheating of the ceramic occurs.
– Finally, polish the adjusted areas to a high gloss.
– Thoroughly clean the restoration.

Secure the restoration on a suitable IPS e.max CAD Crystallization Pin as described in Variant B and C and apply IPS e.max CAD Crystall./Glaze Spray.

Position the IPS e.max CAD Speed Crystallization Tray with max. two IPS e.max CAD HT/MT/LT in the furnace and fire using the parameters for the Speed Crystallization firing.

Remove the cool restoration from the set IPS Object Fix Putty or Flow.

Do not remove residue with Al₂O₃ or glass polishing beads.

Remove residue with ultrasound in a water bath ... or with the steam jet.

Completed IPS e.max CAD LT crown after Speed Crystallization
The following paragraphs will explain the steps for staining and glazing with IPS e.max CAD Crystall./Shades, Stains and Glaze Paste/FLUO. In this processing technique, Crystallization and the Stain/Glaze firing are performed in one step. Characterizations are applied using IPS e.max CAD Crystall./Shades and Stains.

**Required materials**
- IPS e.max CAD Crystall./Shades are ready-to-use "Dentin" stains in syringes.
- IPS e.max CAD Crystall./Stains are ready-to-use intensive stains in syringes.
- IPS e.max CAD Crystall./Glaze Paste/FLUO is a ready-to-use glazing paste.
- IPS e.max CAD Crystall./Glaze Liquid is a special liquid for mixing with Shades, Stains and Glaze.

**Preparation for Crystallization and the Stain/Glaze firing in one step**
Depending on the type of restoration, they must be placed on an IPS e.max CAD Crystallization Pin before the Stains and Glaze are applied. Smaller restorations (thin veneers, veneers, inlays, onlays) do not need to be entirely supported. Either IPS Object Fix Putty or Flow are recommended to secure the restoration on the pin. The Putty demonstrates a denser consistency and thus higher stability. Given its lower viscosity, Flow is suitable for smaller restorations.

**Staining technique on the "blue" restoration**

**Variant B**

**Crystallization and Stain/Glaze firing in one step with glazing paste**

Staining and glazing with IPS e.max CAD Crystall./ Shades, Stain and Glaze spray on the "blue" restoration followed by crystallization.

Use either IPS Object Fix Putty or Flow to secure the restoration on the pin.

- Partial crowns, anterior crowns, posterior crowns, bridges
- Thin veneers, veneers, inlays, onlays

To apply Glaze, Shades, and Stains, secure the restoration with an OptraStick or with diamond tweezers.
Observe the following procedure for positioning the restoration on the IPS e.max Crystallization Pin:
– Select the largest possible IPS e.max CAD Crystallization Pin (S, M, L) that best “fills” the inside of the restoration, but does not come into contact with the circular restoration walls.
– Fill the inside of the restoration with IPS Object Fix Putty or Flow firing paste up to the restoration margin.
  **Immediately reseal the IPS Object Fix Putty/Flow syringe after extruding the material.** Once removed from the aluminium bag, the syringe is ideally stored in a re-sealable plastic bag or a container with a humid atmosphere.
– Press the selected IPS e.max CAD Crystallization Pin deeply into the IPS Object Fix Putty or Flow material so that it is adequately secured.
– Smooth out displaced firing paste using a plastic spatula so that the pin is securely in place and the restoration margins are optimally supported.
– Prevent contamination of the outer restoration surface.
– Clean off any possible contamination with a brush dampened with water and then dry.

**Thin veneers – veneers (optional)**

[Images depicting the process]

**Crowsns – inlays, onlays (optional)**

[Images depicting the process]

This IPS e.max CAD Crystallization Pin is too small and thus unsuitable.
Select the largest possible IPS e.max CAD Crystallization Pin.

Smooth out displaced IPS Object Fix Putty or Flow with a plastic spatula from the margin towards the support pin so that the pin is secured in the paste and the crown margins are exactly supported.

Fill the inner aspects of the crowns of the cleaned bridge with IPS Object Fix Putty or Flow and press the suitable IPS e.max CAD Crystallization Pin into it.

Clean off any possible residue adhering to the outer surface with a brush dampened with water and then dry.

Immediately place the bridge on the IPS e.max CAD Crystallization Tray.

Bridges

Crystallization and Stain/Glaze firing in one step

The following procedure must be observed:

- Thoroughly clean and dry the restoration after clinical try-in.
- Attach veneer, inlay or onlay on a temporary adhesive stick (OptraStick) before the glaze and the characterizations are applied. Alternatively, the restoration may be held using diamond-coated tweezers.
- Extrude IPS e.max CAD Crystal./Glaze Paste/FLUO from the syringe and mix.
- If a slight thinning is desired, the ready-to-use glaze may also be mixed with a little IPS e.max CAD Crystal./Glaze Liquid. Do not dilute too much, as the Glaze Paste will then flow in an uncontrollable manner.
- Apply the glazing paste evenly to the entire restoration using a small brush.
- Avoid applying the glaze layer too thickly. Avoid pooling, especially on the occlusal surface.
- Too thin a Glaze layer may lead to an unsatisfactory gloss.
- If characterizations are desired, the restoration can be individualized using IPS e.max CAD Crystal./Shades and IPS e.max CAD Crystal./Stains before Crystallization firing.
- Extrude Shades and Stains from the syringe and mix thoroughly.
- The ready-to-use Shades and Stains may be slightly thinned using IPS e.max CAD Crystal./Glaze Liquid. However, the consistency should still remain pasty.
- Apply mixed Shades and Stains directly into the unfired glaze layer using a fine brush (2-in-1 technique).
- Observe the Characterization guide (see page 31) for applying Shades and Stains.
Thin veneers, veneers, inlays, onlays

Individualized characterization with IPS e.max CAD Crystall./Shades, Stains and Glaze Paste/FLUO

Secure inlays, onlays on an OptraStick for the application of IPS e.max CAD Crystall./Glaze Paste/FLUO, Shades and Stains.

Crowns, bridges

Apply IPS e.max CAD Crystall./Glaze Paste/FLUO evenly on the blue restoration.

Apply the mixed IPS e.max CAD Crystall./Shades and Stains directly into the unfired IPS e.max CAD Crystall./Glaze Paste/FLUO.
Characterization guide

With the IPS e.max CAD Crystall./Shades and IPS e.max CAD Crystall./Stains, it is possible to characterize the restoration whilst it is in the “blue” state prior to Crystallization. The following Shades and Stains are available for characterization:

IPS e.max CAD Crystall./Shades

- Shade Incisal 1
- Shade Incisal 2
- Shade 0
- Shade 1
- Shade 2
- Shade 3
- Shade 4

IPS e.max CAD Crystall./Stains

- white
- cream
- sunset
- copper
- olive
- khaki
- mahogany

Depending on the individual patient situation, the characterizations may be applied as follows (example: shade A2):

- Minor characterizations on the buccal surface using IPS e.max CAD Crystall./Shade Incisal and Stains.
  - Cusp inclinations: Shade Incisal I1
  - Fissures: Stains mahogany
  - Cusps, marginal ridges: Stains white/cream
  - Enhancing the chroma: Stains sunset/copper

Example of IPS e.max CAD Crystall./Shades and Stains applied too thickly

- Too thick a layer of IPS e.max CAD Crystall./Shades and Stains.
After glazing and staining, crystallization is conducted in a compatible ceramic furnace (e.g. Programat® CS3, CS4). When placing the objects into the furnace and setting the firing parameters, observe the following points:

– Place the restoration in the centre of the IPS e.max CAD Crystallization Tray.
– Place veneers, inlays and onlays directly on the IPS e.max CAD Crystallization Pin with a small amount of IPS Object Fix Flow.
– A maximum of 6 units can be positioned on the firing tray and crystallized with IPS e.max CAD Crystall./Glaze Paste/FLUO.

Inlays, onlays

– Observe the firing parameters for IPS e.max CAD MO or Impulse and IPS e.max CAD HT, MT, LT.
– Speed Crystallization must not be used for this processing technique.

Conduct the Crystallization on the IPS e.max CAD Crystallization Tray using the stipulated firing parameters. Firing parameters see page 50

If a restoration made from IPS e.max CAD MO or Impulse and one made from IPS e.max CAD HT, MT or LT are to be crystallized in the same firing cycle, the firing parameters for IPS e.max CAD MO / Impulse must be used!

Optional:

– If additional characterizations or adjustments are required after crystallization, a Corrective firing using IPS e.max CAD Crystall./Shades and Stains and Glaze Paste/FLUO can be conducted. Conduct the Corrective firing also on the IPS e.max CAD Crystallization Tray.
– For minor shape adjustments (e.g. proximal contact points), IPS e.max CAD Crystall./Add-On is available. The adjustments may be made with both Crystallization and with a Corrective firing cycle.
– The detailed procedure is described on page 40.
- Remove restoration from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.
- Remove the restoration from the set IPS Object Fix Putty/Flow.
- Remove any residue with ultrasound in a water bath and/or with the steam jet.
- Do not remove residue with Al₂O₃ or glass polishing beads.
- Final try-in of the restoration before cementation.
- If grinding adjustments are required, make sure that no overheating of the ceramic occurs.
- Finally, polish the adjusted areas to a high gloss.
- Thoroughly clean the restoration.

Remove the cool restoration from the set IPS Object Fix Putty or Flow.

Remove residue with ultrasound in a water bath...

... or with the steam jet.

Final try-in of the restoration before cementation.

IPS e.max CAD LT bridge after crystallization.
Variant C

Crystallization and Stain/Glaze firing in one step with glazing spray

In this processing technique, IPS e.max CAD Crystall./Glaze Spray is used instead of IPS e.max CAD Crystall./Glaze Paste/FLUO. Crystallization and the Stain/Glaze firing are performed in one step. Characterizations are applied using IPS e.max CAD Crystall./Shades and Stains.

The spray should only be used if IPS Object Fix auxiliary firing paste is adapted up to the margins.

Required materials

- IPS e.max CAD Crystall./Shades are ready-to-use *Dentin* stains in syringes.
- IPS e.max CAD Crystall./Stains are ready-to-use intensive stains in syringes.
- IPS e.max CAD Crystall./Glaze Spray is a ready-to-use glazing spray.

Preparation for Crystallization and the Stain/Glaze firing in one step

If IPS e.max CAD Crystall./Glaze Spray is used, all the restorations, irrespective of their geometry, have to be placed on the IPS e.max CAD Crystallization Pin with the help of IPS Object Fix Putty or Flow.

Procedure:

- Secure the restoration on a suitable IPS e.max CAD Crystallization Pin as described in Variant B (page 27–29).
- Make sure that the firing paste (IPS Object Fix Putty or Flow) is flush with the restoration margin. If veneers, inlays, and onlays are glazed with Glaze Spray, ensure that they are also enclosed with firing paste exactly to the restoration margin.
Practical Procedure – Staining Technique | Staining technique on the “blue” restoration | Variant C

Preparation of the veneer, inlay, onlay for the application of the glaze spray

If the Glaze Spray is used to glaze *veneers, inlays and onlays*, the restorations must be supported by auxiliary firing paste on the inner side. This is to prevent that Glaze Spray is applied to the inner side.

- Before starting the characterization and glazing procedure, make sure the outside of the restoration is free of firing paste.
- If characterizations are desired, the restoration can be individualized using IPS e.max CAD Crystall./Shades and IPS e.max CAD Crystall./Stains before Crystallization firing.
- Extrude ready-to-use Shades and Stains from the syringe and mix thoroughly.
- The Shades and Stains may be slightly thinned using IPS e.max CAD Crystall./Glaze Liquid. However, the consistency should still remain pasty.
- Apply mixed Shades and Stains directly on the blue restoration using a brush.

Crystallization and Stain/Glaze firing in one step

- Before starting the characterization and glazing procedure, make sure the outside of the restoration is free of firing paste.
- If characterizations are desired, the restoration can be individualized using IPS e.max CAD Crystall./Shades and IPS e.max CAD Crystall./Stains before Crystallization firing.
- Extrude ready-to-use Shades and Stains from the syringe and mix thoroughly.
- The Shades and Stains may be slightly thinned using IPS e.max CAD Crystall./Glaze Liquid. However, the consistency should still remain pasty.
- Apply mixed Shades and Stains directly on the blue restoration using a brush.
Please observe the following procedure for the application of the IPS e.max CAD Crystall./Glaze Spray:

– Hold the restoration by the IPS e.max CAD Crystallization Pin. Do not spray the restoration while it is placed on the IPS e.max CAD Crystallization Tray, as this would then also be coated with glaze.
– Shake the Glaze Spray can well immediately before use until the mixing ball in the container is moving freely (approximately 20 seconds). If the can is not shaken sufficiently, the spray will contain mainly the propellant. This means there will be insufficient coverage of glazing powder.
– Observe a distance of 10 cm between the nozzle and the surface to be sprayed.
– Hold the spray can as upright as possible during spraying.
– Spray the restoration from all sides with short bursts while simultaneously rotating the restoration so that an even, covering layer is created. Shake the spray can again between individual bursts.
– Spray the restoration a second time from all sides with short bursts while simultaneously rotating the restoration so that an even covering layer is created. Shake the spray can again between individual bursts.
– Wait briefly until the glaze layer is dry and has assumed a whitish colour.
– Areas that do not show an even layer have to be sprayed again.
– Place the restoration in the centre of the IPS e.max CAD Crystallization Tray and fire using the stipulated firing parameters.
Conduct the Crystallization on the IPS e.max CAD Crystallization Tray using the stipulated firing parameters. Firing parameters see page 50.

If a restoration made from IPS e.max CAD MO or Impulse and one made from IPS e.max CAD HT, MT, LT are to be crystallized in the same firing cycle, the firing parameters for IPS e.max CAD MO / Impulse must be used!

Optional:
- If additional characterizations or adjustments are required after crystallization, a Corrective firing using IPS e.max CAD Crystall./Shades and Stains and Glaze can be conducted. Conduct the Corrective firing also on the IPS e.max CAD Crystallization Tray.
- For minor shape adjustments (e.g. proximal contact points), IPS e.max CAD Crystall./Add-On is available. The adjustments may be made with both Crystallization and with a Corrective firing cycle.
- The detailed procedure is described on page 40.

- Observe the firing parameters for IPS e.max CAD MO or Impulse and IPS e.max CAD HT, MT, LT.
- Speed Crystallization must not be used for this processing technique.

Allow the IPS e.max CAD Crystall./Glaze Spray to dry briefly until a whitish layer has formed. If required, spray the restoration again to achieve an even Glaze Spray layer on the IPS e.max CAD restoration.

Place the restoration in the centre of the IPS e.max CAD Crystallization Tray and fire using the stipulated firing parameters.
– Remove restoration from the furnace after the completion of the firing cycle (wait for the acoustic signal of the furnace).
– Allow the objects to cool to room temperature in a place protected from draft.
– Do not touch the hot objects with metal tongs.
– Remove the restoration from the set IPS Object Fix Putty/Flow.
– Remove any residue with ultrasound in a water bath and/or with the steam jet.
– Do not remove residue with Al₂O₃ or glass polishing beads.
– Final try-in of the restoration before cementation.
– If grinding adjustments are required, make sure that no overheating of the ceramic occurs.
– Finally, polish the adjusted areas to a high gloss.
– Thoroughly clean the restoration.

Remove the cool restoration from the set IPS Object Fix Putty or Flow.
Remove residue with ultrasound in a water bath ...
... or with the steam jet.
Final try-in of the restoration before cementation
### Example of incorrect Glaze Spray application

<table>
<thead>
<tr>
<th>Problem/Cause</th>
<th>Before Firing</th>
<th>After Firing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Problem:</strong></td>
<td>Application of the Glaze Spray</td>
<td>Detailed view of the surface</td>
</tr>
<tr>
<td><strong>Not enough Glaze Spray</strong> on the restoration</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Possible cause:</strong></td>
<td></td>
<td>Insufficient application of IPS e.max CAD Crystal/Glaze Spray.</td>
</tr>
<tr>
<td>– Distance between the spray can and the restoration too far</td>
<td></td>
<td>insufficient gloss or incomplete glaze layer.</td>
</tr>
<tr>
<td>– Spraying too short</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Spray can not shaken sufficiently</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Spray can not held upright during spraying</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Problem:</strong></td>
<td></td>
<td>Too much IPS e.max CAD Crystal/Glaze Spray was applied.</td>
</tr>
<tr>
<td><strong>Too much Glaze Spray</strong> on the restoration</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Possible cause:</strong></td>
<td></td>
<td>Loss of texture and too glossy surface.</td>
</tr>
<tr>
<td>– Distance between the spray can and the restoration too small</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Too much Glaze Spray applied</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Optional:

Adjustments with IPS e.max CAD Crystall./Add-On

For minor shape adjustments (e.g., proximal contact points), IPS e.max CAD Crystall./Add-On is available. The adjustments may be made with both the Crystallization firing or a separate Corrective firing.

Procedure:
- Mix IPS e.max CAD Crystall./Add-On with IPS e.max CAD Crystall./Add-On Liquid to an easy-to-contour consistency.
- Ensure even mixing of the Add-On material and the liquid in order to achieve an optimum firing result.
- Apply the mixed add-on material directly on the unfired Glaze Paste/FLUO and/or Shades and Stains in the areas to be adjusted and fire.
- If the Glaze Spray is used, apply the Shades and Stains first. Subsequently, supplement the missing areas using Add-On. Apply the Glaze Spray immediately after the application of the Add-On and fire.
- Conduct the Crystallization if Add-On is applied on the “blue” uncrystallized restoration.
- Conduct the Corrective firing if Add-On is applied on an already crystallized restoration.
To fabricate highly esthetic restorations, especially in the anterior region, the incisal/occlusal third may be veneered using IPS e.max Ceram nano-fluorapatite layering ceramic. The individual working steps are briefly described below. For a detailed description of the materials used and the individual working steps, please refer to the Instructions for Use of IPS e.max CAD Monolithic Solutions labside.

**Practical Procedure**

**Cut-Back Technique**

**Partially reduced IPS e.max CAD restorations fitted on the model.**

The cut-back may be carried out by using a corresponding milling procedure in the CAD/CAM unit (crown on tooth 11) or by manual reduction (veneer on tooth 21) in the blue state.

**For crystallization, place the partially reduced IPS e.max CAD restorations directly on the IPS e.max CAD Crystallization Tray using IPS Object Fix Putty or Flow.**

**Conduct the Wash firing using IPS Ivocolor Glaze, Shades and Essences.**
Completion of the anatomical shape of the reduced areas using IPS e.max Ceram Incisal and Opal materials.

Finish with diamond burs and design a true-to-nature shape and surface structure. Finally, conduct Glaze firing using IPS Ivocolor Glaze.
Frequently Asked Questions

Why is it important to determine the shade of the preparation?

Depending on the translucency level of the block used, the shade of the preparation influences the seated all-ceramic restoration. Therefore, knowing the shade of the preparation is imperative. A corresponding tooth-coloured die is then fabricated with the help of IPS Natural Die Material. It is used to achieve an optimum match of the restoration shade to the given clinical situation.

When are IPS e.max CAD HT blocks used?

Given their high translucency, HT blocks are ideally suitable for the fabrication of smaller restorations (e.g. inlays and onlays) as well as for veneering structures in the CAD-on technique. Restorations made of HT blocks convince users with their true-to-nature chameleon effect and the exceptional adaption to the remaining tooth structure. When used for larger restorations (e.g. crowns), the brightness level of translucent blocks may decrease. In such cases, a block with a lower translucency (IPS e.max CAD MT, LT) is recommended.

When are IPS e.max CAD MT blocks used?

MT blocks demonstrate medium translucency and are used for restorations that require more brightness than HT restorations and more translucency than LT restorations. They are ideally suitable for the polishing, staining and cut-back technique.

When are IPS e.max CAD LT blocks used?

Given their high brightness value compared to the HT blocks, LT blocks are ideally suitable for the fabrication of larger restorations (e.g. anterior and posterior crowns, 3-unit bridges). Restorations made of IPS e.max CAD LT convince users with their lifelike brightness value and chroma. This prevents the incorporated restorations from greying.

Can IPS e.max CAD LT also be used for the fabrication of frameworks for subsequent veneering?

The shading and translucency of the IPS e.max CAD LT material is designed for restorations fabricated in the staining and cut-back technique. If frameworks are made from IPS e.max CAD LT and subsequently fully veneered with IPS e.max Ceram (Dentin and Incisal materials), the shade and brightness values are slightly mismatched and the tooth shade might differ from the shade guide.

When should manual grinding adjustments be performed?

All manual grinding adjustments of milled IPS e.max CAD restorations should be carried out in the precrystallized (blue) state. It is important to note that the framework in its precrystallized state should be ground only with suitable grinding instruments, low speed and light pressure to prevent delamination and chipping, particularly at the margins.

Do IPS e.max CAD restorations require occlusal adjustment after the CAD/CAM process?

Yes. To smooth the surface relief created by the CAD/CAM process, the occlusal surface, particularly the function areas with antagonist contact, must be surface-ground with a fine diamond instrument.

What kind of preparation requirements must the die demonstrate in order to produce accurately fitting restorations?

The traditional preparation guidelines for all-ceramic restorations apply to IPS e.max CAD. The thickness of the incisal edge of prepared anterior teeth (upper and lower) requires special attention. The prepared incisal edge should be at least as thick as the diameter of the milling instrument used for the cavity. The corresponding manufacturer’s instructions regarding the dimensions of the grinding instruments must be observed during preparation.
Can an incisal edge, which has become too thin during preparation, be adjusted prior to scanning to avoid complicating the fitting procedure after milling?

In cases such as these, we recommend blocking out the incisal edge of the prepared die until the thickness matches that of the bur. These areas will be filled with luting cement when the restoration is seated.

How can the accuracy of fit of IPS e.max CAD restorations be adjusted?

If the accuracy of fit on the die is to be adjusted, this can be achieved by changing the parameters in the corresponding CAD software. Additionally, there is the possibility to change the dimensions of the occlusal and proximal contacts.

Why does the firing paste IPS Object Fix Putty or Flow have to be used during the crystallization process?

In order to prevent distortion of the IPS e.max CAD restoration during crystallization, IPS Object Fix Putty or Flow are used. The material provides an ideal support for the restoration and thus ensures exact accuracy of fit after crystallization. Smaller restorations may be placed directly on the IPS e.max CAD Crystallization Pin with a small amount of IPS Object Fix Putty or Flow.

Can firing pastes other than IPS Object Fix Putty or Flow be used for the crystallization process?

IPS Object Fix Putty and Flow has been specially developed for the crystallization of IPS e.max CAD restorations. The expansion behaviour has been optimally coordinated with IPS e.max CAD. In other words, the consistency before and after the crystallization allows the paste to be easily applied and cleanly removed. Given their composition, pastes of other manufacturers may cause damage to IPS e.max CAD. Furthermore, easy removal may not always be possible.

Can milled IPS e.max CAD restorations in the pre-crystallized (blue) state be completely finished and then just crystallized and glazed?

Milled IPS e.max CAD restorations can be fitted on the dies and all areas fully finished in the pre-crystallized (blue) state. Thin margins only after crystallization (silicone polishers), since margins that are too thin tend to round during crystallization.

Do IPS e.max CAD restorations shrink during crystallization?

During the crystallization process, the microstructure transforms and densifies by 0.2%. The milling software takes the densification factor into account. Therefore, the milled IPS e.max CAD restorations demonstrate precision of fit after crystallization.

How can premature drying out of the IPS Object Fix Putty or Flow in the syringe be prevented?

In order to avoid a premature loss of moisture of the firing pastes, remove the syringe from the aluminium bag only directly before initial use. Close the syringe immediately after usage. Once removed from the aluminium bag, the syringe is ideally stored in a re-sealable plastic bag (e.g. Minigrip) or a container with a humid atmosphere.

Can other firing trays, e.g. honey-comb trays, be used for the crystallization of IPS e.max CAD?

Other firing trays must not be used. The IPS e.max CAD (Speed) Crystallization Tray contained in the assortment stores the heat necessary for slow of the glass-ceramic. Other firing trays, e.g. honey-comb tray, cannot store the heat and therefore cool down too quickly.
Can furnaces other than the ones from Ivoclar Vivadent be used to crystallize IPS e.max CAD restorations?
The crystallization of IPS e.max CAD is specially coordinated with the Ivoclar Vivadent ceramic furnaces (e.g. Programat P310, P510, P710, CS2, CS3, CS4). If you would like to use other, untested ceramic furnaces, please consult Ivoclar Vivadent about their compatibility with IPS e.max CAD. It is important to note that not all ceramic furnaces can be used for crystallization. Ceramic furnaces which, for example, do not feature a controlled (long-term) cooling mode cannot be used for this purpose.

How are contaminations with IPS Object Fix Putty or Flow on the outer surface of the restorations best removed before crystallization?
A short-hair brush or cotton swab dampened with water can be used for cleaning. It must be made sure that any residue has been removed before Shades, Stains or Glaze are applied in order to prevent the residue from being burned in.

What must be considered after the firing of IPS e.max CAD?
In order to prevent tension within the ceramic, remove the restoration from the furnace only after the firing cycles have been completed (wait for the acoustic signal of the ceramic furnace). Allow the objects to cool to room temperature in a place protected from draft and do not touch them with metal tongs during that time. Do not blast or quench the objects.

Which materials should be used if additional shade adjustments are necessary after Crystallization and Glaze firing?
Since the characterizations have already been carried out using IPS e.max CAD Crystall./Shades and Stains for the Crystallization firing, IPS e.max CAD Crystall./Shades and Stains have to be used again.

Can IPS e.max CAD Crystall./Shades, Stains, Glaze and IPS Ivoclor Stains and Essences be used with one another?
No. As the IPS e.max CAD Crystall./ and IPS Ivocolor materials have different firing requirements, they cannot be mixed or applied at the same time.

Can IPS Empress Universal Shades, Stains and Glaze be used for IPS e.max CAD?
IPS Empress Universal Shades, Stains and Glaze were specially developed for and coordinated with the IPS Empress System and are therefore not suitable for IPS e.max products.

Can the quality of the crystallization of IPS e.max CAD restorations be verified?
Visual inspection by means of the enclosed material shade guide can be conducted. If the shade and opacity of the restoration match the material shade guide, crystallization was successful. The shade comparison must always be conducted on a neutral-coloured background and with incident light, rather than transmitted light. If the shade and opacity of the restoration deviate from that of the materials shade guide, e.g. too translucent, the restoration must be milled again. Crystallization cannot be repeated.

Can IPS e.max CAD frameworks be blasted with Al₂O₃ or glass polishing beads before they are veneered or after their completion (on the cavity side)?
IPS e.max CAD restorations must never be blasted with Al₂O₃ or polishing beads, as this would damage the ceramic surface and reduce the outstanding physical properties.
How must the internal (bonding) surface of the IPS e.max CAD restoration be conditioned before cementation?

The inner aspect of the IPS e.max CAD restorations must always be conditioned, irrespective of the cementation protocol used, i.e. adhesive, self-adhesive or conventional. You may choose between two options:

Option 1:
Etching and silanization in one step with Monobond Etch & Prime®.

Option 2:
Separate etching with IPS Ceramic Etching Gel and subsequent silanization with Monobond Plus.

With conventional cementation, silanizing is not necessary.

Can IPS e.max CAD restorations also be conventionally cemented?

Depending on the indication, IPS e.max CAD restorations can be seated using either adhesive, self-adhesive or conventional cementation (see page 47). If the restoration is to be conventionally cemented, however, an appropriately retentive preparation design must be observed (preparation angle of 4° – 8°, preparation height of at least 4 mm). If this is not possible, adhesive cementation should be preferred, e.g. with Variolink® Esthetic and Multilink® Automix.

It is not advisable to use traditional phosphate cements, as they would negatively influence the light transmission of the all-ceramic and therefore compromise the esthetic appearance of all-ceramic restorations.
Cementation and Aftercare

Cementation options

Esthetic cementation options are decisive for the harmonious shade effect of an all-ceramic restoration. Depending on the indication, IPS e.max restorations can be seated using either adhesive, self-adhesive or conventional cementation.

- For the adhesive cementation of IPS e.max restorations, Multilink® Automix or Variolink® Esthetic are the ideal composite cements.
- SpeedCEM® is available for the self-adhesive cementation of IPS e.max restorations.
- The glass ionomer cement Vivaglass® CEM is recommended for the conventional cementation of IPS e.max restorations.

Short definition of the different cementation methods:

- **Adhesive cementation**
  With adhesive cementation, the bond is also created by static friction, but primarily by the chemical and/or micro-mechanical bond between the luting material and the restoration, as well as between the luting material and the preparation. Given the chemical and/or micromechanical bond, retentive preparation is not required. Irrespective of the cementation material, special adhesive systems are used on the preparation to generate the micromechanical bond with the dentin and/or enamel. Adhesive cementation results in enhanced “(overall) strength” of the seated all-ceramic restoration.

- **Self-adhesive cementation**
  The cementation material features self-adhesive properties on the tooth, which is why no additional special conditioning of the tooth surface is necessary. Hence, the adhesion of the restoration is partially achieved by a micromechanical and/or chemical bond. In order to achieve sufficient bonding strength values, retentive preparation (preparation angle 4 – 8°, preparation height at least 4 mm) is recommended. Self-adhesive cementation does not result in enhanced “(overall) strength” of the seated all-ceramic restoration.

- **Conventional cementation**
  With conventional cementation, the bond is almost entirely created by static friction between the cementation material and the restoration, as well as between the cementation material and the preparation. In order to obtain the necessary mechanical friction, a retentive preparation showing a preparation angle of approximately 4 – 8° is required. Conventional cementation does not result in enhanced “(overall) strength” of the seated all-ceramic restoration.

**Cementation possibilities for the different indications**

<table>
<thead>
<tr>
<th>IPS e.max CAD</th>
<th>Adhesive Cementation</th>
<th>Self-Adhesive Cementation</th>
<th>Conventional Cementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occlusal veneers, thin veneers, veneers</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Inlays, onlays, partial crowns</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Minimally invasive anterior and posterior crowns</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Anterior and posterior crowns</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3-Unit Bridges up to the 2nd Premolar</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Care Notes

As with natural teeth, high-quality IPS e.max restorations require regular professional care. This is beneficial for both the health of the gingiva and teeth, as well as the overall appearance. The pumice-free Proxyt® pink polishing paste is used to care for the surfaces without causing any wear. The low RDA* value = 7 (*Relative Dentin Abrasion) is a reliable confirmation that a low-abrasion cleaning paste is used. Scientific investigations and long-term clinical experience have proved the gentle effect compared to other pastes.
Individual characterizations and shade adjustments of IPS e.max CAD restorations are achieved with IPS e.max CAD Crystall./Shades or IPS Ivocolor Shades and Essences.

**IPS e.max Crystall./Shades, Stains**
To be used on “blue” and “tooth-coloured” IPS e.max CAD restorations

<table>
<thead>
<tr>
<th>A–D tooth shade</th>
<th>BL1</th>
<th>BL2</th>
<th>BL3</th>
<th>BL4</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A3.5</th>
<th>A4</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IPS e.max CAD Crystall./Shade</strong></td>
<td></td>
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</tr>
<tr>
<td>IPS e.max CAD Crystall./Shade Incisal</td>
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<tr>
<td>IPS e.max CAD Crystall./Stains</td>
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</tr>
</tbody>
</table>

- BL1: 0
- BL2: 1
- BL3: 2
- BL4: 3
- A1: 4
- A2: 5
- A3: 6
- A3.5: 7
- A4: 8
- B1: 9
- B2: 10
- B3: 11
- B4: 12
- C1: 13
- C2: 14
- C3: 15
- C4: 16
- D1: 17
- D2: 18
- D3: 19
- D4: 20
- White
- Cream
- Sunset
- Copper
- Olive
- Khaki
- Mahogany
Crystallization and Firing Parameters

The following points should be observed for ceramic furnaces, used for the crystallization of IPS e.max CAD:

– Crystallization should be carried out in an Ivoclar Vivadent ceramic furnace (e.g. Programat P310, P510, P710, CS2, CS3, CS4).
– If you use other, untested ceramic furnaces, please consult Ivoclar Vivadent about their compatibility with IPS e.max CAD.
– Basically, the following applies:
  - Ceramic furnaces without function for controlled (long-term) cooling cannot be used.
  - Before the first crystallization and every six months after that, the ceramic furnace must be calibrated.
  - Depending on the mode of operation, more frequent calibrations may be required. Observe the manufacturer’s instructions.

The following aspects should be observed for conducting the crystallization:

– Use only IPS Object Fix Putty or Flow as a firing paste to place the restoration directly on the IPS e.max CAD Crystallization Tray.
– IPS e.max CAD restorations must not be directly placed on the IPS e.max CAD Crystallization Tray and Pins, e.g. without auxiliary firing paste, for crystallization.
– Use exclusively the IPS e.max CAD Crystallization Tray or IPS e.max Speed Crystallization Tray and the corresponding pins.
– Remove IPS e.max CAD objects from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
– Allow the objects to cool to room temperature in a place protected from draft.
– Do not touch the hot objects with metal tongs.
– Do not blast or quench the objects.

These firing parameters are guidance values. They are valid for the Programat furnaces from Ivoclar Vivadent. If furnaces from other manufacturers are used, the firing parameters have to be adjusted accordingly, as the case may be.

Deviations may occur:
– Depending on the furnace generation
– In case of regional differences in the power supply or if several electrical devices are operated on the same circuit.

Due to the IPS e.max Crystallization Tray, the firing temperatures vary depending on the furnace used.
Crystralization and Firing Parameters

Crystallization MO, Impulse, LT, MT, HT
with or without application of IPS e.max CAD Crystall./ materials

<table>
<thead>
<tr>
<th>Furnaces</th>
<th>Stand-by temperature B (°C)</th>
<th>Closing time S (min)</th>
<th>Heating rate T1 (°C/°F/Min)</th>
<th>Firing temperature T1 (°C)</th>
<th>Holding time H1 (min)</th>
<th>Heating rate T2 (°C/°F/Min)</th>
<th>Firing temperature T2 (°C)</th>
<th>Holding time H2 (min)</th>
<th>Vacuum 1 11 (°C/°F)</th>
<th>Vacuum 2 12 (°C/°F)</th>
<th>Long-term cooling L (°C)</th>
<th>Cooling rate tL (°C/°F/Min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P300 P500 P700</td>
<td>403/757</td>
<td>6:00</td>
<td>60/108</td>
<td>770/1418</td>
<td>0:10</td>
<td>30/54</td>
<td>850/1562</td>
<td>10:00</td>
<td>550/770 1022/1418</td>
<td>770/850 1418/1562</td>
<td>700/1292</td>
<td>0</td>
</tr>
<tr>
<td>P310 P510 P710</td>
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<td>60/108</td>
<td>780/1436</td>
<td>0:10</td>
<td>30/54</td>
<td>860/1580</td>
<td>10:00</td>
<td>550/780 1022/1436</td>
<td>780/860 1436/1580</td>
<td>710/1310</td>
<td>0</td>
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<tr>
<td>CS/CS2/ CS3/CS4</td>
<td>Select the corresponding program</td>
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</table>

Crystallization LT, MT, HT
with or without application of IPS e.max CAD Crystall./ materials

<table>
<thead>
<tr>
<th>Furnaces</th>
<th>Stand-by temperature B (°C)</th>
<th>Closing time S (min)</th>
<th>Heating rate T1 (°C/°F/Min)</th>
<th>Firing temperature T1 (°C)</th>
<th>Holding time H1 (min)</th>
<th>Heating rate T2 (°C/°F/Min)</th>
<th>Firing temperature T2 (°C)</th>
<th>Holding time H2 (min)</th>
<th>Vacuum 1 11 (°C/°F)</th>
<th>Vacuum 2 12 (°C/°F)</th>
<th>Long-term cooling L (°C)</th>
<th>Cooling rate tL (°C/°F/Min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P300 P500 P700</td>
<td>403/757</td>
<td>6:00</td>
<td>90/162</td>
<td>820/1508</td>
<td>0:10</td>
<td>30/54</td>
<td>840/1544</td>
<td>7:00</td>
<td>550/820 1022/1508</td>
<td>820/840 1436/1544</td>
<td>700/1292</td>
<td>0</td>
</tr>
<tr>
<td>P310 P510 P710</td>
<td>403/757</td>
<td>6:00</td>
<td>90/162</td>
<td>830/1526</td>
<td>0:10</td>
<td>30/54</td>
<td>850/1562</td>
<td>7:00</td>
<td>550/830 1022/1526</td>
<td>830/850 1526/1562</td>
<td>710/1310</td>
<td>0</td>
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<tr>
<td>CS/CS2/ CS3/CS4</td>
<td>Select the corresponding program</td>
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</tbody>
</table>

Speed Crystallization (Observe the notes on page 25)
A maximum of 2 units with or without application of IPS e.max CAD Crystall./Glaze Spray on an IPS e.max CAD Speed Crystallization Tray

<table>
<thead>
<tr>
<th>Furnaces</th>
<th>Stand-by temperature B (°C)</th>
<th>Closing time S (min)</th>
<th>Heating rate T1 (°C/°F/Min)</th>
<th>Firing temperature T1 (°C)</th>
<th>Holding time H1 (min)</th>
<th>Heating rate T2 (°C/°F/Min)</th>
<th>Firing temperature T2 (°C)</th>
<th>Holding time H2 (min)</th>
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<th>Vacuum 2 12 (°C/°F)</th>
<th>Long-term cooling L (°C)</th>
<th>Cooling rate tL (°C/°F/Min)</th>
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Corrective firing – Stain/Glaze firing
with IPS e.max CAD Crystall./ materials

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