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CHAIRSIDE
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Your purchase of IPS e.max means you have chosen more than simply an all-ceramic system. You have taken the decision to benefit from the unlimited possibilities of all-ceramic. IPS e.max delivers high strength and highly aesthetic materials for the PRESS and the CAD/CAM technology.

The IPS e.max products are unique. They are recognized for their outstanding properties as well as exceptional versatility and flexibility – and they produce results with maximum aesthetics.

IPS e.max CAD is the first, high-strength, highly aesthetic glass-ceramic material that enables you to fully benefit from the full range of chairside CAD/CAM possibilities. The main area of indication is full crowns that are subsequently adhesively or self-adhesively placed.

With the other components of the IPS e.max System you are now also in the position to combine restorations fabricated chairside with lab-fabricated reconstructions in an ideal manner and thus provide your patients with comprehensive IPS e.max restorations. This combination also enables you to fully use the entire spectrum of modern all-ceramics ranging from glass-ceramics to zirconium oxide and thus offer your patients restorations with a maximum of personalized characteristics and true-to-nature individual appearance.
IPS e.max® CAD –
PRODUCT INFORMATION

MATERIAL

IPS e.max CAD is a lithium silicate glass-ceramic block for the CAD/CAM Technology. It is manufactured in an innovative process, which results in the exceptional homogeneity of the material. In its crystalline intermediate («blue») state, the block can be easily milled with CAD/CAM equipment. The striking colour that is characteristic for the pre-crystallized IPS e.max CAD blocks ranges between white, blue and bluish grey. This colour is created by the composition and microstructure of the glass-ceramic. The strength of the material at this machinable intermediary stage is 150 MPa. It is, therefore, comparable to other commercially available glass-ceramic blocks. After the IPS e.max CAD blocks have been milled, the material is crystallized in one of the Ivoclar Vivadent ceramic furnaces (eg Programat® CS or P300). The crystallization process is easy to conduct and takes approx. 25 minutes. In contrast to some other CAD/CAM ceramics, the blocks do not shrink significantly and they do not require complicated infiltration processes. The crystallization process at 840 °C (1544 °F) causes the microstructure to change through controlled growth of lithium disilicate crystals. The milling software takes the resulting densification of 0.2% into account in the milling process. The transformation of the microstructure produces the final physical properties including 360 MPa flexural strength and the suitable optical characteristics, such as shade, translucency and brightness. The IPS e.max CAD LT blocks demonstrate a true-to-nature brightness. The translucency and shade variety permit the fabrication of fully anatomic restorations from this glass-ceramic without any problems.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>CTE (100–400°C) [10^-6/K]</td>
<td>10.2</td>
</tr>
<tr>
<td>CTE (100–500°C) [10^-6/K]</td>
<td>10.5</td>
</tr>
<tr>
<td>Flexural strength (biaxial) [MPa]^*</td>
<td>360</td>
</tr>
<tr>
<td>Fracture toughness [MPa m^0.5]</td>
<td>2.25</td>
</tr>
<tr>
<td>Modulus of elasticity [GPa]</td>
<td>95</td>
</tr>
<tr>
<td>Vickers Hardness [MPa]</td>
<td>5800</td>
</tr>
<tr>
<td>Chemical solubility [µg/cm²]^*</td>
<td>40</td>
</tr>
<tr>
<td>Crystallization temperature [°C]</td>
<td>840</td>
</tr>
</tbody>
</table>

^*according to ISO 6872
**USAGE**

**Indications**
- Veneers
- Partial crowns
- Anterior and posterior crowns

**Contraindications**
- Full veneers on molar crowns
- Very deep subgingival preparations
- Patients with severely reduced residual dentitions
- Bruxism

**Important processing restrictions**
Failure to observe the following restrictions may compromise the results achieved with IPS e.max CAD:
- The frameworks must not fall below the required minimum thickness
- The blocks must not be milled in a non-compatible CAD/CAM system
- Crystallization must not be conducted in a ceramic furnace that has not been calibrated
- Crystallization must not be conducted in a ceramic furnace that has not been approved and/or recommended.
- Crystallization must not be conducted in a high-temperature furnace (e.g. Sintramat)
- IPS e.max CAD Crystall./Glaze, Shades, Stains, and Add-On must not be used on other dental ceramics.
- Do not mix IPS e.max CAD Crystall./Glaze, Shades, Stains, and Add-On with other dental ceramics (e.g. IPS e.max Ceram Glaze, Stains, and Essence).
- Veneering ceramics other than IPS e.max Ceram must not be used

**Side effects**
If the patient is known to be allergic to any of the components of IPS e.max CAD, the product should not be used to fabricate restorations.

**COMPOSITION**

**IPS e.max CAD Blocks**
Components: SiO₂
Additional contents: Li₂O, K₂O, MgO, Al₂O₃, P₂O₅ and other oxides

**IPS e.max CAD Crystall./Glaze, Shades and Stains**
Components: Oxides, glycols

**IPS e.max CAD Crystall./Glaze Spray**
Components: Oxides, propyl alcohol; Propellant: Isobutane

**IPS e.max CAD Crystall./Glaze Liquid**
Components: Butandiole

**IPS e.max CAD Crystall./Add-On**
Components: Oxides

**IPS e.max CAD Crystall./Add-On Liquid**
Components: Water, propylene glycol, butandiol, and chloride

**IPS Object Fix Putty / Flow**
Components: Oxides, water, thickening agent

**IPS Contrast Spray Chairside**
Components: Pigment suspension in ethanol; the propellant is a fluoridated hydrocarbon

**IPS Natural Die Material**
Components: Polyester urethane dimethacrylate, paraffin oil, SiO₂ and copolymer

**IPS Natural Die Material Separator**
Components: Wax dissolved in hexane

**IPS Ceramic Etching Gel**
Components: Hydrofluoric acid

**Warnings**
- Hexane is highly flammable and detrimental to health. Avoid contact with skin and eyes. Do not inhale the vapours and keep away from sources of ignition.
- Do not inhale ceramic grinding dust during processing – use suction equipment and a face mask.
- Etching gel contains hydrofluoric acid. Avoid contact with skin, eyes, and clothing at any time, since the material is highly toxic and corrosive. The etching gel is intended for professional use only and must not be applied intra-orally (in the oral cavity).
**BLOCK CONCEPT**

The shading and opacity control of the IPS e.max CAD blocks is based on a unique translucency/opacity concept. The system offers flexibility and can be used with A-D, Chromascop and Bleach BL shades. IPS e.max CAD blocks are available in 2 degrees of translucency. The individual levels of the concept are determined by processing techniques and indications. Consequently, maximum flexibility and application variety can be achieved. For chairside applications (staining and cut-back technique) the IPS e.max CAD LT block is used.

<table>
<thead>
<tr>
<th>Translucency level</th>
<th>Processing technique</th>
<th>Indications</th>
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<tbody>
<tr>
<td>Low Translucency</td>
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<tr>
<td></td>
<td>Staining technique</td>
<td>Veneers</td>
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<td></td>
<td>Cut-back technique</td>
<td>Partial crowns</td>
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<td></td>
<td>Layering technique</td>
<td>Anterior crowns</td>
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<td></td>
<td></td>
<td>Posterior crowns</td>
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<tr>
<td>IPS e.max CAD LT (Low Translucency)</td>
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</tbody>
</table>
The blocks are available in 9 A-D, 4 Bleach BL shades and in 2 different sizes (I12, C14). Due to their translucency, they are ideal for fabricating restorations in the staining and cut-back technique. Shading is based on the tried-and-tested shades of IPS Empress CAD LT. The blocks are shaded according to the tooth shade. Thus, staining and veneering is reduced to a minimum.

Comparison: IPS e.max CAD LT before and after crystallization

IPS e.max CAD LT (above) compared to IPS Empress CAD LT (below)
IPS e.max CAD for CEREC® Basic Kit LT (Low Translucency) A–D

The IPS e.max CAD for CEREC Basic Kit LT comprises blocks as well as the necessary working accessories for chairside applications using the CEREC System (Sirona). The Basic Kit is supplied in a materials cabinet and can be expanded as desired with other IPS e.max Kits.

**Delivery form:**
- IPS e.max CAD for CEREC Basic Kit LT (Low Translucency) A–D
  - 4x 5 IPS e.max CAD LT for CEREC and inLab Blocks C14;
    - Shades: LT A1, LT A2, LT A3, LT B1
  - 2x 3 g IPS e.max CAD Crystall./ Shades
    - Shades: 1, 2
  - 2x 3 g IPS e.max CAD Crystall./ Shades Incisal
    - Shades: SH 11, SH 12
  - 4x 1 g IPS e.max CAD Crystall./ Stains
    - Shades: white, sunset, khaki, mahogany
  - 1x 3 g IPS e.max CAD Crystall./Glaze Paste
  - 1x 270 ml IPS e.max CAD Crystall./Glaze Spray
  - 1x 15 ml IPS e.max CAD Crystall./Liquid
  - 1x 5 g IPS e.max CAD Crystall./Add-On
  - 1x 15 ml IPS e.max CAD Crystall./Add-On Liquid
  - 1x IPS e.max CAD Crystallization Tray
  - 1x 10 ml IPS Object Fix Flow
  - 1x 10 g IPS Object Fix Putty
  - 1x 50 ml IPS Contrast Spray Chairside
  - 1x IPS Ceramic Etching Gel Kit
  - 1x Virtual CADbite Test Pack
  - 1x IPS e.max Press/CAD LT Materials Shade Guide
  - var. accessories

IPS e.max CAD for CEREC® and inLab® LT Blocks (Low Translucency)

The Blocks for the staining and cut-back technique are available in 2 sizes (I12 and C14) and in 9 A–D shades as well as in 4 Bleach BL shades.

**Delivery form:**
- IPS e.max CAD for CEREC and inLab LT Blocks Refill
  - 13 x 5 IPS e.max CAD for CEREC and inLab LT I12
    - Shades: LT BL1, LT BL2, LT BL3, LT BL4, LT A1, LT A2, LT A3, LT A3.5, LT B1, LT B2, LT B3, LT C2, LT D3
  - 13 x 5 IPS e.max CAD for CEREC and inLab LT C14
    - Shades: LT BL1, LT BL2, LT BL3, LT BL4, LT A1, LT A2, LT A3, LT A3.5, LT B1, LT B2, LT B3, LT C2, LT D3

For information about the CEREC® System, please contact:
Sirona Dental Systems GmbH
Fabrikstrasse 31
64625 Bensheim
Germany
E-mail: contact@sirona.de
www.sirona.com

CEREC® is a registered trademark of Sirona Dental Systems GmbH
Successful results can only be achieved with IPS e.max CAD if the guidelines and framework thicknesses are strictly observed.

**Veneer**
If possible, the preparation should be entirely located in the enamel. The incisal preparation margins should not be located in the area of the abrasion surfaces or dynamic occlusal surfaces. By preparing orientation grooves using a depth marker, controlled enamel reduction can be achieved. Dissolution of the proximal contacts is not required.

For **preparation without involving reduction of the incisal edge (only labial reduction)**, the preparation depth in the labial area should be at least 0.6 mm.

For **preparation involving reduction of the incisal edge (labial/incisal reduction)**, the preparation depth in the cervical and labial area should be at least 0.6 mm. The incisal edge must be reduced by 0.7 mm. The extent of the incisal reduction depends on the desired translucency of the incisal area to be built up. The more transparent the incisal edge of the intended veneer, the more pronounced the reduction should be. Discoloured teeth may require more preparation.

**Partial crown**
Provide at least 1.5 mm of space in the cusp areas. Partial crowns are indicated if the preparation margin is less than approx. 0.5 mm away from the cusp tip, or if the enamel is severely undermined. The shoulder should be prepared without a chamfer, i.e. in a 90° angle to the residual tooth structure.
Anterior and posterior crowns
The anatomic shape is evenly reduced while observing the given minimum framework thickness. A circular shoulder is prepared with rounded inner edges or a chamfer at an angle of 10-30º. The width of the circular shoulder/chamfer is approx. 1.0 mm. Reduction incisal or occlusal by approx. 1.5 mm. The vestibular or lingual reduction is approximately 1.2 mm for anterior teeth and approximately 1.5 mm for posterior teeth. The incisal edge of the preparation should be at least 1.0 mm (milling tool geometry) in order to permit optimum milling of the incisal edge during CAD/CAM processing.
IPS e.max® CAD – OVERVIEW OF THE TREATMENT PROCEDURE

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<th>Working Steps</th>
<th>Ivoclar Vivadent products</th>
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<td>Tooth Shade Determination</td>
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<tr>
<td>Intra-Oral Imaging</td>
<td>IPS e.max Press/CAD LT</td>
</tr>
<tr>
<td>Milling</td>
<td>Materials Shade Guide</td>
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<tr>
<td>Preparing for crystallization</td>
<td>IPS® Natural Die Material</td>
</tr>
<tr>
<td>Characterization / Glaze / Adjustments</td>
<td>To determine the die shade of the prepared tooth</td>
</tr>
<tr>
<td>Combination firing (Crystallization/Glaze)</td>
<td>OptraGate®</td>
</tr>
<tr>
<td>Preparing for cementation</td>
<td>Provides easy access to the extended treatment area by circular retraction of lips and cheeks.</td>
</tr>
<tr>
<td>Cementation</td>
<td>IPS® Contrast Spray Chairside</td>
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<td>Enables optimum imaging through detailed definition of the margins.</td>
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<tr>
<td></td>
<td>Virtual® CADbite Registration</td>
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<tr>
<td></td>
<td>Scannable bite registration material, e.g. to record the occlusal bite for the fabrication of indirect restorations.</td>
</tr>
<tr>
<td></td>
<td>IPS e.max CAD Blocks</td>
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<tr>
<td></td>
<td>Lithium silicate glass-ceramic blocks for the CAD/CAM technology</td>
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<tr>
<td></td>
<td>IPS e.max CAD Crystallization Tray / Pins</td>
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<td></td>
<td>Special firing tray and pins for the crystallization of IPS e.max CAD.</td>
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<td></td>
<td>IPS® Object Fix Putty / Flow</td>
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<td>Auxiliary firing paste in different viscosities for the crystallization of IPS e.max CAD.</td>
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<tr>
<td></td>
<td>IPS e.max CAD Crystall./Shades, Stains, Glaze and Glaze Liquid</td>
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<tr>
<td></td>
<td>Special Shades, Stains and Glaze in paste form for IPS e.max CAD</td>
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<tr>
<td></td>
<td>IPS e.max CAD Crystall./Glaze Spray</td>
</tr>
<tr>
<td></td>
<td>Special glaze in spray form for IPS e.max CAD.</td>
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<tr>
<td></td>
<td>IPS e.max CAD Crystall./Add-On und Add-On Liquid</td>
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<tr>
<td></td>
<td>Special add-on material for IPS e.max CAD LT</td>
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<td>Programat® CS</td>
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<td>Compact, easy-to-operate ceramic furnace with vacuum function for the dental office.</td>
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<td>IPS® Ceramic Etching Gel</td>
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<td>For the fabrication of retentive bonding surfaces on ceramic restorations.</td>
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<tr>
<td></td>
<td>Monobond-S®</td>
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<tr>
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<td>Produces silanated bonding surfaces on etched all-ceramic restorations.</td>
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<tr>
<td></td>
<td>Variolink®, Multilink® Automix</td>
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<td>Tried-and-tested adhesive cementation systems.</td>
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<td></td>
<td>Vivaglass® CEM</td>
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<tr>
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<td>Aesthetic glass ionomer cement for the conventional cementation.</td>
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<tr>
<td></td>
<td>bluephase®</td>
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<td></td>
<td>The cordless high-performance LED for all indications.</td>
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</tbody>
</table>
Shade determination

The correct tooth shade is the basis for a restoration with a life-like appearance. After tooth cleaning, the tooth shade of the non-prepared tooth and/or the adjacent teeth is determined. Individual characteristics have to be taken into consideration when determining the tooth shade. If a crown preparation is planned, for example, the cervical shade should also be determined. In order to achieve true-to-nature results, shade determination should be carried out at daylight. Furthermore, the patient should not wear clothes of intensive colours and/or lipstick. Basically, it has to be kept in mind that the final shade of the restoration is the result of the following individual shades:
- Die shade
- Shade of the ceramic block
- Shade of the layering ceramic
- Shade of the cementation material

IPS e.max Press/CAD LT Materials Shade Guide
Since the IPS e.max CAD blocks demonstrate a bluish shade prior to crystallization, they cannot be used for the selection of the block shades. For that purpose, the materials shade guide is used, which shows the shade of all the available IPS e.max CAD blocks after crystallization, as well as all the IPS e.max Press ingots.

IPS Natural Die Material
In order to facilitate the reproduction of the tooth shade, the shade of the prepared tooth can be determined with the help of the IPS Natural Die Material shade guide. With the help of the die shade and the desired tooth shade, the corresponding block can be selected. Further information regarding the influence of the die shade on the final shade of the restoration can be found on the combination tables.
Intra-oral imaging

To prepare for optical imaging, OptraGate® is placed to facilitate access to the treatment field. OptraGate is a clinical auxiliary device that retracts lips and cheeks during dental treatment. It enables a full view of the treatment field, facilitates the accessibility, and improves the moisture control in the oral cavity.

IPS® Contrast Spray Chairside is used to achieve optimum recordings for CAD/CAM restorations. The IPS Contrast Spray Chairside balances out the different optical properties of the natural tooth (dentin and enamel) and thus permits excellent impressions using a camera. With the atomizing nozzle, an optimum covering layer with a detailed representation of the preparation surfaces and margins is achieved easily and efficiently with only a short spray discharge. Angled atomizing heads are available for the spray. Please observe the corresponding Instructions for Use.

Virtual® CADbite is a scannable bite registration material with a reflective surface, which is ideally suitable for capturing images with intra-oral scanning devices (antagonist data).

Milling

The IPS e.max CAD LT block is selected in accordance with the clinical situation. It not only determines the selection of the block in the required shade, but also the block size to be used. Once the desired block has been selected, it is mounted in the CAM unit and the restoration is milled.
Preparing for crystallization

IPS Object Fix Putty and IPS Object Fix Flow are auxiliary firing pastes to support all-ceramic restorations during the firing and/or crystallization procedure. The pastes are used to stabilize and secure the corresponding restoration on the IPS e.max CAD Crystallization Pins.

IPS Object Fix Putty / Flow are easy to apply, as well as easy to remove after the firing procedure.

Characterization / Glaze / Adjustments

IPS e.max CAD restorations are characterized with IPS e.max CAD Crystall./Shades and Stains.

There are 7 IPS e.max CAD Crystall./Stains and 5 IPS e.max CAD Crystall./Shades available. To imitate the incisal area, 2 IPS e.max Crystall./Shade Incisal can be used, which enhance the optical in-depth effect and translucency in the incisal third.

To glaze the IPS e.max CAD restoration, you may choose between the IPS e.max CAD Crystall./Glaze Paste and the IPS e.max CAD Crystall./Glaze Spray.

For shape adjustments (e.g. proximal or occlusal contact points), IPS e.max CAD Crystall./Add-On is available. It is mixed with IPS e.max CAD Crystall./Add-On Liquid and can be directly applied with the Crystallization firing or any subsequent corrective firing.
**Combination firing**  
*(Crystallization / Glaze)*

For crystallization, IPS e.max CAD is fired on the **IPS e.max CAD Crystallization Tray** and the corresponding **IPS e.max CAD Crystallization Pins**. This firing tray stores heat and ensures slow and most of all tension-free cooling of the glass-ceramic.

The firing cycles are conducted in the **Programat CS** or any other Ivoclar Vivadent ceramic furnace. The Programat CS is easy to operate and is especially suitable for glaze and crystallization firings. Including its integrated vacuum function, the furnace has been ideally coordinated with the IPS e.max CAD blocks.

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**Preparing for cementation**

Conditioning of the ceramic furnace to prepare for adhesive cementation is required for a sound bond between the cementation material and the all-ceramic restoration. Generally, glass-ceramics are etched using **IPS® Ceramic Etching Gel**. Etching produces retentive bonding surfaces, which increases the bond between the luting composite and the all-ceramic restoration. IPS Ceramic Etching gel is exclusively intended for extra-oral use and must not be applied in the oral cavity.

Subsequent silanating of the bonding surface using **Monobond-S** results in a sound bond between the etched all-ceramic material and the luting composite. The bonding silane is thus an important contributor to the bonding strength between the IPS e.max CAD restorations and the tooth structure.
Cementation

For the cementation of IPS e.max restorations, you may choose between the tried-and-tested cementation materials from the coordinated assortment of Ivoclar Vivadent.

**Variolink® II / Variolink Veneer**
The dual-curing, highly aesthetic luting composite Variolink II has been successfully used for more than 10 years and offers excellent clinical results. The light-curing Variolink Veneer is especially indicated for the adhesive cementation of veneers to achieve enhanced shade and translucency effects.

**Multilink® Automix**
The universal, dual-curing luting composite offers a wide range of indications. Furthermore, it generates a very strong bond on all material surfaces.

**Vivaglass® CEM**
Vivaglass CEM is an aesthetic glass ionomer cement for the conventional cementation of high-strength all-ceramic restorations (zirconium oxide and lithium disilicate ceramics). Vivaglass CEM contains a particularly transparent glass filler for achieving aesthetic results.

LED lights of the **bluephase®** family are used for the polymerization of light-curing and dual-curing adhesive composites. The high light intensity achieved with bluephase permits comparatively short polymerization times with simultaneous good polymerization depth.

Especially for the demanding polymerization of adhesively cemented all-ceramic restorations, **bluephase 16i** is used. In the process, the entire strength of the high performance LED is utilized. All-ceramic restorations are incorporated as quickly as possible.

| IPS e.max Press | Thin veneers, veneers | ✔ | – |
|                | Partial crowns       | ✔ | – |
|                | Anterior and posterior crowns, 3-unit bridges up to the second premolar | ✔ | ✔ |
| IPS e.max ZirPress | Veneers | ✔ | – |
| IPS e.max ZirCAD + IPS e.max ZirPress | Inlay-retained bridges | ✔ | – |
| IPS e.max ZirCAD | Crowns and bridges | ✔ | ✔ |
| IPS e.max CAD | Veneers | ✔ | – |
|                | Partial crowns       | ✔ | – |
|                | Anterior and posterior crowns | ✔ | ✔ |
| IPS e.max Ceram | Veneers | ✔ | – |

**Recommended cementation materials**

| IPS e.max Press | Variolink II | Variolink Veneer | Multilink Automix | Vivaglass CEM |
| IPS e.max ZirPress | – | – | – | – |
| IPS e.max ZirCAD | – | – | – | – |
| IPS e.max ZirCAD | – | – | – | – |
| IPS e.max CAD | – | – | – | – |
| IPS e.max Ceram | – | – | – | – |

✔ recommended product combination
– not recommended/product combination not possible
* self-adhesive powder-liquid systems
IPS e.max® CAD LT – STAINING TECHNIQUE

The IPS e.max CAD blocks have been developed for processing in CAD/CAM systems. After the CAD/CAM process, the restorations are tried-in in the blue state. Any necessary adjustments should be done in this stage. Individualized characterizations and glaze are applied before the combined Crystallization and Glaze firing is conducted. In this way, processing is very efficient and leads to an aesthetic result quickly and easily.

Preparation

After the determination of the tooth shade, preparation is carried out according to the preparation guidelines. As a preparation for intra-oral imaging, the cleaned and dried preparation is covered with IPS Contrast Spray Chairside with one short spray discharge.

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

Preparation: Occlusal view

Preparation: Buccal view

Preparation sprayed with IPS Contrast Spray Chairside ready for intra-oral recording.

Please refer to the corresponding Operating Instructions and/or Manuals of the respective CAD/CAM system for further information on the CAD/CAM processing procedure. The instructions by the manufacturer must be observed.
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 (please see the corresponding recommendations from Ivoclar Vivadent).

The following procedure is recommended to finish IPS e.max CAD restorations:
– Grinding adjustments of milled IPS e.max CAD frameworks must be made in the precrystallized (blue) state if possible.
– Only use suitable grinding instruments, low rpms and light pressure to prevent delamination and chipping at the edges in particular.
– Adjustments by grinding are carried out with fine-grained diamonds (<60 µm) and/or fine, diamond-coated rubber polishers or silicon carbide rubber polishers.
– Overheating of the glass-ceramic must be avoided.
– Smooth out the attachment point of the block and consider the proximal contacts.
– If necessary, carry out individual shape adjustments.
– Try-in the restoration in its blue state and adjust the occlusion/articulation.
– Do not finish the crown margins too thinly, since these margins may round out during crystallization.
– Prior to crystallization, always clean the restoration with ultrasound in a water bath and/or the steam jet.

Make sure that the restorations are thoroughly cleaned before further processing and that any residue of the milling additive of the CAD/CAM milling unit has been removed. Residue of the milling additive remaining on the surface may result in bonding problems and discolouration during the speed Crystallization/Glaze firing.

Smooth out the attachment points and finish the restoration after the CAD/CAM process with fine-grained diamonds.

Finish margins with suitable polishers.

Try-in the IPS e.max CAD crown in its pre-crystallized (“blue”) state.

Check the proximal and occlusal contact points.
Preparing the restoration for the combination firing

For crystallization, the restoration has to be placed on the IPS e.max CAD Crystallization Tray. To support the restoration during crystallization, two auxiliary firing pastes (IPS Object Fix Putty and IPS Object Fix Flow) with different viscosities are available.

To prepare the combination firing (crystallization/glaze) please observe the following procedure:

– 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 crown walls.
– Fill the inside of crowns with IPS Object Fix Putty / Flow up to the restoration margin.
– For full crowns, it is recommended to use the Putty variant, while the Flow variant should be used for partial crowns and veneers.
– Press the selected IPS e.max CAD Crystallization Pin deeply into the Putty / Flow material so that it is adequately secured.
– Smooth out displaced auxiliary firing paste using a plastic spatula (e.g. Optra®Sculpt) so that the pin is securely in place in the paste and the crown margin is optimally supported.
– Avoid contamination of the outer side of the restoration. Clean off any possible residue adhering to the outer surface of the restoration with a brush dampened with water and dry.
Remove any contamination from the outer surface of the crown using a brush dampened with water and dry.

Smooth displaced IPS Object Fix or Putty between the margin and the support pin using a plastic spatula so that the pin is securely in place in the paste and the crown margin is optimally supported.

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

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

With the IPS e.max CAD Crystall./Shades and IPS e.max CAD Crystall./Stains, you have the possibility to apply characterizations already in the “blue” state of the restoration prior to combination firing. The following Shades and Stains are available for characterization:

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

<table>
<thead>
<tr>
<th>Shade Incisal 1</th>
<th>Shade Incisal 2</th>
<th>Shade 0</th>
<th>Shade 1</th>
<th>Shade 2</th>
<th>Shade 3</th>
<th>Shade 4</th>
</tr>
</thead>
</table>

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

- Cusps: white/creme
- Cusps, marginal ridges: white/creme
- Cusps, marginal ridges: Stains white/creme
- Cusps, marginal ridges: mahogany
- Fissures: Stains mahogany
- Enhancing the chroma: Stains sunset/copper

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

- Slight characterizations on the buccal surface with IPS e.max CAD Crystall./Shade Incisal and Stains.
- Occlusal characterizations with IPS e.max CAD Crystall./Shades and Stains.

**Example of an excessively thick layer of IPS e.max CAD Crystall./Shades and Stains**

- Excessively thick layer of IPS e.max CAD Crystall./Shades
- Excessively thick layer of IPS e.max CAD Crystall./Shades and Stains
Combination firing (crystallization/glaze)

In a combination firing, the crystallization of IPS e.max CAD and the Glaze firing are conducted in one single step. Characterizations and the glaze may basically be applied in two ways. Please observe the different procedures for the use of the IPS e.max CAD Crystall./Glaze Spray and the IPS e.max CAD Crystall./Glaze Paste.

**Variant A:**

**IPS e.max CAD Crystall./Glaze Paste**

To apply individual characterizations and glaze, please observe the following procedure:

- The extended surface of the restoration must be free of auxiliary firing paste and dry before the IPS e.max CAD Crystall./Shades, Stains, and Glaze are applied.
- Extrude IPS e.max CAD Crystall./Glaze paste from the syringe and mix thoroughly.
- If a slight thinning is desired, the Glaze can be mixed with a little IPS e.max CAD Crystall./Glaze Liquid. Do not thin the material too much, since this will cause the Glaze Paste to run uncontrollably.
- Hold the restoration by the firing pin and evenly apply IPS e.max CAD Crystall./Glaze paste on the entire restoration using a brush.
- Avoid to apply too thick a glaze layer. Avoid pooling, especially on the occlusal surface.
- Too thin a glaze layer may lead to an unsatisfactory gloss.
- If characterizations are desired, the restorations can be individualized using IPS e.max CAD Crystall./Shades and/or IPS e.max CAD Crystall./Stains before crystallization firing.
- Extrude Shades and Stains from the syringe and mix thoroughly.
- The Shades and Stains can be thinned to the desired consistency using IPS e.max CAD Crystall./Glaze Liquid. Do not thin too much, since this will cause the Shades and Stains to run uncontrollably.
- Apply mixed Shades and Stains directly into the unfired glaze layer using a fine brush (2-in-1 technique).
After glazing and staining, the combination firing (Crystallization/Glaze) is conducted in a compatible ceramic furnace (e.g. Programat CS). When placing the objects into the furnace and setting the firing parameters, please observe the following points:

- Place the restoration including the pin into the center of the IPS e.max CAD Crystallization Tray.
- A maximum of 6 restorations can be positioned on the firing tray and crystallized using the combination firing with IPS e.max CAD Crystall./Glaze paste.

Place the glazed and stained restoration including the pin into the center of the IPS e.max CAD Crystallization Tray. Do not use a honey-comb firing tray for crystallization.

Conduct the combination firing (Crystallization/Glaze) using the following parameters

### Firing parameters for the Combination firing Crystallization/Glaze

<table>
<thead>
<tr>
<th>Furnace</th>
<th>Stand-by temperature</th>
<th>Closing time</th>
<th>Heating rate</th>
<th>Firing temperature</th>
<th>Holding time</th>
<th>Heating rate</th>
<th>Firing temperature</th>
<th>Holding time</th>
<th>Vacuum 1</th>
<th>Vacuum 2</th>
<th>Longterm cooling</th>
<th>Cooling rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programat CS Program 1</td>
<td>403°C 757°F</td>
<td>6:00 min</td>
<td>90°C/min 162°F/min</td>
<td>820°C 1508°F</td>
<td>0:10 min</td>
<td>30°C/min 54°F/min</td>
<td>840°C 1544°F</td>
<td>7:00 min</td>
<td>550/820°C 1022/1508°F</td>
<td>820/840°C 1508/1544°F</td>
<td>700°C 1292°F</td>
<td>20°C/min 36°F/min</td>
</tr>
<tr>
<td>Programat CS Program 2</td>
<td>403°C 757°F</td>
<td>6:00 min</td>
<td>60°C/min 108°F/min</td>
<td>840°C 1544°F</td>
<td>3:00 min</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>450°C 842°F</td>
<td>839°C 1542°F</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Please note: these firing parameters are not suitable for the crystallization of IPS e.max CAD MO!

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.

### Firing parameters for the Correction firing

<table>
<thead>
<tr>
<th>Furnace</th>
<th>Stand-by temperature</th>
<th>Closing time</th>
<th>Heating rate</th>
<th>Firing temperature</th>
<th>Holding time</th>
<th>Heating rate</th>
<th>Firing temperature</th>
<th>Holding time</th>
<th>Vacuum 1</th>
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<td>450°C 842°F</td>
<td>839°C 1542°F</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
Variant B:

**IPS e.max CAD Crystall./Glaze Spray**

Instead of the IPS e.max CAD Crystall./Glaze Paste, IPS e.max CAD Crystall./Glaze Spray may also be used. Follow the procedure below for this purpose:

– Secure the restoration on a suitable IPS e.max CAD Crystallization Pin as described above.
– Make sure that the auxiliary firing paste (IPS e.max CAD Object Fix Putty or Flow) is flush with the crown margin.
– Before characterization and glazing, the outer surface of the restoration must be dry and free of auxiliary firing paste.
– If characterizations are desired, the restoration may be individualized using IPS e.max CAD Crystall./Shades and IPS e.max CAD Crystall./Stains before the crystallization firing.
– Extrude Shades and Stains from the syringe and mix thoroughly.
– The Shades and Stains can be thinned to the desired consistency using IPS e.max CAD Crystall./Glaze Liquid.
  
  Do not thin too much, since this will cause the Shades and Stains to run uncontrollably.
– Apply the mixed Shades and Stains directly on the blue restoration using a brush.
– Observe the Characterization Guide (see page 20) for the application of the Shades and Stains.
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.
– Shake the spray can well immediately before use until the mixing ball in the container is moving freely (approximately 20 seconds). If the spray is not sufficiently shaken, mainly the propellant is discharged with a spraying burst. This, in turn, results in the glazing powder in the spray not being entirely used up and a residue remaining in the can.
– 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. Shake the spray can again between individual bursts.
– Wait 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 center of the IPS e.max CAD Crystallization Tray.
– Conduct the combination firing using the stipulated firing parameters (Crystallization/Glaze).

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 well 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 on the IPS e.max CAD Crystallization Tray in the furnace and fire using the stipulated parameters.

Conduct the Combination firing (Crystallization/Glaze) in a furnace using the following parameters:

### Firing parameters for the Combination firing Crystallization/Glaze

<table>
<thead>
<tr>
<th>Furnace</th>
<th>Stand-by temperature B</th>
<th>Closing time S</th>
<th>Heating rate t₁</th>
<th>Heating rate t₂</th>
<th>Firing temperature T₁</th>
<th>Holding time H₁</th>
<th>Firing temperature T₂</th>
<th>Holding time H₂</th>
<th>Vacuum 1 1₁ 1₂</th>
<th>Vacuum 2 2₁ 2₂</th>
<th>Long-term cooling L</th>
<th>Cooling rate t₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programat CS Program 1</td>
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<td>700°C / 1292°F</td>
<td>20°C/min / 36°F/min</td>
</tr>
<tr>
<td>Programat CS Program 2</td>
<td>403°C / 757°F</td>
<td>6.00 min</td>
<td>60°C/min / 108°F/min</td>
<td>840°C / 1544°F</td>
<td>3.00 min</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>450°C / 842°F</td>
<td>839°C / 1542°F</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

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.

### Firing parameters for the Correction firing

<table>
<thead>
<tr>
<th>Furnace</th>
<th>Stand-by temperature B</th>
<th>Closing time S</th>
<th>Heating rate t₁</th>
<th>Heating rate t₂</th>
<th>Firing temperature T₁</th>
<th>Holding time H₁</th>
<th>Firing temperature T₂</th>
<th>Holding time H₂</th>
<th>Vacuum 1 1₁ 1₂</th>
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<td>839°C / 1542°F</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
### Example of incorrect Glaze Spray application

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

<table>
<thead>
<tr>
<th>Problem: Too much Glaze Spray on the restoration</th>
<th>Before Firing</th>
<th>After Firing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Possible cause:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Distance between the spray can and the restoration too close</td>
<td>Too much IPS e.max CAD Crystall./Glaze Spray applied</td>
<td>Loss of texture and too glossy surface</td>
</tr>
<tr>
<td>– Too much spray applied</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Optional

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

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

Processing:
– Mix IPS e.max CAD Crystall./Add-On with IPS e.max Crystall./Add-On to a creamy consistency.
– Make sure that the Add-On material is thoroughly mixed with the liquid so that an optimum firing result can be achieved.
– Apply the mixed Add-On material directly on the areas to be adjusted on the unfired Glaze Paste and/or Shades and Stains using a brush 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.

Firing parameters for the Correction firing

<table>
<thead>
<tr>
<th>Furnace</th>
<th>Stand-by temperature</th>
<th>Closing time</th>
<th>Heating rate</th>
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<td>450°C 842°F</td>
<td>839°C 1542°F</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
Preparing for cementation

Once the IPS e.max CAD restoration has cooled to room temperature, proceed with the following steps:

– Remove the restoration from the hardened IPS Object Fix Putty / Flow.
– Remove any residue with ultrasound in a water bath and/or with steam.
– Do not remove residue with Al₂O₃ or glass polishing beads.
– Finally, try-in the restoration before permanent cementation.
– Adjustments by grinding of the crystallized restoration are to be avoided whenever possible due to the high final strength of the material. Shape adjustments and occlusal/proximal contact points should have be carried out already in the blue state.
– If adjustments by grinding of the restoration are required, make sure that no overheating of the ceramic occurs.
– Use fine-grained diamonds (<60 µm) for finishing, followed by rubber polishers at low speed and limited pressure.
– Finally, polish the adjusted areas to a high gloss (e.g. using OptraFine).
– Thoroughly clean the restoration.
Etching and silanating

Irrespective of the cementation method and material used, the IPS e.max CAD restoration is prepared as follows:
  – Apply IPS Ceramic Etching Gel on the surface to be etched using a plastic spatula or disposable brush. Prevent the Etching Gel from contacting surfaces that do not have to be etched.
  – Allow the IPS Ceramic Etching Gel to react for 20 seconds. A longer etching time does not result in enhanced bonding strength with the cementation material.
  – After the reaction time, rinse off Etching Gel under running water into a cup (polyethylene, approx. 250 ml). For neutralization, please observe the Instructions for Use of the IPS Ceramic Etching Gel.
  – Thoroughly dry the restoration.
  – If the restoration should be adhesively cemented, subsequently apply Monobond-S on the etched surfaces and allow to react for 60 seconds.
  – After the reaction time, dry the remaining residue with water- and oil-free air.

![Etching of the IPS e.max CAD restoration for 20 seconds using IPS Ceramic Etching Gel](image1)

![Apply Monobond-S on the etched surface, let it react for 60 seconds and blow dry](image2)
Cementation

For the cementation of IPS e.max CAD restorations, you may basically choose between the tried-and-tested cementation materials from Ivoclar Vivadent.

Cementation of IPS e.max CAD restorations with Multilink® Automix

For the cementation of IPS e.max CAD restorations with **Multilink Automix** please proceed as follows:
- Clean the preparation, rinse with water and dry with air.
- Apply Multilink Primer A and B on enamel and dentin.
- Apply Multilink Automix directly into the etched and silanized restoration.
- Place the restoration and remove excess cementation material.

Cementation of IPS e.max CAD restorations with Vivaglass® CEM

For the cementation of IPS e.max CAD restorations with **Vivaglass CEM** please proceed as follows:
- Clean the preparation, rinse with water and dry with air.
- Apply mixed Vivaglass CEM into the restoration.
- Place the restoration and remove excess cementation material.

Please observe the detailed processing steps of the respective cementation material!
Clean preparation, rinse with water ...

... and blow dry with air. Depending on the cementation material used, subsequently apply the bonding system.

Apply Multilink Automix directly in the etched and silanated restoration.

Set the restoration and remove excess.

Completed IPS e.max CAD restoration in situ, occlusal and buccal view.
To fabricate highly aesthetic restorations, especially in the anterior region, the incisal and/or occlusal third may be veneered using the IPS e.max Ceram nano-fluorapatite glass-ceramic. The individual working steps are briefly described below. For a more detailed description of the materials involved, as well as the individual working steps, please refer to the IPS e.max CAD labside Instructions for Use.

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.

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 e.max Ceram Glaze, Shades, and Essence.
Completion of the anatomical shape of the reduced areas using IPS e.max Ceramic Incisal and Opal materials.

Finish the restoration using diamond finishers and work out the natural shape and surface. Finally, conduct the Glaze firing using IPS e.max Ceram Glaze.
**PREPARING FOR CEMENTATION**

Conditioning of the ceramic surface in preparation for cementation is decisive for generating a sound bond between the luting material and the all-ceramic restoration.

The following steps must be observed:

- Glass-ceramics must **not** be blasted with Al₂O₃ or glass polishing beads.
- High-strength glass-ceramics are generally etched with hydrofluoric acid gel (IPS Ceramic Etching Gel).
- In order to further increase the bond strength (restoration/cementation material), silanize the surface with Monobond-S.

---

<table>
<thead>
<tr>
<th>IPS e.max CAD</th>
<th>Material: Lithium disilicate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indication</td>
<td>Veneers 1), partial crowns 2), anterior and posterior crowns</td>
</tr>
<tr>
<td>Cementation method</td>
<td>Adhesive cementation</td>
</tr>
<tr>
<td>Etching</td>
<td>20 sec. with IPS Ceramic Etching Gel</td>
</tr>
<tr>
<td>Conditioning / Silanization</td>
<td>60 sec. with Monobond-S</td>
</tr>
<tr>
<td>Cementation system</td>
<td>Variolink® Veneer Variolink® II Multilink® Automix</td>
</tr>
</tbody>
</table>

1) For adhesive cementation, the restorations must be silanized.
2) Partial crowns and veneers must be adhesively cemented.

Please observe the corresponding Instructions for Use.
CARE INSTRUCTIONS

Proxyt® – Professional care

Like natural teeth, high-quality IPS e.max CAD restorations require regular professional care. This is not only beneficial to the health of the gingiva and teeth but also to the overall aesthetic appearance. You can care for valuable surfaces without abrasion using the pumice-free polishing paste Proxyt pink. The low RDA* value = 7 gives you peace of mind of cleaning with a low-abrasion paste. Scientific investigations and longstanding practical experience confirm the gentle effect compared to other pastes.

*Relative Dentin Abrasion

Application of Proxyt
CRYSTALLIZATION/FIRING PARAMETERS

For the crystallization of IPS e.max CAD, the following aspects have to be observed:

– Conduct the crystallization in an Ivoclar Vivadent ceramic furnace (e.g. Programat CS, Programat P300) using the stipulated parameters.
– If other, non-tested ceramic furnaces are used, inquire from Ivoclar Vivadent regarding the compatibility with IPS e.max CAD.
– Basically, the following points apply:
  Ceramic furnaces without
    – a function for controlled (long-term) cooling
    – a programming option for a two-stage firing process
    – vacuum function
  cannot be used.
– The ceramic furnace must be calibrated before the first crystallization procedure and then once every six months.
– Depending on the operating mode, more frequent calibration may be required. The instructions of the respective manufacturer must be observed.

For conducting the crystallization, the following aspects have to be observed:

– Use only the IPS Object Fix Putty or Flow as an auxiliary firing paste to place the restoration directly on the IPS e.max CAD Crystallization Tray or the IPS e.max CAD Crystallization Pin.
– IPS e.max CAD restorations must not be placed directly, i.e. without auxiliary firing paste, on the IPS e.max CAD Crystallization Pin for crystallization.
– The cavity of the restoration must always be filled up to the restoration margins with IPS Object Fix Putty or Flow for crystallization.
– Use only the enclosed IPS e.max CAD Crystallization Tray and the respective IPS e.max CAD Crystallization Pins, since it stores the heat required for slow and above all tension-free cooling of the glass-ceramic.
– Always conduct the crystallization under vacuum.
– After the crystallization procedure, always allow the restoration to cool to room temperature before further processing.
### Firing parameters for the Combination firing Crystallization/Glaze

<table>
<thead>
<tr>
<th>Furnace</th>
<th>Stand-by temperature</th>
<th>Closing time</th>
<th>Heating rate $t_1$</th>
<th>Heating rate $t_2$</th>
<th>Holding time $H_1$</th>
<th>Holding time $H_2$</th>
<th>Vacuum 1 $T_1$</th>
<th>Vacuum 2 $T_2$</th>
<th>Longterm cooling $L$</th>
<th>Cooling rate $t_l$</th>
</tr>
</thead>
</table>
| **Programat CS**  
**Program 1** | 403°C 757°F | 6.00 min | 90°C/min 162°F/min | 820°C 1508°F | 0:10 min | 30°C/min 54°F/min | 840°C 1544°F | 7:00 min | 550/820°C/1022/1508°F | 820/840°C/1508°/1544°F | 700°C 1292°F | 20°C/min 36°F/min |
| **Programat P300** | 403°C 757°F | 6.00 min | 90°C/min 162°F/min | 820°C 1508°F | 0:10 min | 30°C/min 54°F/min | 840°C 1544°F | 7:00 min | 550/820°C/1022/1508°F | 820/840°C/1508°/1544°F | 700°C 1292°F | 20°C/min 36°F/min |

**Please note:** these firing parameters are not suitable for the crystallization of IPS e.max CAD MO!

### Firing parameters for the Correction firing

<table>
<thead>
<tr>
<th>Furnace</th>
<th>Stand-by temperature</th>
<th>Closing time</th>
<th>Heating rate $t_1$</th>
<th>Heating rate $t_2$</th>
<th>Holding time $H_1$</th>
<th>Holding time $H_2$</th>
<th>Vacuum 1 $T_1$</th>
<th>Vacuum 2 $T_2$</th>
<th>Longterm cooling $L$</th>
<th>Cooling rate $t_l$</th>
</tr>
</thead>
</table>
| **Programat CS**  
**Program 2** | 403°C 757°F | 6.00 min | 60°C/min 108°F/min | 840°C 1544°F | 3:00 min | – | – | 450°C 842°F | 839°C 1542°F | – | – |
| **Programat P300** | 403°C 757°F | 6.00 min | 60°C/min 108°F/min | 840°C 1544°F | 3:00 min | – | – | 450°C 842°F | 839°C 1542°F | – | – |

- These firing parameters represent standard values. The temperatures indicated also apply to furnaces of older generations and/or to furnaces of other manufacturers. If one of these furnaces is used, however, the temperatures may deviate by ± 10 °C/18 °F.
- If a non-Ivoclar Vivadent furnace is used, temperature corrections may be necessary.
- Regional differences in the power supply or the operation of several electronic devices by means of the same circuit may render adjustments of the firing and press temperatures necessary.
# Shade selection of the IPS e.max CAD LT Blocks

In order to determine the required ingot shade, both the desired tooth shade (A–D or Bleach BL) and the shade of the preparation (ND1–ND9) is determined. The selection of the block shade is a combination of the desired tooth shade and the actual shade of the preparation. The shades which are not available as blocks are achieved by characterization and/or intensifying the dentin shade. The recommendations are standard values and have to be adjusted by staining, if required.

## Shade of preparation

<table>
<thead>
<tr>
<th>IPS Natural Die Material</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A3.5</th>
<th>A4</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
</tr>
</thead>
<tbody>
<tr>
<td>ND 8</td>
<td>**</td>
<td>**</td>
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<td>**</td>
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<tr>
<td>ND 9</td>
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</tr>
</tbody>
</table>

* as a basis for Staining Technique
** in order to achieve the desired tooth shade, the preparation has to be lightened
Characterizations – IPS e.max CAD Crystall./Shades and Stains on IPS e.max CAD LT

Individual characterizations and shade adjustments of IPS e.max CAD LT restorations are achieved with IPS e.max CAD Crystall./Shades and IPS e.max CAD Crystall./Stains.

<table>
<thead>
<tr>
<th>Shade of preparation</th>
<th>Desired tooth shade: Bleach BL</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPS Natural Die Material</td>
<td>BL1</td>
</tr>
<tr>
<td>ND 1</td>
<td>LT BL1</td>
</tr>
<tr>
<td>ND 2</td>
<td>LT BL1</td>
</tr>
<tr>
<td>ND 3</td>
<td>**</td>
</tr>
<tr>
<td>ND 4</td>
<td>**</td>
</tr>
<tr>
<td>ND 5</td>
<td>**</td>
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<td>ND 6</td>
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<td>ND 7</td>
<td>**</td>
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<tr>
<td>ND 8</td>
<td>**</td>
</tr>
<tr>
<td>ND 9</td>
<td>**</td>
</tr>
</tbody>
</table>

** In order to achieve the desired tooth shade, the preparation has to be lightened.
Which type of plaster should be used to fabricate the models?

The instructions of the manufacturer of the CAD/CAM system in use should be observed in the fabrication of the models. The following basic rule applies: Depending on the CAD/CAM system and equipment, special plasters may have to be used for the fabrication of models and dies to ensure the quality of the scan. If a special scanning plaster is unavailable, models and dies can be fabricated with high-strength stone, which is sprayed with IPS Contrast Spray Chairside or IPS Contrast Spray Labside immediately before the scanning procedure.

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 bur used in the cavity. The corresponding instructions of the manufacturer 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 try-in procedure after machining?

In cases such as these, we recommend blocking out the incisal edge of the prepared die until the thickness matches that of the bur.

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

The auxiliary firing paste ideally supports the restorations fabricated of IPS e.max CAD during crystallization, which ensures that the restorations demonstrate optimum accurate fit. Furthermore, the auxiliary firing paste thoroughly secures the restoration on the IPS e.max CAD Crystallization Pin during staining and glazing.

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

Milled IPS e.max CAD restorations can be tried in on the die and all areas fully finished in the precrystallized (blue) state. Special attention must be paid to the restoration margins in this state. The margins should be created in relation to the preparation and the thickness of the restoration. Margins that are too thin are not suitable for crystallization, as these areas are rounded during this process and therefore shortened. In these cases, the margins should be thinned out after the crystallization process.

Do IPS e.max CAD restorations shrink during crystallization?

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

Should manual adjustments with grinding instruments be done before or after crystallization?

All grinding adjustments of milled IPS e.max CAD restorations should be made 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 at low rpms and light pressure to prevent chipping, particularly at the margins.
Can firing pastes other than IPS Object Fix Putty or Flow be used in the crystallization process?

IPS Object Fix Putty or 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. Other pastes must not be used as they are not easy to remove. Destructive blasting with Al₂O₃ or glass polishing beads is necessary to remove these pastes. Furthermore, other pastes may damage glass-ceramic surfaces because of their compositions.

How can the restoration be filled with IPS Object Fix Putty?

IPS Object Fix Putty can be filled into the inner aspect of the restoration with the help of a plastic spatula (e.g. Optra® Sculpt). Furthermore, a small amount of IPS Object Fix Putty may be rolled between the fingers and then pressed into the restoration. IPS Object Fix Putty excess, forced out when the IPS e.max CAD Crystallization Pin is pressed into the Putty, can also be adapted with a plastic spatula or the fingers. Always make sure, however, that the outer surface of the restoration is not contaminated with IPS Object Fix.

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.

How can a premature drying 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. If the syringe is not used for a longer period of time, it can be stored in a resealable plastic bag together with a moist paper tissue.

Can other firing trays, e.g. “honeycomb” trays, be used for the crystallization of IPS e.max CAD?

No other firing trays should be used. The IPS e.max CAD Crystallization Tray contained in the assortment stores the heat necessary for a slow and above all tension-free cooling of the glass-ceramic. Firing trays, eg “honeycomb” trays, cannot store heat and therefore cool down too quickly, creating tension in the ceramic.

Can furnaces other than those 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 (eg Programat CS, P300). 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 any ceramic furnace can be used for crystallization. Ceramic furnaces that do not feature a controlled long-term cooling mode or vacuum cannot be used for this purpose.
Can the crystallization quality of IPS e.max CAD restorations be controlled?

Optical checks can be conducted with the help of the accompanying material shade guide. If the shade and opacity are comparable to that of the material shade guide, the crystallization process has been carried out successfully. The colours must always be compared on a neutral background in incident light. If the colour and opacity of the restorations are different from the shade guide, e.g., too translucent, a new restoration must be milled. Crystallization cannot be repeated.

Can IPS Empress Universal Shades, Stains and Glaze be used on IPS e.max CAD?

IPS Empress Universal Shades, Stains and Glaze have been specially developed for the IPS Empress System. They cannot be used with IPS e.max products.

Can IPS e.max CAD frameworks be blasted with Al₂O₃ or glass polishing beads before they are veneered or after their completion (on the cavity side)?

IPS e.max CAD restorations must not be blasted with Al₂O₃ or glass polishing beads before veneering and placement, as this would damage the ceramic surface and reduce the strength.

How must the internal (bonding) surface of IPS e.max CAD restorations be conditioned before cementation?

The internal (bonding) surfaces of IPS e.max CAD restorations must always be etched with hydrofluoric acid etching gel (IPS Ceramic Etching Gel) for 20 seconds, irrespective of whether they are cemented with adhesive, self-adhesive or conventional methods. The resulting retentive pattern enables an enhanced bond both with adhesives and self-adhesives, as well as conventional bonding agents. After etching, the glass-ceramics are silanated using Monobond-S when adhesive or self-adhesive cementation is used. With conventional cementation, silanating is not necessary.
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