

e.max[®] Ceram

IPS



INSTRUCTIONS FOR USE

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.

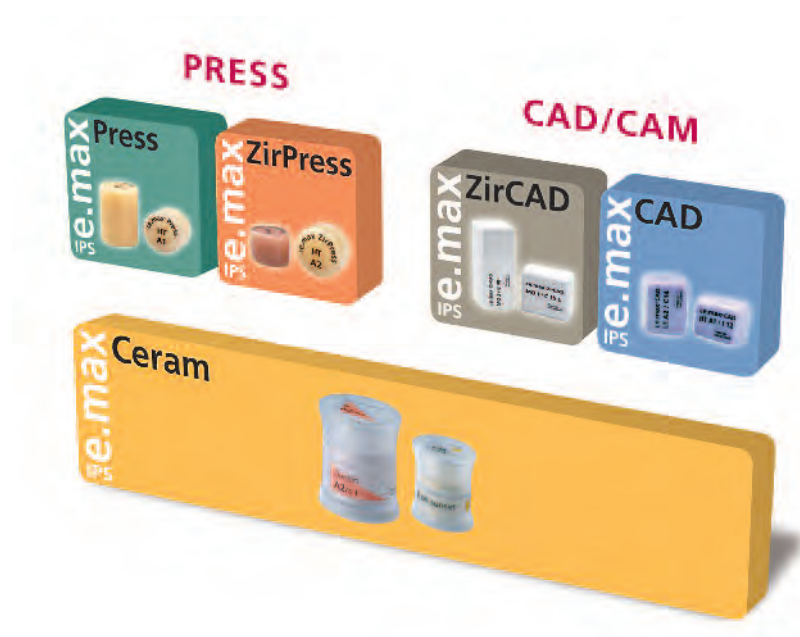
Every patient situation presents its own requirements and objectives. IPS e.max meets these requirements, because due to the system components you obtain exactly what you need.

- The components for 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-zirconium oxide technique.
- Depending on the case requirements, two types of materials are available for the CAD/CAM technique: the innovative IPS e.max CAD lithium disilicate glass-ceramic blocks and the IPS e.max ZirCAD high-strength zirconium oxide.
- 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 Ceram

The versatile layering ceramic is optimally coordinated with the materials of the IPS e.max System. Matching the shade when using different framework materials is clearly facilitated by the universal layering diagram and the precise shade coordination. After all, the veneering ceramic is the key to highly esthetic results within the IPS e.max System – both on lithium disilicate (LS₂) and zirconium oxide (ZrO₂). The unique combination of translucency, brightness and opalescence leads to natural light scattering and a balanced relationship between brightness and chroma.

In addition to the traditional dentin and incisal materials in A–D, Chromascop and Bleach shades, there is a sophisticated range of additional materials (Impulse, Essence, Stains, etc.) for individual esthetics during internal and external characterization. With the Gingiva ceramic materials, true-to-nature gingival areas are designed, which are particularly important for implant-retained restorations.



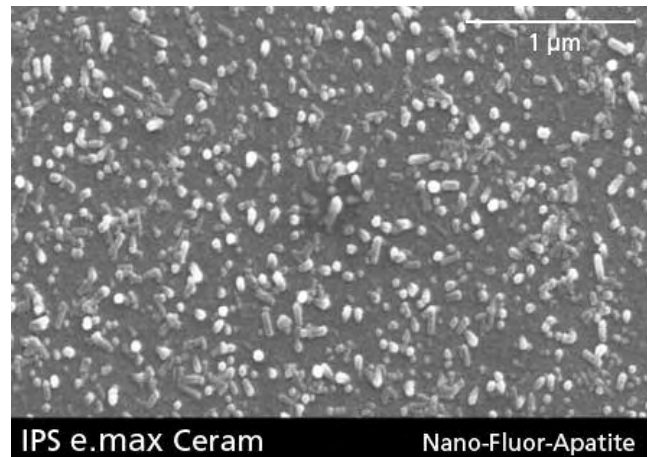
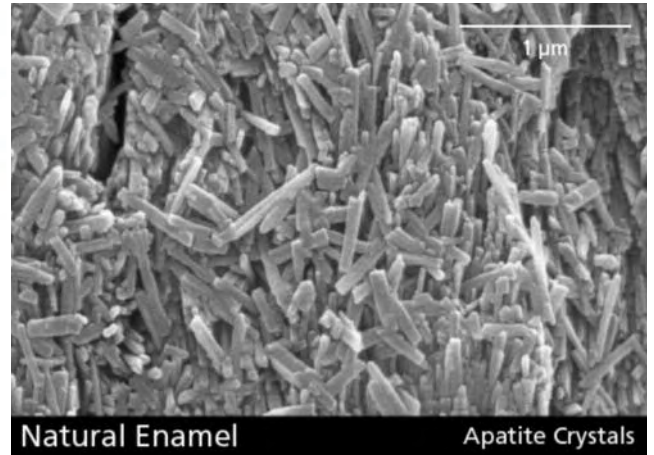
IPS e.max® Ceram

Product Information

Material

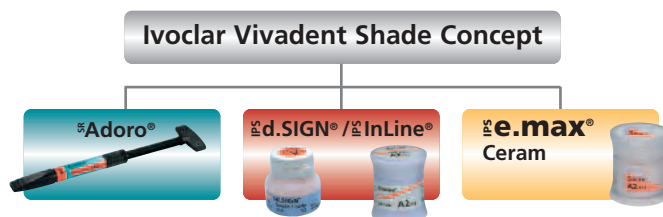
IPS e.max Ceram is a low-fusing nano-fluorapatite glass-ceramic which permits the veneering and characterization of restorations fabricated using either the press technology and/or the CAD/CAM technology. This glass-ceramic, which contains nano-fluorapatite crystals, demonstrates a crystal structure similar to that of vital teeth. The optical properties are controlled by the nano-fluorapatite crystals in the size range of 100–300 nm and micro-fluorapatite crystals with a length of 1–2 µm. The individual IPS e.max Ceram materials contain different concentrations of the apatite crystals, which then enable a unique and adjustable combination of translucency, brightness and opalescence, depending on the type of layering material. The IPS e.max ZirLiners are yet another innovation of this new material concept. They enable an exceptionally good bond with the zirconium oxide framework and demonstrate high light transmitting capability coupled with high fluorescence. They thus make the white and not very translucent zirconium oxide frameworks look as if they have been shaded and permit the adjustment of the basic zirconium oxide shade of the framework to the shade of the IPS e.max Press and IPS e.max CAD glass-ceramics. In this way, the achieved layering concept permits the fabrication of highly esthetic restorations that demonstrate optimum stability of shape both on shaded/translucent glass-ceramic frameworks and on less translucent zirconium oxide frameworks. The uniform material composition and, consequently, homogeneous clinical properties, irrespective of the framework material used, underlines the comprehensive IPS e.max restorative concept.

IPS e.max Ceram is based on the tried-and-tested shade concept of other Ivoclar Vivadent veneering materials. In this way, a continuous concept covering composites, metal-ceramics and all-ceramics has been achieved. The easy application makes the time-consuming re-familiarization with the individual veneering materials a thing of the past.



CTE (100–400°C) [10 ⁻⁶ /K]	9.5
Flexural resistance (biaxial) [MPa]*	90
Vickers hardness [MPa]	5400
Chemical solubility [µg/cm ²]*	15
Firing temperature [°C/°F]	750/1382

*according to ISO 6872



Usage

Indications

- Characterization and veneering of IPS e.max Press restorations
- Characterization and veneering of IPS e.max ZirPress restorations
- Characterization and veneering of IPS e.max CAD restorations
- Characterization and veneering of IPS e.max ZirCAD frameworks
- Characterizing and veneering Straumann® Anatomic IPS e.max® Abutments
- Characterization and veneering of frameworks, implant abutments and implant superstructures made of
 - sintered zirconium oxide and/or HIP zirconium oxide, as well as
 - presintered zirconium oxideand demonstrating a CTE range of $10.5\text{--}11.0 \times 10^{-6} \text{ K}^{-1}$ [100–500 °C].
- Layered veneers on fire-resistant investment materials
- Creation of gingival portions on restorations made of IPS e.max ZirCAD or IPS e.max ZirPress

Contraindications

- Patients with severely reduced residual dentitions
- Patients suffering from bruxism
- Any other use not listed in the indications

Important processing restrictions

If the following notes are not observed, successful work with IPS e.max Ceram cannot be ensured:

- The necessary veneering layer thickness must be observed.
- The required layer thickness relation between the framework and the layering ceramic must be observed.
- IPS e.max Ceram materials must not be mixed with other dental ceramics
- Zirconium oxide frameworks with a CTE different from the one stipulated must not be veneered.
- Veneering of zirconium oxide frameworks which were not conditioned according to the stipulations for IPS e.max ZirCAD, e.g. blasting with Al_2O_3 .
- Metal-frameworks must not be veneered.
- Other pressed ceramics (e.g. IPS Empress® Esthetic) must not be veneered.
- Aluminium oxide frameworks (e.g. Procera Alumina, Vita In-Ceram 200 Al Cubes) must not be veneered.
- Slipped and CAD/CAM-fabricated Vita InCeram frameworks (e.g. In-Ceram Classic Spinell, Alumina, Zirconia) must not be veneered.
- Cast and CAD/CAM-fabricated titanium oxide must not be veneered.
- IPS e.max Ceram ZirLiner and Margin materials should not be used on IPS e.max Press and IPS e.max CAD.
- Inlays, onlays without framework (CAD / ZrO_2 / Press)

Side effects

If a patient is known to be allergic to any of the components of IPS e.max Ceram, the material should not be used.

Composition

IPS e.max Ceram and the processing accessories consist of the following main components:

- **IPS e.max Ceram**
Components: SiO_2
Additional contents: Al_2O_3 , ZnO_2 , Na_2O , K_2O , ZrO , CaO , P_2O_5 , fluoride and pigments
- **IPS e.max Ceram Shades and Glaze Pastes**
Components: oxides, glycerine, butandiol, poly(vinyl pyrrolidone)
- **IPS e.max Ceram Glaze Spray**
Components: Glazing powder, propellant, isobutane
- **IPS e.max Ceram ZirLiner Build-Up Liquid (allround)**
Components: Water, butandiol and chloride
- **IPS e.max Ceram Margin Build-Up Liquids (allround and carving)**
Components: Water, zinc chloride and hydroxyl ethyl cellulose
- **IPS e.max Ceram Build-Up Liquids (allround and soft)**
Components: Water, propylene glyco, butandiol and chloride
- **IPS e.max Ceram Stain and Glaze Liquids (allround and longlife)**
Components: Butandiol, pentandiol
- **IPS Model Sealer**
Components: Ethyl acetate, softener and nitrocellulose
- **IPS Ceramic Separating Liquid**
Components: Paraffin oil
- **IPS Margin Sealer**
Components: Wax dissolved in hexane

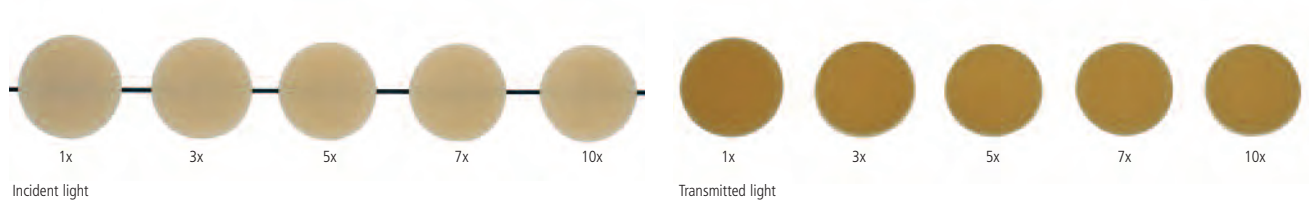
Warnings:

- Ethyl acetate is highly inflammable – keep it away from sources of ignition. Do not inhale the vapours.
- Hexane is highly inflammable and detrimental to health. Avoid contact with the skin and eyes. Do not inhale the vapours and keep the material away from sources of ignition.
- Do not inhale ceramic dust during finishing – use suction equipment and a face-mask.

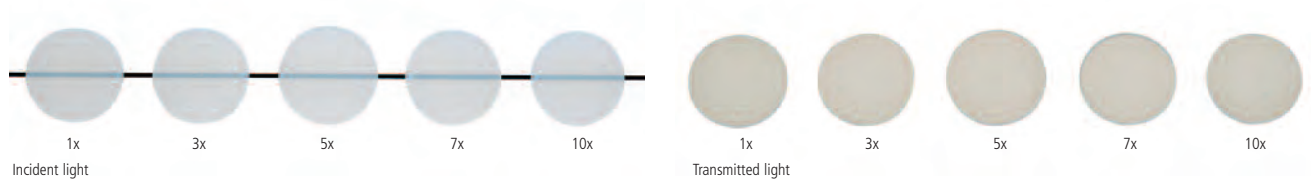
Firing behaviour and firing process

Shade stability

IPS e.max Ceram is a low-fusing nano-fluorapatite glass-ceramic. The new material generation contains nano-fluorapatite crystals and demonstrates a crystal structure similar to that of vital teeth. Depending on the type of layering material, this permits a unique and adjustable combination of translucency, brightness and opalescence which is characterized by a high stability of shape and shade, even after several firing procedures. The following images of fired tabs show the shade stability of IPS e.max Ceram Dentin A3 after several firing procedures. Even after ten firings, no obvious shade difference to the original tab is visible. After three firings, the shade of the tab already corresponds with that of the fired restoration (2 Dentin/Incisal firings and 1 Glaze firing).

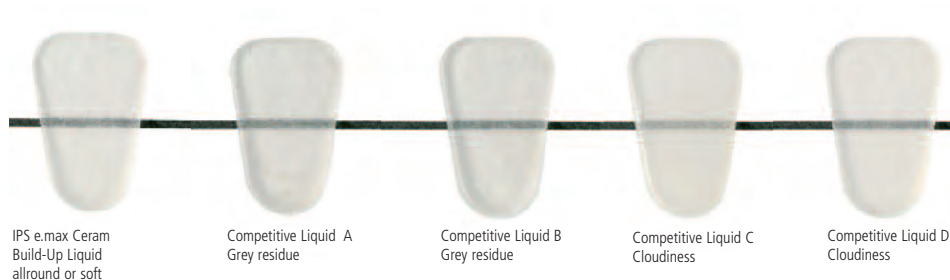


The high shade stability is particularly important for the Opal materials (Opal Effect 1), which are predominantly used in the incisal area, in order not to obtain a lifeless, greyish incisal third, even after several firing procedures. The following images show an Opal Effect 1 tab after 10 firings. There are no visible differences as regards the opalescence and brightness.



Burn-out behaviour

Given the low transformation point of low-fusing ceramic materials, the burn-out of the organic components in the build-up liquids occurs in a shorter time frame than that of high- and medium-fusing ceramics. If build-up liquids other than the IPS e.max Ceram Liquids are used, therefore, there is a risk of incomplete burn-out and thus discolouration of the restoration (e.g. cloudiness, greying). The following images show fired IPS e.max Ceram clear tabs for which different build-up liquids were used. With certain liquids, the discolouration is clearly visible. Therefore, Ivoclar Vivadent recommends using only the liquids contained in the IPS e.max Ceram Kits. If silver dust is used to design the surface, make sure that it is completely removed during cleaning. If this is not done, discolouration (e.g. yellowish) may occur after glaze firing.



Firing of lithium disilicate-supported restorations

- Use the honey-combed firing tray and the corresponding support pins to fire the restorations.
- Do not use ceramic pins, since they may stick to the restoration.
- The processing temperatures must be observed. Increasing the firing temperature will result in severe vitrification between the framework and the veneering ceramic, which may lead to crack formation later on. Reducing the firing temperature results in the ceramic being underfired, rendering it very brittle, which may ultimately lead to delamination.
- The parameters listed in the Instructions for Use apply to Ivoclar Vivadent furnaces (temperature tolerance $\pm 10\text{ }^{\circ}\text{C}/18\text{ }^{\circ}\text{F}$).
- If furnaces other than those from Ivoclar Vivadent are used, temperature adjustments may be necessary.

Firing of zirconium oxide-supported restorations

In order to obtain optimum firing results for IPS e.max Ceram, the following points have to be observed:

- In order to ensure an even thickness of the veneer, the zirconium oxide framework must be designed in such a way that it supports the cusps. Depending on the clinical situation, the results are different wall thicknesses and dimensions of the framework.
- Since ZrO_2 is a poor heat conductor compared to other framework materials, a **low temperature increase rate** is required. This ensures even heat distribution in the bonding area between the framework and the veneer as well as the outer surfaces of the restoration even with different framework thicknesses. In this way, an optimum bond as well as even sintering of the layering materials is achieved.
- During cooling of the restorations after firing, stress occurs as a result of the different cooling speeds at the outside and within the material. With **long-term cooling L** for the "final firing cycle" this stress can be reduced and the risk of delamination minimized, particularly in ZrO_2 -supported restorations.

Notes on cooling after completion of the firing program

In order to ensure "smooth" cooling of the restoration after firing, please observe the following notes:

- Wait for the acoustic signal or optical indication of the furnace at the end of the firing cycle before the firing tray with the fired objects is removed.
- Do not touch the hot objects with metal tongs.
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not blast or quench the objects.

Scientific Data

Further scientific data (i.e. strength, wear, biocompatibility) are contained in the “Scientific Documentation IPS e.max Ceram”. The Documentation also provides a set of studies that describe the clinical performance of IPS e.max Ceram.

This Scientific Documentation can be obtained from Ivoclar Vivadent.

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



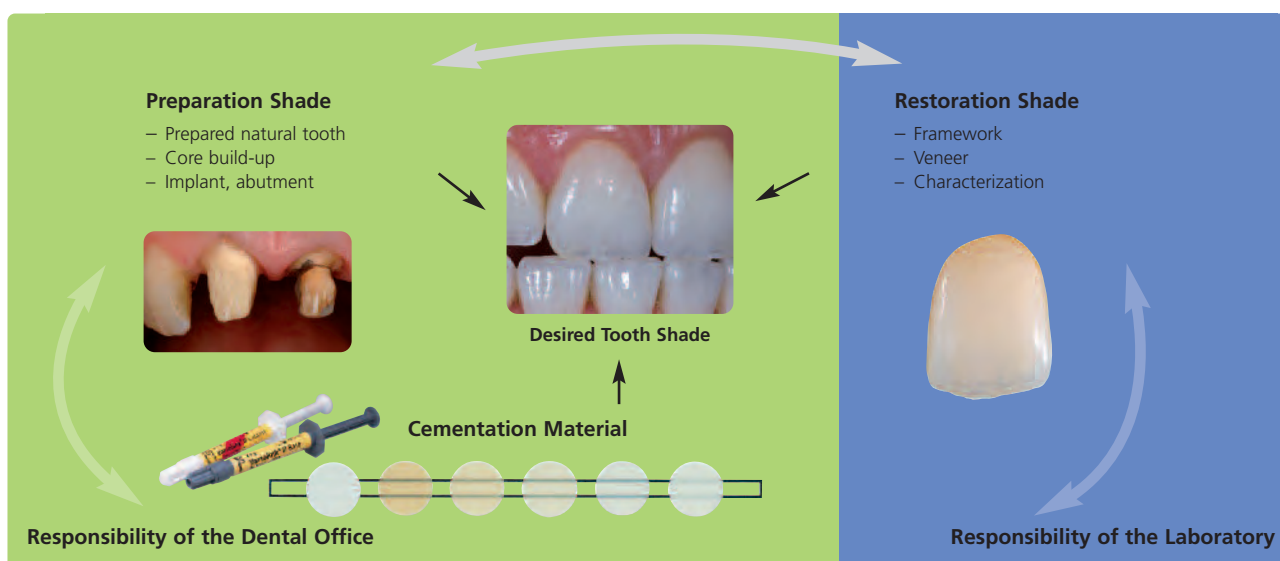
Shade Determination – Tooth Shade, Shade of the Prepared Tooth

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

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

- **Shade of 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. Only if the dentist determines the shade of the preparation and its subsequent transmission to the laboratory may the desired esthetics be achieved in a targeted fashion.



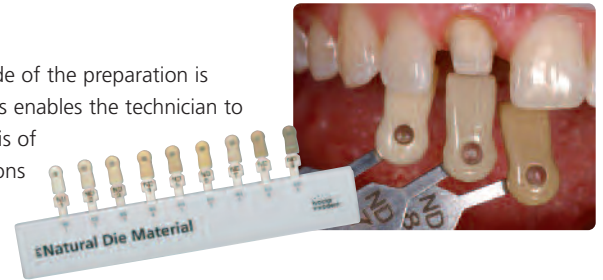
Shade determination of the natural tooth

After tooth cleaning, the tooth shade of the non-prepared tooth and/or the adjacent teeth is determined with the help of a shade guide. Individual characteristics have to be considered when determining the tooth shade. If a crown preparation is planned, for example, the cervical shade should also be determined. In order to achieve the best possible true-to-nature results, shade determination should be carried out at daylight. Furthermore, the patient should not wear clothes of intensive colours 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 enables the technician to fabricate a model die similar to the preparation of the patient, on the basis of which the correct shade and brightness values of the all-ceramic restorations may be selected.



IPS e.max Ceram Material Shade Guides

For IPS e.max Ceram, the material shade guides are an integral part of the product concept. For reasons of light refraction, the dentin shade tabs have been given an anatomical shape and surface structure. All the other shade tabs demonstrate a slight wedge shape, in order to better illustrate the translucency of the individual materials. The shade tabs are fired from the original ceramic materials. To facilitate the distinction from the existing material shade guides (e.g. IPS d.SIGN, IPS InLine, SR Adoro), the rods and holders of the IPS e.max Ceram material shade guides are light-grey.



Layering Diagram

The layering diagram of IPS e.max Ceram has been designed in such a way that easy and reliable shade reproduction is possible, irrespective of the framework material or framework shade. A proportional framework design that supports both shape and cusps represents the ideal basis.

Layering Diagram for Lithium Disilicate (LS₂)

(IPS e.max Press and IPS e.max CAD)



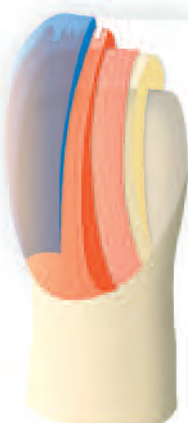
Highly esthetic glass-ceramic framework



Wash (foundation) application



Dentin application



Completing the layering with Incisal material

Layering Diagram for Zirconium Oxide (ZrO₂)

(IPS e.max ZirCAD)



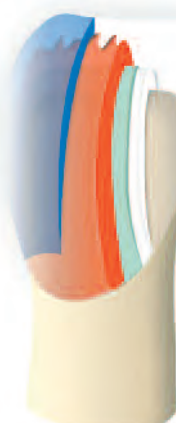
High-strength zirconium oxide framework



ZirLiner application



Dentin application



Completing the layering with Incisal material

Framework Design

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

The framework design must always support the shape of the restoration and the cusps in order to obtain an even layer thickness of the veneer with IPS e.max Ceram.

Framework Design Lithium Disilicate (LS₂)



Framework Design for Zirconium Oxide (ZrO₂)



Tips and tricks on layering

Application of the Impulse materials

Increasing the brightness value



By applying **Opal Effect 4** or **Deep Dentin** directly on the wash layer or ZirLiner, the in-depth brightness value in the dentin area can be enhanced. The corresponding areas are subsequently covered with Dentin materials.



To increase the brightness value in the incisal third, e.g. if space is limited, **Inter Incisal white-blue** can be used.

Enhancing the in-depth effect – internal



To enhance the in-depth effect in the incisal third, e.g. if space is limited, **Special Incisal**, e.g. **SI grey**, can be used.

Designing a true-to-nature incisal third



The Mamelon materials permit a true-to-nature interplay of shades in the incisal third. They are applied on the completed incisal area, e.g. **MM light**, **MM salmon**.



To complete and enhance the vitality in the incisal area, the shaded Transparent materials can be used, e.g. **T brown-grey**.



With the Opal Effect materials, a lifelike opalescent effect in the incisal third can be achieved. **OE 2** can be applied on the individualized cut-back.



Opal Effect 1 is layered in the mesial and distal areas. Opal Effect 5 is excellently suitable to imitate secondary dentin.

Enhancing the in-depth effect – external



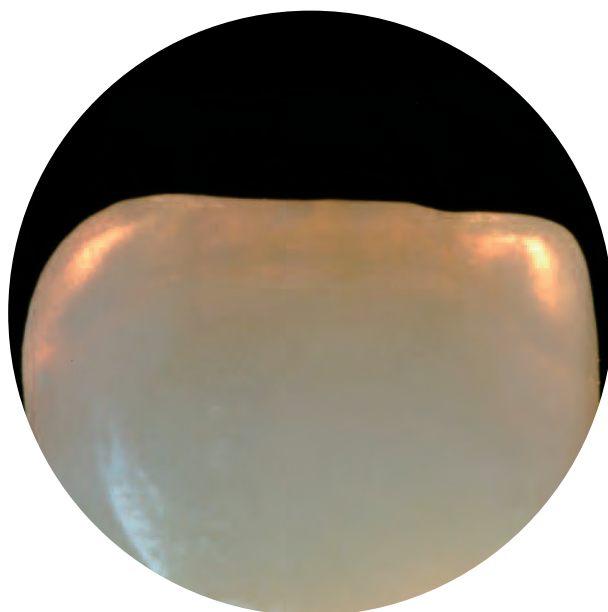
The Cervical Transparent materials with their slightly higher fluorescence are used to complete the layering of the cervical third, e.g. **CT orange-pink**.

Halo effect



To achieve what is known as the halo effect, **Incisal Edge** is used and applied to prolong the incisal edge.

Result of an individual IPS e.max Ceram Impulse layering procedure



Applications for the Essence powders

Essence powders are intensively shaded and should, therefore, only be used in very small quantities.

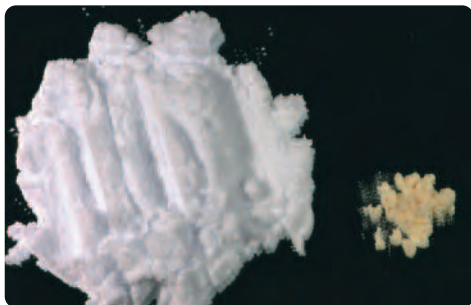
Essence – mixing



Dentin before

Dentin after

Increasing the chroma or the shade saturation of layering materials, such as Deep Dentin and Dentin.



Transpa Incisal before

Transpa Incisal after

Enhancing the shade effect of Incisal materials, e.g. adjusting of warm and chromatic Incisal materials.



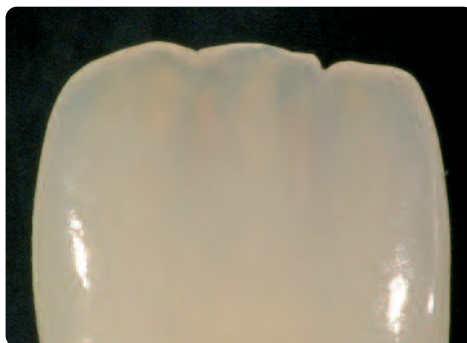
Transpa neutral before

Transpa neutral after

Shading of Transparent clear to create new individual Transpa materials.

Essence – internal

Internal characterizations should only be applied on thoroughly moist areas.



To design **Mamelons**, e.g. E 02 cream or E 10 terracotta are used.



To enhance the **in-depth effect**, E 15 profundo can be flushed in.



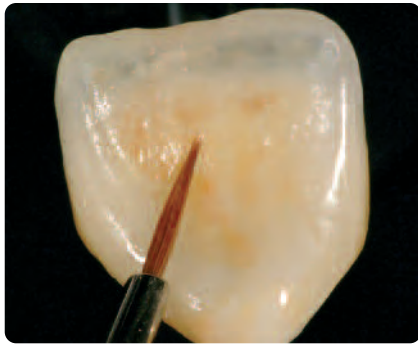
To increase the **brightness value** and to **imitate incisal discolouration**, E 01 white and e.g. E 04 sunset can be flushed in.



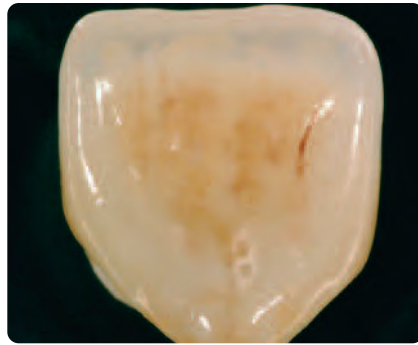
To design **enamel cracks**, E 02 cream or any mixture can be applied.

Essence – external

Superficial deposits, such as the ones caused by coffee or tea, can be imitated using, e.g. E 13 espresso.



Staining



Completed crown



Natural tooth

Fissures and occlusal surfaces can be reproduced in a lifelike fashion using, e.g. E 05 copper, E 11 mahogany or E 14 terra.



Staining

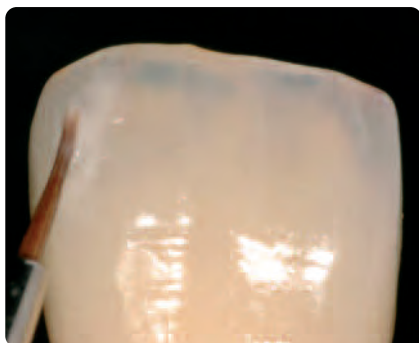


Completed crown



Natural tooth

Enamel stains are imitated with e.g. E 01 white or E 02 cream.



Staining



Completed crown



Natural tooth

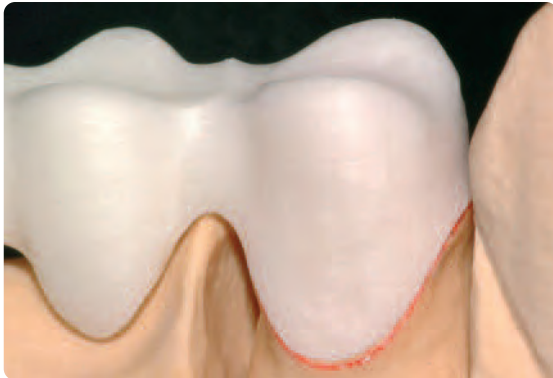
IPS e.max® Ceram – Processing on ZrO₂ Frameworks

Framework preparation

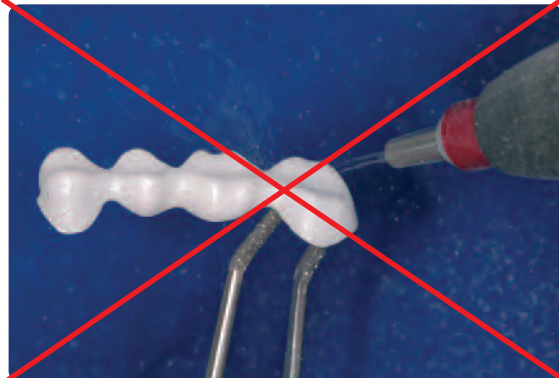
The stipulations of the manufacturer of the zirconium oxide regarding framework fabrication and preparation for veneering must be observed. When using IPS e.max ZirCAD, please observe the notes on finishing and regeneration firing in the respective Instructions for Use.

Place the sintered zirconium oxide framework on the model. Reduce the margins of the premolar for a fused-on ceramic shoulder down to the inner edge of the chamfer or shoulder preparation. Observe the following procedure:

- Make sure that the minimum thicknesses are maintained even after minor adjustments.
- Check marginal area and carry out slight adjustments, if necessary.
- Do not 'post-separate' the bridge framework after sintering using separating disks, since this may result in undesired pre-determined breaking points, which will subsequently compromise the stability of the all-ceramic restoration.
- Before veneering, clean framework under running water or with the steam jet and dry.
- The framework **must not** be blasted with Al₂O₃ or polishing jet medium, since this would damage the surfaces.
- Before ZirLiner is applied, the framework must be free of dirt and grease. Prevent any contamination after cleaning.



Reduce the margins of the premolar down to the inner edge of the chamfer or shoulder preparation for the fused-on ceramic shoulder.



Before veneering, clean framework under running water or with the steam jet and dry. The framework **must not** be blasted with Al₂O₃.



Finished and cleaned zirconium oxide framework

ZirLiner firing

Before ZirLiner is applied, the framework must be free of dirt and grease. Avoid any contamination after cleaning. Observe the following procedure.

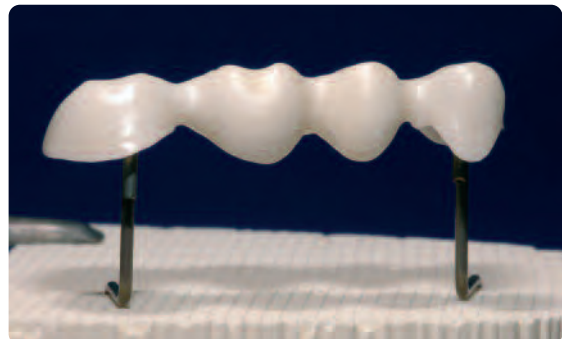
- The IPS e.max ZirLiners are only suitable for the application on IPS e.max ZirCAD and other zirconium oxide frameworks.
- IPS e.max Ceram ZirLiner must always be applied prior to veneering in order to achieve a sound bond as well as an in-depth shade effect and fluorescence.
- Direct layering on ZirCAD framework without using IPS e.max Ceram ZirLiner results in a poor bond and may lead to delamination.
- For unshaded frameworks, use the IPS e.max Ceram ZirLiners 1-4. If the frameworks are shaded, the IPS e.max Ceram ZirLiner clear is applied.
- Mix the IPS e.max Ceram ZirLiner in the corresponding shade with the respective liquid to a creamy consistency.
- If a different consistency is desired, the IPS e.max Ceram Build-Up Liquids (allround or soft) and the Glaze and Stain Liquids (allround or longlife) may be used. The liquids may also be mixed with each other at any mixing ratio.
- Apply ZirLiner on the entire framework, pay special attention to the margins. If required, the restoration may be vibrated until an even, greenish colour effect is achieved. If the colour appears too pale, the layer is too thin.
- For more intensively shaded areas, 4 IPS e.max Ceram Intensive ZirLiners (yellow, orange, brown and incisal) are available.
- After that, the applied ZirLiner is briefly dried and fired.
- The IPS e.max Ceram ZirLiner should have a layer thickness of approximately 0.1 mm after firing
- If ZirLiner is to be individually characterized after the Margin firing, IPS e.max Ceram Essence is suitable for this purpose. Given the lower firing temperature of Essence, characterization prior to Margin firing is not possible.



Mix the corresponding IPS e.max Ceram ZirLiner with ZirLiner Liquid to a creamy consistency.



Cover the entire framework with the mixed ZirLiner. Make sure that an even, greenish colour effect is achieved.



Conduct the ZirLiner firing on a honey-combed firing tray using the stipulated firing parameters.

Firing parameters for the ZirLiner firing (note the temperature control)

IPS e.max Ceram on ZrO ₂	B °C/°F	S min	t _↑ °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F
ZirLiner firing	403/ 757	4:00	40/ 72	960/ 1760	1:00	450/ 842	959/ 1758



Do not apply any layering materials on unfired ZirLiner, since this will lead to delamination of the layering ceramic. Before the actual layering is commenced, the ZirLiner must be fired.

1st Margin firing (optional)

A ceramic shoulder is applied to the reduced premolar bridge abutment after the ZirLiner firing. Observe the following procedure:

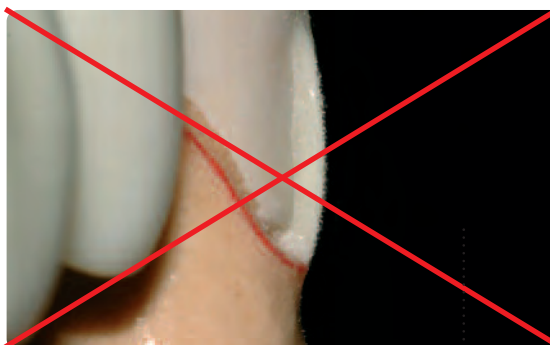
- Before the ceramic shoulder is applied, cover the model die with IPS Margin Sealer and allow it to dry. After that, isolate the shoulder areas using IPS Ceramic Separating Liquid.
- Place the framework on the die and make sure it is correctly positioned.
- Subsequently, mix IPS e.max Ceram Margin in the desired shade with the corresponding Margin Build-Up Liquid (allround or carving) and apply in drop-shaped increments.
- For more intensively shaded areas, 4 Intensive Margin materials (yellow, yellow-orange and orange-pink) are available.
- Contour the Margin material as desired and dry.
- Carefully remove the framework with the applied and dried shoulder material from the die, place it on a honey-combed tray and fire.



Isolate the die and apply the Margin material on the entire shoulder preparation.



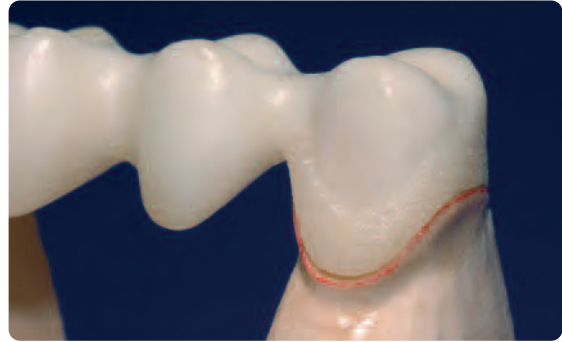
Apply the Margin material in drop-shaped increments.



Do not apply the Margin material too thinly or with a concave shape.



Before firing, carefully remove the framework with the applied and dried shoulder material from the die and fire.



Ceramic shoulder after firing. Compensate for the sinter shrinkage with the 2nd Margin firing.

Firing parameters for the 1st Margin firing (note the temperature control)

IPS e.max Ceram on ZrO ₂	B °C/°F	S min	t °C/°F/min	T °C/°F	H min	V1 °C/°F	V2 °C/°F
1 st Margin firing	403/ 757	4:00	40/ 72	800/ 1472	1:00	450/ 842	799/ 1470



Important: IPS e.max Ceram Margin materials are only suitable for the application on IPS e.max ZirCAD and other zirconium oxide frameworks and must not be used in conjunction with glass-ceramic materials.

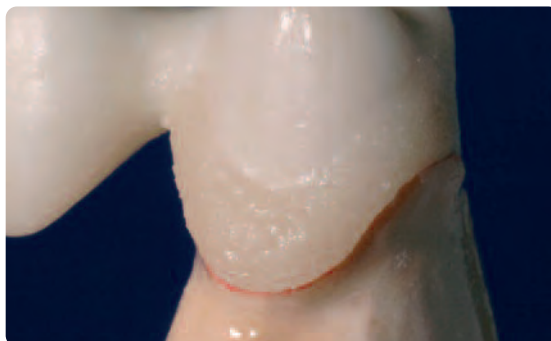
2nd Margin firing (optional)

After firing, the shoulder may require minor adjustments by grinding. Observe the following procedure for the 2nd Margin firing:

- Isolate the die once again using IPS Ceramic Separating Liquid.
- Complete the areas affected by shrinkage and any missing areas using the same Margin material that was used for the 1st firing.
- Depending on the size of the gap, the shoulder material may be slightly vibrated.
- Carefully remove the framework with the completed and dried shoulder from the die, position it on the firing tray, and fire.
- After the 2nd firing, the shoulder may require minor adjustments to achieve ideal accuracy of fit.



Complete the areas affected by shrinkage and any missing areas using the same Margin material that was used for the 1st firing



If necessary, slightly adjust the fired shoulder by grinding to achieve very good accuracy of fit.

Firing parameters for the 2nd Margin firing (note the temperature control)

IPS e.max Ceram on ZrO ₂	B °C/°F	S min	t _r °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F
2 nd Margin firing	403/ 757	4:00	40/ 72	800/ 1472	1:00	450/ 842	799/ 1470



Important:

If the fit of the shoulder is to be optimized during the subsequent Dentin and Incisal firing, mix the corresponding Margin material with the Add-On Margin material in a 1:1 ratio and fire using the firing parameters for the Dentin / Incisal firing.

Wash firing (Foundation)

Begin the veneering process by conducting a wash firing of Dentin or Deep Dentin material. This procedure ensures controlled shrinkage of the veneering material in the direction of the substructure and ensures a homogeneous bond to the underlying ZirLiner material. In order to achieve this:

- Mix the required IPS e.max Ceram layering materials (Dentin or Deep Dentin) with the Build-Up Liquids allround or soft. If a more plastic consistency is desired, IPS e.max Ceram Glaze and Stain Liquids (allround or longlife) can be used to mix with the Build-Up Liquids at any ratio.
- Provide a thin even coverage of the Dentin or Deep Dentin material on the entire veneering surface.
- After the surface is completely covered, position the restoration on the firing tray and fire according to the given parameters.



Fire the Dentin or Deep Dentin materials according to the firing parameters

Firing parameters for Wash firing (Foundation) (note the temperature control)

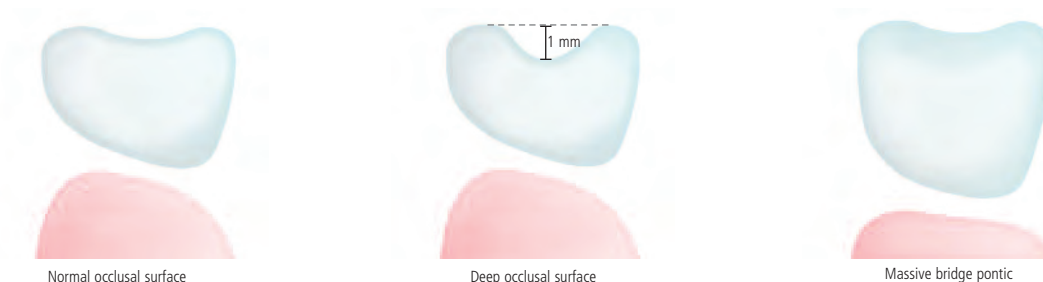
IPS e.max Ceram on ZrO ₂	B °C/°F	S min	t _r °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F
Wash firing (Foundation)	403/ 757	4:00	40/ 72	750/ 1382	1:00	450/ 842	749/ 1380



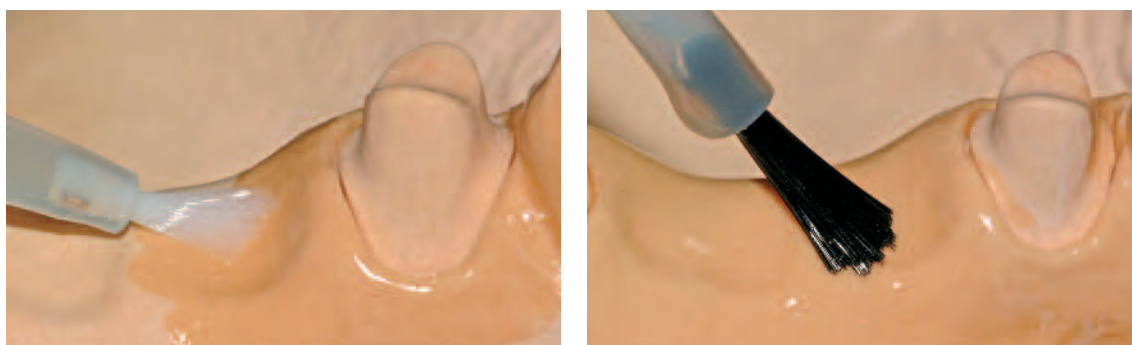
1st Dentin and Incisal firing

In order to fabricate highly esthetic restorations, please observe the following procedure:

- Before layering, apply IPS Model Sealer on the model and allow it to dry. Then, isolate the corresponding areas using IPS Ceramic Separating Liquid.
- Place the framework on the die and make sure it is correctly positioned.
- Mix the required IPS e.max Ceram layering materials with the Build-Up Liquids allround or soft. If a different consistency of the ceramic is desired, the Liquids may also be mixed with each other at any ratio.
- Use distilled water to rewet the layering materials on the mixing pad to avoid accumulation of organic components.
- Underlay the pontic areas with Deep Dentin in the next lighter shade and make sure that a good rest is reached. After that, layer these areas using Deep Dentin and Dentin materials.
- The low thermal conductivity of zirconium oxide frameworks provides an insulating effect that in a small number of cases such as restorations with an abnormally deep occlusal fossa or bulky molar pontics, present challenges in achieving properly fired veneering ceramic. To optimize the sintering result, control shrinkage and ensure a well bonded veneer layer, two veneering options may be used:
 - Option 1: Intermediate firing
Use Deep Dentin, Dentin or Impulse materials for an intermediate firing to minimize the bulk of veneering ceramic during the initial build-up. The layering has to cover the complete surface.
 - Option 2: Fissure separation
Separate the central fissure from mesial to distal including the marginal ridges with a thin scalpel. This allows optimal sintering behaviour and results in uniform shrinkage that is easily corrected during the 2nd Dentin and Incisal firing.



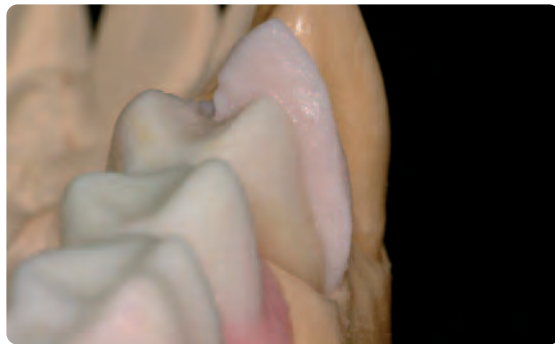
- Subsequently, conduct the layering procedure according to the layering diagram. Observe the necessary layer thicknesses.
- For individual characterizations, use e.g. Occlusal Dentin (see also pages 13–16).
- Carefully remove the restorations from the model and supplement the contact points.
- Do not apply excessive suction and prevent the restoration from drying out.
- Before firing, all the interdental areas must be separated down to the framework using a scalpel.
- Position the restoration on the firing tray and fire using the stipulated firing parameters.



Before layering, apply IPS Model Sealer and allow it to dry. Then, isolate the corresponding areas using IPS Ceramic Separating Liquid.



Underlay the pontic areas with Deep Dentin in the next lighter shade and make sure that a good rest is reached.



Observe the necessary layer thicknesses. Continue the layering with Dentin.



Layer the entire dentin core.



Apply Occlusal Dentin orange and complete the occlusal surface.



Carefully reduce the completed dentin layering and provide sufficient space for the Incisal materials.



Individually supplement the restorations with Transparent and Impulse material and completely cover them with Incisal materials.



Remove the completed layered restorations from the model, supplement the contact points and separate all interdental areas down to the framework.



Fired restorations after the 1st Dentin / Incisal firing.

Firing parameters for the 1st Dentin/Incisal firing (note the temperature control)

IPS e.max Ceram on ZrO ₂	B °C/°F	S min	t _Δ °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F
1 st Dentin / Incisal firing	403/ 757	4:00	40/ 72	750/ 1382	1:00	450/ 842	749/ 1380



2nd Dentin and Incisal firing

Touch up the restoration and clean it completely. Cleaning is carried out with ultrasound in a water bath or the steam jet. Blasting the surface with Al₂O₃ Type 50 at 1 bar (15 psi) pressure is only necessary if superficial contamination is evident after cleaning. Thoroughly dry the restoration and complete any missing areas. Interdental areas and contact points should be given special attention.

Use distilled water to rewet the layering materials on the mixing pad to avoid accumulation of organic components.



Thoroughly dry the restoration and complete any missing areas. Interdental areas and contact points should be given special attention.



Fired restorations after the 2nd Dentin / Incisal firing

Firing parameters for the 2nd dentin and incisal firing (note the temperature control)

IPS e.max Ceram on ZrO ₂	B °C/°F	S min	t _r °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F
2 nd Dentin / Incisal firing	403/ 757	4:00	40/ 72	750/ 1382	1:00	450/ 842	749/ 1380

Depending on the furnace type, the firing temperature can be reduced by 5 °C to max. 10 °C (9 °F to max. 18 °F) for the 2nd Dentin / Incisal firing.

Finishing and preparation for the Stain and Glaze firing

The restoration must be finished and polished as follows before the stain and glaze firing:

- Use finishing diamonds to achieve a natural shape and surface structure of the restoration, such as growth lines, convex/concave areas.
- Areas that should demonstrate a stronger gloss after glaze firing (e.g. pontic rests) can be smoothed and prepolished using silicone wheels.
- If gold or silver dust is used for the surface design, the restoration must be thoroughly cleaned with the steam jet. Make sure that any gold or silver dust is entirely removed in order to prevent discolouration after firing.



Create a natural shape and surface structure with finishing diamonds.



Finished restoration ready for stain and glaze firing.



Stain and Glaze firing

Stain firing is conducted with Essence or Shade material, while Glaze firing is carried out with Glaze powder. Depending on the situation, the firings may be conducted together or separately. The firing parameters are identical. The restoration must be free of dirt and grease. Avoid any contamination of the restoration after cleaning with ultrasound in the water bath or with the steam jet. With this firing, final adjustments of the shoulder and contact points are also possible. Observe the following procedure:

- To promote wetting of the Stains and Glaze materials, IPS e.max Ceram Glaze and Stain Liquid can be lightly painted onto the surface.
- Mix the paste or powder with the IPS e.max Ceram Glaze and Stain Liquid (allround or longlife) until the desired consistency is reached.
- More intensive shades are achieved by repeated staining (1–3 firings), rather than by applying thicker layers.
- Individually characterize cusps and fissures using Essence materials.
- If shade modifications are required, Shades can be used.
- Use Glaze material in powder or paste form.
- Apply Glaze material in an even layer on the entire restoration.
- Make any adjustment of the shoulder using Add-On Margin.
- Adjustments of contact points are carried out with a 1:1 mixture of e.g. Incisal and Add-On Incisal.
- Polish the supplemented areas to a high gloss using silicone polishers.

The combinations listed below represent suggestions:

IPS e.max Ceram Shade	Chromascop	A–D	Bleach BL
Shade Incisal 1 	110–140, 210, 220, 310, 320	A1, A2, A3, B1, B2, B3, B4	BL1, BL2, BL3, BL4
Shade Incisal 2 	230, 240, 330, 340, 410–440, 510–540	A3.5, A4, C1, C2, C3, C4, D2, D3, D4	
Shade 0 			BL1, BL2, BL3, BL4
Shade 1 	110–140, 210–240	A1, A2, A3, A3.5	
Shade 2 	310–330	B1, B2, B3, B4, D4	
Shade 3 	410–440	C1, C2, C3, C4	
Shade 4 	340, 510–540	A4, D2, D3	



Apply Glaze material in an even layer on the entire restoration. Basal area and the pontic should be given particular attention.



Characterize the fissures with Essence and supplement the contact points with a 1:1 mixture.



Completely stained, glazed and adjusted restoration ready to be fired.

Polish the supplemented areas to a high gloss using silicone polishers.

Firing parameters for the Stain and Glaze firing – note the slow cooling!



IPS e.max Ceram on ZrO ₂	B °C/°F	S min	t [↗] °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F	L °C/°F
Stain firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842
Glaze firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842

Optional

Stain and Glaze firing with IPS e.max Ceram Glaze Spray

As an alternative to IPS e.max Ceram Glaze Paste and Powder, IPS e.max Ceram Glaze Spray can be used.

Please observe the following procedure:

- Prepare the IPS e.max restoration for Stain and Glaze firing as usual (surface texture, shape, etc.).
- Clean the restoration with ultrasound in a water bath and/or with a steam jet.
- If you wish to characterize the restoration using Essence and Shade material, apply a small portion of Glaze and Stain Liquid on the surface before in order to promote wetting of the Stains materials.
- Hold the IPS e.max restoration with tweezers or secure it with a small amount of IPS Object Fix Putty or Flow on a firing pin.
- The cavities of bridges can be filled with IPS Object Fix Putty or Flow in order to avoid application of the spray on the inner aspects of the anchor crowns.
- Shake the spray can well immediately before use until the mixing ball in the container is moving freely (approximately 20 seconds).
- Observe a distance of 10 cm between the nozzle and the surface to be sprayed.
- Spray the restoration from all sides with short bursts to coat the (characterized) restoration with an even layer. Shake the spray can well between individual bursts.
- Hold the spray can as upright as possible during spraying.
- Wait briefly until the glaze layer is dry and has assumed a whitish colour. If required, apply Glaze Spray again.
- If IPS e.max Ceram Glaze Spray accidentally reaches the inner aspects of the restoration, remove it with a dry brush.
- Place the IPS e.max restoration on a honey-combed firing tray for the (Stain and) Glaze firing and fire according to the firing parameters for Stain and Glaze firing.
- Should renewed application of the spray be necessary after firing, spray the restoration in the same manner again.



Observe a distance of 10 cm when applying the IPS e.max Ceram Glaze Spray.



Spray IPS e.max Ceram Glaze Spray with short bursts directly on the unfired Essence materials and/or Shades from different directions.



Shake the spray can well between individual bursts.



Restoration with evenly applied IPS e.max Ceram Glaze Spray before Stain and Glaze firing.

Firing parameters for the Stain and Glaze firing – note the slow cooling!

IPS e.max Ceram on ZrO ₂	B °C/°F	S min	t [↑] °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F	L °C/°F
Stain firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842
Glaze firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842



Add-On firing

There are 3 IPS e.max Ceram Add-On materials available for adjustments. Depending on the individual application, the materials are processed differently.

Option 1 – Add-On with Glaze firing

This method is used if minor adjustments are made together with the Glaze firing. If you use this method, proceed as follows:

- If IPS e.max Ceram Glaze Spray is used for glazing, spray it once the Add-On materials have been applied.
- If necessary, optimize the accuracy of fit of the shoulder using IPS e.max Ceram Add-On Margin (alone).



- Mix IPS e.max Ceram Add-On Dentin and Incisal in a 1:1 ratio and then mix it with Dentin and Transparent Incisal material. Apply the mixture on the corresponding areas and fire.



- Polish the adjusted areas to a high gloss after firing.

Firing parameters for Add-On with Glaze firing – note the slow cooling!

IPS e.max Ceram on ZrO ₂	B °C/°F	S min	t ^r °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F	L °C/°F
Add-On with Glaze firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842

Option 2 – Add-On after Glaze firing

Additional corrections may be required once the restoration has been completed and tried in with the patient (e.g. pontic rest, contact points). In such cases, proceed as follows:

- Apply IPS e.max Ceram Add-On Dentin and Incisal (alone) to the corresponding areas and fire.
- Polish the adjusted areas to a high gloss after firing.



Firing parameters for Add-On after Glaze firing – note the slow cooling!

IPS e.max Ceram on ZrO ₂	B °C/°F	S min	t ^r °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F	L °C/°F
Add-On after Glaze firing	403/757	6:00	50/90	700/1292	1:00	450/842	699/1290	450/842



Completed IPS e.max Ceram restoration



Homogeneous, true-to-nature surface and gloss



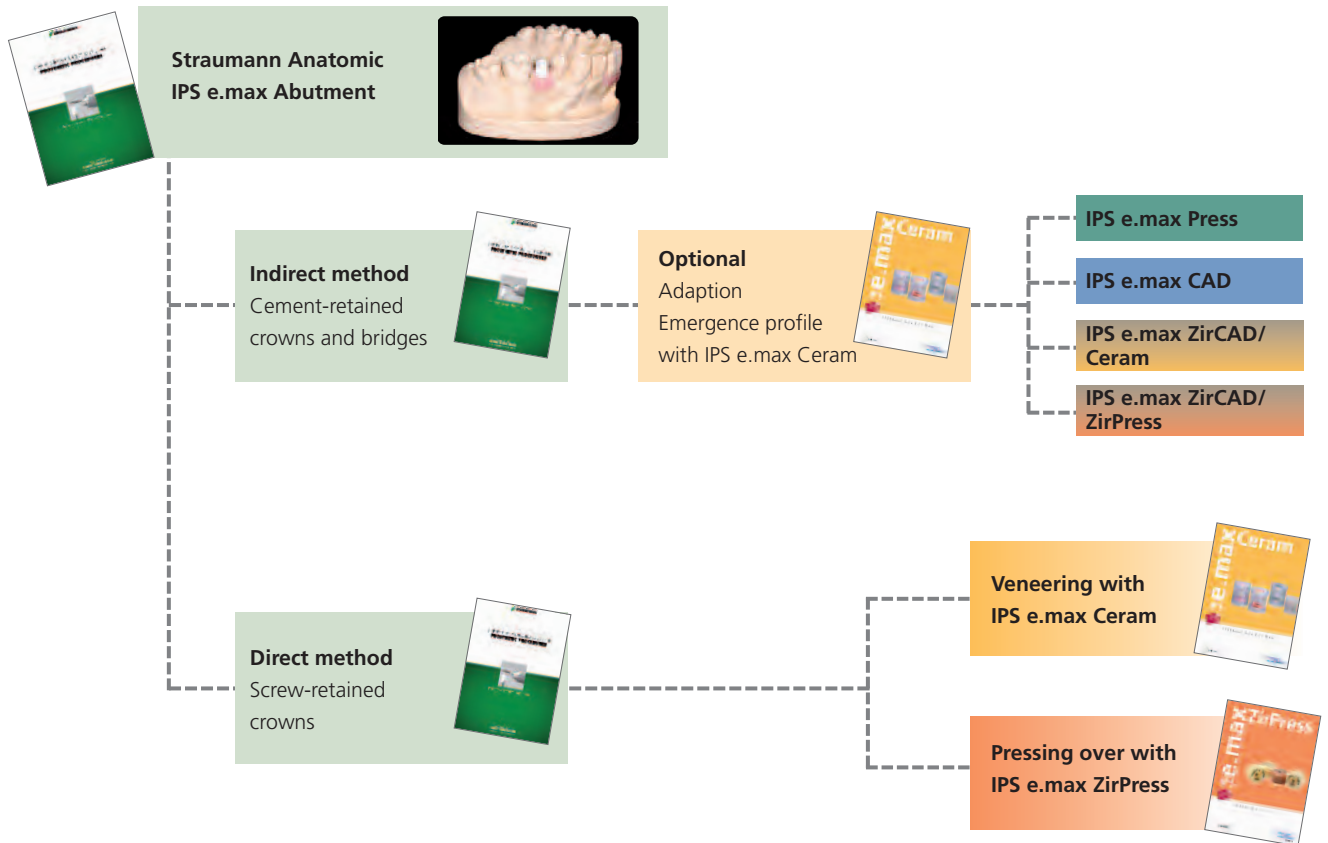
High-gloss basal area of the pontics for optimum cleaning

The dental lab work was carried out by
Jürgen Seger, Ivoclar Vivadent, Schaan/Liechtenstein

IPS e.max® Ceram

Abutment Technique

Overview of the processing possibilities of the Straumann® Anatomic IPS e.max® Abutment



Definition "Indirect / Direct Method"



Indirect method – Cement-retained crowns and bridges

- Straumann Anatomic IPS e.max Abutment screwed onto the implant
- (Laboratory) Fabrication of the IPS e.max restoration same as on natural preparations
- IPS e.max restoration incorporated using a cementation material



Direct method – Screw-retained crown

- Direct veneering of the Straumann Anatomic IPS e.max Abutment with IPS e.max Ceram or direct pressing on of IPS e.max ZirPress
- Screwing down of the veneered and/or pressed-over Straumann Anatomic IPS e.max Abutment on the implant

Preparing the Straumann® Anatomic IPS e.max® Abutment

The Straumann Anatomic IPS e.max Abutment is prepared according to the step-by-step instructions. For the selection of the grinding instruments, please refer to the Ivoclar Vivadent Flow Chart "Recommended grinding tools for IPS e.max zirconium oxide". Conduct a Regeneration firing after preparing the abutment.



Individualized Straumann® Anatomic IPS e.max® Abutment on the model

Please observe the following procedure for conducting the Regeneration firing:

- Clean and dry the individualized abutment with the steam jet.
- Position the abutment on a metal pin on a honey-combed tray.
- Conduct the Regeneration firing in a ceramic furnace (e.g. Programat P700) using the respective parameters.
- Do **not** adjust the abutment by grinding after the Regeneration firing.
- Do **not** blast the framework with Al_2O_3 or glass polishing beads before veneering, since this may cause lasting damage to the surface.
- Before veneering, clean the abutment with running water or the steam jet.

Firing parameters for the Regeneration firing



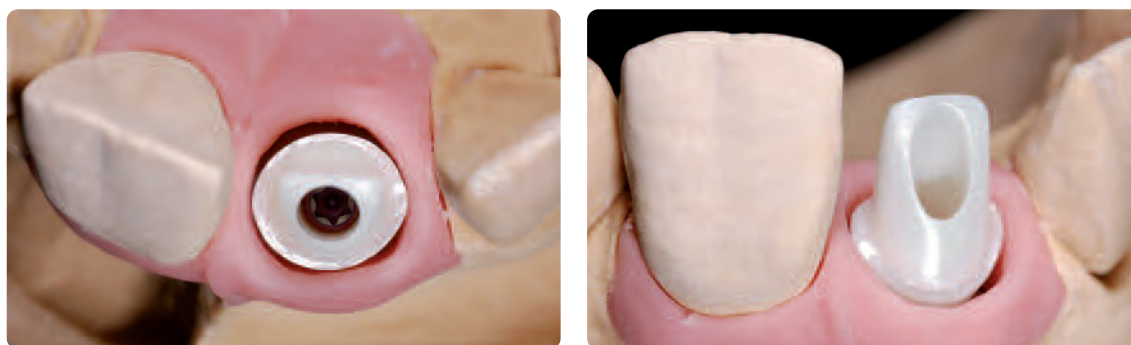
Furnace	B °C/°F	S min	t ₁ ↗ °C/°F/min	T ₁ °C/°F	H ₁ min	L °C/°F	t ↘ °C/°F/min
P300 P500 P700 EP 3000 EP 5000	403 757	0:18	65 117	1050 1922	15:00	750 1382	25 45
P80 P100 P200 EP 600	403 757	0:18	65 117	1050 1922	15:00	750 1382	—
PX1	403 757	0:30	65 117	1050 1922	15:00	750 1382 12 min	—

Adaptation of the emergence profile

If there is a gap between the "gingiva" (gingiva mask) and the abutment on the model with the abutment screwed down, it can be closed by adding and firing IPS e.max Ceram.

The emergence profile can be adapted using tooth-shaded or gingiva-shaded materials as necessary.

When adapting the emergence profile, the maximum layer thickness of 1.0 mm of IPS e.max Ceram must not be exceeded.



Screwed-down abutment on the model with individualized incisal adaptation. The gap between the abutment and the "gingiva" requires adaptation of the emergence profile.

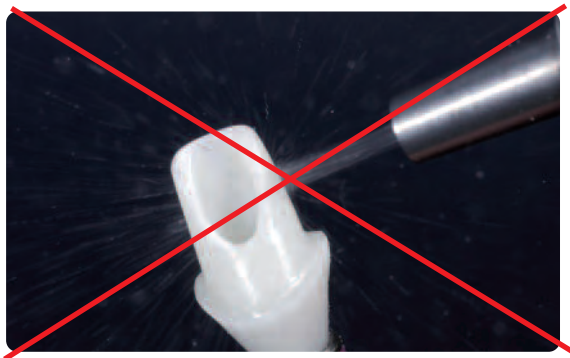
Application of IPS e.max Ceram ZirLiner

IPS e.max Ceram ZirLiner must always be applied before the application of the IPS e.max Ceram layering materials to achieve an optimum bond. Direct layering onto the abutment without ZirLiner may result in cracks and delamination.

- Remove the Straumann Anatomic IPS e.max Abutment from the model for the application of the IPS e.max Ceram ZirLiner.
- Do not blast the Straumann Anatomic IPS e.max Abutment with Al_2O_3 , since this may damage the surface.
- Clean the abutment with the steam jet before the application of the IPS e.max Ceram ZirLiner.
- Mix the IPS e.max Ceram ZirLiner in the desired shade or gingiva shade with the respective IPS e.max Ceram ZirLiner Build-Up Liquid to a creamy consistency.
- For shaded abutments, use IPS e.max ZirLiner clear.
- If a different consistency is desired, IPS e.max Ceram Build-Up Liquid (allround or soft) as well as the IPS e.max Ceram Glaze and Stain Liquids (allround or longlife) may be used. The liquids may also be mixed with each other at any mixing ratio.
- Cover the areas to be adapted with ZirLiner. If necessary, briefly vibrate until an even, greenish colour effect is achieved. If the colour appears too pale, the layer is too thin.
- For more intensively shaded areas, four IPS e.max Ceram Intensive ZirLinings (yellow, orange, brown, incisal) are available.
- **It is important that no ZirLiner reaches the contact surface between the abutment and the implant.**
- Conduct the ZirLiner firing on a honey-combed firing tray.
- After firing, the IPS e.max Ceram ZirLiner should exhibit a layer thickness of approx. 0.1 mm.
- Remove the restoration from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.



Before the application of the ZirLiner, clean the abutment with the steam jet.



Do **not** blast with Al_2O_3 or glass polishing beads.



Cover the entire abutment with the tooth-shaded or gingiva-shaded ZirLiner



Place the abutment on a honey-combed firing tray for ZirLiner firing. Before firing, make sure that the contact surface between the abutment and the implant is free from contamination.

Firing parameter for the ZirLiner firing

IPS e.max Ceram ZirLiner on Straumann® Anatomic IPS e.max® Abutment	B °C/°F	S min	t °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F	L °C/°F
ZirLiner firing	403/ 757	4:00	40/72	960/1760	1:00	450/842	959/1758	



Dentin firing

For the application of the layering materials on the fired ZirLiner, observe the following procedure:

- Secure the Straumann® Anatomic IPS e.max® Abutment with the fired Liner on the model.
- Mix the required IPS e.max Ceram layering materials Deep Dentin or Gingiva with the Build-Up Liquids allround or soft. If a different consistency of the ceramic is desired, the liquids may also be mixed with each other at any mixing ratio.
- Subsequently, layer the emergence profile. Observe the necessary layer thicknesses.
- Loosen the screw and carefully remove the abutment from the model.
- **Before firing, the contact surface between the abutment and the implant must be checked. It must be absolutely free of layering material so that the accuracy of fit is not compromised.**
- Position the restoration on a honey-combed tray and fire it according to the stipulated firing parameters.
- Remove the restoration from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.



Layer the emergence profile using Deep Dentin and/or Gingiva.



Place the abutment on a honey-combed firing tray for the Dentin firing.

Firing parameters for the Dentin firing

IPS e.max Ceram on Straumann® Anatomic IPS e.max® Abutment	B °C/°F	S min	t _r °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F	L °C/°F
Dentin firing	403/757	4:00	40/72	750/1382	1:00	450/842	749/1380	



Finishing and preparing for the Stain and Glaze firing

Before the Stain and Glaze firing, the abutment has to be finished as follows:

- Check the restoration on the model. The fired emergence profile must be designed in such a way that it rests flush against the "gingiva" without exerting pressure.
- It is important that the contact surface between the abutment and the implant is not finished in any way. The polishing aid can be used for finishing.
- If necessary, the emergence profile can be finished using fine-grain diamonds and rubber polishers.
- Prepolish tapered areas with a rubber polisher so that a very smooth transition to the abutment is achieved.



Check of the restoration on the model. The fired emergence profile must rest flush against the gingiva.



finishing the layered areas with fine-grain diamonds and rubber polishers.

Glaze firing

The abutment must be free of dirt and grease prior to the Glaze firing. Any contamination after cleaning must be prevented.

The following steps must be observed:

- Mix the paste or powder with the IPS e.max Ceram Glaze and Stain Liquids allround or longlife to the desired consistency.
- The shade of the emergence profile can be individually designed using IPS e.max Ceram Essence and Shade materials.
- Apply the Glaze and Stains layer thinly using a brush.
- **Before firing, the contact surface between the abutment and the implant must be checked. It must be absolutely free of Glaze and Stains so that the accuracy of fit is not compromised.**
- Position the restoration on a honey-combed tray and fire it according to the stipulated parameters for the Glaze firing.
- Remove the restoration from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.



Apply Glaze and/or Stains on the fired areas.



Conduct the Glaze firing on a honey-combed tray with the stipulated firing parameters. Before firing, make sure that the contact surface between the abutment and the implant is free from contamination.



Firing parameters for the Glaze firing – note the slow cooling!

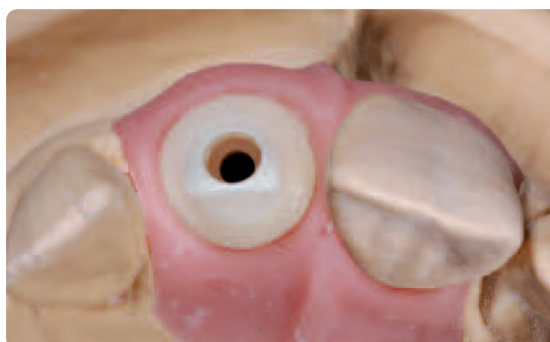
IPS e.max Ceram on Straumann® Anatomic IPS e.max® Abutment	B °C/°F	S min	t °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F	L °C/°F
Glaze firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842



Straumann® Anatomic IPS e.max® Abutment with individually adapted emergence profile.



Straumann® Anatomic IPS e.max® Abutment with individually adapted emergence profile.

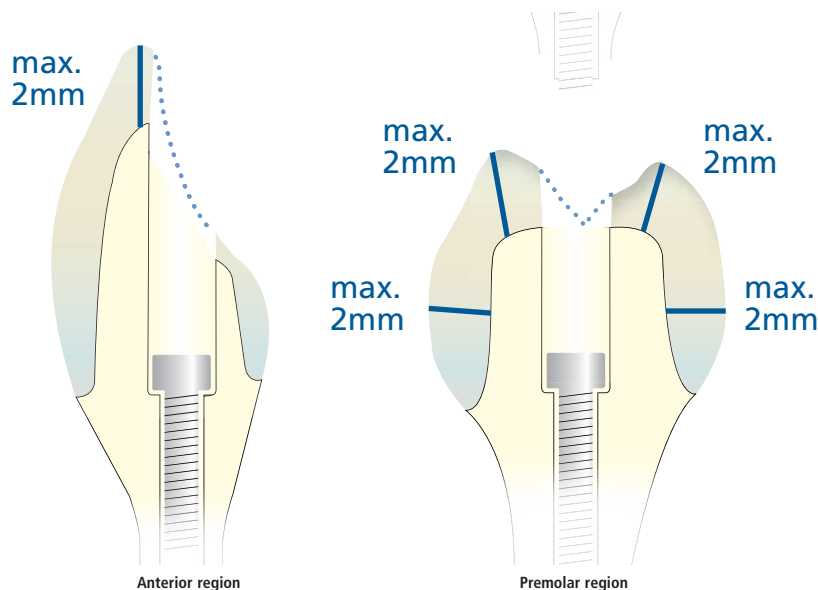


Comparison: Abutment before and after the adaption of the emergence profile

Direct firing of IPS e.max Ceram

IPS e.max Ceram offers the possibility to directly veneer the Straumann® Anatomic IPS e.max® Abutment. The veneered abutment is intraorally screwed down with the abutment and the screw cavity sealed with composite.

When firing IPS e.max Ceram on the Straumann® Anatomic IPS e.max® Abutment, the following maximum layering thicknesses must not be exceeded.



Application of IPS e.max Ceram ZirLiner

IPS e.max Ceram ZirLiner must always be applied before the application of the IPS e.max Ceram layering materials to achieve an optimum bond as well as a true-to-nature shade effect and in-depth translucency.

Direct layering onto the abutment without ZirLiner may result in cracks and delamination.

- Remove the Straumann Anatomic IPS e.max Abutment from the model for the application of the IPS e.max Ceram ZirLiner.
- Do not blast the Straumann Anatomic IPS e.max Abutment with Al_2O_3 , since this may damage the surface.
- Clean the abutment with the steam jet before the application of the IPS e.max Ceram ZirLiner.
- Mix the IPS e.max Ceram ZirLiner in the desired shade with the respective IPS e.max Ceram ZirLiner Build-Up Liquid to a creamy consistency.
- For shaded abutments, use IPS e.max ZirLiner clear.
- If a different consistency is desired, IPS e.max Ceram Build-Up Liquid (allround or soft), as well as the IPS e.max Ceram Glaze and Stain Liquids (allround or longlife) may be used. The liquids may also be mixed with each other at any mixing ratio.
- Cover the areas to be veneered with ZirLiner. If necessary, briefly vibrate until an even, greenish colour effect is achieved. If the colour appears too pale, the layer is too thin.
- For more intensively shaded areas, four IPS e.max Ceram Intensive ZirLinings (yellow, orange, brown, incisal) are available.
- **It is important that no ZirLiner reaches the contact surface between the abutment and the implant.**
- Conduct the ZirLiner firing on a honey-combed firing tray.
- After firing, the IPS e.max Ceram ZirLiner should exhibit a layer thickness of approx. 0.1 mm.
- Remove the restoration from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.



Before the application of the ZirLiner, clean the abutment with the steam jet.



Do **not** blast with Al_2O_3 or glass polishing beads.



Cover the entire abutment with ZirLiner.



Place the abutment for ZirLiner firing on a honey-combed firing tray. Before firing, make sure that the contact surface between the abutment and the implant is free from contamination.



The fired ZirLiner shows a homogeneous, silky-mat surface.

Firing parameters for the ZirLiner firing

IPS e.max Ceram ZirLiner on Straumann® Anatomic IPS e.max® Abutment	B °C/°F	S min	t °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F	L °C/°F
ZirLiner firing	403/757	4:00	40/72	960/1760	1:00	450/842	959/1758	



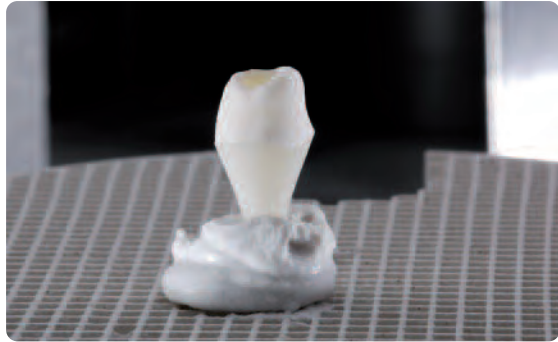
Wash Firing

The low heat conductivity of zirconium oxide requires a Wash firing. The Wash firing ensures controlled sintering of the ceramic onto the framework surface and enables a homogeneous bond to the fired ZirLiner. In order to achieve this, please proceed as follows:

- Before the application of the Wash layer, clean the abutment with the steam jet.
- Mix the required IPS e.max Ceram Dentin or Deep Dentin material with the IPS e.max Ceram Build-Up Liquids allround or soft. If a different consistency of the ceramic is desired, the liquids may also be mixed with each other at any mixing ratio.
- Apply the wash in a thin coat on the entire fired ZirLiner.
- **It is important that no layering material reaches the contact surface between the abutment and the implant.**
- Position the abutment on a honey-combed tray for the Wash firing.
- Remove the restoration from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.



Apply the wash in a thin coat on the entire fired ZirLiner. Secure the abutment on the polishing aid for the application of the Wash.



Remove the abutment from the polishing aid and place it on a honey-combed tray for the Wash firing. Before firing, make sure that the contact surface between the abutment and the implant is free from contamination.

Firing parameters for the Wash firing

IPS e.max Ceram on Straumann® Anatomic IPS e.max® Abutment	B °C/°F	S min	t _r °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F	L °C/°F
Wash Firing	403/757	4:00	40/72	750/1382	1:00	450/842	749/1380	



1st/2nd Dentin and Incisal firing

For the application of the layering materials on the fired Wash, observe the following procedure:

- Secure the Straumann® Anatomic IPS e.max® Abutment with the fired Liner on the model using the screw.
- Mix the required IPS e.max Ceram layering materials, i.e. Dentin, Incisal and Effect, with the Build-Up Liquids allround or soft. If a different consistency of the ceramic is desired, the liquids may also be mixed with each other at any mixing ratio.
- Seal the screw cavity before layering so that no material may enter.
- Subsequently, layer the IPS e.max Ceram layering materials. Observe the maximum layer thicknesses.
- Loosen the screw after layering and carefully remove the abutment from the model.
- **Before firing, the contact surface between the abutment and the implant as well as the screw cavity must be checked. They must be absolutely free of layering material so that the accuracy of fit is not compromised.**
- Position the restoration on honey-combed tray and fire it according to the stipulated firing parameters.
- Remove the restoration from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.
- If a second firing is required, it can be conducted using the same parameters.



Layer the IPS e.max Ceram layering materials.



Before firing, make sure that the contact surface between the abutment and the implant and the screw cavity are free from contamination.

Firing parameters for the Dentin firing

IPS e.max Ceram on Straumann® Anatomic IPS e.max® Abutment	B °C/°F	S min	t °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F	L °C/°F
Dentin firing	403/757	4:00	40/72	750/1382	1:00	450/842	749/1380	



Finishing and preparing for the Stain and Glaze firing

Before the Stain and Glaze firing, the abutment has to be finished as follows:

- Check the restoration on the model. Check the proximal and occlusal contact points.
- Secure the abutment on the polishing aid for finishing.
- Finish the veneered abutments with fine-grain diamonds and rubber polishers to obtain a true-to-nature shape and surface structure, such as growth lines and convex/concave areas.
- Areas which should exhibit a higher gloss after Glaze firing can be smoothed out and prepolished using silicone disks.
- Prepolish the transition area between the veneer and the abutment rubber polishers so that a very smooth transition is achieved.
- If gold and/or silver dust was used to design the surface texture, the restoration has to be thoroughly cleaned with steam. Make sure to remove all gold or silver dust in order to avoid any discolouration after firing.



Check the restoration on the model. The fired emergence profile must rest flush against the "gingiva" without exerting pressure.



Finish the layered areas with fine-grain diamonds and rubber polishers.

Glaze firing

Stain firing is conducted with Essence and/or Shades, while glaze powder or paste is used for Glaze firing. Depending on the situation, the Stain and Glaze firings may be conducted together or separately one after the other. The firing parameters are identical.

The restoration must be free of dirt and grease. Avoid any contamination after cleaning the restoration with ultrasound in a water bath or steam jet. With this firing, final adjustments of contact points are also possible. The following steps must be observed:

- For better wetting of the Stains and Glaze, a small amount of Glaze and Stain Liquid can be applied on the surface.
- Mix the Glaze paste or powder with the IPS e.max Ceram Glaze and Stain Liquids allround or longlife to the desired consistency.
- If more intensive shades are desired, they are achieved by several staining procedures, not by applying thicker layers.
- The cusps and fissures can be individualized using Essence.
- If shade adjustments are required, Shade materials can be used.
- Apply the glazing material in an even layer on the entire restoration.
- For the adjustment of the contact points, mix e.g. IPS e.max Ceram Incisal and Add-On Incisal in a 1:1 ratio. Polish the adjusted areas to a high gloss after firing using silicone polishers.
- **Before firing, the contact surfaces between the abutments and the implant must be checked. It must be absolutely free of Glaze and Stains so that the accuracy of fit is not compromised.**
- Position the restoration on a honey-combed tray and fire it according to the stipulated parameters for the Glaze firing.
- Remove the restoration from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.



Apply the Glaze in an even layer.



Apply characterizations using Shades and Essence



Supplement the contact points using a 1:1 mixture.



Conduct the Glaze firing on a honey-combed tray with the stipulated firing parameters. Before firing, make sure that the contact surface between the abutment and the implant is free from contamination.

Firing parameters for the Glaze firing – note the slow cooling!



IPS e.max Ceram on Straumann® Anatomic IPS e.max® Abutment	B °C/°F	S min	t↕ °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F	L °C/°F
Stain firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842
Glaze firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842

If the gloss is unsatisfactory after the first Glaze firing, further Glaze firing procedures may be conducted using the same firing parameters.



IPS e.max Ceram on Straumann® Anatomic IPS e.max® Abutment – fabricated in the staining technique.

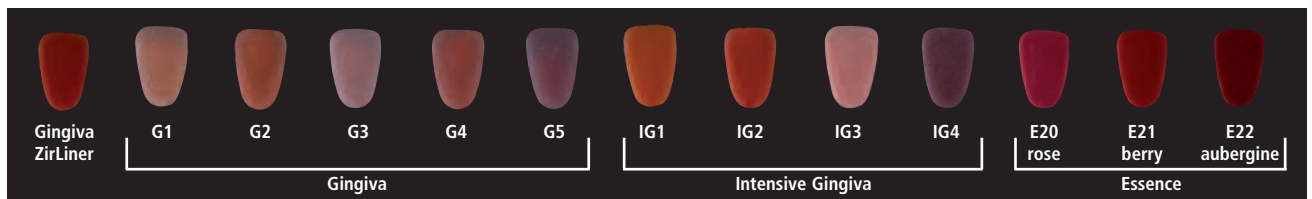
IPS e.max® Ceram

Gingiva



IPS e.max Ceram Gingiva layering materials can be used to create a lifelike gingiva, particularly for implant superstructures. The materials are applied together with the Dentin and Incisal materials and fired.

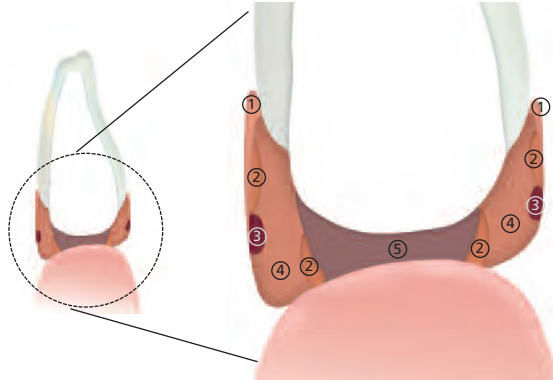
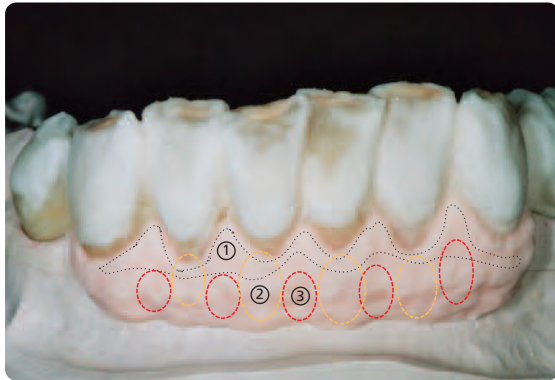
A total of 13 ceramic materials are available for fabricating the gingival portions. For determining the gingival characteristics a shade guide which shows the different Gingiva materials after firing is available.



Note: As with the tooth-shaded layering materials, gingival portions made of IPS e.max Ceram have to be adequately supported by a respective zirconium oxide framework.

Please observe the following procedure:

- Before layering, apply IPS Model Sealer on the model and allow it to dry. After that, isolate the corresponding areas using IPS Ceramic Separating Liquid.
- For frameworks made of zirconium oxide, the IPS e.max Ceram ZirLiner Gingiva or a tooth-shaded ZirLiner has to be fired on the gingival areas (application of ZirLiner see page 20/observe the firing parameters).
- The ZirLiner Gingiva is applied together with the tooth-shaded ZirLiner and fired.
- Mix the required IPS e.max Ceram layering materials (e.g. Dentin, Deep Dentin, Incisal, Gingiva) with the Build-Up Liquids allround or soft. If another consistency is desired, the liquids may also be mixed with each other at any mixing ratio.
- Use distilled water to rewet the layering materials on the mixing pad to avoid accumulation of organic components.
- Underlay the pontic areas of bridges with Deep Dentin in the next lighter shade.
- Place the framework on the model and make sure it is correctly positioned.
- Layer tooth-shaded areas of the restoration according to the layering diagram.
- Depending on the restoration size and extension of the gingival portions, the Gingiva materials can be applied with the first or second Dentin/Incisal firing.
- Use the Gingiva materials to create the basal rest of the restoration on the “natural” gums. In order to ensure proper oral hygiene of the inserted restorations, observe a homogeneous basal area free of pores and a correct shape.
- Apply the vestibular and oral portions of the gingiva.
- Do not apply excessive suction and prevent the restoration from drying out.
- Before firing, all the interdental areas must be separated down to the framework using a scalpel.
- Position the restoration on the firing tray and fire it according to the firing parameters for Dentin/Incisal firing.
- If required, an additional Dentin/Incisal firing can be conducted. Moreover, the gingival portions can be adjusted.



Apply the Gingiva materials according to the clinical situation.

① Gingiva G1 ② Gingiva G2 ③ Essence E22 ④ Gingiva G3 ⑤ Gingiva G5



Complete the tooth-shaded portions of the restoration using Incisal and Impulse materials for the second Dentin/Incisal firing.

Firing parameters for IPS e.max Ceram Gingiva

IPS e.max Ceram <i>Cut-Back and layering technique</i>	B °C/°F	S min	t↗ °C/°F/min	T °C/°F	H min	V1 °C/°F	V2 °C/°F
ZirLiner firing	403/ 757	4:00	40/ 72	960/ 1760	1:00	450/ 842	959/ 1758
1 st Dentin/Incisal firing	403/ 757	4:00	40/ 72	750/ 1382	1:00	450/ 842	749/ 1380
2 nd Dentin/Incisal firing	403/ 757	4:00	40/ 72	750/ 1382	1:00	450/ 842	749/ 1380



Stain and Glaze firing

The gingival portions are characterized and glazed together with the tooth-shaded areas of the restoration. Stain firing is conducted with IPS e.max Ceram Essence and Shades, while Glaze firing is carried out with Glaze powder or paste. Depending on the situation, the firing cycles may be conducted together or separately. The firing parameters are identical.

Please observe the following procedure:

- Finish the restoration with diamonds and provide a true-to-nature shape and surface structure, e.g. stippling.
- Areas which should exhibit a higher gloss after Glaze firing (e.g. pontic rests) can be smoothed out and prepolished using silicone wheels.
- In order to improve the wetting properties of the surface, rub the restoration with moist ceramic or pumice.
- The restoration must be free of dirt and grease. Avoid any contamination after cleaning the restoration with ultrasound in a water bath or with a steam jet.
- Mix the pastes or powder with the IPS e.max Ceram Glaze and Stain Liquids (allround or longlife) until the desired consistency is achieved.
- If shade adjustments on the gingival portions are required, the Gingiva Essence materials can be used.
- Evenly apply the glazing material to the entire surface of the restoration. Do not use any IPS e.max Ceram Glaze FLUO on the gingival portions, since natural gingiva does not exhibit any fluorescence.
- Conduct Stain and Glaze firing according to the firing parameters.
- IPS e.max Ceram Add-On materials can be used for further adjustments (page 33).

Firing parameters for IPS e.max Ceram Gingiva – note the slow cooling!

IPS e.max Ceram <i>Cut-Back and layering technique</i>	B °C/°F	S min	t _↑ °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F
Stain firing	403/ 757	6:00	60/ 108	725/ 1337	1:00	450/ 842	724/ 1335
Glaze firing	403/ 757	6:00	60/ 108	725/ 1337	1:00	450/ 842	724/ 1335



Completed restoration after Glaze firing

IPS e.max® Ceram

Veneers

The following chart shows the step-by-step layering of IPS e.max Ceram veneers on refractory dies.

Important: Prior to each working step, the refractory model has to be immersed in distilled water for about 5–10 minutes.

TIP:

For the fabrication of veneers, smaller working steps and several intermediate firing cycles are recommended.

Fabricating the model



Prepare dies made of refractory die material for the veneer fabrication

Fabricate a duplicate model and subsequently cast it with commercially available refractory die material, e.g. BegoForm® from Bego or Cosmotech VEST, G-CERA™ Vest from GC (observe the instructions of the manufacturer). Die materials that feature an even, light colour after firing are particularly suitable. Fabricate the model as small as possible in order to minimize the effects on firing!

Wash firing



Conduct the Wash firing using Add-On, Dentin or Transpa clear materials. Apply the layering materials in a thin layer.

For the wash firing, IPS e.max Ceram Add-On is preferably applied. However, IPS e.max Ceram Dentin or Transpa clear can also be used. Mix the materials with Build-up Liquid, apply in a thin layer on the refractory model, and fire at the respective temperature.

Wash firing with IPS e.max Ceram Add-On

T °C/°F	B °C/°F	S min	t [↗] °C/°F/min	H min	V ₁ °C/°F	V ₂ °C/°F
720/ 1328	403/ 757	8:00	50/ 90	1:00	450/ 842	719/ 1326

Wash firing with IPS e.max Ceram Dentin/Transpa clear

T °C/°F	B °C/°F	S min	t [↗] °C/°F/min	H min	V ₁ °C/°F	V ₂ °C/°F
780/ 1436	403/ 757	8:00	50/ 90	1:00	450/ 842	779/ 1434

Cervical firing



Build up the marginal areas using Deep Dentin.

Build up the marginal areas using IPS e.max Ceram Dentin.

T °C/°F	B °C/°F	S min	t [↗] °C/°F/min	H min	V ₁ °C/°F	V ₂ °C/°F
770/ 1418	403/ 757	8:00	50/ 90	1:00	450/ 842	769/ 1416

1st Dentin/Impulse/Incisal firing



Individual layering with Dentin, Impulse and Incisal materials

Layer the restoration according to the clinical requirements using IPS e.max Ceram Dentin and IPS e.max Ceram Incisal. Individual layering with the Impulse and Transpa materials enables mamelons, opalescent and translucent effects to be achieved.

T °C/°F	B °C/°F	S min	t _↑ °C/°F/min	H min	V ₁ °C/°F	V ₂ °C/°F
770/ 1418	403/ 757	8:00	50/ 90	1:00	450/ 842	769/ 1416

2nd Dentin/Corrective firing



Compensate for the anatomical shape using Transpa and Incisal materials.

The anatomical form is adjusted and supplemented using Incisal and Transpa materials. Several corrective firing cycles can be conducted using the same firing parameters.

T °C/°F	B °C/°F	S min	t _↑ °C/°F/min	H min	V ₁ °C/°F	V ₂ °C/°F
770/ 1418	403/ 757	8:00	50/ 90	1:00	450/ 842	769/ 1416

Stains and Glaze firing



Conduct the Stain and Glaze firing with Essence, Shades and Glaze materials.

Evenly apply glaze paste to the surface of the veneers. If desired, Essence material and/or Shades can be used to apply characterizations.

T °C/°F	B °C/°F	S min	t _↑ °C/°F/min	H min	V ₁ °C/°F	V ₂ °C/°F
740/ 1364	403/ 757	8:00	50/ 90	1:00	450/ 842	739/ 1362

Divesting of veneers



Divest the veneers with polishing jet medium at max. 1 bar (15 psi) pressure.

Remove large amounts of die material using a grinding disk. Subsequently, clean the inner aspects of the veneers with polishing jet medium at approx. 1 bar pressure.

Conditioning the veneers for adhesive luting

Before the veneers are placed, the inner aspects have to be etched with IPS Ceramic Etching Gel for 20 seconds and subsequently silanized with Monobond-S.

Important:

IPS e.max Ceram veneers have to be adhesively cemented.

IPS e.max® Ceram – One for 4

Versatility and simplicity of IPS e.max Ceram on the various IPS e.max framework materials



Glass-ceramic framework prepared for the wash application



Wash application



Fired wash



Building up the tooth shape using Dentin materials



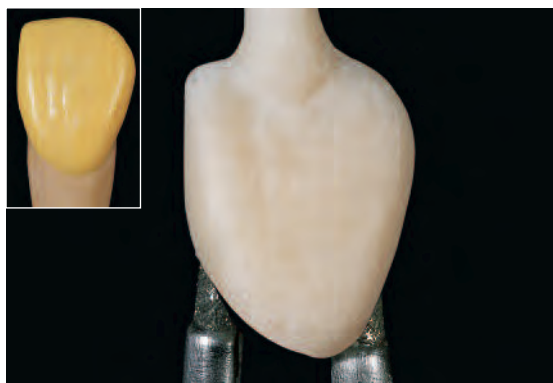
Zirconium oxide framework prepared for the ZirLiner application



ZirLiner application



Fired ZirLiner



Pressing over the tooth shape



IPS e.max[®] ZirCAD



Framework prepared for the ZirLiner application



ZirLiner application



Fired ZirLiner



Conducting the Wash firing and building-up the tooth shape using Dentin materials



IPS e.max[®] CAD



Framework prepared for the wash application



Wash application



Fired wash



Building-up the tooth shape using Dentin materials



IPS e.max Press



Reducing the tooth shape to the dentin core



Completing the layering with Incisal materials



Labial view of the completed restoration after glaze firing



Palatal view of the completed restoration after glaze firing

IPS e.max ZirPress





IPS e.max[®] ZirCAD



Reducing the tooth shape to the dentin core



IPS e.max[®] CAD



Completing the layering with incisal materials



Labial view of the completed restoration after glaze firing



Palatal view of the completed restoration after glaze firing



IPS e.max® Ceram – All you need

Uniform layering diagram

Uniform esthetic appearance irrespective of the framework material

Maximum efficiency and performance through one layering ceramic



The crowns were fabricated by Thorsten Michel, M.D.T., Schorndorf/Germany



Possibilities for Cementation

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

- For the adhesive cementation of IPS e.max ZirPress restorations, Variolink® II, Variolink® Veneer or Multilink® Automix are the ideal composites.
- SpeedCEM is available for the self-adhesive cementation of IPS e.max ZirPress.
- We recommend using the glass ionomer cement Vivaglass® CEM* for the conventional cementation of IPS e.max ZirPress.

*The range of available products may vary from country to country.

Short definition of the different cementation methods

• Adhesive cementation

With adhesive cementation, the bond is also created by static friction, but primarily by the chemical and/or micro-mechanical bond between the luting material and the restoration, as well as between the luting material and the preparation. Given the chemical and/or micromechanical bond, retentive preparation is not required. Irrespective of the cementation material, special adhesive systems are used on the preparation to generate the micromechanical bond with the dentin and/or enamel.

Adhesive cementation results in enhanced "(overall) strength" of the seated all-ceramic restoration.

• Self-Adhesive Cementation

The cementation material features self-etching properties to the tooth, which is why no additional special conditioning of the tooth surface is necessary. Hence, the adhesion of the restoration is partially achieved by a micromechanical and/or chemical bond. In order to achieve sufficient bonding strength values, retentive preparation is recommended. Self-adhesive cementation does not result in enhanced "(overall) strength" of the seated all-ceramic restoration.

• Conventional Cementation

With conventional cementation, the bond almost entirely created by static friction between the luting material and the restoration, as well as between the luting material and the preparation. To achieve the necessary static friction, retentive preparation with a preparation angle of approximately 4-6° is required. Conventional cementation does not result in enhanced "(overall) strength" of the seated all-ceramic restoration.

Cementation possibilities for the different indications

		Adhesive Cementation	Self-Adhesive Cementation	Conventional Cementation
IPS e.max Ceram	Veneers	✓	—	—
IPS e.max Ceram on ZrO ₂	Anterior and Posterior Crowns	✓	✓	✓
	Bridges with/without ceramic shoulder	✓	✓	✓

Preparing for Cementation

Conditioning of the restoration and preparation depends on the cementation method used as well as the cementation material. The following paragraphs describe the basic working steps to prepare for cementation. Please refer to the Instructions for Use of the corresponding cementation material regarding the detailed processing procedure.

a. Conditioning of the restoration

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

Observe the following procedure for **zirconium oxide-supported** restorations:

- The surface of zirconium oxide-supported restorations may be cleaned with max. 1 bar (15 psi) pressure before cementation.
- High-strength zirconium oxide ceramics are generally not etched with hydrofluoric acid gel (IPS Ceramic Etching Gel), since no etching pattern is produced. In pressed-over inlay-retained bridges – with contact of the glass-ceramic and the tooth structure – the pressed-on glass-ceramic must be etched with hydrofluoric acid (IPS Ceramic Etching Gel).
- Thoroughly clean the restoration with water and blow dry.
- For adhesive cementation, condition the bonding surface of the restoration using Monobond Plus.

For **veneers** made of IPS e.max Ceram, observe the following procedure:

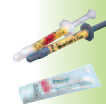
- **Do not** blast the veneer with Al₂O₃ before incorporation.
- Generally etch the bonding surface with 5% hydrofluoric acid gel (IPS Ceramic Etching Gel).
- Condition the bonding surface of the veneer with Monobond Plus.

Material	IPS e.max Ceram	IPS e.max ZirCAD / IPS e.max Ceram	
	Nano-fluorapatite glass-ceramic	Zirconium oxide / Nano-fluorapatite glass-ceramic	
Indication	Veneers	Crowns and Bridges	
Cementation method	adhesive	adhesive	self-adhesive / conventional
Blasting	—	Cleaning with Al ₂ O ₃ at max. 1 bar (15 psi)	
Etching	20 sec with IPS Ceramic Etching Gel	—	
Conditioning/Silanization	60 sec with Monobond Plus	60 sec with Monobond Plus	—
Cementation system	Variolink® Veneer, Variolink® II	Multilink® Automix	SpeedCEM Vivaglass® CEM

The range of available products may vary from country to country.



Please observe the corresponding Instructions for Use.

**b. Conditioning of the preparation**

Thoroughly clean the preparation once the temporary has been removed. Before it is conditioned, the restoration is tried-in and the occlusion and articulation checked. If adjustments are required, the restoration may be polished extraorally in these areas before final incorporation.

Conditioning of the restoration and preparation depends on the cementation method used and is carried out according to the respective Instructions for Use.

Care notes

Same as natural teeth, high-quality IPS e.max ZirPress restorations require regular professional care. This is beneficial for both the health of the gingiva and teeth, as well as the overall appearance. The pumice-free Proxylt pink polishing paste is used to care for the surfaces without causing any wear. The low RDA value of 7 (Relative Dentin Abrasion) is a reliable confirmation to use a cleaning paste that is only a little abrasive. Scientific investigations and long-term clinical experience have proved the gentle effect compared with other pastes.



General Information | Questions and Answers

Is IPS e.max Ceram also suitable to veneer frameworks made of other glass-ceramic materials?

IPS e.max Ceram is not suitable to veneer and characterize glass-ceramic frameworks made of materials other than IPS e.max Press, IPS e.max ZirPress, and IPS e.max CAD. On the one hand, the CTE of other glass-ceramic materials is not compatible and, on the other hand, the shade coordination between framework and veneering ceramics is not ensured.

Is IPS e.max Ceram (besides IPS e.max ZirCAD) also suitable to veneer frameworks made of other zirconium oxide materials?

IPS e.max Ceram can be used to veneer frameworks made of sintered zirconium oxide, HIP zirconium oxide as well as pre-sintered zirconium oxide with a CTE range of $10.5\text{--}11.0 \times 10^{-6} \text{ K}^{-1}$ (100–500 °C). The following zirconium oxide materials have been tested:

- KaVo Everest – Bio ZS (coloured and uncoloured) and Bio ZH Blanks
- Nobel Biocare – Procera Zirconia
- DeguDent – Cercon Base
- 3M/Espe – Lava Frame (coloured and uncoloured)
- DCS – DC-Zirkon
- Cad.esthetics – Denzir
- Vita – In-Ceram 2000 YZ Cubes (coloured and uncoloured)
- Diatomic – Diadem/Diazir (coloured and uncoloured)
- Wieland – Zeno Zr Disc
- etkon – Zerion
- Sirona – inCoris
- AmannGirrbach – Ceramill Zi

Is IPS e.max Ceram also suitable to individualize and veneer implant abutments?

Yes. IPS e.max Ceram is suitable to individualize and veneer zirconium oxide abutments, e.g. the Straumann® Anatomic IPS e.max® Abutment, with a CTE in the range of $10.5\text{--}11.0 \times 10^{-6} \text{ K}^{-1}$ (100–500 °C). Both an adaption of the emergence profile and a full direct veneer may be carried out. It must be made sure that the abutment is not designed too small in order to ensure adequate support of the tooth shape and cusps. The instructions of the respective manufacturers must be observed.



Is IPS e.max Ceram also suitable for the fabrication of veneers?

IPS e.max Ceram is suitable to fabricate veneers on fire resistant investment material dies. The material meets the required strength values (ISO standard: at least 50 MPa). The physical properties, such as the setting expansion, must be taken into consideration when selecting the corresponding investment material.

What is the purpose of the IPS e.max Ceram ZirLiner?

IPS e.max Ceram ZirLiners are translucent. Their three major purposes are as follows:

1. They enable a strong, homogeneous bond with the zirconium oxide framework.
2. They provide the white, non-coloured zirconium oxide frameworks with chroma, an in-depth effect, and a shaded character without increasing their opacity.
3. They also provide the non-fluorescent zirconium oxide framework with a natural fluorescence, thus enabling the fabrication of lifelike restorations.

Which type of IPS e.max Ceram ZirLiner should be used on shaded zirconium oxide frameworks?

The clear IPS e.max Ceram ZirLiner should be used on shaded zirconium oxide frameworks. The transparent character of the IPS e.max Ceram ZirLiner does not affect the framework shade. An outstanding bond as well as natural-looking fluorescence is achieved. If shaded frameworks from other manufacturers are used, the colour compatibility of the IPS e.max Ceram and that of the framework must be ensured.

Can zirconium oxide frameworks also be veneered without IPS e.max Ceram ZirLiner, or with a wash firing of dentin material, respectively?

An IPS e.max Ceram ZirLiner in the corresponding shade must always be applied prior to veneering. A wash firing, e.g. with dentin, as it is done for glass-ceramics, is not sufficient.

Why is the IPS e.max Ceram ZirLiner powder green and how should it be applied?

Since zirconium oxide is white and, therefore, shows a poor contrast to tooth-coloured and/or white powders, the IPS e.max ZirLiner was given an identification colour to render its application more simple and efficient. The IPS e.max Ceram ZirLiner consists of a very fine powder and appears somewhat thick due to the dense packing of the grains. Make sure that the material is applied in an even, greenish coat. If the shade is too pale, the layer is too thin. After firing, however, the ZirLiner demonstrates a layer thickness of approximately 0.1 mm.

How are the IPS e.max Ceram Add-On materials correctly used?

There are 3 Add-On materials available for final adjustments. Add-On Margin with a firing temperature of 725 °C (1337 °F) is used for shoulder adjustments with the dentin / incisal firings as well as with the final glaze firing. Depending on the application, the Add-On Margin material is mixed 1:1 with the correspondingly shaded Margin material (adjustment with the dentin/incisal firing) or used alone (adjustment with the glaze firing). Add-On Dentin and Add-On Incisal with a firing temperature of 700 °C (1292 °F) are used to supplement missing areas (e.g. contact points) with the final glaze firing or a separate add-on firing after glaze firing. Depending on the application Add-On Dentin and Add-On Incisal are mixed 1:1 with the Dentin and Incisal material in the corresponding shade (supplements with the glaze firing) or used alone (supplements after glaze firing) (see also page 33).

How should completely layered IPS e.max Ceram restorations be prepared for firing?

Separate the completely layered IPS e.max Ceram restorations in the interdental area down to the framework and only blot them dry with a cloth. Excessive vibration of the restorations by drawing another instrument over the grooves of the forceps grip and using suction equipment or excessive drying with blown air should not be done.

How can the shrinkage be compensated for deep occlusal preparations or very concave areas?

With deep occlusal surfaces and/or steep cusp inclinations and particularly with massive zirconium oxide pontics and abutments, it is favourable to separate the central fissure with a scalpel down to the framework before the first firing (with the ZirLiner layer already fired). In this way, the ceramic may sinter to the framework surface in a controlled fashion. During the subsequent 2nd Dentin and Incisal firing, the central fissure and occlusal surface are then closed.

How can the shrinkage of the ceramic be reduced, especially in large bridges and implant superstructures?

If enough space is available, a special Deep Dentin or intermediate Dentin firing is recommended, to distribute the overall shrinkage to two firing procedures. In this way, especially the position of the Impulse materials after the second firing can be ensured.

What liquid should be used to rewet IPS e.max Ceram layering materials?

If a layering material has to be rewetted on the mixing pad, distilled water has to be used for that purpose. No Build-Up Liquids must be used, since this would result in an accumulation of organic components, which may lead to gray discolouration of the veneer as they fail to fire without leaving residue.

How can the wetting properties of the restoration be improved before the Stain and Glaze firing?

The wetting properties of the surface can either be improved by slight blasting with Al₂O₃ (Type 100 µm/ max. 1 bar/15 psi) or by rubbing with moist ceramic powder or pumice. Good wetting properties are important for a homogeneous application of the Shades, Essence and Glaze materials.

IPS e.max® Ceram – Combination Table

A-D	BL1	BL2	BL3	BL4	A1	A2	A3	A3.5	A4	B1
IPS e.max Ceram ZirLiner	 ZL clear				 ZL 1	 ZL 1	 ZL 2	 ZL 2	 ZL 4	 ZL 1
IPS e.max Ceram Intensive ZirLiner					 yellow				 orange	
IPS e.max Ceram Margin	 M BL1	$\frac{2}{3}$ BL1 $\frac{1}{3}$ BL4 = M BL2	$\frac{1}{3}$ BL1 $\frac{2}{3}$ BL4 = M BL3	 M BL4	 M A1	 M A2	 M A3	 M A3.5	 M A4	 M B1
IPS e.max Ceram Intensive Margin					 yellow				 yellow-green	
IPS e.max Ceram Deep Dentin	 DD BL1	$\frac{2}{3}$ BL1 $\frac{1}{3}$ BL4 = DD BL2	$\frac{1}{3}$ BL1 $\frac{2}{3}$ BL4 = DD BL3	 DD BL4	 DD A1	 DD A2	 DD A3	 DD A3.5	 DD A4	 DD B1
IPS e.max Ceram Dentin	 D BL1	 D BL2	 D BL3	 D BL4	 D A1	 D A2	 D A3	 D A3.5	 D A4	 D B1
IPS e.max Ceram Transpa Incisal	 I BL				 TI 1	 TI 1	 TI 2	 TI 2	 TI 3	 TI 1
IPS e.max Ceram Transpa					 T neutral					
IPS e.max Ceram Add-On	 A-O BL				 A-O Margin					
IPS e.max Ceram Impulse	Occlusal Dentin		 OD orange	 OD brown	Mamelon		 MM light	 MM salmon	 MM yellow-orange	
	Incisal Edge		 Incisal Edge	Transparent	 T blue	 T brown-grey	 T orange-grey			
IPS e.max Ceram Essence	 E 01 white	 E 02 creme	 E 03 lemon	 E 04 sunset	 E 05 copper	 E 06 hazel	 E 07 olive	 E 08 khaki	 E 09 emerald	
IPS e.max Ceram Shade	 Shade Incisal 1	 Shade Incisal 2			 Shade 0			 Shade 1		
IPS e.max Ceram Gingiva	Gingiva ZirLiner		 ZL Gingiva	Gingiva	 G1	 G2	 G3	 G4	 G5	

A-D

B2	B3	B4	C1	C2	C3	C4	D2	D3	D4
ZL 1	ZL 3	ZL 3	ZL 1	ZL 4	ZL 4	ZL 4	ZL 4	ZL 4	ZL 4
brown			incisal						
M B2	M B3	M B4	M C1	M C2	M C3	M C4	M D2	M D3	M D4
orange			orange-pink						
DD B2	DD B3	DD B4	DD C1	DD C2	DD C3	DD C4	DD D2	DD D3	DD D4
D B2	D B3	D B4	D C1	D C2	D C3	D C4	D D2	D D3	D D4
TI 1	TI 1	TI 2	TI 1	TI 3	TI 3	TI 3	TI 3	TI 3	TI 3
T clear									
A-O Dentin			A-O Incisal						
Opal Effect									
OE 1	OE 2	OE 3	OE 4	OE 5	OE violet				
Special Incisal			Inter Incisal			Cervical Transpa			
SI yellow	SI grey	II white-blue			CT yellow				CT orange
E 10 terracotta	E 11 mahogany	E 12 cappucino	E 13 espresso	E 14 terra	E 15 profundo	E 16 ocean	E 17 sapphire	E 18 anthracite	E 19 black
Shade 1			Shade 2			Shade 3			Shade 4
Intensive Gingiva			Essence						
IG1	IG2	IG3	IG4	E20 rose	E21 berry	E22 aubergine			

IPS e.max® Ceram – Combination Table

Chromascope	110	120	130	140	210	220	230	240	310
IPS e.max Ceram ZirLiner	 ZL 1				 ZL 2				
IPS e.max Ceram Intensive ZirLiner					 yellow				 orange
IPS e.max Ceram Margin	 M 110	 M 120	 M 130	 M 140	 M 210	 M 220	 M 230	 M 240	 M 310
IPS e.max Ceram Intensive Margin					 yellow				 yellow-green
IPS e.max Ceram Deep Dentin	 DD 110	 DD 120	 DD 130	 DD 140	 DD 210	 DD 220	 DD 230	 DD 240	 DD 310
IPS e.max Ceram Dentin	 D 110	 D 120	 D 130	 D 140	 D 210	 D 220	 D 230	 D 240	 D 310
IPS e.max Ceram Incisal	 I 1	 I 1	 I 1	 I 2	 I 2	 I 2	 I 3	 I 3	 I 3
IPS e.max Ceram Transpa					 T neutral				
IPS e.max Ceram Add-On	 A-O Margin								
IPS e.max Ceram Impulse	Occlusal Dentin		 OD orange	 OD brown	Mamelon		 MM light	 MM salmon	 MM yellow-orange
	Incisal Edge		 Incisal Edge	Transparent		 T blue	 T brown-grey	 T orange-grey	
IPS e.max Ceram Essence	 E 01 white	 E 02 creme	 E 03 lemon	 E 04 sunset	 E 05 copper	 E 06 hazel	 E 07 olive	 E 08 khaki	 E 09 emerald
IPS e.max Ceram Shade	 Shade Incisal 1				 Shade Incisal 2				 Shade 0
IPS e.max Ceram Gingiva	Gingiva ZirLiner		 ZL Gingiva	Gingiva		 G1	 G2	 G3	 G4

Chromascop

320330340			410420430440				510520530540																																	
 ZL 3			 ZL 4				 ZL 4																																	
 brown						 incisal																																		
 M 320			 M 330			 M 340			 M 410		 M 420		 M 430		 M 440		 M 510		 M 520		 M 530		 M 540																	
 orange						 orange-pink																																		
 DD 320			 DD 330			 DD 340			 DD 410				 DD 420				 DD 430				 DD 440				 DD 510				 DD 520				 DD 530				 DD 540			
 D 320			 D 330			 D 340			 D 410				 D 420				 D 430				 D 440				 D 510				 D 520				 D 530				 D 540			
 I 3			 I 3			 I 3			 I 3				 I 3				 I 3				 I 3				 I 3				 I 3				 I 3				 I 3			
 T clear																																								
 A-O Dentin						 A-O Incisal																																		
Opal Effect						 OE 1						 OE 2		 OE 3		 OE 4		 OE 5		 OE violet																				
Special Incisal						 SI yellow		 SI grey		Inter Incisal				 II white-blue		Cervical Transpa				 CT yellow		 CT orange-pink		 CT khaki		 CT orange														
 E 9		 E 10 terracotta		 E 11 mahogany		 E 12 cappucino		 E 13 espresso		 E 14 terra		 E 15 profundo		 E 16 ocean		 E 17 sapphire		 E 18 anthracite		 E 19 black																				
 Shade 1						 Shade 2						 Shade 3						 Shade 4																						
Intensive Gingiva						 IG1						 IG2		 IG3		 IG4		Essence						 E20 rose		 E21 berry		 E22 aubergine												

Firing parameters

Firing of lithium disilicate glass-ceramic (LS₂)-supported restorations

- Use the honey-combed firing tray and the corresponding support pins to fire the restorations.
- Do not use ceramic pins, since they may stick to the restoration.
- The processing temperatures must be observed. Increasing the firing temperature will result in severe vitrification between the framework and the veneering ceramic, which may lead to crack formation later on. Reducing the firing temperature results in the ceramic being underfired rendering it very brittle, which may ultimately lead to delamination.
- The parameters in the Instructions for Use apply to Ivoclar Vivadent furnaces (tolerance: +/- 10 °C/18 °F)
- If furnaces other than those from Ivoclar Vivadent are used, temperature adjustments may be necessary.
- At the beginning, open the furnace and wait for the acoustic signal. Subsequently, place the firing tray with the objects in the center of the firing table and start the program.
- Remove IPS e.max 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.

IPS e.max Ceram on IPS e.max Press or IPS e.max CAD (Staining technique)

IPS e.max Ceram on IPS e.max Press or IPS e.max CAD Staining technique	B	S	t	T	H	V ₁	V ₂
	°C/°F	min	°C/°F/min	°C/°F	min	°C/°F	°C/°F
Stain and characterization firing	403/ 757	6:00 6:00	60/ 108	770/ 1418	1:00 1:00	450/ 842	769/ 1416
Glaze firing	403/ 757	6:00 6:00	60/ 108	770/ 1418	1:00 1:00	450/ 842	769/ 1416
Add-On after Glaze firing	403/ 757	6:00 6:00	50/ 90	700/ 1292	1:00 1:00	450/ 842	699/ 1290

IPS e.max Ceram on IPS e.max Press or IPS e.max CAD (Cut-back and Layering technique)

IPS e.max Ceram on IPS e.max Press or IPS e.max CAD Cut-back and layering technique	B	S	t	T	H	V ₁	V ₂
	°C/°F	min	°C/°F/min	°C/°F	min	°C/°F	°C/°F
Wash firing (foundation)	403/ 757	4:00 4:00	50/ 90	750/ 1382	1:00 1:00	450/ 842	749/ 1380
Wash firing (foundation) characterization	403/ 757	4:00 4:00	50/ 90	750/ 1382	1:00 1:00	450/ 842	749/ 1380
1 st Dentin/Incisal firing	403/ 757	4:00 4:00	50/ 90	750/ 1382	1:00 1:00	450/ 842	749/ 1380
2 nd Dentin/Incisal firing	403/ 757	4:00 4:00	50/ 90	750/ 1382	1:00 1:00	450/ 842	749/ 1380
Stain firing	403/ 757	6:00 6:00	60/ 108	725/ 1337	1:00 1:00	450/ 842	724/ 1335
Glaze firing	403/ 757	6:00 6:00	60/ 108	725/ 1337	1:00 1:00	450/ 842	724/ 1335
Add-On with Glaze firing	403/ 757	6:00 6:00	60/ 108	725/ 1337	1:00 1:00	450/ 842	724/ 1335
Add-On after Glaze firing	403/ 757	6:00 6:00	50/ 90	700/ 1292	1:00 1:00	450/ 842	699/ 1290

Depending on the furnace type, the firing temperature can be reduced by 5 °C to max. 10 °C (9 °F to max. 18 °F) for the 2nd Dentin / Incisal firing.

Firing of zirconium oxide (ZrO₂)--supported restorations

- Several units (e.g. multi-unit bridges with bulky pontics) in the furnace impede even and thorough heating of the individual units.
- Heat penetration in the firing chamber depends on the type of furnace and the size of the firing chamber.
- The parameters listed in the Instructions for Use apply to Ivoclar Vivadent furnaces (temperature tolerance ± 10 °C/18 °F).
- If furnaces other than those from Ivoclar Vivadent are used, temperature adjustments may be necessary.
- At the beginning, open the furnace and wait for the acoustic signal. Subsequently, place the firing tray with the objects in the center of the firing table and start the program.
- Remove IPS e.max 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.

IPS e.max Ceram on IPS e.max ZirPress (Staining technique)



IPS e.max Ceram on IPS e.max ZirPress Staining Technique	B °C/°F	S min	t _↑ °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F	L °C/°F
ZirLiner firing – before wax-up and pressing	403/757	4:00	40/72	960/1760	1:00	450/842	959/1758	
Stain and characterization firing	403/757	6:00	60/108	770/1418	1:00-2:00	450/842	769	450/842
Glaze firing	403/757	6:00	60/108	770/1418	1:00-2:00	450/842	769	450/842
Add-On after Glaze firing	403/757	6:00	50/90	700/1292	1:00	450/842	699	450/842

IPS e.max Ceram on IPS e.max ZirPress (Cut-back and Layering technique)



IPS e.max Ceram on IPS e.max ZirPress Cut-back and Layering technique	B °C/°F	S min	t _↑ °C/°F/min	T °C/°F	H min	V ₁ °C/°F	V ₂ °C/°F	L °C/°F
ZirLiner firing – before wax-up and pressing	403/757	4:00	40/72	960/1760	1:00	450/842	959/1758	
Wash firing (Foundation)	403/757	4:00	40/72	750/1382	1:00	450/842	749/1380	
Wash firing (Foundation) characterization	403/757	4:00	40/72	750/1382	1:00	450/842	749/1380	
1 st Dentin/Incisal firing	403/757	4:00	40/72	750/1382	1:00	450/842	749/1380	
2 nd Dentin/Incisal firing	403/757	4:00	40/72	750/1382	1:00	450/842	749/1380	
Stain firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842
Glaze firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842
Add-On with Glaze firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842
Add-On after Glaze firing	403/757	6:00	50/90	700/1292	1:00	450/842	699/1290	450/842

Depending on the furnace type, the firing temperature can be reduced by 5 °C to max. 10 °C (9 °F to max. 18 °F) for the 2nd Dentin / Incisal firing.

IPS e.max Ceram on IPS e.max ZirCAD (Layering technique)



IPS e.max Ceram on IPS e.max ZirCAD Layering technique	B °C	S min	t °C/min	T °C	H min	V ₁ °C	V ₂ °C	L °C
ZirLiner firing	403/757	4:00	40/72	960/1760	1:00	450/842	959/1758	
1 st Margin firing	403/757	4:00	40/72	800/1472	1:00	450/842	799/1470	
2 nd Margin firing	403/757	4:00	40/72	800/1472	1:00	450/842	799/1470	
Wash firing (Foundation)	403/757	4:00	40/72	750/1382	1:00	450/842	749/1380	
1 st Dentin/Incisal firing	403/757	4:00	40/72	750/1382	1:00	450/842	749/1380	
2 nd Dentin/Incisal firing	403/757	4:00	40/72	750/1382	1:00	450/842	749/1380	
Stain firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842
Glaze firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842
Add-On with Glaze firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842
Add-On after Glaze firing	403/757	6:00	50/90	700/1292	1:00	450/842	699/1290	450/842

Depending on the furnace type, the firing temperature can be reduced by 5 °C to max. 10 °C (9 °F to max. 18 °F) for the 2nd Dentin / Incisal firing.

IPS e.max Ceram on Straumann® Anatomic IPS e.max® Abutment



IPS e.max Ceram on Straumann® Anatomic IPS e.max® Abutment	B °C	S min	t °C/min	T °C	H min	V ₁ °C	V ₂ °C	L °C
ZirLiner firing	403/757	4:00	40/72	960/1760	1:00	450/842	959/1758	
Wash firing (Foundation)	403/757	4:00	40/72	750/1382	1:00	450/842	749/1380	
1 st Dentin/Incisal firing	403/757	4:00	40/72	750/1382	1:00	450/842	749/1380	
2 nd Dentin/Incisal firing	403/757	4:00	40/72	750/1382	1:00	450/842	749/1380	
Stain firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842
Glaze firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842
Add-On with Glaze firing	403/757	6:00	60/108	725/1337	1:00	450/842	724/1335	450/842
Add-On after Glaze firing	403/757	6:00	50/90	700/1292	1:00	450/842	699/1290	450/842

Firing of IPS e.max Ceram Veneers

- The firing parameters for the fabrication of veneers must be observed.
- The prolonged closing time ensures a gentle and complete drying of the refractory die material and thus enables to achieve a homogeneous firing result.
- If furnaces other than those from Ivoclar Vivadent are used, temperature adjustments may be necessary.
- At the beginning, open the furnace and wait for the acoustic signal. Subsequently, place the firing tray with the objects in the center of the firing table and start the program.
- Remove IPS e.max 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.

IPS e.max Ceram Veneers

IPS e.max Ceram Veneer	B		S		t _r		T		H		V ₁		V ₂	
	°C/°F		min		°C/°F/min		°C/°F		min		°C/°F		°C/°F	
Wash firing with IPS e.max Ceram Add-On	403/ 757		8:00 8:00		50/ 90		720/ 1328		1:00 1:00		450/ 842		719/ 1326	
Wash firing with IPS e.max Ceram Dentin/Transpa	403/ 757		8:00 8:00		50/ 90		780/ 1436		1:00 1:00		450/ 842		779/ 1434	
Cervical firing	403/ 757		8:00 8:00		50/ 90		770/ 1418		1:00 1:00		450/ 842		769/ 1416	
1 st Dentin/Incisal firing	403/ 757		8:00 8:00		50/ 90		770/ 1418		1:00 1:00		450/ 842		769/ 1416	
2 nd Dentin/Incisal firing	403/ 757		8:00 8:00		50/ 90		770/ 1418		1:00 1:00		450/ 842		769/ 1416	
Stain and Glaze firing	403/ 757		8:00 8:00		50/ 90		740/ 1364		1:00 1:00		450/ 842		739/ 1362	

- The parameters listed represent standard values and apply to the Ivoclar Vivadent furnaces: P300, P500, P700, EP 600, EP 3000, EP 5000. The temperatures indicated also apply to furnaces of older generations, such as the P20, P80, P90, P95, P100, P200 and PX1. If one of these furnaces is used, however, the temperatures may deviate by ± 10 °C/18 °F, depending on the age and type of the heating muffle.
- If furnaces other than those from Ivoclar Vivadent are used, temperature adjustments may be necessary.
- Regional differences in the power supply or the operation of several electronic devices by means of the same circuit may render adjustments of the firing and press temperatures necessary.

Ivoclar Vivadent – worldwide

Ivoclar Vivadent AG

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