

**IPS<sup>®</sup>  
e.max<sup>®</sup>**

# CAD

**Monolithic Solutions CHAIRSIDE**  
Instructions for Use

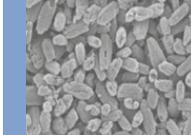


**all ceramic  
all you need**



**ivoclar<sup>®</sup>  
vivadent<sup>®</sup>**  
technical

# Table of Contents

Product Information		<b>3</b>	<b>IPS e.max System</b>
		<b>4</b>	<b>IPS e.max CAD</b> Material Uses Scientific data CAD/CAM partners Block concept
Practical Procedure		<b>10</b>	<b>Overview of the Clinical Working Steps, Fabrication Process</b> Block selection using the IPS e.max® Shade Navigation App Preparation guidelines Minimum layer thicknesses Model and tooth preparation
		<b>18</b>	<b>Overview of the Processing Techniques</b>
		<b>19</b>	<b>Preparation</b>
		<b>20</b>	<b>Polishing Technique (Self-Glaze)</b> Finishing Polishing Speed Crystallization or Crystallization
General Information		<b>23</b>	<b>Staining Technique</b> Finishing – Staining technique on the "blue" restoration <ul style="list-style-type: none"> <li>• Variant A: Crystallization and Glaze Firing in one step with glazing spray</li> <li>• Variant B: Crystallization and Stain/Glaze Firing in one step with glazing paste</li> <li>• Variant C: Crystallization and Stain/Glaze Firing in one step with glazing spray</li> </ul>
		<b>41</b>	<b>Cut-Back Technique</b>
General Information		<b>43</b>	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 / IPS e.max® ZirCAD

For maximum flexibility



## IPS e.max® CAD

Lithium disilicate glass-ceramic (LS<sub>2</sub>)

**For:** Crowns, bridges, inlays, onlays, veneers, partial crowns and implant-supported hybrid restorations

**Strength:** 530 MPa\*



## IPS e.max® ZirCAD

Zirconium oxide ceramic (ZrO<sub>2</sub>)

**For:** Full-contour crowns and bridges

**Strength:** 1200 MPa\*



## IPS e.max® CAD Crystall./Shades/Stains and Glaze

Universal Stains and Glazes

**For:** IPS e.max CAD, IPS e.max ZirCAD and IPS Empress CAD

\*typical average value for the biaxial strength of IPS e.max ZirCAD LT  
Source: R&D Ivoclar Vivadent AG, Schaan, Liechtenstein

**IPS e.max CAD** is the innovative lithium disilicate glass-ceramic (LS<sub>2</sub>) 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<sup>®</sup> CAD Monolithic Solutions

## Material

### IPS e.max<sup>®</sup> 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  $\geq 130$  MPa. After the IPS e.max CAD blocks are milled, the restoration is crystallized in an Ivoclar Vivadent ceramic furnace (e.g. Programat<sup>®</sup> 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.



IPS e.max CAD

Lithium Disilicate

Property	Specification	Typical average value
CTE (25–500°C) [10 <sup>-6</sup> /K]	10.1 ± 0.5	–
Flexural strength (biaxial) [MPa]	$\geq 360$	530
Chemical solubility [ $\mu\text{g}/\text{cm}^2$ ]	< 100	–
Type/Class	Type II / Class 3	–

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](http://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):



Translucency Level	Processing Technique					Indications									
	Polishing Technique	Staining Technique	Cut-Back Technique	Layering Technique	CAD-on Technique	Occlusal veneer 1)	Thin veneer 1)	Veneer	Inlay and Onlay	Partial Crown	Anterior and Posterior Crown	3-Unit Bridge	Multi-Unit Bridge	Hybrid Abutment	Hybrid Abutment Crown
<b>HT</b> High Translucency	✓	✓	✓			✓	✓	✓	✓	✓					
					✓						✓ CAD-on	✓ CAD-on	✓ CAD-on		
<b>MT</b> Medium Translucency	✓	✓	✓			✓	✓	✓		✓	✓			✓	✓
<b>LT</b> Low Translucency	✓	✓	✓					✓		✓	✓	✓ <sup>2)</sup>		✓	✓
<b>MO</b> Medium Opacity				✓							✓ <sup>3)</sup>			✓	
<b>I</b> Impulse	✓	✓	✓			✓	✓	✓							

<sup>1)</sup> The cut-back technique must not be used for the fabrication of thin and occlusal veneers

<sup>2)</sup> Only up to the second premolar as the distal abutment

<sup>3)</sup> 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

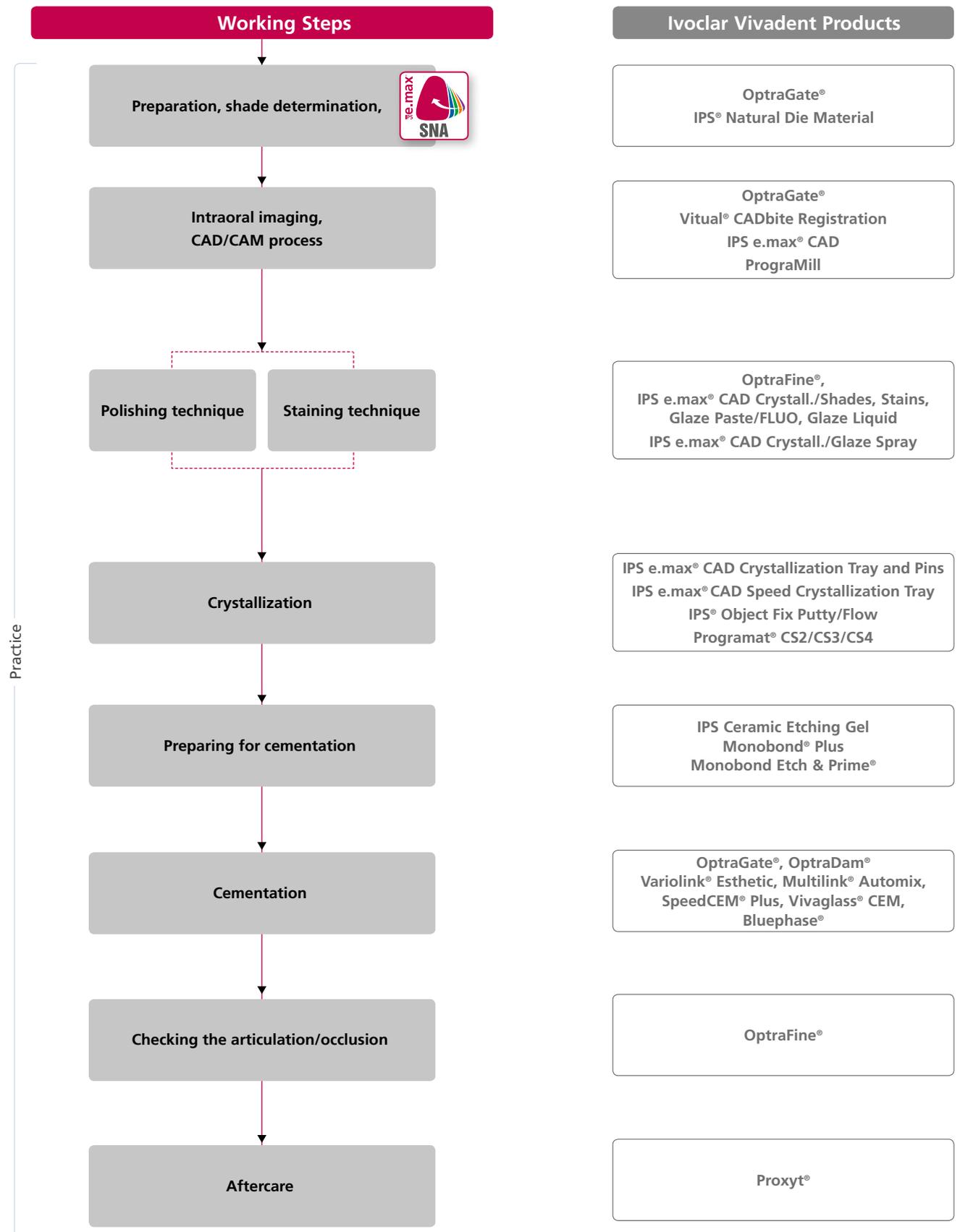
The Impulse blocks enable the fabrication of restorations with pronounced opalescent properties. The **opalescent blocks** are available in **two versions with different opalescence values (Opal 1, Opal 2)**. The blocks are suitable for veneers in light tooth shades, for which an opalescent effect is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



Detailed information on the available block sizes and shades can be found in the "CAD/CAM Block Overview" at [www.ivoclarvivadent.com](http://www.ivoclarvivadent.com).



# Overview of the Clinical Working Steps, Fabrication Process

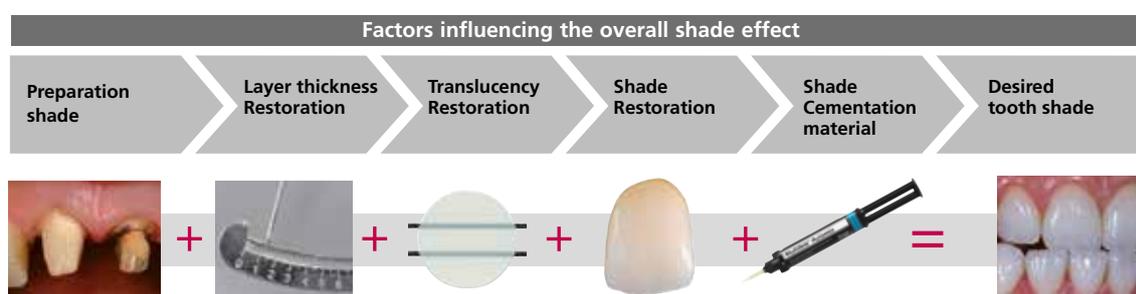


## Block selection using the IPS e.max® Shade Navigation App

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.**



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.



# 2

## Enter the indication

(Veneer, inlay, etc.)



### 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:

Non-listed indications	Alternative indications
Bridge	Crown
Partial crown	Onlay
Occlusal veneer (table top)	Onlay

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.

# 3

## Enter the die shade

(Shade of the preparation defined with the IPS Natural Die Material shade guide)



### 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

# 4

## Enter the layer thickness

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

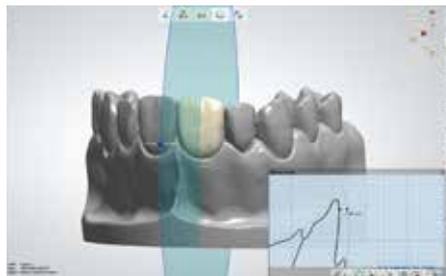


### Tips on determining the layer thickness:

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.



Manual determination of the layer thickness, in the centre of the thinnest, vestibular area



Digital determination of the layer thickness, in the centre of the thinnest, vestibular area

### Example - Influence of layer thickness and translucency:



Restoration: left: Veneer (0.5 mm, IPS e.max® CAD HT B1);  
 right: Crown (1.5 mm, IPS e.max® CAD LT B1)  
 Cementation material: Variolink® Esthetic neutral  
 Preparation shade: IPS® Natural Die Material, ND 6

# 5

## Enter the material

(IPS e.max CAD, IPS e.max Press, IPS e.max ZirCAD)



### 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 recognized any necessary shade adjustments well in advance.



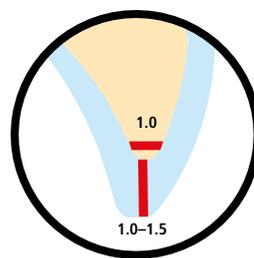
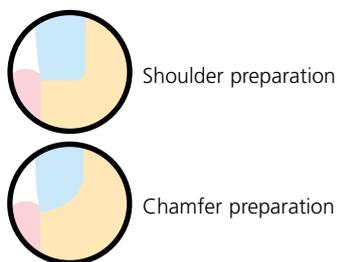
More detailed information on the function and the procedure can be found under [www.ipsemax.com/sna](http://www.ipsemax.com/sna) or directly in the app.

## 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.

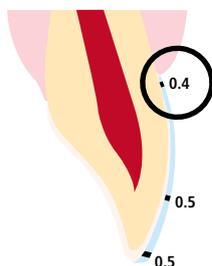


### Occlusal veneer (table top)



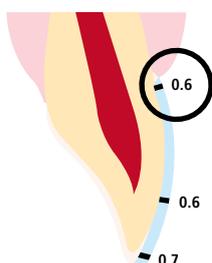
- Reduce the anatomical shape and observe the stipulated minimum layer thickness.
- Circular shoulder preparation with rounded inner edges and/or chamfer preparation with an angle of approximately 10°-30°. Width of the circular shoulder/chamfer at least 1.0 mm.
- Reduce the occlusal crown third by at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

### Thin veneer



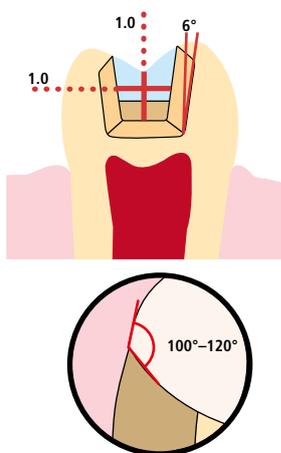
- If possible, the preparation should be located in the enamel.
- The incisal preparation margins should not be located in the area of the abrasion surfaces or dynamic occlusal surfaces.
- The minimum layer thickness of the thin veneer in the cervical and labial area is 0.4 mm. A restoration thickness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

### Veneer



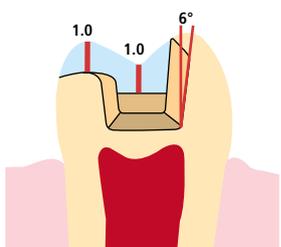
- If possible, the preparation should be located in the enamel.
- The incisal preparation margins should not be located in the area of the abrasion surfaces or dynamic occlusal surfaces.
- Reduce the cervical and/or labial area by at least 0.6 mm, and the incisal edge by at least 0.7 mm

### Inlay



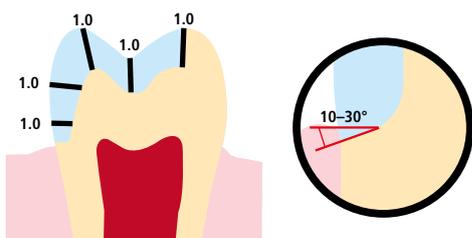
- Static and dynamic antagonist contacts must be taken into consideration.
- The preparation margins must not be located on centric antagonist contacts.
- A preparation depth of at least 1.0 mm and an isthmus width of at least 1.0 mm must be observed in the fissure area.
- Prepare the proximal box with 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



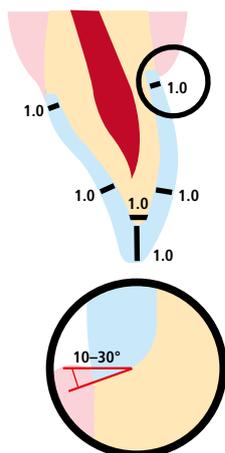
- Static and dynamic antagonist contacts must be taken into consideration.
- The preparation margins must not be located on centric antagonist contacts.
- A preparation depth of at least 1.0 mm and an isthmus width of at least 1.0 mm must be observed in the fissure area.
- Prepare the proximal box with 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



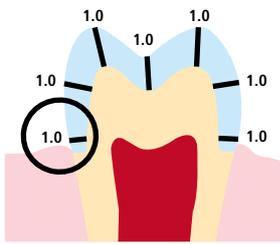
- Static and dynamic antagonist contacts must be taken into consideration.
- The preparation margins must not be located on centric antagonist contacts.
- Provide at least 1.0 mm of space in the cusp areas.
- Prepare a circular shoulder with rounded inner edges or a chamfer at an angle of approximately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

### Minimally invasive anterior crown (adhesive cementation mandatory)



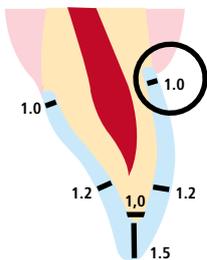
- Reduce the anatomical shape and observe the stipulated minimum layer thickness. Circular shoulder preparation with rounded inner edges and/or pronounced chamfer preparation. Width of the circular shoulder/chamfer at least 1.0 mm.
- Reduce the incisal crown third by at least 1.0 mm.
- Reduce the vestibular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

### Minimally invasive posterior crown (adhesive cementation mandatory)



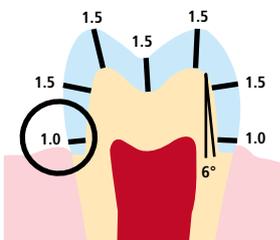
- Reduce the anatomical shape and observe the stipulated minimum layer thickness. Circular shoulder preparation with rounded inner edges and/or pronounced chamfer preparation. Width of the circular shoulder/chamfer at least 1.0 mm.
- Reduce the occlusal crown third by at least 1.0 mm.
- Reduce the vestibular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

### Anterior crown / bridge abutment in the anterior region



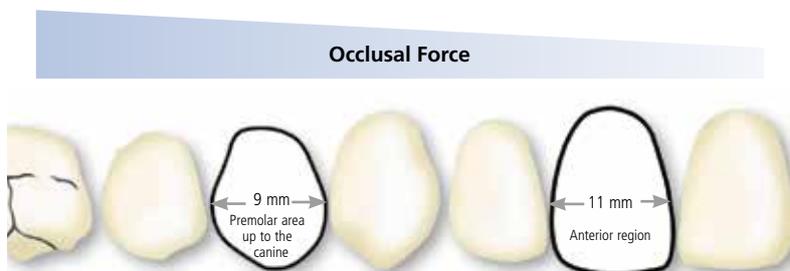
- Reduce the anatomical shape and observe the stipulated minimum layering thickness. Prepare a circular shoulder with rounded inner edges or a pronounced chamfer at an angle of approximately 10°–30°. Width of the circular shoulder/chamfer at least 1.0 mm.
- Reduce the incisal crown third by at least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

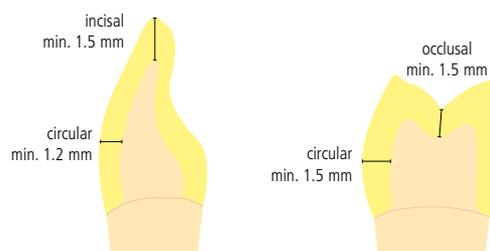
### Minimum layer thicknesses for IPS e.max CAD restorations (depending on the indication) in the polishing and staining technique

Cementation	Mandatory adhesive cementation							Optional adhesive, self-adhesive or conventional cementation			
	Occlusal veneer	Thin veneer	Veneer	Inlay	Onlay	Partial Crown	Minimally invasive crowns for the anterior and posterior region	Crown		Bridge	
Indication								Anterior Region	Posterior Region	Anterior Region	Posterior Region
Minimum layer thickness IPS e.max CAD – <b>polishing technique</b>											
Minimum layer thickness IPS e.max CAD – <b>staining technique</b>											
incisal/occlusal	1.0	0.5	0.7	1.0 Fissure depth	1.0	1.0	1.0	1.5	1.5	1.5	1.5
circular	1.0	0.4	0.6	1.0 Isthmus width	1.0	1.0	1.0	1.2	1.5	1.2	1.5
Connector dimensions	–	–	–	–	–	–	–	–	–	16 mm <sup>2</sup> In general the following applies: Height ≥ Width	

Dimensions in mm

#### 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

Efficiency		Esthetics		
Technique	Polishing technique (self-glaze)	Staining technique Staining technique on the "blue" restoration		
Description	  <p><b>Polishing</b> of the "blue" restoration, followed by <b>crystallization</b> without individual characterization and glaze.</p>	<b>Variant A</b>   <p>Glazing with IPS e.max CAD Crystall./Glaze Spray on the blue restoration followed by <b>Speed Crystallization</b> (Speed Crystallization and Glaze firing in one step).</p>	<b>Variant B</b>   <p>Staining and glazing with IPS e.max CAD Crystall./Glaze Paste/FLUO on the blue restoration followed by <b>Crystallization</b> and the <b>Stain/Glaze firing</b> in one step.</p>	<b>Variant C</b>   <p>Staining and glazing with IPS e.max CAD Crystall./Glaze Spray on the blue restoration followed by <b>Crystallization</b> and the <b>Stain/Glaze firing</b> in one step.</p>
Firing cycles and times	<p><b>Speed Crystallization</b> without staining and glazing (max. 2 units) approx. 14:55 min</p> <p>or</p> <p><b>Crystallization</b> without staining and glazing approx. 25 min</p>	<p><b>Speed Crystallization</b> with IPS e.max CAD Crystall./Glaze Spray (max. 2 units) approx. 14:55 min</p>	<p><b>Crystallization</b> with IPS e.max CAD Crystall./Shade, Stains and Glaze Paste/FLUO approx. 25 min</p>	<p><b>Crystallization</b> with IPS e.max CAD Crystall./Shades, Stains and Glaze spray approx. 25 min</p>
Total firing time	 <p>14:55 min or 25:00 min</p> <p>Page 20</p>	 <p>14:55 min</p> <p>Page 25</p>	 <p>25:00 min</p> <p>Page 27</p>	 <p>25:00 min</p> <p>Page 34</p>

# 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 (<math>< 60 \mu\text{m}</math>) 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  $\text{Al}_2\text{O}_3$  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.



Smooth out the attachment point of the holder and finish the restoration using suitable grinding instruments.

**Pre-polishing** with e.g. OptraFine F. Prevent the glass-ceramic from overheating.

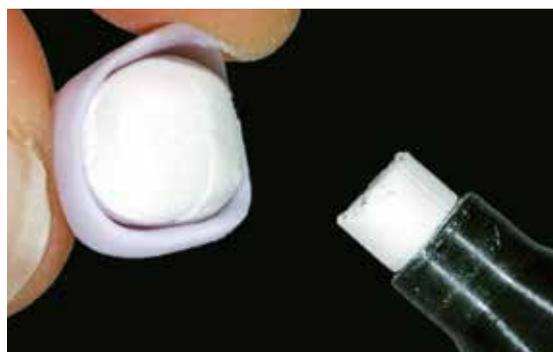
**High-gloss polishing** with e.g. OptraFine P. Overheating of the glass-ceramic must be prevented.

### 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.



Fill the inside of the crown with IPS Object Fix Putty or Flow.



Press the selected IPS e.max CAD Crystallization Pin deeply into the IPS Object Fix Putty or Flow.



Place the restoration in the centre of the IPS e.max CAD Speed Crystallization Tray and crystallize using the stipulated firing parameters.



- **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.**



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.**



- 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.

- 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  $Al_2O_3$  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.



Completed, polished and crystallized IPS e.max CAD 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 discolouration.
- Do **not** blast restorations with Al<sub>2</sub>O<sub>3</sub> 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.

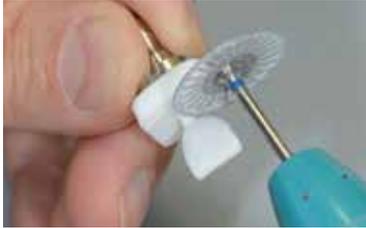


Adjusting the outer surface, particularly functional areas of the restoration with a fine diamond to smooth out the surface structure created by the CAD/CAM process.



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.

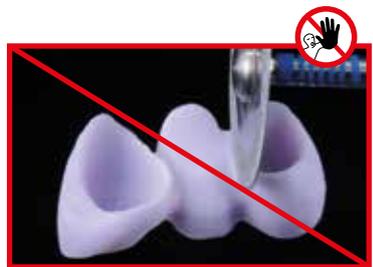
**Bridges**



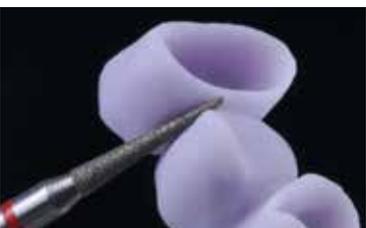
Bridge after the CAD/CAM process.



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:

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

#### 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  $Al_2O_3$  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.



Remove residue with ultrasound in a water bath ...



... or with the steam jet.



Do **not** remove residue with  $Al_2O_3$  or glass polishing beads.



Completed IPS e.max CAD LT crown after Speed Crystallization

## 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.

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.

**with**  
IPS e.max CAD Crystallization Pin



**Partial crowns, anterior crowns,  
posterior crowns, bridges**

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

**without (optional)**  
IPS e.max CAD Crystallization Pin



**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)



Fill the inside of the veneer with IPS Object Fix Flow.



Place the restoration on the IPS e.max CAD Crystallization Pin.

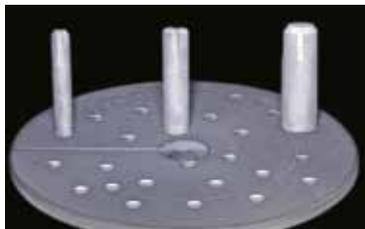


Adapt IPS Object Fix Putty to the pin and restoration margin. Remove any contamination from the outer surface.

### Crowns – inlays, onlays (optional)



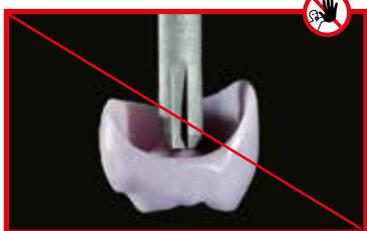
IPS Object Fix Flow and IPS Object Fix Putty



IPS e.max CAD Crystallization Pins in three sizes S, M, L on the IPS e.max CAD Crystallization Tray



Select the largest possible IPS e.max CAD Crystallization Pin.



This IPS e.max CAD Crystallization Pin is too small and thus unsuitable.



Fill the inside of the restoration with IPS Object Fix Putty or Flow.



Press the selected IPS e.max CAD Crystallization Pin deeply into the IPS Object Fix Putty or Flow.



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 margin is exactly supported.



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

## Bridges



Select the largest possible IPS e.max CAD Crystallization Pin.



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.



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



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.



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

## Crystallization and Stain/Glaze firing in one step

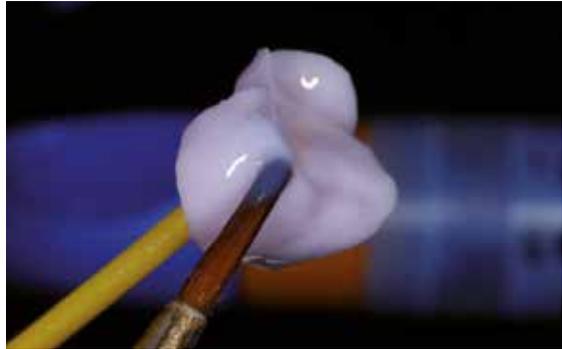
The following procedure must be observed:

- Thoroughly clean and dry the restoration after clinical try-in.
- Attach veneer, inlay or onlay on a temporary adhesive stick (OpraStick) before the glaze and the characterizations are applied. Alternatively, the restoration may be held using diamond-coated tweezers.
- Extrude IPS e.max CAD Crystall./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 Crystall./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 Crystall./Shades and IPS e.max CAD Crystall./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 Crystall./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 OpraStick 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:

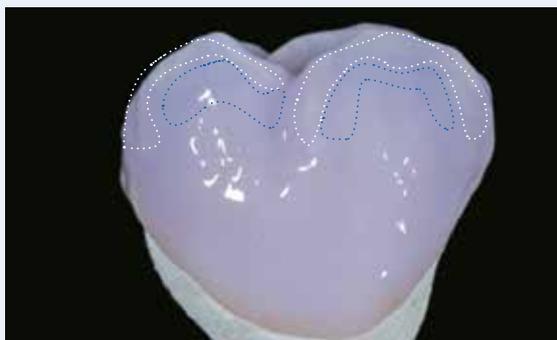
### IPS e.max CAD Crystall./Shades



### IPS e.max CAD Crystall./Stains



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



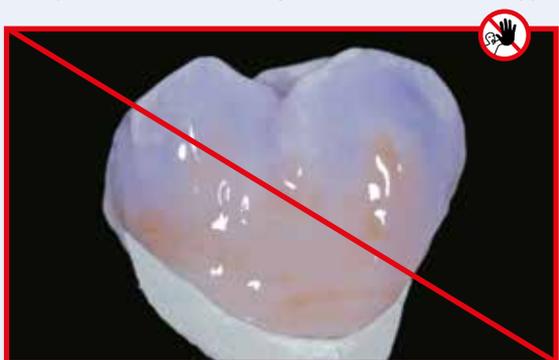
Minor characterizations on the buccal surface using IPS e.max CAD Crystall./Shade Incisal and Stains.



Occlusal characterizations using IPS e.max CAD Crystall./Shades 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.

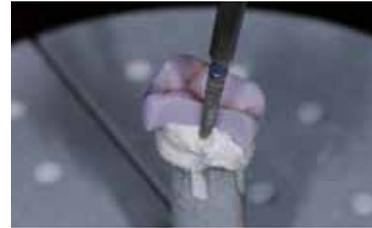
### Inlays, onlays



Apply IPS Object Fix Flow on the IPS e.max CAD Crystallization Pin.



Place the onlay on the Crystallization Pin using diamond-coated tweezers.



Press the onlay slightly into the IPS Object Fix Flow material.



Place the restoration in the centre of the IPS e.max CAD Crystallization Tray and fire using the stipulated firing parameters.



- **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 Al<sub>2</sub>O<sub>3</sub> 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



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

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.

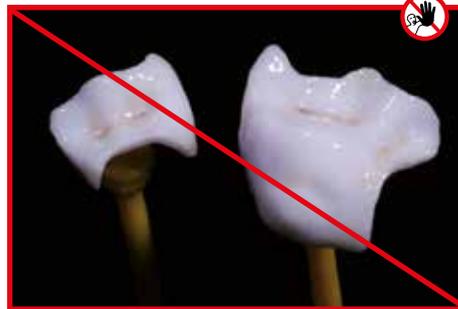
**with**  
IPS e.max CAD Crystallization Pin



**Thin veneers, veneers,  
inlays, onlays, partial crowns, anterior crowns,  
posterior crowns**

Adapt IPS Object Fix Putty or Flow exactly up to the restoration margin so that the glazing spray does not touch the the inner areas.

**without**  
IPS e.max CAD Crystallization Pin



#### 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.

### 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.



Apply a small amount of IPS Object Fix Putty or Flow to the inner side of the restoration.



Press the suitable IPS e.max CAD Crystallization Pin into the Putty or Flow material.



Adapt IPS Object Fix Putty or Flow exactly to the margins.



Thoroughly clean off contamination with a brush dampened with water and dry.

### 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.



Extrude IPS e.max CAD Crystall./Shades and Stains from the syringe and mix thoroughly. If required, thin with IPS e.max CAD Crystall./Glaze Liquid.



Apply mixed Shades and Stains directly on the blue restoration.

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.



Thoroughly shake the Glaze Spray can before application.



Hold the restoration by the IPS e.max CAD Crystallization Pin.



Spray the IPS e.max CAD Crystall./Glaze Spray directly on the unfired IPS e.max CAD Crystall./Shades and Stains. Spray the restoration from all sides while simultaneously rotating it.



Shake the spray can again between individual bursts.



Spray an even layer onto the restoration.



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.



- 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**



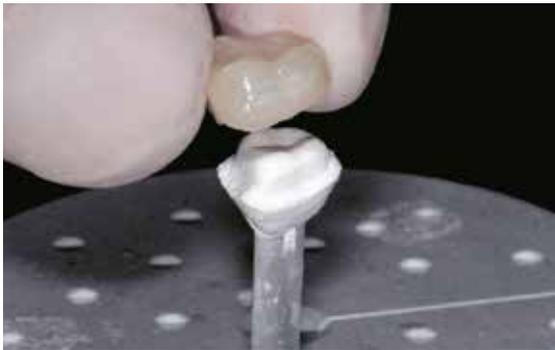
If a restoration made from IPS e.max CAD MO or Impulse and one made from IPS e.max CAD HT, MT or LT are to be crystallized in the same firing cycle, the firing parameters for IPS e.max CAD MO / Impulse must be used!

### Optional:

- If additional characterizations or adjustments are required after crystallization, a Corrective firing using IPS e.max CAD Crystall./Shades and Stains and Glaze 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 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 Al<sub>2</sub>O<sub>3</sub> 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**

Problem/Cause	Before Firing Application of the Glaze Spray	After Firing Detailed view of the surface
<p><b>Problem:</b> <b>Not enough Glaze Spray</b> on the restoration</p> <p><b>Possible cause:</b></p> <ul style="list-style-type: none"> <li>– Distance between the spray can and the restoration too far</li> <li>– Spraying too short</li> <li>– Spray can not shaken sufficiently</li> <li>– Spray can not held upright during spraying</li> </ul>	 <p>Insufficient application of IPS e.max CAD Crystall./ Glaze Spray.</p>	 <p>Insufficient gloss or incomplete glaze layer.</p>
<p><b>Problem:</b> <b>Too much Glaze Spray</b> on the restoration</p> <p><b>Possible cause:</b></p> <ul style="list-style-type: none"> <li>– Distance between the spray can and the restoration too small</li> <li>– Too much Glaze Spray applied</li> </ul>	 <p>Too much IPS e.max CAD Crystall./Glaze Spray was applied.</p>	 <p>Loss of texture and too glossy surface.</p>

## 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.



Mixing IPS e.max CAD Crystall./Add-On with IPS e.max CAD Crystall./Add-On Liquid to an easy-to-contour consistency.



Application of the mixed Add-On on the blue restoration before crystallization

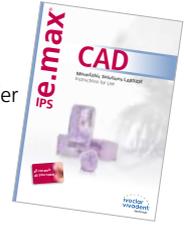


Application of the mixed Add-On on the crystallized restoration

# Practical Procedure

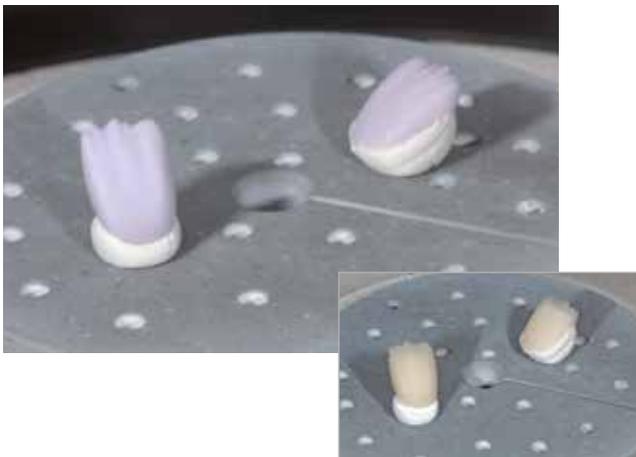
## Cut-Back Technique

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.



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.



IPS e.max CAD LT veneer and anterior crown after glaze firing (partially reduced and veneered with IPS e.max Ceram)

## 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 adaptation 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 Ivoclar 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 Al<sub>2</sub>O<sub>3</sub> 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 Al<sub>2</sub>O<sub>3</sub> 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

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



#### Find your way out of the cements maze

Detailed information can be found under [www.cementation-navigation.com](http://www.cementation-navigation.com)



More detailed information on the clinical working steps can be found in the IPS e.max Clinical Guide.

### 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 Proxyl® 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.





## 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.



## Crystallization and Firing Parameters

### Crystallization MO, Impulse, LT, MT, HT

with or without application of [IPS e.max CAD Crystall./ materials](#)



Furnaces Programat	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t <sub>1</sub> [°C/°F/min]	Firing temperature T <sub>1</sub> [°C/°F]	Holding time H <sub>1</sub> [min]	Heating rate t <sub>2</sub> [°C/°F/min]	Firing temperature T <sub>2</sub> [°C/°F]	Holding time H <sub>2</sub> [min]	Vacuum 1 1 <sub>1</sub> [°C/°F] 1 <sub>2</sub> [°C/°F]	Vacuum 2 2 <sub>1</sub> [°C/°F] 2 <sub>2</sub> [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t <sub>f</sub> [°C/°Fmin]
P300 P500 P700	403/757	6:00	60/108	770/1418	0:10	30/54	850/1562	10:00	550/770 1022/1418	770/850 1418/1562	700/1292	0
P310 P510 P710	403/757	6:00	60/108	780/1436	0:10	30/54	860/1580	10:00	550/780 1022/1436	780/860 1436/1580	710/1310	0
CS/CS2/ CS3/CS4	Select the corresponding program											

### Crystallization LT, MT, HT

with or without application of [IPS e.max CAD Crystall./ materials](#)



Furnaces Programat	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t <sub>1</sub> [°C/°F/min]	Firing temperature T <sub>1</sub> [°C/°F]	Holding time H <sub>1</sub> [min]	Heating rate t <sub>2</sub> [°C/°F/min]	Firing temperature T <sub>2</sub> [°C/°F]	Holding time H <sub>2</sub> [min]	Vacuum 1 1 <sub>1</sub> [°C/°F] 1 <sub>2</sub> [°C/°F]	Vacuum 2 2 <sub>1</sub> [°C/°F] 2 <sub>2</sub> [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t <sub>f</sub> [°C/°Fmin]
P300 P500 P700	403/757	6:00	90/162	820/1508	0:10	30/54	840/1544	7:00	550/820 1022/1508	820/840 1508/1544	700/1292	0
P310 P510 P710	403/757	6:00	90/162	830/1526	0:10	30/54	850/1562	7:00	550/830 1022/1526	830/850 1526/1562	710/1310	0
CS/CS2/ CS3/CS4	Select the corresponding program											

### 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



Furnaces Programat	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t <sub>1</sub> [°C/°F/min]	Firing temperature T <sub>1</sub> [°C/°F]	Holding time H <sub>1</sub> [min]	Heating rate t <sub>2</sub> [°C/°F/min]	Firing temperature T <sub>2</sub> [°C/°F]	Holding time H <sub>2</sub> [min]	Vacuum 1 1 <sub>1</sub> [°C/°F] 1 <sub>2</sub> [°C/°F]	Vacuum 2 2 <sub>1</sub> [°C/°F] 2 <sub>2</sub> [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t <sub>f</sub> [°C/°Fmin]
P300 P500 P700	403/757	1:00	110/198	800/1472	0:00	50/90	850/1562	3:00	690/800 1274/1472	800/850 1472/1562	700/1292	40/72
P310 P510 P710	403/757	0:30	120/216	850/1562	0:00	70/126	870/1598	3:30	690/850 1274/1562	850/870 1562/1598	705/1301	0
CS/CS2/ CS3/CS4	Select the corresponding program											

### Corrective firing – Stain/Glaze firing

with [IPS e.max CAD Crystall./ materials](#)



Furnaces Programat	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t <sub>1</sub> [°C/°F/min]	Firing temperature T <sub>1</sub> [°C/°F]	Holding time H <sub>1</sub> [min]	Heating rate t <sub>2</sub> [°C/°F/min]	Firing temperature T <sub>2</sub> [°C/°F]	Holding time H <sub>2</sub> [min]	Vacuum 1 1 <sub>1</sub> [°C/°F] 1 <sub>2</sub> [°C/°F]	Vacuum 2 2 <sub>1</sub> [°C/°F] 2 <sub>2</sub> [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t <sub>f</sub> [°C/°Fmin]
P300 P500 P700	403/757	6:00	90/162	820/1508	0:10	30/54	840/1544	3:00	550/820 1022/1508	820/840 1508/1544	700/1292	0
P310 P510 P710	403/757	6:00	90/162	830/1526	0:10	30/54	850/1562	3:00	550/830 1022/1526	830/850 1526/1562	710/1310	0
CS/CS2/ CS3/CS4	Select the corresponding program											



# Ivoclar Vivadent – worldwide

**Ivoclar Vivadent AG**  
Bendererstrasse 2  
9494 Schaan  
Liechtenstein  
Tel. +423 235 35 35  
Fax +423 235 33 60  
[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

**Ivoclar Vivadent Pty. Ltd.**  
1 – 5 Overseas Drive  
P.O. Box 367  
Noble Park, Vic. 3174  
Australia  
Tel. +61 3 9795 9599  
Fax +61 3 9795 9645  
[www.ivoclarvivadent.com.au](http://www.ivoclarvivadent.com.au)

**Ivoclar Vivadent GmbH**  
Tech Gate Vienna  
Donau-City-Strasse 1  
1220 Wien  
Austria  
Tel. +43 1 263 191 10  
Fax: +43 1 263 191 111  
[www.ivoclarvivadent.at](http://www.ivoclarvivadent.at)

**Ivoclar Vivadent Ltda.**  
Alameda Caiapós, 723  
Centro Empresarial Tamboré  
CEP 06460-110 Barueri – SP  
Brazil  
Tel. +55 11 2424 7400  
Fax +55 11 3466 0840  
[www.ivoclarvivadent.com.br](http://www.ivoclarvivadent.com.br)

**Ivoclar Vivadent Inc.**  
1-6600 Dixie Road  
Mississauga, Ontario  
L5T 2Y2  
Canada  
Tel. +1 905 670 8499  
Fax +1 905 670 3102  
[www.ivoclarvivadent.us](http://www.ivoclarvivadent.us)

**Ivoclar Vivadent Shanghai Trading Co., Ltd.**  
2/F Building 1, 881 Wuding Road,  
Jing An District  
200040 Shanghai  
China  
Tel. +86 21 6032 1657  
Fax +86 21 6176 0968  
[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

**Ivoclar Vivadent Marketing Ltd.**  
Calle 134 No. 7-B-83, Of. 520  
Bogotá  
Colombia  
Tel. +57 1 627 3399  
Fax +57 1 633 1663  
[www.ivoclarvivadent.co](http://www.ivoclarvivadent.co)

**Ivoclar Vivadent SAS**  
B.P. 118  
74410 Saint-Jorioz  
France  
Tel. +33 4 50 88 64 00  
Fax +33 4 50 68 91 52  
[www.ivoclarvivadent.fr](http://www.ivoclarvivadent.fr)

**Ivoclar Vivadent GmbH**  
Dr. Adolf-Schneider-Str. 2  
73479 Ellwangen, Jagst  
Germany  
Tel. +49 7961 889 0  
Fax +49 7961 6326  
[www.ivoclarvivadent.de](http://www.ivoclarvivadent.de)

**Ivoclar Vivadent Marketing (India) Pvt. Ltd.**  
503/504 Raheja Plaza  
15 B Shah Industrial Estate  
Veera Desai Road, Andheri (West)  
Mumbai, 400 053  
India  
Tel. +91 22 2673 0302  
Fax +91 22 2673 0301  
[www.ivoclarvivadent.in](http://www.ivoclarvivadent.in)

**Ivoclar Vivadent Marketing Ltd.**  
The Icon  
Horizon Broadway BSD  
Block M5 No. 1  
Kecamatan Cisauk Kelurahan Sampora  
15345 Tangerang Selatan – Banten  
Indonesia  
Tel. +62 21 3003 2932  
Fax +62 21 3003 2934  
[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

**Ivoclar Vivadent s.r.l.**  
Via Isonzo 67/69  
40033 Casalecchio di Reno (BO)  
Italy  
Tel. +39 051 6113555  
Fax +39 051 6113565  
[www.ivoclarvivadent.it](http://www.ivoclarvivadent.it)

**Ivoclar Vivadent K.K.**  
1-28-24-4F Hongo  
Bunkyo-ku  
Tokyo 113-0033  
Japan  
Tel. +81 3 6903 3535  
Fax +81 3 5844 3657  
[www.ivoclarvivadent.jp](http://www.ivoclarvivadent.jp)

**Ivoclar Vivadent Ltd.**  
12F W-Tower  
54 Seocho-daero 77-gil, Seocho-gu  
Seoul, 06611  
Republic of Korea  
Tel. +82 2 536 0714  
Fax +82 2 596 0155  
[www.ivoclarvivadent.co.kr](http://www.ivoclarvivadent.co.kr)

**Ivoclar Vivadent S.A. de C.V.**  
Calzada de Tlalpan 564,  
Col Moderna, Del Benito Juárez  
03810 México, D.F.  
México  
Tel. +52 (55) 50 62 10 00  
Fax +52 (55) 50 62 10 29  
[www.ivoclarvivadent.com.mx](http://www.ivoclarvivadent.com.mx)

**Ivoclar Vivadent BV**  
De Fruittuin 32  
2132 NZ Hoofddorp  
Netherlands  
Tel. +31 23 529 3791  
Fax +31 23 555 4504  
[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

**Ivoclar Vivadent Ltd.**  
12 Omega St, Rosedale  
PO Box 303011 North Harbour  
Auckland 0751  
New Zealand  
Tel. +64 9 914 9999  
Fax +64 9 914 9990  
[www.ivoclarvivadent.co.nz](http://www.ivoclarvivadent.co.nz)

**Ivoclar Vivadent Polska Sp. z o.o.**  
ul. Jana Pawla II 78  
00-175 Warszawa  
Poland  
Tel. +48 22 635 5496  
Fax +48 22 635 5469  
[www.ivoclarvivadent.pl](http://www.ivoclarvivadent.pl)

**Ivoclar Vivadent LLC**  
Prospekt Andropova 18 korp. 6/  
office 10-06  
115432 Moscow  
Russia  
Tel. +7 499 418 0300  
Fax +7 499 418 0310  
[www.ivoclarvivadent.ru](http://www.ivoclarvivadent.ru)

**Ivoclar Vivadent Marketing Ltd.**  
Qlaya Main St.  
Siricon Building No.14, 2<sup>nd</sup> Floor  
Office No. 204  
P.O. Box 300146  
Riyadh 11372  
Saudi Arabia  
Tel. +966 11 293 8345  
Fax +966 11 293 8344  
[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

**Ivoclar Vivadent S.L.U.**  
Carretera de Fuencarral nº24  
Portal 1 – Planta Baja  
28108-Alcobendas (Madrid)  
Spain  
Tel. +34 91 375 78 20  
Fax +34 91 375 78 38  
[www.ivoclarvivadent.es](http://www.ivoclarvivadent.es)

**Ivoclar Vivadent AB**  
Dalvägen 14  
169 56 Solna  
Sweden  
Tel. +46 8 514 939 30  
Fax +46 8 514 939 40  
[www.ivoclarvivadent.se](http://www.ivoclarvivadent.se)

**Ivoclar Vivadent Liaison Office**  
: Tesvikiye Mahallesi  
Sakayik Sokak  
Nisantas' Plaza No:38/2  
Kat:5 Daire:24  
34021 Sisli – Istanbul  
Turkey  
Tel. +90 212 343 0802  
Fax +90 212 343 0842  
[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

**Ivoclar Vivadent Limited**  
Compass Building  
Feldspar Close  
Warrens Business Park  
Enderby  
Leicester LE19 4SD  
United Kingdom  
Tel. +44 116 284 7880  
Fax +44 116 284 7881  
[www.ivoclarvivadent.co.uk](http://www.ivoclarvivadent.co.uk)

**Ivoclar Vivadent, Inc.**  
175 Pineview Drive  
Amherst, N.Y. 14228  
USA  
Tel. +1 800 533 6825  
Fax +1 716 691 2285  
[www.ivoclarvivadent.us](http://www.ivoclarvivadent.us)

**CE 0123**

Rx ONLY  
For dental use only!



Manufacturer:  
Ivoclar Vivadent AG, 9494 Schaan, Liechtenstein  
[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

Date information prepared: 2017-02, Rev. 0

These materials have been developed solely for use in dentistry. Processing should be carried out strictly according to the Instructions for Use. Liability cannot be accepted for damages resulting from failure to observe the Instructions or the stipulated area of application. The user is responsible for testing the products for their suitability and use for any purpose not explicitly stated in the Instructions. Descriptions and data constitute no warranty of attributes and are not binding. These regulations also apply if the materials are used in conjunction with products of other manufacturers.

Printed in Germany  
© Ivoclar Vivadent AG, Schaan / Liechtenstein  
689916/en

**ivoclar**  
**vivadent**  
technical