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IPS e.max CAD





INSTRUCTIONS FOR USE

CHAIRSIDE

CE 0123

ivoclar vivadent technical

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IPS e.max® System – all you need

IPS e.max – one system for every indication

IPS e.max is an innovative all-ceramic system which covers the entire all-ceramic indication range – from thin veneers to 12-unit bridges.

IPS e.max delivers high-strength and highly esthetic materials for the Press and the CAD/CAM technologies. The system consists of innovative lithium disilicate glass-ceramics used mainly for single-tooth restorations and high-strength zirconium oxide for large-span bridges.

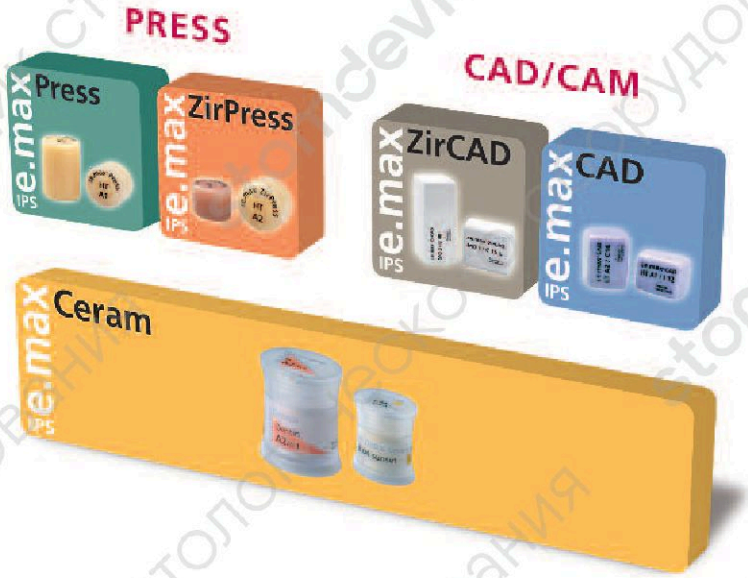
Every patient situation presents its own requirements and objectives. IPS e.max meets these requirements. Due to the system components you obtain exactly what you need.

- The components of the Press technology include the highly esthetic IPS e.max Press lithium disilicate glass-ceramic ingots and the IPS e.max ZirPress fluorapatite glass-ceramic ingots for the fast and efficient press-on-zirconia technique.
- Depending on the case requirements, two types of materials are available for CAD/CAM techniques: the innovative IPS e.max CAD lithium disilicate blocks and the high-strength zirconium oxide IPS e.max ZirCAD.
- The nano-fluorapatite layering ceramic IPS e.max Ceram, which is used to characterize/veneer all IPS e.max components – glass or oxide ceramics – completes the IPS e.max system.

IPS e.max CAD

The shades and translucency levels of the IPS e.max CAD blocks are based on the overarching IPS e.max shade system.

The IPS e.max CAD blocks are available in three different levels of opacity; the opaque MO blocks are for labside use (layering technique). The more translucent LT and HT blocks are suitable for the chairside fabrication of fully anatomical restorations (staining technique). The selection of the translucency level is based on the clinical requirements (indication, shade of the prepared tooth, desired tooth shade) presented by the patient.



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IPS e.max® CAD –
Product Information

Material

IPS e.max CAD is a lithium disilicate glass-ceramic block for the CAD/CAM technique. 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 its pre-crystallized ("blue") state. The typical and striking color of the pre-crystallized IPS e.max CAD blocks ranges from whitish to blue and bluish-grey. The shade is a result of the composition and the microstructure of the glass-ceramic. The strength of the material is 130 to 150 MPa and thus comparable to other glass-ceramic blocks currently available on the market. After the IPS e.max CAD blocks are milled, the restoration is crystallized in an Ivoclar Vivadent ceramic furnace (e.g. Programat® CS). Contrary to some other CAD/CAM ceramics, the crystallization process does not lead to significant shrinking and does not require time-consuming infiltration processes. Crystallization is completed after approx. 20 to 25 minutes. The crystallization at a temperature of 840°C (1544°F) causes a transformation of the microstructure, during which lithium disilicate crystals grow in a controlled manner. The densification of 0.2% is accounted for in the CAD software and taken into account upon milling. The key physical parameters, such as the strength of 360 MPa and the corresponding optical properties, are achieved through the transformation of the microstructure.
IPS e.max CAD blocks show a natural brightness. Due to the translucency and shade variety, fully anatomical restorations can easily be fabricated with this glass-ceramic.





CTE (100-400°C) [10^{-6} /K]	10.2
CTE (100-500°C) [10^{-6} /K]	10.5
Flexural strength (biaxial) [MPa]*	360
Fracture toughness [MPa $m^{0.5}$]	2.25
Modulus of elasticity [GPa]	95
Vickers hardness [MPa]	5800
Chem. solubility [µg/cm^2]*	40
Crystallization temperature [°C/°F]	840/1544

*according to ISO 6872

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Usage

Indications
- Veneers
- Inlays
- Onlays
- Partial crowns
- Crowns for anterior and posterior restorations
- Implant superstructures for single-tooth restorations (anterior and posterior region)

Contraindications
- Full veneers on molar crowns
- Very deep subgingival preparations
- Patients with severely reduced residual dentition
- Bruxism
- Any other use not listed in the indications

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.
- Do not mill the blocks with non-compatible CAD/CAM systems.
- Crystallization must not be conducted in a ceramic furnace that has no vacuum function.
- 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).
- Do not mix IPS e.max CAD Crystall./Glaze, Shades and Stains with other dental ceramics (e.g. IPS e.max Ceram Glaze, Stains and Essence).

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

Composition

- **IPS e.max CAD Blocks**
  Components: SiO_2
  Additional contents: Li_2O, K_2O, MgO, Al_2O_3, P_2O_5 and other oxides

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

- **IPS e.max CAD Crystall./Glaze Spray**
  Components: oxides, propanol, propellant: isobutane

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

- **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 (blue-lemon, cream-lemon)**
  Components: pigment suspension in ethanol, propellant: fluorinate hydrocarbon

- **IPS Ceramic Etching Gel**
  Components: hydrofluoric acid (approx. 5%)

Warning
- Do not inhale ceramic dust during finishing — use exhaust air discharge and mouth protection.
- IPS Ceramic Etching Gel contains hydrofluoric acid. Contact with skin, eyes and clothing must be prevented at all costs, since the material is extremely toxic and corrosive. The etching gel is intended for extraoral use only and must not be applied intra-orally (inside the mouth).

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Scientific Data

Further scientific data (i.e. strength, wear, biocompatibility) are contained in the "Scientific Documentation IPS e.max CAD". The Documentation also provides a set of studies that describe the clinical performance of IPS e.max CAD.
This Scientific Documentation can be obtained from Ivoclar Vivadent.

For further information about all-ceramics and IPS e.max in general, please refer to the Ivoclar Vivadent Reports No. 16 and No. 17.



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Block Concept

IPS e.max CAD is available in the A-D and Bleach BL shades as well as in **three levels of translucency (HT, LT, MO)** and **two sizes (I 12, C 14)**. From a processing point of view, basically all restorations can be fabricated from any block. Both the IPS e.max CAD HT and IPS e.max CAD LT blocks are used for chairside applications (staining technique).
For reasons of esthetics, however, the following processing techniques and indications are recommended for the individual blocks (translucency levels):

Translucency level	Processing Technique			Indications					
	Staining Technique	Cut-Back Technique	Layering Technique[1)]	Inlays	Onlays	Veneers	Partial Crowns	Anterior Crowns	Posterior Crowns
High Translucency				✓	✓	✓	✓	✓	✓
Low Translucency						✓	✓	✓	✓
Medium Opacity								✓	✓*

CR %

[1)]labside application
* up to the second premolar



IPS e.max CAD HT (High Translucency)

The HT Blocks are available in **16 A-D** and **4 Bleach BL shades** and **2 sizes (I 12, C 14)**. Given their high translucency, HT blocks are ideally suitable for the fabrication of smaller restorations (e.g. inlays and onlays). Restorations made of HT blocks convince users with their true-to-nature chameleon effect and the exceptional adaption to the remaining tooth structure.



IPS e.max CAD LT (Low Translucency)

The LT Blocks are available in **16 A-D** and **4 Bleach BL shades** and **2 sizes (I 12, C 14)**. Due to their high brightness values compared to the HT blocks, LT blocks are ideally suitable for the fabrication of larger restorations (e.g. anterior and posterior crowns). Restorations made of LT blocks convince users with their lifelike brightness value and chroma. This prevents the incorporated restorations from graying. The cut-back technique can also be ideally used for restorations made from LT blocks.

The entire IPS e.max delivery program can be found at www.ivoclarvivadent.com!

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CAD/CAM Partners

IPS e.max CAD is processed by means of CAD/CAM systems from authorized partners. For questions regarding these systems, please contact the respective cooperation partners.

sirona
The Dental Company

Information about the CEREC® System is available from:
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



D4D technologies

Information on the E4D® System ca be obtained from:

D4D Technologies
630 International Parkway # 150
Richardson, TX 75081
USA
E-mail:business@d4dtech.com
www.d4dtech.com

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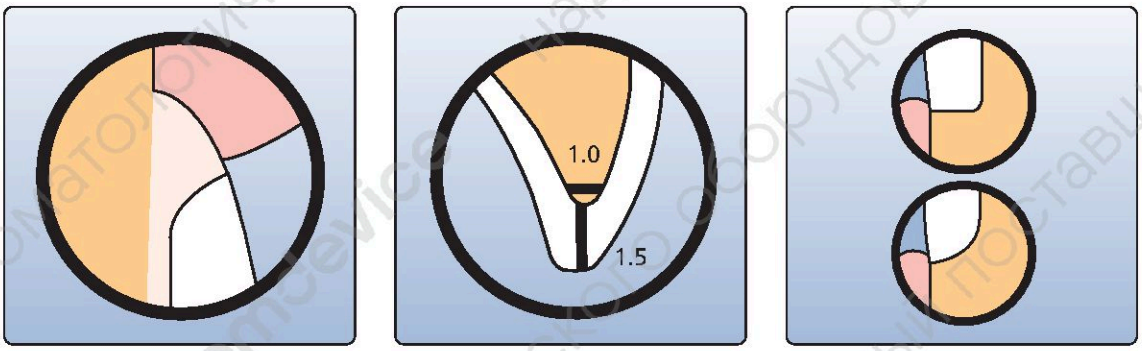
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Preparation Guidelines

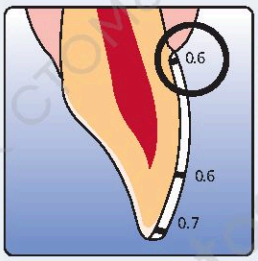
Successful results can only be achieved with IPS e.max CAD if the guidelines and framework thicknesses are strictly observed.

Basic preparation guidelines for all-ceramic restorations

- no angles or sharp edges
- shoulder preparation with rounded inner edges and/or chamfer preparation
- the indicated dimensions reflect the minimum thickness for IPS e.max CAD restorations
- the incisal edge of the preparation, particularly for anterior teeth, should be at least 1.0 mm (milling tool geometry) in order to permit optimum milling during CAD/CAM processing.

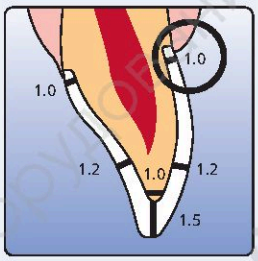


Veneers



- If possible, the preparation should be located in the enamel.
- The incisal preparation margins should not be located in the area of static or dynamic enamel contact.
- Reduction in the cervical and/or labial area by 0.6 mm, and the incisal edge by 0.7 mm.

Anterior crown

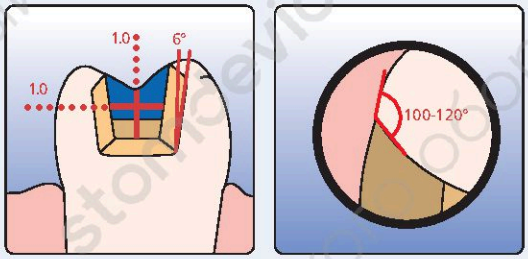


- Reduce the anatomical shape and observe the stipulated minimum thickness. Prepare a shoulder with rounded inner edges or a deep chamfer. Width of the shoulder/chamfer at least 1.0 mm.
- Reduce the incisal edge by approx. 1.5 mm.
- Reduce the labial or lingual area by approx. 1.2 mm.
- For conventional and/or self-adhesive cementation, the preparation must demonstrate retentive surfaces.

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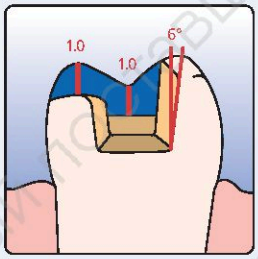
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Inlay



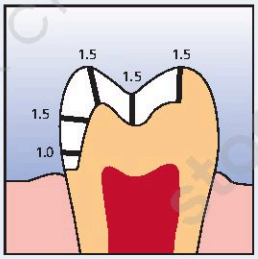
- Static and dynamic antagonist contacts must be taken into consideration.
- The preparation margins must not be located on centric antagonist contacts.
- A preparation depth of at least 1.0 mm and an isthmus width of at least 1.0 mm must be observed in the fissure area.
- Prepare the proximal box with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

Onlay



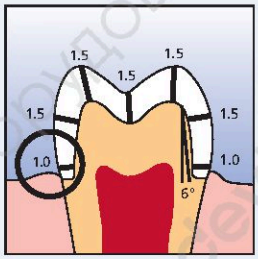
- Static and dynamic antagonist contacts must be taken into consideration.
- The preparation margins must not be located on centric antagonist contacts.
- A preparation depth of at least 1.0 mm and an isthmus width of at least 1.0 mm must be observed in the fissure area.
- Prepare the proximal box with slightly diverging walls and observe an angle of 100°-120° between the proximal cavity walls and the prospective proximal onlay surfaces.
  For onlays with pronounced convex cavity walls without adequate support by the proximal shoulder, marginal ridge contacts should be avoided.
- Round out internal edges in order to prevent stress concentration within the ceramic material.
- Do not prepare slice-cuts/bevels or feather edges.
- Provide at least 1.0 mm of reduction 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 1.5 mm of reduction in the cusp areas.
- Prepare a circular shoulder with rounded inner edges or a deep chamfer. Width of the shoulder/chamfer should be at least 1.0 mm.

Posterior crown



- Reduce the anatomical shape and observe the stipulated minimum thickness. Prepare a circular shoulder with rounded inner edges or a deep chamfer. Width of the shoulder/chamfer at least 1.0 mm.
- Reduce the incisal crown third by approx. 1.5 mm.
- Reduce the buccal or lingual area by approx. 1.5 mm.
- For conventional and/or self-adhesive cementation, the preparation must demonstrate retentive surfaces.

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IPS e.max® CAD

Overview of the Treatment Procedure

Treatment Procedure

Working Steps	Ivoclar Vivadent products
Shade Determination	*Tooth shade determination*: **IPS e.max Press/CAD HT and LT materials shade guide** For optimum selection of the block shade. *Die shade determination*: **IPS® Natural Die Material** To determine the shade of the prepared tooth.
Intraoral imaging	**OptraGate®** Provides easy access to an enlarged treatment area by circular retraction of lips and cheeks. **IPS® Contrast Spray Chairside** (blue-lemon, cream-lemon) Enables optimum imaging through detailed definition of the margins **Virtual® CADbite Registration** Scannable bite registration material, e.g. to record data used for optical imaging.
Milling	**IPS e.max CAD Blocks** Lithium disilicate glass-ceramic blocks for the CAD/CAM technology.
Preparing for Crystallization	**IPS e.max CAD Crystallization Tray / Pins** Special firing tray and pins for the crystallization of IPS e.max CAD **IPS® Object Fix Putty / Flow** Auxiliary firing paste in different viscosities for the crystallization of IPS e.max CAD.
Characterization / Glaze / Adjustments	**IPS e.max CAD Crystall./Shades, Stains, Glaze and Glaze Liquid** Special stains in paste form for the individual surface characterization of IPS e.max CAD in the "blue" state. **IPS e.max CAD Crystall./Glaze Spray** Special glaze in spray form for IPS e.max CAD **IPS e.max CAD Crystall./ Add-On and Add-On Liquid** Special add-on material for IPS e.max CAD
Combination firing (Crystallization/Glaze)	**Programat® CS** Compact, easy-to-operate ceramic furnace with vacuum function for the dental practice.
Preparation for Cementation	**IPS® Ceramic Etching Gel** For the fabrication of retentive bonding surfaces on all-ceramic restorations. **Monobond® Plus** Produces silanated bonding surfaces on etched all-ceramic restorations.
Cementation	**Variolink® Veneer, Variolink® II, Multilink® Automix** Tried-and-tested adhesive cementation system. **SpeedCEM** Self-adhesive, self-curing resin cement with light-curing option for quick and easy cementation. **bluephase®** Cordless high-performance LED light for all indications.

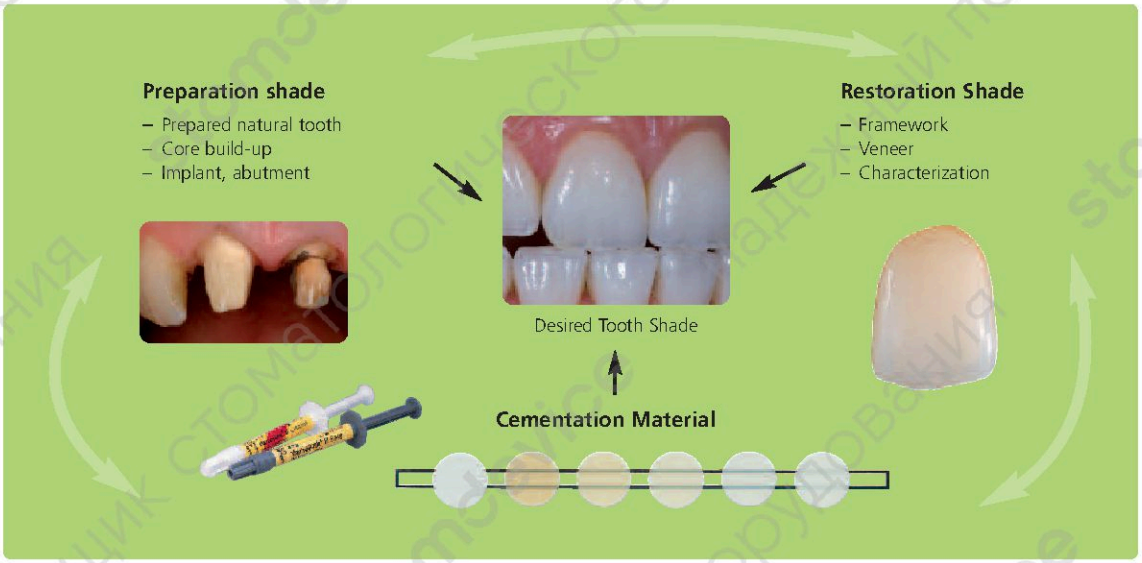
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Shade Determination — Tooth Shade, Shade of the Prepared Tooth

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

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

The optical effect of the preparation shade must not be underestimated during the fabrication of highly esthetic restorations. For that reason, the shade of the preparation should be determined together with the desired tooth shade in order to select the suitable block. Especially with severely discoloured preparations or non-tooth-shaded build-ups, this is of utmost importance. In order to achieve the desired esthetics, the shade of the prepared tooth must first be determined.



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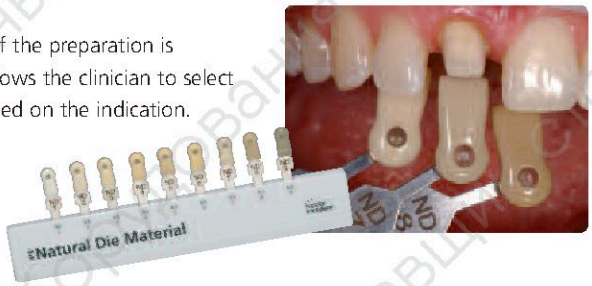
Shade determination of the natural tooth

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



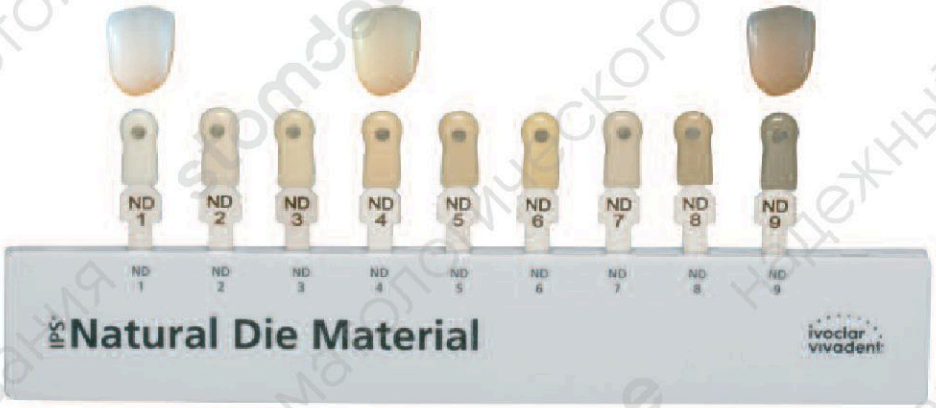
Die shade selection

In order to facilitate the reproduction of the desired tooth shade, the shade of the preparation is determined with the help of the IPS Natural Die Material shade guide. This allows the clinician to select the appropriate IPS e.max CAD blocks in terms of shade and translucency based on the indication. Please refer to the table on page 49 for block selection.



Example of the preparation shade effect

Crown made of IPS e.max CAD HT B1 on different preparation shades.



Which block should be used?

The suitable block is selected on the basis of the following criteria:

1. Desired tooth shade
2. Preparation shade or abutment shade
3. Type of restoration
4. Restoration thickness and/or preparation depth
5. Processing technique (staining and cut-back technique)
6. Cementation material



Please refer to the table on page 49 for block selection.

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Intraoral Imaging

To prepare for the 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 prepare the intraoral situation for optical imaging. The IPS Contrast Spray Chairside balances out the different optical properties of the natural tooth (dentin and enamel) and thus permits optimum recording using the camera. The optimized geometry of the rotatable single-use nozzle provides good accessibility to the preparation. The IPS Contrast Spray is available in the colors blue and cream; both versions feature a fresh lemon flavour.



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





Milling

In order to mill the restoration, the appropriate **IPS e.max CAD 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 offered. Once the desired block has been selected, it is mounted in the CAM unit and the restoration is milled.



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Preparing for Crystallization

IPS Object Fix Putty and **IPS Object Fix Flow** are auxiliary firing pastes with different viscosities to support IPS e.max CAD restorations during the crystallization process. The pastes are used to stabilize and secure the corresponding restoration on the **IPS e.max CAD Crystallization Pins**.
IPS Object Fix Putty and IPS Object Fix Flow are easy to apply and remove after the firing procedure.



Characterization / Glaze / Adjustments

IPS e.max CAD restorations are characterized with **IPS e.max CAD Crystall./Shades und 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 CAD Crystall./Shade Incisal materials, which enhance the optical in-depth effect and the translucency in the incisal third, can be used.
IPS e.max CAD Crystall./Glaze Liquid is used to dilute the IPS e.max CAD Crystall./Shades, Stains and Glaze pastes.



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 the **IPS e.max CAD Crystall./ Add-On Liquid** and can be directly applied with the crystallization firing or any subsequent corrective firing.



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Combination Firing
(Crystallization/Glaze)

As a general rule, 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 cooling of the glass-ceramic.



The firing cycles are conducted in a **Programat CS** or any other ceramic furnace from Ivoclar Vivadent.
The Programat CS is easy to operate and especially suitable for glaze and crystallization firings. Also because of the integrated vacuum function, this furnace is ideally suitable for processing IPS e.max CAD blocks.

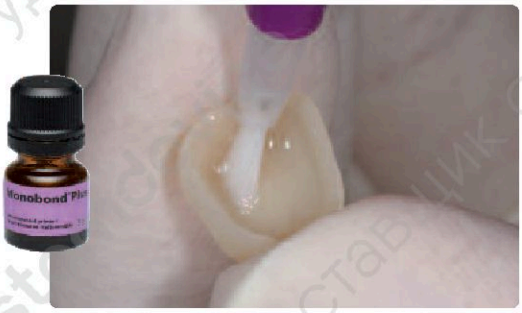


Preparing for Cementation

Conditioning of the ceramic surface to prepare for cementation is decisive for generating a sound bond between the cementation material and the all-ceramic restoration. Generally, glass-ceramics are etched with **IPS Ceramic Etching Gel** (5% hydrofluoric acid). IPS e.max CAD is etched for 20 seconds.
Etching produces retentive bonding surfaces, which increases the bond between luting composite and the all-ceramic restoration.
IPS Ceramic Etching Gel is for extraoral use only and must not be applied in the oral cavity.



Subsequent silanization of the bonding surface with **Monobond® Plus** generates a sound bond between the etched all-ceramic material and the luting composite.
The bonding silane thus plays an important role for the overall bonding strength between the IPS e.max CAD restoration and the tooth structure.



Total Etch
Total Etch is used to prepare the tooth for the adhesive cementation using Variolink.
Total Etch is a gel used to etch the enamel and condition the dentin in situations where all-ceramic restorations are to be cemented adhesively.



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Cementation

For the cementation of IPS e.max CAD restorations, you may choose between conventional, self-adhesive or the adhesive cementation technique, according to the indication. For this purpose, 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 esthetic luting composite Variolink II has been successfully used for more than 10 years and offers excellent clinical results. The new light-curing Variolink Veneer is especially indicated for the adhesive cementation of veneers. This material allows the user to increase or decrease the brightness of the ceramic restoration due to a special shade concept.



Multilink® Automix Easy Clean-Up

This universal dual-curing luting composite offers a wide range of indications and high bond strengths to IPS e.max CAD.



SpeedCEM

SpeedCEM is a dual-curing, self-adhesive resin cement for the quick and easy cementation of high-strength all-ceramic, metal and metal-ceramic restorations. SpeedCEM eliminates the need for conditioning of enamel or dentin with phosphoric acid and bonding.



Cementation methods in relation to the indication

		Adhesive cementation	Self-adhesive cementation	Conventional cementation
IPS e.max CAD	Veneers	✓	—	—
	Inlays, onlays, partial crowns	✓	—	—
	Anterior crowns	✓	✓	✓
	Posterior crowns	✓	✓	✓

LED lights from the **bluephase®** family are used for the polymerization of light- and dual-curing composites.
The high light intensity achieved with bluephase permits comparatively short polymerization times and at the same time good curing depths.

Especially for the demanding polymerization of adhesively cemented all-ceramic restorations, **bluephase 20i*** is used. In the process, the entire strength of the high performance LED is utilized. All-ceramic restorations are incorporated in the shortest time possible.



the range of products on offer may vary from country to country

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IPS e.max® CAD
Processing Options

After clinical try-in, the restoration is finished, depending on the type of restoration. There are various options available for finishing.

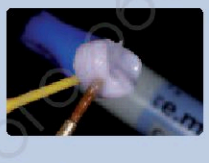
Preparation

CAD/CAM Process

Clinical try-in

Recommended option

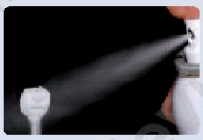
Veneer, inlay, onlay
using **glaze paste**
See page 21





- Veneer, inlay, onlay on **OptraStick**
- Aplication of the glaze paste and stains using a brush
- **Combination firing**(Crystallization/Glaze); duration: approx. **25 minutes**

Veneer, inlay, onlay
using **glaze spray**
See page 30

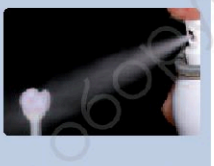




- Veneer, inlay, onlay **must** be secured with IPS Object Fix Putty on a pin. Adapt Object Fix Putty exactly to the margins (see page 27).
- Application of stains using a brush
- Application of the Glaze Spray
- **Speed-crystallization/Glaze Spray** (at most 2 restorations at a time), duration: approx. **20 minutes**

Recommended option

Partial crown, crown
using **glaze spray**
See page 24





- Attach the partial crown, crown to the pin using IPS Object Fix Putty or Flow
- Apply the stains using a brush
- Application of the Glaze Spray
- **Speed-crystallization/Glaze Spray** (at most 2 restorations at a time), duration: approx. **20 minutes**

Partial crown, crown
using **glaze paste**
See page 34





- Attach the partial crown, crown to the pin using IPS Object Fix Putty or Flow
- Aplication of the glaze paste and stains using a brush
- **Combination firing** (Crystallization/Glaze); duration: approx. **25 minutes**

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IPS e.max® CAD

Staining Technique – Veneers, Inlays, Onlays



IPS e.max CAD HT blocks are particularly suitable for the fabrication of veneers, inlays and onlays. Please note that, due to the high translucency of the HT blocks, the prepared tooth must show no or only slight discolouration.
Individualized characterizations and glaze are applied before the combined Crystallization and Glaze firing is conducted.
Because of the combined firing, processing is very efficient and leads to a highly esthetic 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 (blue-lemon or cream-lemon) with one short spray discharge.



Initial situation: Restoration of tooth 26 is to be replaced.

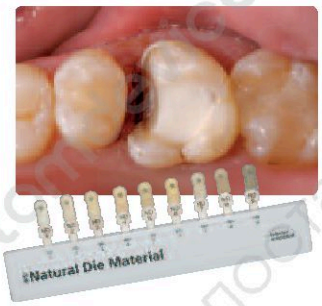


Preparation: occlusal view



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

The suitable IPS e.max CAD Block is selected on the basis of the desired tooth shade and the determined shade of the prepared tooth.
Please refer to the table on page 49 for block selection.



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 instructions of the manufacturers must be followed.

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Finishing

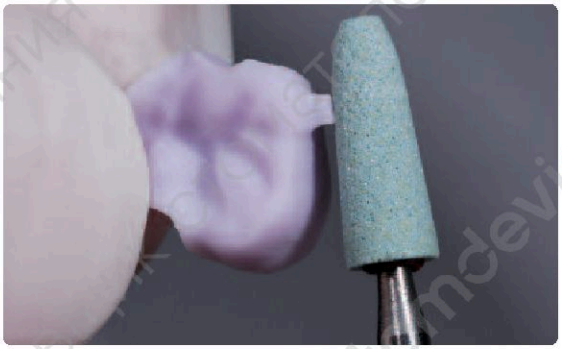
It is of critical importance to use the correct grinding instruments for finishing and adjusting IPS e.max CAD. If unsuitable grinding instruments are used, chipping of the edges and local overheating may occur (please observe the Ivoclar Vivadent Flow Chart "Recommended grinding tools for IPS e.max glass-ceramics").

Observe the following procedure for finishing IPS e.max CAD restorations:

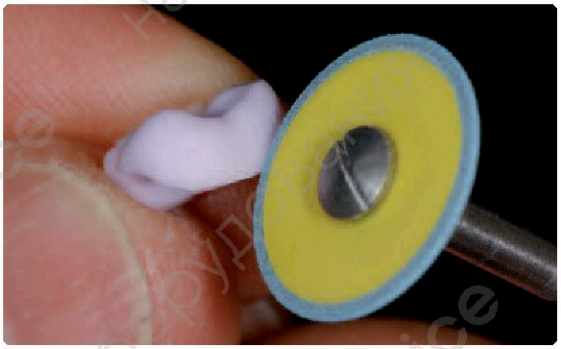
- Carry out adjustments by grinding of IPS e.max CAD restorations while they are still in their pre-crystallized (blue) state, if possible.
- Only use suitable grinding instruments, low rpms and light pressure to prevent delamination and chipping at the edges in particular.
- Adjustments by grinding are carried out with fine-grained diamonds (<60 µm) and/or 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.

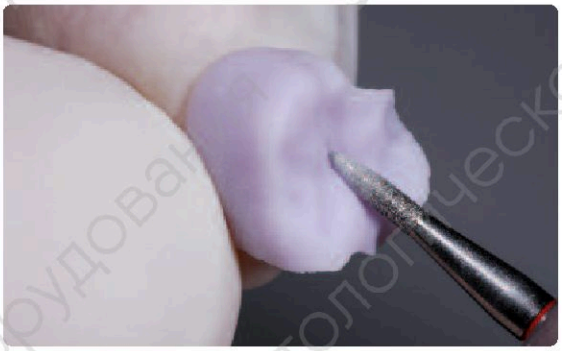
- Carefully try-in the restoration in its blue state and adjust the occlusion/articulation.
- Design surface textures.
- Always clean the restoration with ultrasound in a water bath or blast with the steam jet before crystallization. Make sure to thoroughly clean the restoration before further processing and to remove any residue of the milling additive of the CAD/CAM milling unit. Residue of the milling additive remaining on the surface may result in bonding problems and discolouration during the Crystallization/Glaze firing.
- **Do not blast the restorations with Al_2O_3 or glass polishing beads.**



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.

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Combination firing (Crystallization/Glaze firing)

Crystallization and Glaze firing in one step with IPS e.max CAD Crystall./Glaze paste
(recommended option for veneers, inlays and onlays)



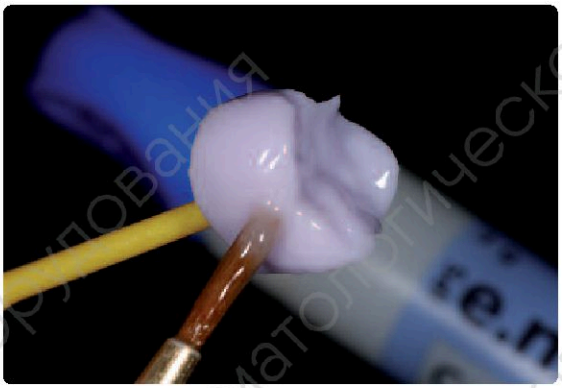
Option
Application of IPS e.max CAD Crystall./Glaze Spray procedure corresponds to crowns, page 30.

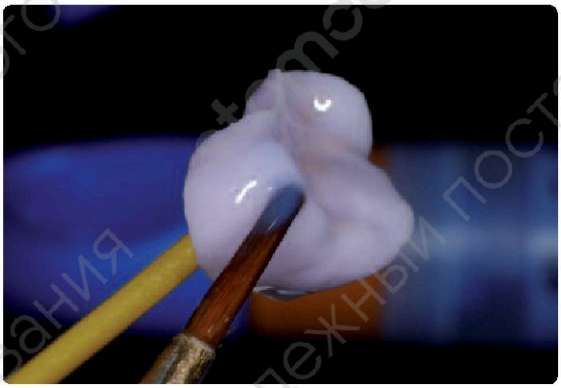
1st step: Characterization
In the Combination firing, the crystallization of IPS e.max CAD and Glaze firing are performed in one step. The characterizations and the glaze are applied before the crystallization to the "blue" restoration.



- IPS e.max CAD Crystall./Shades are ready-to-use "Dentin and Incisal" stains in syringes
- IPS e.max CAD Crystall./Stains are ready-to-use intensive stains in syringes
- IPS e.max CAD Crystall./Glaze Paste is a ready-to-use glazing paste

Please proceed as follows to apply individualized characterizations and glaze:
- Thoroughly clean and dry the restoration after clinical try-in.
- Attach veneer, inlay or onlay on a temporary adhesive stick (OptraStick) before the glaze and the characterizations are applied. Alternatively, the restoration may be held also using diamond-coated tweezers.
- Extrude IPS e.max CAD Crystall./Glaze Paste 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 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 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 28) for applying Shades and Stains.


Attach onlay to an OptraStick to apply the glaze.


Apply individual characterizations using IPS e.max CAD Crystall./Shades and/or Stains.

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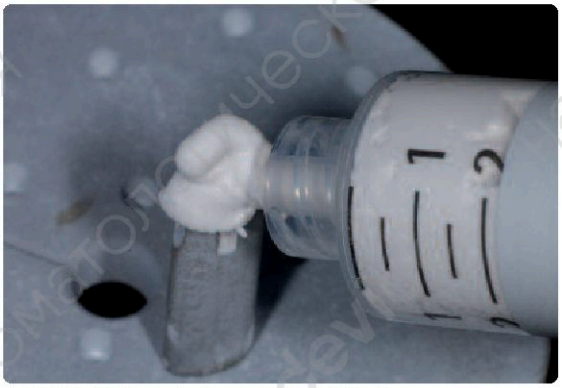
2nd step : Crystallization/Glaze firing

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:

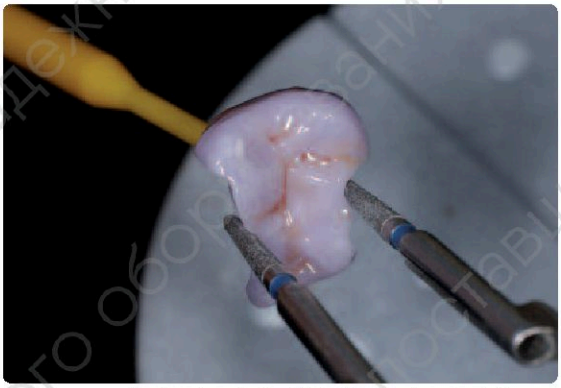
- An IPS e.max CAD Crystallization Tray and the corresponding pins must be used for the combination firing. Do not use a honey-combed tray!
- Place the Crystallization Pin into the center of the IPS e.max CAD Crystallization Tray.

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.

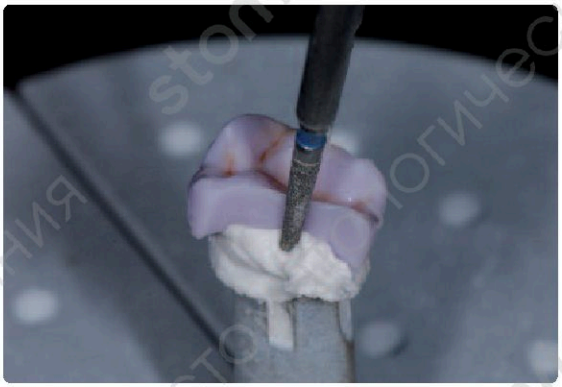
- Apply some IPS Object Fix Flow or Putty to the pin.
- Place the restoration on the Crystallization Pin using diamond-coated tweezers.
- A maximum of 6 restorations can be positioned on the firing tray and crystallized using the Combination firing with IPS e.max CAD Crystall./Glaze Paste.
- If glaze paste is used, Speed Crystallization/Glaze Spray must not be used.



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 center of the IPS e.max CAD Crystallization Tray and fire using the stipulated parameters.

Conduct the combination firing (crystallization/glaze) in a ceramic furnace (e.g. Programat CS) using the following parameters:



Crystallization/Glaze

Furnace	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t_1 [°C/°F/min]	Firing temperature T_1 [°C/°F]	Holding time H_1 [min]	Heating rate t_2 [°C/°F/min]	Firing temperature T_2 [°C/°F]	Holding time H_2 [min]	Vacuum 1 1_1 [°C/°F] 1_2 [°C/°F]	Vacuum 2 2_1 [°C/°F] 2_2 [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t_1 [°C/°F/min]
Programat CS Program 1	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

Please note:

- **If glaze paste is used, Speed Crystallization/Glaze Spray must not be used.**
- **These firing parameters Crystallization/Glaze are not suitable for the crystallization of IPS e.max CAD MO!**

Notes on cooling:

- **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.**

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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 or occlusal contact points), IPS e.max CAD Crystall./Add-On is available. The adjustments may be made with both Crystallization/Glaze and Corrective firing. The detailed procedure is described on page 36.

Correction firing

Furnace	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t_1 [°C/°F/min]	Firing temperature T_1 [°C/°F]	Holding time H_1 [min]	Heating rate t_2 [°C/°F/min]	Firing temperature T_2 [°C/°F]	Holding time H_2 [min]	Vacuum 1 1_1 [°C/°F] 1_2 [°C/°F]	Vacuum 2 2_1 [°C/°F] 2_2 [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t_l [°C/°F/min]
Programat CS Program 2	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

Completion of the Restoration

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

- Remove the restoration from the hardened auxiliary firing paste.
- Remove any residue with ultrasound in a water bath and/or with steam.
- **Do not blast residues using Al_2O_3 or glass polishing beads.**
- Final try-in of the restoration before cementation.
- If adjustments by grinding are required, make sure that no overheating of the glass-ceramic occurs.
- Use fine-grained diamonds (< 60 µm) for finishing, followed by rubber polishers at low speed and limited pressure. For the selection of the appropriate grinding tools, refer to the Ivoclar Vivadent Flow Chart "Recommended grinding tools – chairside".
- Finally, polish the adjusted areas to a high gloss (e.g. using OptraFine).
- Thoroughly clean the restoration.



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



Remove residue with ultrasound in a water bath …



… or with steam.



Final try-in of the restoration before cementation

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IPS e.max® CAD

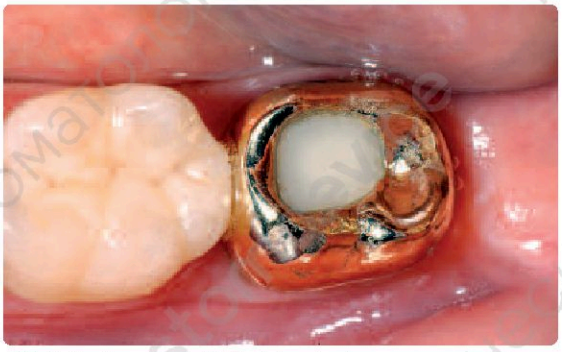
Staining Technique – Partial Crowns, Crowns

IPS e.max CAD LT blocks are ideally suitable for the fabrication of larger restorations (partial crowns, crowns) on prepared teeth that are not or only slightly discoloured. Due to the higher brightness compared with IPS e.max CAD HT, a "greying" of the restoration is prevented.
Individualized characterizations and glaze are applied before the combined Crystallization and Glaze firing is conducted. Because of the combined firing, processing is very efficient and leads to a highly esthetic 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 (blue-lemon or cream-lemon) with one short spray discharge.



Initial situation: The crown on tooth 37 has to be replaced



Preparation: occlusal view

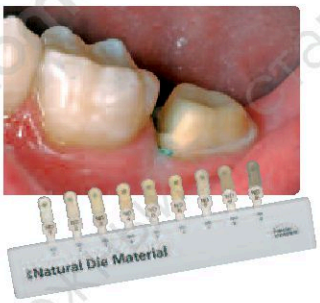


Preparation: buccal



Preparation sprayed with IPS Contrast Spray Chairside cream-lemon; ready for intraoral recording

The suitable IPS e.max CAD Block is selected on the basis of the desired tooth shade and the determined shade of the prepared tooth.
Please refer to the table on page 49 for block selection.



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 instructions of the manufacturers must be followed.

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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 observe the Ivoclar Vivadent Flow Chart "Recommended grinding tools for IPS e.max glass-ceramics").

Observe the following procedure for finishing IPS e.max CAD restorations:

- Carry out adjustments by grinding of IPS e.max CAD restorations while they are still in their pre-crystallized (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 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.
- Carry out individual shape adjustments, if required.

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.

- Careful try-in of the restoration in its blue state and adjust the occlusion/articulation.
- Design surface textures.
- Always clean the restoration with ultrasound in a water bath or blast with the steam jet before crystallization. Make sure to thoroughly clean the restoration before further processing and to remove any residue of the milling additive of the CAD/CAM milling unit. Residue of the milling additive remaining on the surface may result in bonding problems and discolouration during the Crystallization/Glaze firing.
- **Do not blast the restorations with Al_2O_3 or glass polishing beads.**



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.

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Preparing the restoration for Combination Firing

Larger restorations (partial crowns and crowns) made of IPS e.max CAD must be secured on a Crystallization Pin with IPS Object Fix Putty of Flow. This supports the restoration during the crystallization process and thus prevents warping.

Please observe the following procedure:
- Thoroughly clean and dry the restoration after clinical try-in.
- 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 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 auxiliary firing paste using a plastic spatula (e.g. OptraSculpt) so that the pin is securely in place and the restoration margins are optimally supported.
- Prevent contamination of the outer restoration surface. Clean off contamination with a brush dampened with water and dry.



IPS Object Fix Flow and IPS Object Fix Putty



IPS e.max CAD Crystallization Pins in threes 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

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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



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 wall is exactly supported



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

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

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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



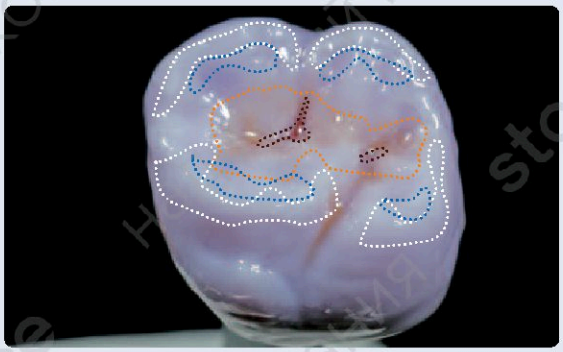
IPS e.max CAD Crystall./Stains



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



Slight characterizations on the buccal surfaces using IPS e.max CAD Crystall./Shades 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
- Reinforcing the chroma: Stains sunset/copper

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



Too thick a layer of IPS e.max CAD Crystall./Shades and Stains



Too thick a layer of IPS e.max CAD Crystall./Shades and Stains

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Combination Firing

In the Combination firing, the crystallization of IPS e.max CAD and Glaze firing are performed in one step. Characterizations and the glaze may be applied in two ways.
Please note the different procedures when using the IPS e.max CAD Crystall./Glaze Spray and the IPS e.max CAD Crystall./Glaze Paste.

Option A:
Crystallization and Stain/Glaze firing in one step with IPS e.max CAD Crystall./Glaze Spray





- Characterization on the uncrystallized, blue restoration
- Application of the Glaze Spray
- Firing program Speed Crystallization/Glaze Spray **at most 2 restorations with Glaze Spray**, duration 20 minutes

Option B:
Crystallization and Glaze firing in one step with IPS e.max CAD Crystall./Glaze paste





- Application of the glaze paste and the characterizations on the uncrystallized, blue restoration
- Firing program Crystallization/Glaze, duration 25 minutes

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Option A:

Crystallization and Stain/Glaze firing in one step with IPS e.max CAD Crystall./Glaze Spray



The spray should only be used for restorations which allow IPS Object Fix auxiliary firing paste to be adapted exactly to the margins.

Please observe the following procedure:

- 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.
- Hold the restoration by the IPS e.max CAD Crystallization Pin.
- Apply mixed Shades and Stains directly on the blue restoration using a brush.
- Observe the Characterization guide (see page 28) for applying Shades and Stains.



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 on the IPS e.max CAD Crystallization Tray, as it would also be coated with glaze.
- Shake the Glaze Spray 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 insufficient application of the Glaze Spray.
- Observe a distance of approx. 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 color.
- 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.

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– If a maximum of 2 restorations to which the Glaze Spray has been applied are crystallized at the same time, the Speed Crystallization/Glaze Spray can be used.
– If more than 2 restorations are crystallized, crystallization is carried out with the firing program Crystallization/Glaze.



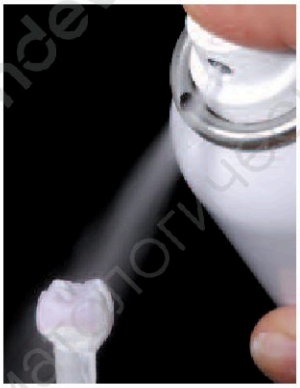
Hold the restoration by the IPS e.max CAD Crystallization Pin.



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 again between individual bursts.

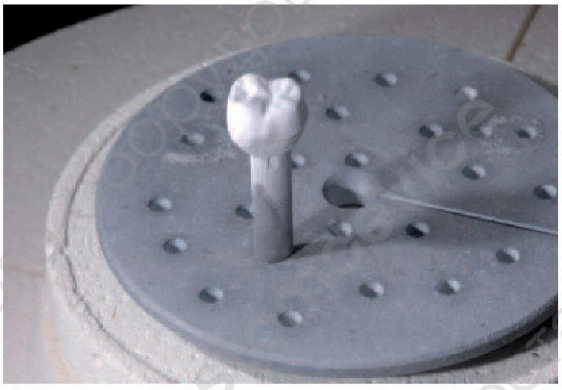




Spray an even layer onto the restoration.



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 center of the IPS e.max CAD Crystallization Tray and fire using the stipulated parameters.

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Select the firing parameters in accordance with the number of restorations and carry out the firing in a ceramic furnace (e.g. Programat CS) using the following parameters.



Speed Crystallization/Glaze Spray (at most 2 restorations with Glaze Spray)

Furnace	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t_1 [°C/°F/min]	Firing temperature T_1 [°C/°F]	Holding time H_1 [min]	Heating rate t_2 [°C/°F/min]	Firing temperature T_2 [°C/°F]	Holding time H_2 [min]	Vacuum 1 1_1 [°C/°F] 1_2 [°C/°F]	Vacuum 2 2_1 [°C/°F] 2_2 [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t_1 [°C/°F/min]
Programat CS Program 3	403/757	1:30	90/162	820/1508	0:10	30/54	840/1544	7:00	550/820 1022/1508	820/840 1508/1544	700/1292	0

Crystallization/Glaze (at most 6 restorations)

Furnace	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t_1 [°C/°F/min]	Firing temperature T_1 [°C/°F]	Holding time H_1 [min]	Heating rate t_2 [°C/°F/min]	Firing temperature T_2 [°C/°F]	Holding time H_2 [min]	Vacuum 1 1_1 [°C/°F] 1_2 [°C/°F]	Vacuum 2 2_1 [°C/°F] 2_2 [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t_1 [°C/°F/min]
Programat CS Program 1	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

Please note:
- **If glaze paste is used, Speed Crystallization/Glaze Spray must not be used.**
- **Both Speed Crystallization and Crystallization/Glaze are not suitable for the crystallization of IPS e.max CAD MO.**

Notes on cooling:
- **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.**

If additional characterizations or adjustments are required after crystallization, a corrective firing using IPS e.max CAD Crystall./Shades, 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 or occlusal contact points), IPS e.max CAD Crystall./Add-On is available. The adjustments may be made with Speed Crystallization, Crystallization/Glaze and Corrective Firing. The detailed procedure is described on page 36.



Correction firing

Furnace	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t_1 [°C/°F/min]	Firing temperature T_1 [°C/°F]	Holding time H_1 [min]	Heating rate t_2 [°C/°F/min]	Firing temperature T_2 [°C/°F]	Holding time H_2 [min]	Vacuum 1 1_1 [°C/°F] 1_2 [°C/°F]	Vacuum 2 2_1 [°C/°F] 2_2 [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t_1 [°C/°F/min]
Programat CS Program 2	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

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Example of incorrect Glaze Spray application

Problem/Cause	Before Firing Application of the Glaze Spray	After Firing Detailed view of the surface
Problem: **Not enough Glaze Spray** on the restoration **Possible cause:** – Distance between the spray can and the restoration too far – Spraying too short – Spray can not shaken sufficiently – Spray can held not upright during spraying	 Insufficient application of IPS e.max CAD Crystall./Glaze Spray	 Insufficient gloss or imcomplete glossy layer
Problem: **Too much Glaze Spray** on the restoration **Possible cause:** – Distance between the spray can and the restoration too close – Too much Glaze Spray applied	 Too much IPS e.max CAD Crystall./Glaze Spray applied	 Loss of texture and too glossy surface

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Option B:

Crystallization and Glaze firing in one step with IPS e.max CAD Crystall./Glaze paste

Before crystallization, IPS e.max CAD Crystall./Glaze, Shades und Stains are applied to the "blue" restoration.



- IPS e.max CAD Crystall./Shades are ready-to-use "Dentin and Incisal" stains in syringes
- IPS e.max CAD Crystall./Stains are ready-to-use intensive stains in syringes
- IPS e.max CAD Crystall./Glaze Paste is a ready-to-use glazing paste

Please observe the following procedure:

- Extrude the ready-to-use IPS e.max CAD Crystall./Glaze Paste from the syringe and mix.
- If a slight thinning is desired, the glaze paste may also be mixed with a little IPS e.max CAD Crystall./Glaze Liquid.
- Hold the restoration by the IPS e.max CAD Crystallization Pin.
- Apply the glazing paste evenly to the entire restoration using a brush.
- Avoid applying 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 restoration can be individualized using IPS e.max CAD Crystall./Shades and Stains before the 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 into the unfired glaze layer using a fine brush (2-in-1 technique).
- Observe the Characterization guide (see page 28) for applying Shades and Stains.



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



Hold the restoration by the firing pin and apply IPS e.max CADCrystall./Glaze Paste evenly on the blue restoration



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

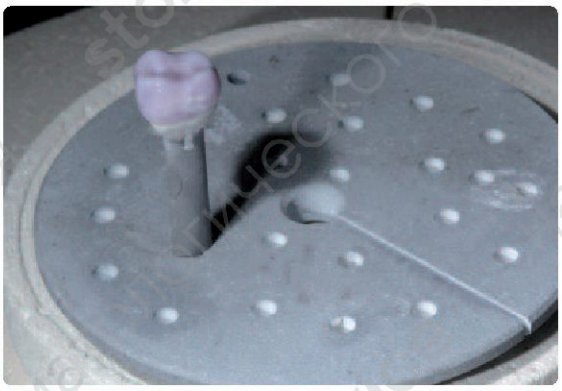


Apply the mixed IPS e.max CAD Crystall./Shades and Stains directly into the unfired IPS e.max CAD Crystall./Glaze Paste

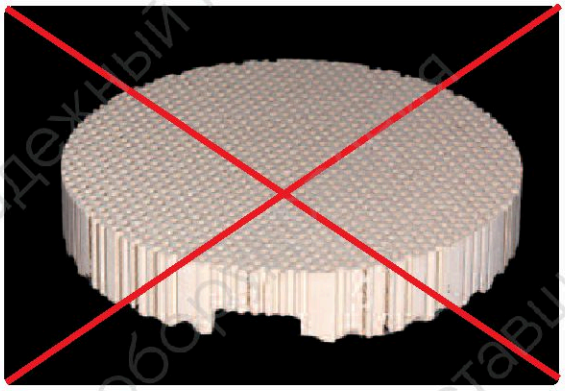
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After glazing and staining, the Combination firing (crystallization/glaze) is conducted in a compatible ceramic furnace (e.g. Programat CS). When placing the objects into the furnace and setting the firing parameters, please observe the following points:

- 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 IPS e.max CAD Crystallization Tray and crystallized using the Combination firing with IPS e.max CAD Crystall./Glaze **Paste**.
- If glaze paste is used, Speed Crystallization/Glaze Spray must not be used.



Place the glazed and stained restoration into the centre of the IPS e.max CAD Crystallization Tray.



Do not use a honey-combed tray for crystallization!

Conduct the combination firing (crystallization/glaze) in a ceramic furnace (e.g. Programat CS) using the following parameters:



Crystallization/Glaze

Furnace	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t_1 [°C/°F/min]	Firing temperature T_1 [°C/°F]	Holding time H_1 [min]	Heating rate t_2 [°C/°F/min]	Firing temperature T_2 [°C/°F]	Holding time H_2 [min]	Vacuum 1 1_1 [°C/°F] 1_2 [°C/°F]	Vacuum 2 2_1 [°C/°F] 2_2 [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t_1 [°C/°F/min]
Programat CS Program 1	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

Please note:

- **If glaze paste is used, Speed Crystallization/Glaze Spray must not be used.**
- **These firing parameters are not suitable for the crystallization of IPS e.max CAD MO!**

Notes on cooling:

- **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.**

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 or occlusal contact points), IPS e.max CAD Crystall./Add-On is available. The adjustments may be made with both Crystallization/Glaze and Corrective firing. The detailed procedure is described on page 36.



Correction firing

Furnace	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t_1 [°C/°F/min]	Firing temperature T_1 [°C/°F]	Holding time H_1 [min]	Heating rate t_2 [°C/°F]	Firing temperature T_2 [°C/°F]	Holding time H_2 [°C/°F]	Vacuum 1 1_1 [°C/°F] 1_2 [°C/°F]	Vacuum 2 2_1 [°C/°F] 2_2 [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t_1 [°C/°F/min]
Programat CS Program 2	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

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Optional

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

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



Processing:

- 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 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 Combination firing (crystallization/glaze HT/LT) after the application of Add-On on the «blue», non-crystallized restoration.
- Conduct the Corrective firing if Add-On is applied on an already crystallized restoration.
- Speed Crystallization/Glaze Spray must not be used in conjunction with the Add-On.



Mix 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

Firing parameters Crystallization / Glaze HT/LT

Furnace	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t1 [°C/°F/min]	Firing temperature T1 [°C/°F]	Holding time H1 [min]	Heating rate t2 [°C/°Fmin]	Firing temperature T2 [°C]	Holding time H2 [min]	Vacuum 1 1₁ [°C/°F] 1₂ [°C/°F]	Vacuum 2 2₁ [°C/°F] 2₂ [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate tl [°C/°F/min]
Programat CS Program 1	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

Firing parameters for the Corrective firing

Furnace	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t1 [°C/°F/min]	Firing temperature T1 [°C/°F]	Holding time H1 [min]	Heating rate t2 [°C/°Fmin]	Firing temperature T2 [°C]	Holding time H2 [min]	Vacuum 1 1₁ [°C/°F] 1₂ [°C/°F]	Vacuum 2 2₁ [°C/°F] 2₂ [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate tl [°C/°F/min]
Programat CS Program 2	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

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Completion of the Restoration

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

- Remove the restoration from the hardened auxiliary firing paste.
- Remove any residue with ultrasound in a water bath and/or with steam.
- **Do not blast the restoration with Al_2O_3 or glass polishing beads.**
- Final try-in of the restoration before cementation.
- If adjustments by grinding are required, make sure that no overheating of glass-ceramic occurs.
- Use fine-grained diamonds (< 60 µm) for finishing, followed by rubber polishers at low speed and limited pressure. For the selection of the appropriate grinding tools, refer to the Ivoclar Vivadent Flow Chart "Recommended grinding tools – chairside".
- Finally, polish the adjusted areas to a high gloss (e.g. using OptraFine).
- Thoroughly clean the restoration.



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



Remove residue with ultrasound in a water bath…



… or with steam.



Final try-in of the restoration before cementation

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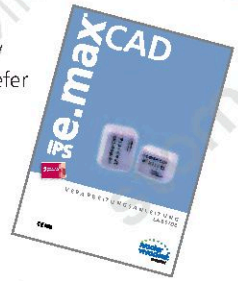
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IPS e.max® CAD

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 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 e.max Ceram Glaze, Shades and Essences.

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Completion of the anatomical shape of the reduced areas using IPS e.max Ceram Incisal and Opal materials.



Finish the restoration with diamonds and give it a true-to-nature shape and surface structure. Finally, conduct glaze firing using IPS e.max Ceram Glaze.



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

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IPS e.max® CAD –
Seating and Follow-Up Care

Possibilities for Cementation

Esthetic cementation options are crucial for the harmonic shade effect of all-ceramic restorations. Depending on the indication, IPS e.max CAD restorations may be placed using the adhesive, self-adhesive or the conventional cementation technique.

- For the adhesive cementation of IPS e.max CAD restorations, Variolink® II, Variolink® Veneer or Multilink® Automix are the ideal composites.
- For the self-adhesive cementation of IPS e.max CAD restorations, we recommend using SpeedCEM.
- Powder-liquid systems are used for the self-adhesive cementation technique.

Definition

- **Adhesive cementation**
  In the adhesive cementation technique, bonding is achieved also through mechanical adhesion, but mainly through chemical/micromechanical adhesion between the cementation material and the restoration and between the cementation material and the preparation. Due to the chemical/micromechanical bonding, a retentive preparation is not required. Depending on the cementation material, specific adhesive systems are used on prepared teeth in order to achieve the micromechanical bond to dentin or enamel.
  Adhesive cementation increases the "(overall) strength" of the incorporated all-ceramic restoration.
- **Self-adhesive cementation**
  The cementation material shows self-etching properties on the tooth, but not on the restoration. Therefore, the tooth surface does not need to be specifically conditioned. The bond is generated in part by micromechanical/chemical adhesion. In order to achieve sufficient bonding strengths, a retentive preparation is recommended.
- **Conventional cementation**
  In the conventional cementation technique, the bond is achieved nearly exclusively through mechanical friction between the cementation material and the restoration as well as between the cementation material and the preparation. In order to obtain the required mechanical friction, a retentive preparation showing a preparation angle of approximately 4-6° is required.

* the range of products on offer may vary from country to country

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Seating

The conditioning of the restoration and the preparation depends on the cementation technique applied and the cementation material. For the cementation of IPS e.max CAD restorations, you may choose between the tried-and-tested cementation materials from Ivoclar Vivadent according to the indication.
The following list describes the basic working steps to prepare the seating. For a detailed description of the procedure, please refer to the respective Instructions for Use of the cementation material used.

a. Conditioning of the restoration

Conditioning of the ceramic surface to prepare the cementation is decisive for generating a sound bond between the cementation material and the all-ceramic restoration. The conditioning procedure depends on the choice of cementation material according to the indication.

Material	**IPS e.max CAD**		
	Lithium disilicate glass-ceramic		
Indication	**Veneers, inlays, onlays, partial crowns**	**Anterior and posterior crowns**	
Cementation method	adhesive	adhesive	self-adhesive / conventional *
Blasting	—		
Etching	20 sec with IPS Ceramic Etching Gel		
Conditioning / silanization	60 sec with Monobond® Plus		
Cementation system	Variolink® Veneer, Variolink® II, Multilink® Automix	Variolink® II, Multilink® Automix	SpeedCEM

* Conventional cementation is done without conditioning

The range of products on offer may vary from country to country

Please observe the corresponding Instructions for Use.

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Etching and silanating

Depending on the cementation method and the material used, the IPS e.max CAD restoration is prepared as follows:

- Thoroughly clean the restoration after clinical try-in.
- **Do not blast IPS e.max CAD with Al_2O_3 or with glass polishing beads before seating**.
- For the etching procedure, place the restoration on a temporary adhesive stick (OptraStick).
- Apply IPS Ceramic Etching Gel (gel containing 5% hydrofluoric acid) on the surface to be etched using a plastic spatula, disposable brush or plastic application tips. 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 adhesive or self-adhesive cementation technique is used to seat the restoration, silanize the bonding surface using Monobond Plus.
- Apply Monobond Plus on the etched surface using a disposable brush and allow to react for 60 seconds.
- After the reaction time, dry the remaining residue with water- and oil-free air.



Do **not** blast the IPS e.max CAD restoration.



Etch for 20 sec. with IPS Ceramic Etching Gel



Allow Monobond Plus to react for 60 seconds and dry with air.

b. Conditioning of the preparation and seating

The conditioning of the preparation also depends on the cementation material used and is carried out according to the respective Instructions for Use.

Cementation of the restoration using Variolink® Veneer or Variolink® II

For the cementation of IPS e.max CAD restorations with Variolink Veneer or Variolink II, please proceed as follows:

- Clean the preparation, rinse with water and dry with air.
- Enamel etching (etch for 30 sec) and dentin conditioning (etch for 10 to 15 sec) using Total Etch Gel.
- Apply the bonding agent Syntac or ExciTE DSC.
- After application of Syntac, apply Heliobond to dentin and enamel.
- Apply Variolink Veneer or Variolink II directly into the etched and silanized restoration.
- Place the restoration and remove excess cementation material.
- Cover the restoration margins with Liquid Strip (glycerine gel) for the polymerization process.
- Polish the cementation margin.

Cementation of IPS e.max CAD restorations with Multilink®Automix Easy Clean-Up

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 silanated restoration
- Seating of the restoration
- Conduct the pre-polymerization using the four-quarter technique
- Remove excess material
- Conduct final polymerization

Cementation of IPS e.max CAD restorations with SpeedCEM

For the cementation of IPS e.max CAD restorations with SpeedCEM, please proceed as follows:

- Clean the preparation, rinse with water and highly dry with oil-free air
- Apply SpeedCEM directly into the etched and silanated restoration
- Place the restoration and remove excess cementation material
- Polish the cementation margin.

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Example: Cementation with SpeedCEM



Clean preparation, rinse with water …



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



Apply SpeedCEM directly into the etched and silanated restoration



Set the restoration and remove of excess





Completed IPS e.max CAD restoration in situ, occlusal and buccal view

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Care instructions

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 esthetic appearance. You can maintain valuable surfaces without abrasion using the pumice-free polishing paste Proxyt pink. The low RDA (Relative Dentin Abrasion) value of 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.







Application of Proxyt

Clinical images
The clinical pictures used herein were taken by Dr. A. Peschke, Ivoclar Vivadent AG, Schaan.

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IPS e.max® CAD – Questions and answers

If a plaster working model is used to work with, which type of plaster should be used to fabricate the model?

The directions of the manufacturers 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.

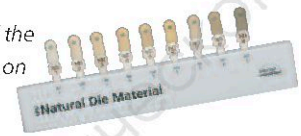
What kind of preparation requirements must the die demonstrate in order to produce accurately fitting restorations?

The 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 is it necessary to determine the shade of the tooth after preparation?



It is necessary to know the shade of the prepared tooth because, depending on the translucency level of the block used, the shade of the prepared tooth may have an influence on the seated all-ceramic restoration. The appropriate block can be selected using the IPS Natural Die shade guide.

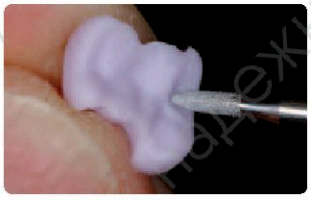
In what situations are IPS e.max CAD HT blocks used?

Given their high translucency, HT blocks are ideally suitable for the fabrication of smaller restorations (e.g. inlays and onlays). Restorations made of HT blocks convince users with their true-to-nature chameleon effect and the exceptional adaption to the remaining tooth structure. The brightness may be lower if translucent blocks are used to fabricate larger restorations (e.g. crowns). In such cases, it is recommended to use blocks with lower translucency levels (IPS e.max CAD LT).

In which situations are IPS e.max CAD LT blocks used?

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

Does the occlusal surface of IPS e.max CAD restorations have to be ground after the CAD/CAM processing?



***Yes**. In order to smooth out the surface structure created by the CAD/CAM milling, the occlusal surface and particularly the functional areas which show antagonist contact must be surface-ground with fine diamonds.*

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

Corrections by grinding should always be carried out on the blue restoration prior to crystallization. In doing so, it must be ensured that the restoration is processed using only suitable grinding instruments, low speed and light pressure to prevent delamination and chipping at the edges in particular.

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Can machined 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 should be carefully tried in and finished in their pre-crystallized ("blue") state. In the blue state, special attention must be paid to the restoration margins. The margins should be created in relation to the preparation and the thickness of the restoration.

Do IPS e.max CAD restorations shrink during crystallization?

No. During the crystallization process, the microstructure becomes transformed and a densification of 0.2 % takes place. The CAD software takes the densification factor into account. Therefore, the milled IPS e.max CAD restorations demonstrate precision of fit after crystallization. No further manual adjustments are necessary.

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 IPS e.max CAD restorations during crystallization, which ensures that the restorations demonstrate optimum accuracy of fit.



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

IPS Object Fix Putty and Flow has been speically developed for the crystallization of IPS e.max CAD restorations. The expansion behavior 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.

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. OptraSculpt). Alternatively, 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 which is 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?

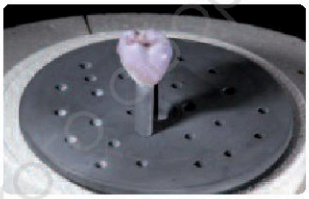
A brush, a cotton swab or a microbrush dampened with water can be used for cleaning. It must be made sure that any residue has been removed before Shades, Stains or Glaze are applied in order to prevent the residue from being burned in.

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.

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Can other firing trays, e.g. honey-combed 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 slow and above all tension-free cooling of the glass-ceramic. Other firing trays, e.g. honey-combed 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 CS). If you would like to use other ceramic furnaces, please consult Ivoclar Vivadent about their compatibility with IPS e.max CAD. It is important to note that not every ceramic furnace can be used for crystallization. Ceramic furnaces which, for example, do not feature a controlled (long-term) cooling mode or vacuum cannot be used for this purpose.

Can IPS e.max CAD Crystall./Add-On also be fired with the parameters Speed Crystallization/Glaze Spray?

No. Since the IPS e.max CAD Crystall./Add-On Liquid contains organic components that only slowly evaporate during pre-drying, the parameters Speed Crystallization/Glaze Spray cannot be used due to the short closing time.

Can the IPS e.max CAD Crystall./Glaze Paste also be fired with the parameters Speed Crystallization/Glaze Spray?

No. Since the IPS e.max CAD Crystall./Glaze Paste contains organic components that only slowly evaporate during pre-drying, the parameters Speed Crystallization/Glaze Spray cannot be used due to the short closing 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.*

What must be considered after the firing of IPS e.max CAD?

In order to prevent tensions 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.

Can IPS e.max CAD restorations be blasted with Al_2O_3 or glass polishing beads (on the cavity side) as a preparation for the seating?

*IPS e.max CAD restorations must **not** be blasted with Al_2O_3 or glass polishing beads before placement, as this damages the ceramic surface and significantly reduces the strength.*

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

The internal (bonding) surfaces of IPS e.max CAD restorations must always be etched with 5% hydrofluoric acid etching gel (IPS Ceramic Etching Gel) for 20 seconds, 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 silanized using Monobond Plus when adhesive and self-adhesive cementation is used. With conventional cementation, silanizing is not necessary.

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IPS e.max® CAD – Table on Block Selection

The blocks are selected on the basis of the desired tooth shade (Bleach BL or A-D), the determined shade of the preparation (ND 1 - ND 9), and/or abutment shade, as well as the desired processing technique. The following procedure results in the selection of the appropriate block:

1. Select the column with the desired tooth shade.
2. Select the line with the shade of the preparation.
3. Select the adequate block in accordance with the desired processing technique (staining or cut-back technique) in the intersection field.
4. If a certain combination is not possible (e.g. HT block on a dark preparation), select a block with a lower translucency.

- **The recommendations for the block selection correlate with the indications as well as the preparation guidelines and minimum layer thicknesses.**
- **In case of shade deviations, adjust the restoration shade by means of characterization with IPS e.max CAD Crystall./ Shades and Stains.**
- **If (highly) translucent blocks are used, the layer thickness and die shade must be carefully observed.**
- **With thicker layers, a block with lower translucency must be selected to prevent a loss in brightness (graying).**

1 ⇩

2 ⇨

Shade of the prepared natural tooth / *IPS Natural Die Material*	Desired Tooth Shade: *Bleach BL and A-D Shade Guide*																			
	BL1	BL2	BL3	BL4	A1	A2	A3	A3.5	A4	B1	B2	B3	B4	C1	C2	C3	C4	D2	D3	D4
ZrO_2 Abutment (unshaded)	HT BL1	HT BL2	HT BL3	HT BL4	HT A1	HT A2	HT A3	HT A3.5	HT A4	HT B1	HT B2	HT B3	HT B4	HT C1	HT C2	HT C3	HT C4	HT D2	HT D3	HT D4
	LT BL1	LT BL2	LT BL3	LT BL4	LT A1	LT A2	LT A3	LT A3.5	LT A4	LT B1	LT B2	LT B3	LT B4	LT C1	LT C2	LT C3	LT C4	LT D2	LT D3	LT D4
ND 1	HT BL1	HT BL2	HT BL3	HT BL4	HT A1	HT A2	HT A3	HT A3.5	HT A4	HT B1	HT B2	HT B3	HT B4	HT C1	HT C2	HT C3	HT C4	HT D2	HT D3	HT D4
	LT BL1	LT BL2	LT BL3	LT BL4	LT A1	LT A2	LT A3	LT A3.5	LT A4	LT B1	LT B2	LT B3	LT B4	LT C1	LT C2	LT C3	LT C4	LT D2	LT D3	LT D4
ND 2	HT BL1	HT BL2	HT BL3	HT BL4	HT BL2	HT A2	HT A3	HT A3.5	HT A4	HT BL2	HT B2	HT B3	HT B4	HT C1	HT C2	HT C3	HT C4	HT D2	HT D3	HT D4
	LT BL1	LT BL2	LT BL3	LT BL4	HT A1	LT A2	LT A3	LT A3.5	LT A4	LT B1	LT B2	LT B3	LT B4	LT C1	LT C2	LT C3	LT C4	LT D2	LT D3	LT D4
ND 3						HT BL2	HT A1	HT A3.5	HT A4	HT BL1	HT BL2	HT B2	HT B2	HT BL2	HT C1	HT C2	HT B4	HT B1	HT D2	HT D2
		LT BL1	LT BL2	LT BL4	LT BL3	LT A1	LT A2	LT A3.5	LT A4	LT B1	LT B2	LT B3	LT B4	LT C1	LT C2	LT C3	LT C4	LT D2	LT D3	LT D4
ND 4*								HT B3	HT A4			HT BL2	HT BL2	HT BL1	HT B1	HT B3	HT C2	HT BL1	HT B1	HT D2
	LT BL2	LT A1	LT A2	LT A3	LT BL2	LT A1	LT A2	LT A3	LT A4	LT BL3	LT B1	LT B2	LT B3	LT C1	LT B2	LT C3	LT C4	LT D2	LT B2	LT D3
ND 5*						HT BL1	HT BL1	HT A3.5	HT A4		HT BL1	HT BL1	HT BL2	HT BL2	HT A1	HTA3	HT B3	HT BL1	HT A2	HT C1
		LT BL1	LBL2	LT BL4	LT BL2	LT A1	LT A2	LT A3	LT A4	LT BL3	LT B1	LT B2	LT B3	LT C1	LT B2	LT C3	LT C4	LT D2	LT B2	LT D3
ND 6*						HT BL1	HT BL1	HT BL1	HT A3			HT BL1	HT BL2		HT B1	HT B2	HT B3	HT BL1	HT BL2	HT BL2
		LT BL1	LBL2	LT BL4	LT BL1	LT A1	LT A2	LT A3	LT A4	LT BL3	LT B1	LT B2	LT B3	LT C1	LT B2	LT C3	LT C4	LT D2	LT B2	LT D3
ND 7*												HT BL1	HT BL1	HT A1	HT A3	HT A3.5	HT A4	HT B1	HT BL2	HT BL2
		LT BL1	LBL2	LT BL4	LT BL1	LT A1	LT A2	LT A3	LT A4	LT BL3	LT B1	LT B2	LT B3	LT C1	LT B2	LT C3	LT C4	LT D2	LT B2	LT D3
ND 8*													HT B2	HT C1	HT B2	HT C3	HT C4	HT D2	HT B2	HT D2
								LT A3	LT A4				LT BL2	LT C1	LT B2	LT C3	LT C4	LT D2	LT B2	LT D2
ND 9*																				
Ti Abutment*																				

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Shade of the prepared natural tooth *IPS Natural Die Material*	Desired Tooth Shade: *Bleach BL and A-D Shade Guide*																			
	BL1	BL2	BL3	BL4	A1	A2	A3	A3.5	A4	B1	B2	B3	B4	C1	C2	C3	C4	D2	D3	D4
ZrO_2 Abutment (unshaded)	HT BL1	HT BL2	HT BL3	HT BL4	HT A1	HT A2	HT A3	HT A3.5	HT A4	HT B1	HT B2	HT B3	HT B4	HT C1	HT C2	HT C3	HT C4	HT D2	HT D3	HT D4
	LT BL1	LT BL2	LT BL3	LT BL4	LT A1	LT A2	LT A3	LT A3.5	LT A4	LT B1	LT B2	LT B3	LT B4	LT C1	LT C2	LT C3	LT C4	LT D2	LT D3	LT D4
ND 1	HT BL1	HT BL2	HT BL3	HT BL4	HT A1	HT A2	HT A3	HT A3.5	HT A4	HT B1	HT B2	HT B3	HT B4	HT C1	HT C2	HT C3	HT C4	HT D2	HT D3	HT D4
	LT BL1	LT BL2	LT BL3	LT BL4	LT A1	LT A2	LT A3	LT A3.5	LT A4	LT B1	LT B2	LT B3	LT B4	LT C1	LT C2	LT C3	LT C4	LT D2	LT D3	LT D4
ND 2	HT BL1	HT BL2	HT BL3	HT BL4	HT BL2	HT A2	HT A3	HT A3.5	HT A4	HT BL2	HT B2	HT B3	HT B4	HT C1	HT C2	HT C3	HT C4	HT D2	HT D3	HT D4
	LT BL1	LT BL2	LT BL3	LT BL4	LT A1	LT A2	LT A3	LT A3.5	LT A4	LT B1	LT B2	LT B3	LT B4	LT C1	LT C2	LT C3	LT C4	LT D2	LT D3	LT D4
ND 3						HT BL2	HT A1	HT A3.5	HT A4	HT BL1	HT BL2	HT B2	HT B2	HT BL2	HT C1	HT C2	HT B4	HT B1	HT D2	HT D2
		LT BL1	LT BL2	LT BL4	LT BL 3	LT A1	LT A2	LT A3.5	LT A4	LT B1	LT B2	LT B3	LT B4	LT C1	LT C2	LT C3	LT C4	LT D2	LT D3	LT D4
ND 4*								HT B3	HT A4			HT BL2	HT BL2	HT BL1	HT B1	HT B3	HT C2	HT BL1	HT B1	HT D2
	LT BL 2	LT A1	LT A2	LT A3	LT BL 2	LT A1	LT A2	LT A3	LT A4	LT BL3	LT B1	LT B2	LT B3	LT C1	LT B2	LT C3	LT C4	LT D2	LT B2	LT D3
ND 5*						HT BL1	HT BL1	HT A3.5	HT A4		HT BL1	HT BL1	HT BL2	HT BL2	HT A1	HTA3	HT B3	HT BL1	HT A2	HT C1
		LT BL1	LBL2	LT BL4	LT BL2	LT A1	LT A2	LT A3	LT A4	LT BL3	LT B1	LT B2	LT B3	LT C1	LT B2	LT C3	LT C4	LT D2	LT B2	LT D3
ND 6*						HT BL1	HT BL1	HT BL1	HT A3			HT BL1	HT BL2		HT B1	HT B2	HT B3	HT BL1	HT BL2	HT BL2
		LT BL1	LBL2	LT BL4	LT BL1	LT A1	LT A2	LT A3	LT A4	LT BL3	LT B1	LT B2	LT B3	LT C1	LT B2	LT C3	LT C4	LT D2	LT B2	LT D3
ND 7*												HT BL1	HT BL1	HT A1	HT A3	HT A3.5	HT A4	HT B1	HT BL2	HT BL2
		LT BL1	LBL2	LT BL4	LT BL1	LT A1	LT A2	LT A3	LT A4	LT BL3	LT B1	LT B2	LT B3	LT C1	LT B2	LT C3	LT C4	LT D2	LT B2	LT D3
ND 8*													HT B2	HT C1	HT B2	HT C3	HT C4	HT D2	HT B2	HT D2
								LT A3	LT A4				LT BL2	LT C1	LT B2	LT C3	LT C4	LT D2	LT B2	LT D2
ND 9*																				
Ti Abutment*																				

* In order to achieve the desired tooth shade, the preparation has to be lightened. If this cannot be done, the restoration can be fabricated in the laboratory (layering technique) using opaque IPS e.max CAD MO blocks.

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Characterizations - IPS e.max CAD Crystall./Shades and Stains on IPS e.max CAD

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

A–D	A1	A2	A3	A3.5	A4	B1	B2	B3	B4	C1	C2	C3	C4	D2	D3	D4
IPS e.max CAD Crystall./Shade	SH 1	SH 1	SH 1	SH 1	SH 1	SH 2	SH 2	SH 2	SH 2	SH 3	SH 3	SH 3	SH 3	SH 4	SH 4	SH 4
IPS e.max CAD Crystall./Shade Incisal	SH I1	SH I1	SH I1	SH I2	SH I2	SH I1	SH I1	SH I1	SH I1	SH I2	SH I2	SH I2	SH I2	SH I2	SH I2	SH I2
IPS e.max CAD Crystall./Stains	white, creme, sunset, copper, olive, khaki, mahogany															

Bleach BL	BL1	BL2	BL3	BL4
IPS e.max CAD Crystall./Shade	SH 0	SH 0	SH 0	SH 0
IPS e.max CAD Crystall./Shade Incisal	SH I1	SH I1	SH I1	SH I1
IPS e.max CAD Crystall./Stains	white, creme, sunset, copper, olive, khaki, mahogany			

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IPS e.max® CAD – Crystallization Parameters

The following notes should be observed for the crystallization of IPS e.max CAD:
- Carry out the crystallization in a Programat CS or another Ivoclar Vivadent ceramic furnace using the indicated parameters.
- If you would like to 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
  - vacuum function

  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 calibration should be required. Follow the instructions for the manufacturer.

The following aspects should be observed **for conducting the crystallization**:
- Use only IPS Object Fix Putty or Flow as an auxiliary firing paste.
- 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 only the IPS e.max CAD Crystallization Tray and the corresponding IPS e.max Crystallization Pins, since they store the heat necessary for slow and above all tension-free cooling of the glass-ceramic.
- Always conduct the crystallization under vacuum.
- Always allow the restoration to cool to room temperature after crystallization before further processing.
- 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.

Crystallization/Glaze (at most 6 restorations)

Furnace	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t_1 [°C/°F/min]	Firing temperature T_1 [°C/°F]	Holding time H_1 [min]	Heating rate t_2 [°C/°F/min]	Firing temperature T_2 [°C/°F]	Holding time H_2 [min]	Vacuum 1 1_1 [°C/°F] 1_2 [°C/°F]	Vacuum 2 2_1 [°C/°F] 2_2 [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t_1 [°C/°F/min]
Programat CS Program 1	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

Correction firing

Furnace	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t_1 [°C/°F/min]	Firing temperature T_1 [°C/°F]	Holding time H_1 [min]	Heating rate t_2 [°C/°F]	Firing temperature T_2 [°C/°F]	Holding time H_2 [°C/°F]	Vacuum 1 1_1 [°C/°F] 1_2 [°C/°F]	Vacuum 2 2_1 [°C/°F] 2_2 [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t_1 [°C/°F/min]
Programat CS Program 2	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

Speed Crystallization/Glaze Spray (at most 2 Restaurationen with Glaze Spray)

Furnace	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t_1 [°C/°F/min]	Firing temperature T_1 [°C/°F]	Holding time H_1 [min]	Heating rate t_2 [°C/°F/min]	Firing temperature T_2 [°C/°F]	Holding time H_2 [min]	Vacuum 1 1_1 [°C/°F] 1_2 [°C/°F]	Vacuum 2 2_1 [°C/°F] 2_2 [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t_1 [°C/°F/min]
Programat CS Program 3	403/757	1:30	90/162	820/1508	0:10	30/54	840/1544	7:00	550/820 1022/1508	820/840 1508/1544	700/1292	0

Please note:
- **If glaze paste is used, Speed Crystallization/Glaze Spray must not be used.**
- **Both Speed Crystallization and Crystallization/Glaze are not suitable for the crystallization of IPS e.max CAD MO.**

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Ivoclar Vivadent – worldwide

Ivoclar Vivadent AG
Bendererstrasse 2
FL-9494 Schaan
Liechtenstein
Tel. +423,235 35 35
Fax +423,235 33 60
www.ivoclarvivadent.com

Ivoclar Vivadent Pty. Ltd.
1 – 5 Overseas Drive
P.O. Box 367
Noble Park, Vic. 3174
Australia
Tel. +61 3 979 595 99
Fax +61 3 979 596 45
www.ivoclarvivadent.com.au

Ivoclar Vivadent GmbH
Bremschlstr. 16
Postfach 223
6706 Bürs
Austria
Tel. +43 5552 624 49
Fax +43 5552 675 15
www.ivoclarvivadent.com

Ivoclar Vivadent Ltda.
Rua Geraldo Flausino Gomes,
78 – 6.° andar Cjs. 61/62
Bairro: Brooklin Novo
CEP: 04575-060 São Paulo – SP
Brazil
Tel. +55 11 3466 0800
Fax +55 11 3466 0840
www.ivoclarvivadent.com.br

Ivoclar Vivadent Inc.
2785 Skymark Avenue, Unit 1
Mississauga
Ontario L4W 4Y3
Canada
Tel. +1,905,238 5700
Fax +1,905,238 5711
www.ivoclarvivadent.us

Ivoclar Vivadent Marketing Ltd.
Rm 603 Kuen Yang
International Business Plaza
No. 798 Zhao Jia Bang Road
Shanghai 200030
China
Tel. +86 21 5456 0776
Fax +86 21 6445 1561
www.ivoclarvivadent.com

Ivoclar Vivadent Marketing Ltd.
Calle 134 No. 7-B-83, Of. 520
Bogotá
Colombia
Tel. +57 1,627 33 99
Fax +57 1,633 16 63
www.ivoclarvivadent.com

Ivoclar Vivadent SAS
B.P. 118
F-74410 Saint-Jorioz
France
Tel. +33 450 88 64 00
Fax +33,450 68 91 52
www.ivoclarvivadent.fr

Ivoclar Vivadent GmbH
Dr. Adolf-Schneider-Str. 2
73479 Ellwangen, Jagst
Germany
Tel.
Fax +49 (0) 79 61 / 63 26
www.ivoclarvivadent.de

Ivoclar Vivadent Marketing Ltd.
(Liaison Office)
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.com

Ivoclar Vivadent s.r.l. & C. s.a.s
Via Gustav Flora, 32
39025 Naturno (BZ)
Italy
Tel. +39 0473 67 01 11
Fax +39 0473 66 77 80
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

Ivoclar Vivadent S.A. de C.V.
Av. Mazatlán No. 61, Piso 2
Col. Condesa
06170 México, D.F.
Mexico
Tel. +52 (55) 5062-1000
Fax +52 (55) 5062-1029
www.ivoclarvivadent.com.mx

Ivoclar Vivadent Ltd.
12 Omega St, Albany
PO Box 5243 Wellesley St
Auckland, New Zealand
Tel. +64 9,914 9999
Fax +64 9,814 9990
www.ivoclarvivadent.co.nz

Ivoclar Vivadent
Polska Sp. z.o.o.
ul. Jana Pawla II 78
PL-00175 Warszawa
Poland
Tel. +48 22,635 54 96
Fax +48 22,635 54 69
www.ivoclarvivadent.pl

Ivoclar Vivadent Marketing Ltd.
Derbenevskaja Nabereshnaya 11, Geb. W
115114 Moscow
Russia
Tel. +7,495,913 66 19
Fax +7,495,913 66 15
www.ivoclarvivadent.ru

Ivoclar Vivadent Marketing Ltd.
171 Chin Swee Road
#02-01 San Centre
Singapore 169877
Tel. +65 6535 6775
Fax +65 6535 4991
www.ivoclarvivadent.com

Ivoclar Vivadent S.L.U.
c/ Emilio Muñoz N° 15
Entrada c/ Albarracin
E-28037 Madrid
Spain
Tel. + 34 91 375 78 20
Fax + 34 91 375 78 38
www.ivoclarvivadent.es

Ivoclar Vivadent AB
Dalvägen 14
S-169 56 Solna
Sweden
Tel. +46 (0) 8,51493,930
Fax +46 (0) 8,51493,940
www.ivoclarvivadent.se

Ivoclar Vivadent Liaison Office
Ahi Evran Caddesi No 1
Polaris Is Merkezi Kat: 7
80670 Maslak
Istanbul
Turkey
Tel. +90 212 346 04 04
Fax +90 212 346 04 24
www.ivoclarvivadent.com

Ivoclar Vivadent Limited
Ground Floor Compass Building
Feldspar Close
Warrens Business Park
Enderby
Leicester LE19 4SE
United Kingdom
Tel. +44,116,284 78 80
Fax +44,116,284 78 81
www.ivoclarvivadent.com

Ivoclar Vivadent, Inc.
175 Pineview Drive
Amherst, N.Y. 14228
USA
Tel. +1,800,533 6825
Fax +1 716 691 2285
www.ivoclarvivadent.us

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