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

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

The components for the PRESS technique include the highly aesthetic glass-ceramic IPS e.max Press ingots and the glass-ceramic IPS e.max ZirPress ingots for pressing onto zirconium oxide. Depending on the case requirements, two types of materials are available for CAD/CAM techniques: the innovative IPS e.max CAD glass-ceramic blocks and the high-strength zirconium oxide IPS e.max ZirCAD.

The IPS e.max System is further enhanced by the nano-fluorapatite layering ceramic IPS e.max Ceram, which is used as a veneering material for all the IPS e.max components – either glass-ceramics or zirconium oxide ceramics.

This proves that really exceptional all-ceramic systems are well designed. The system allows you to take advantage of a single, standardized layering scheme to offer your dentists and their patients restorations with maximum individuality and naturalness.
IPS e.max® ZirCAD –
PRODUCT INFORMATION

MATERIAL

IPS e.max ZirCAD are presintered, yttrium-stabilized zirconium oxide blocks for the CAD/CAM technology. After thorough sintering, the material forms a polycrystalline oxide ceramic material made up of a tetragonal zirconium oxide phase (TZP). With more than 900 MPa flexural strength, the material demonstrates a high fracture resistance and its fracture toughness is more than twice that of glass-infiltrated ceramic. In its partially sintered, "chalk-like" state, IPS e.max ZirCAD is easily milled using a CAD/CAM machine. Milling is always carried out with an enlargement of the framework of approximately 20 % per spatial axis. Given the controlled manufacturing process of the blocks, combined with an optimized sintering process in the Sintramat high-temperature furnace from Ivoclar Vivadent, the shrinkage of the slightly enlarged, milled frameworks can be controlled so that accuracy of fit is achieved. During the sintering procedure, the final, material-specific properties of the TZP are achieved. In the process, a structure that is densified to more than 99 % is created, which features a high fracture resistance combined with high fracture toughness as a result of the transformation reinforcement of the ZrO2 crystals. As a result, the material meets the clinical requirements to withstand the masticatory forces, particularly in the posterior region. Therefore, IPS e.max ZirCAD supplements the range of indications of the IPS e.max material in an ideal fashion. The high-strength IPS e.max ZirCAD frameworks are either pressed-over using IPS e.max ZirPress and/or veneered using IPS e.max Ceram.

USAGE

Indications
- Crown frameworks for the anterior and posterior regions
- 3- to 4-unit bridge frameworks for the anterior and posterior regions
- Inlay-retained bridges
- Primary telescope crowns
- Implant superstructures (single tooth and bridge frameworks)

Contraindications
- Very deep, subgingival preparations (adhesive cementation)
- Patients with severely reduced residual dentitions
- Bruxism

Important processing restrictions
Failure to observe the following restrictions may compromise the results achieved with IPS e.max ZirCAD:
- The necessary connector and framework dimensions must be observed.
- IPS e.max ZirCAD frameworks must only be processed using IPS e.max Ceram ZirLiner.
- Do not mill the blocks with non-compatible CAD/CAM systems.
- Do not sinter the material in a non-compatible high-temperature furnace.

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

COMPOSITION

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

- **IPS e.max ZirCAD Blocks**
  Components: ZrO2 87–95 % wt.
  Additional contents: HfO2, Al2O3, Y2O3 and other oxides

- **IPS Contrast Spray**
  Components: Pigment suspension in ethanol; a fluorinated hydrocarbon acts as the propellant

- **IPS Natural Die Material**

- **IPS Natural Die Material Separator**
  Components: Wax dissolved in > 95 % wt. hexane
Do the IPS e.max ZirCAD frameworks have to be pretreated prior to sintering?

Make sure that the frameworks are cleaned. Clean dry frameworks with compressed air and moist frameworks under running water. The framework must not be cleaned with ultrasound in a water bath or with a steam jet. Furthermore, frameworks must not be blasted with Al₂O₃ or polishing jet medium. The frameworks must be dried prior to the sintering procedure.

Can moist frameworks be sintered in the Sintramat?

The framework must be dry prior to the sintering procedure. Moist frameworks must not be sintered. Therefore, the framework may be dried either in a drying cabinet (at approximately 80 °C / 176 °F) or under an infrared lamp.

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 framework 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

Can IPS e.max ZirCAD frameworks also be pressed-over and/or veneered without IPS e.max Ceram ZirLiner?

A suitably shaded IPS e.max Ceram ZirLiner must always be applied before waxing up. The IPS e.max Ceram ZirLiner generates an outstanding bond and gives the restoration an effect of depth with regard to colour and fluorescence.

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.

Can furnaces from other manufacturers also be used to sinter IPS e.max ZirCAD restorations?

IPS e.max ZirCAD has been especially coordinated with the Sintramat from Ivoclar Vivadent. The sinter program was developed with requirements, such as accuracy of fit and durability, in mind. Other high-temperature furnaces may thus only be used under certain conditions. Please contact Ivoclar Vivadent to learn more about compatible furnaces.

May IPS e.max ZirCAD restorations be sandblasted with Al₂O₃ prior to veneering?

Clean the framework under running water or with a steam jet prior to veneering. The framework should not be sandblasted with Al₂O₃, since this may damage the ceramic surface and even jeopardize the bond between the framework and the layering ceramic.

Can IPS e.max ZirCAD restorations be conventionally cemented?

IPS e.max ZirCAD restorations may be either adhesively or conventionally cemented. For conventional cementation, however, an appropriately retentive preparation design must be observed. If this is not possible, adhesive cementation, e.g. with Multilink® should be used. Vivaglass® CEM is available for conventional cementation. We advise against the use of traditional phosphate cements, since they negatively influence the light transmission through the all-ceramic and compromise the aesthetic appearance of the all-ceramic restorations. Pressed-over, inlay-retained bridges must be seated using adhesive cementation.
IPS e.max ZirCAD for inLab® Basic Kit

The IPS e.max ZirCAD for inLab Basic Kit contains all the blocks for the Sirona inLab System, as well as the necessary processing accessories. The Basic Kit is supplied in the new material box and can be supplemented with any other IPS e.max Basic Kit or Additional Assortment.

**Delivery form:**
- IPS e.max ZirCAD for inLab Basic Kit
  - 2x 5 IPS e.max ZirCAD for inLab Blocks C15
  - 2x 3 IPS e.max ZirCAD for inLab Blocks B40
  - 1x 50 ml IPS Contrast Spray

IPS e.max ZirCAD for inLab® Blocks

IPS e.max ZirCAD for inLab Blocks are non-shaded and available in 2 sizes (C15 and B40).

**Delivery form:**
- IPS e.max ZirCAD for inLab Blocks Refill
  - 1x 5 IPS e.max ZirCAD for inLab Blocks C15
  - 1x 3 IPS e.max ZirCAD for inLab Blocks B40

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

inLab® is a registered trademark of Sirona Dental Systems GmbH
IPS Contrast Spray

IPS Contrast Spray is used for optimal imaging of CAD/CAM restorations. The IPS Contrast Spray evens out the different optical properties of the natural tooth (dentin and enamel) and of the plaster model and therefore allows an impeccable scan to be conducted. An optimal coating of the spray which clearly shows up all the edges is applied quickly and easily with the atomizer nozzle.

Delivery form:
IPS Contrast Spray
- 1x 50 ml [75 ml] IPS Contrast Spray

IPS® Natural Die Material

The light-curing IPS Natural Die Material simulates the shade of the prepared tooth and thus represents the optimum basis for natural shade reproduction of the given oral situation when fabricating all-ceramic restorations. IPS Natural Die Material is available in 9 shades. The shades were newly arranged and the assortment now contains all the shade variations necessary for the fabrication of lifelike all-ceramic restorations:
- 1 shade to imitate bleached preparations (ND 1)
- 1 shade to imitate secondary dentin that demonstrates an intensive shade (ND 6)
- 1 shade to imitate severely discoloured / devitalized preparations (ND 9)

The following chart shows the arrangement and designations of IPS Natural Die Material shades compared to those of the IPS Empress Die material.

<table>
<thead>
<tr>
<th>IPS Natural Die Material</th>
<th>ND 1</th>
<th>ND 2</th>
<th>ND 3</th>
<th>ND 4</th>
<th>ND 5</th>
<th>ND 6</th>
<th>ND 7</th>
<th>ND 8</th>
<th>ND 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPS Empress Die Material</td>
<td>–</td>
<td>St 9</td>
<td>St 1</td>
<td>St 2</td>
<td>St 3</td>
<td>–</td>
<td>St 8</td>
<td>St 5</td>
<td>–</td>
</tr>
</tbody>
</table>

Delivery form:
IPS Natural Die Material Kit
- 9x 8 g IPS Natural Die Material,
  Shades: ND 1, ND 2, ND 3, ND 4, ND 5, ND 6, ND 7, ND 8, ND 9
- 1x 20 ml IPS Natural Die Material Separator
- 8x 10 IPS Condensers
- 8x 10 IPS Die Holders
- 2x Universal Holders
- 1x IPS Natural Die Material Shade Guide
**Sintramat**

The new Sintramat is a high-temperature furnace for sintering oxide ceramics. The temperature course and the sintering process have been optimized for frameworks made of IPS e.max ZirCAD. The Sintramat is distinguished by its easy operating concept, quick sintering process, a special cleaning program, and very accurate temperature control. Furthermore, the firing chamber is designed to hold up to 75 single restorations (3 firing saggers containing 25 units each).

**Delivery form:**
- 1x Sintramat
- 1x Warranty Card
- 1x Operating Instructions
- 1x Firing Sagger with ZrO₂ beads
- 1x Ventilation Tube
- 1x Tongs
- 1x Allen Key
- 1x Ventilation Tube Cover

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**Firing Sagger**

In combination with the sintering beads, the firing sagger permits an optimum sintering process. The firing sagger provides enough space for approximately 25 single restorations or 8–10 3-unit bridge frameworks. In order to render the sintering process as efficient as possible, up to 3 firing saggers may be stacked one on top of the other. The rectangular shape of the firing sagger optimally uses the space in the firing chamber.

**Delivery form:**
- 1x Firing Sagger

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**Sintramat ZrO₂ Beads**

The zirconium oxide beads thoroughly support the IPS e.max ZirCAD frameworks during the sintering process, while allowing free mobility at the same time. Therefore, they are indispensable in achieving sound accuracy of fit by ensuring that the frameworks do not sag during sintering.

**Delivery form:**
- 1x 100 g Sintramat ZrO₂ Beads
IPS e.max® ZirCAD – PRACTICAL USE

SHADE DETERMINATION

Chromascop
The Chromascop shade guide provides the shade standard for Ivoclar Vivadent products. The individual shades of the Chromascop are logically arranged and therefore allow shades to be determined accurately and efficiently. The 20 shades are divided into five shade groups. In addition, the Chromascop Bleach shade group comprises four very light shades. Once the basic hue has been established, the most suitable shade is chosen from within the shade group. All superfluous effects (e.g., cervical and translucent areas, severe discolourations in the incisal area and dentin as well as superficial characterizations) have been left out, making the selection of the proper shade much easier.

IPS Natural Die Material Shade Guide
In order to facilitate the reproduction of the tooth shade, dentists have the possibility of communicating the shade of the preparation of the given clinical situation to the dental laboratory using the IPS Natural Die Material shade guide. In this way, the fabrication of all-ceramic restorations is facilitated and a patient’s individual characteristics can be taken into consideration.
PREPARATION GUIDELINES AND MINIMUM THICKNESSES

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

Crowns and bridges
The anatomic shape is evenly reduced while observing the given minimum framework thickness. A circular shoulder is prepared with rounded inner edges or a chamfer at an angle of 10-30°. The width of the circular shoulder/chamfer is approx. 1 mm. Reduction of the crown third – incisal or occlusal by approx. 1.5 mm. For anterior crowns, the labial and palatal/lingual part of the tooth should be reduced by about approx. 1.2 mm. The incisal edge of the preparation should be at least 1 mm (milling tool geometry) in order to permit optimum milling of the incisal area during CAD/CAM processing.

Multi-unit bridges
FRAMEWORK DESIGN CRITERIA

The framework design is the key to the success of durable all-ceramic restorations. The more attention given to framework design, the better the final results and the clinical success will turn out to be. The following basic guidelines have to be observed:

- The framework material is the high-strength component of your restoration and should, therefore, be designed in such a way that it supports the shape of the restoration and the cusps. Reinforcements and supports have to be built up using the corresponding tools of the respective software.
- In large preparations, the excess in available space must be compensated by the design of the framework and not by the layering material.
- If possible, the connector design should be extended in the vertical direction, rather than in the sagittal or horizontal direction.
- It is not always possible to establish the necessary connector dimensions with regard to the sagittal (linguo-vestibular) region. In these cases, the connector dimensions must always be increased in the vertical (inciso-cervical) direction.
- Reducing the framework thickness always related to a reduction in strength.
- The integrated parameters in the software are basic recommendations. Depending of the overall thickness of the restoration it can be necessary to adjust the parameters.

<table>
<thead>
<tr>
<th>Anterior Region</th>
<th>Crowns</th>
<th>Splinted Crowns</th>
<th>3-Unit Bridges</th>
<th>4-Unit Bridges with 2 Pontics</th>
<th>Cantilever Bridges with 1 Pontic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Framework Thickness</td>
<td>circular</td>
<td>min. 0.5 mm</td>
<td>min. 0.5 mm</td>
<td>min. 0.7 mm</td>
<td>min. 0.7 mm</td>
</tr>
<tr>
<td></td>
<td>incisal</td>
<td>min. 0.7 mm</td>
<td>min. 0.7 mm</td>
<td>min. 0.7 mm</td>
<td>min. 1.0 mm</td>
</tr>
<tr>
<td>Connector Dimensions</td>
<td>–</td>
<td>min. 7 mm²</td>
<td>min. 7 mm²</td>
<td>min. 9 mm²</td>
<td>min. 12 mm²</td>
</tr>
<tr>
<td>Design</td>
<td>supporting the tooth shape</td>
<td>supporting the tooth shape</td>
<td>supporting the tooth shape</td>
<td>supporting the tooth shape</td>
<td>supporting the tooth shape</td>
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<table>
<thead>
<tr>
<th>Posterior Region</th>
<th>Crowns</th>
<th>Splinted Crowns</th>
<th>3-Unit Bridges</th>
<th>4-Unit Bridges with 2 Pontics</th>
<th>Cantilever Bridges with 1 Pontic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Framework Thickness</td>
<td>circular</td>
<td>min. 0.5 mm</td>
<td>min. 0.5 mm</td>
<td>min. 0.7 mm</td>
<td>min. 0.7 mm</td>
</tr>
<tr>
<td></td>
<td>incisal</td>
<td>min. 0.7 mm</td>
<td>min. 0.7 mm</td>
<td>min. 0.7 mm</td>
<td>min. 1.0 mm</td>
</tr>
<tr>
<td>Connector Dimensions</td>
<td>–</td>
<td>min. 9 mm²</td>
<td>min. 9 mm²</td>
<td>min. 12 mm²</td>
<td>min. 12 mm²</td>
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<tr>
<td>Design</td>
<td>supporting the tooth shape</td>
<td>supporting the tooth shape</td>
<td>supporting the tooth shape</td>
<td>supporting the tooth shape</td>
<td>supporting the tooth shape</td>
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Anterior and posterior crowns
Failure to observe the stipulated framework design criteria, minimum thicknesses, and minimum connector dimensions may result in clinical failures, such as cracks, delamination, and fracture of the restoration.
Cementation

For the cementation of the IPS e.max restorations, you may select between the tried-and-tested adhesive luting composites and cements from the coordinated assortment of Ivoclar Vivadent. Adhesive cementation achieves a sound bond between the preparation and the cementation material, while conventional cementation requires a retentive preparation to ensure the durability of the IPS e.max restorations.

<table>
<thead>
<tr>
<th>IPS e.max Press</th>
<th>IPS e.max ZirPress Veneers</th>
<th>IPS e.max ZirCAD</th>
<th>IPS e.max CAD</th>
<th>IPS e.max Ceram Veneers</th>
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<tr>
<td>Adhesive Cementation</td>
<td>Conventional Cementation</td>
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<tr>
<td>Variolink® II</td>
<td>Multilink®</td>
<td>Vivaglass® CEM</td>
<td>PhosphaCEM</td>
<td>Variolink® II</td>
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- **Especially recommended product combination**
- **Recommended product combination (2nd choice)**
- **Not recommended; product combination not possible**
IPS e.max® ZirCAD – CROWNS AND BRIDGES

Model and die preparation

A model with detachable segments is fabricated as usual. The directions of the manufacturers of the different CAD/CAM systems regarding the plaster to be used must be observed. Attention must be paid to the following points during the preparation of the die:
– The thickness of the incisal edge of prepared anterior teeth (upper and lower) must be checked.
– The prepared incisal edge should be at least as thick as the diameter of the bur used in the cavity.
– If the incisal edge of the prepared die is thinner than the diameter of the bur, the incisal edge has to be blocked out accordingly.

![A stone model with detachable segments is used as a working model.](image)

CAD/CAM processing

Since the IPS e.max ZirCAD frameworks shrink by approximately 20 % during sintering, the shrinkage factor of the respective batch, which is included in the bar code on the material block, must be read into the software. If the scanner is unable to read the barcode, it has to be entered and confirmed manually by means of the keyboard. The shrinkage factor then ensures that the milled IPS e.max ZirCAD restorations demonstrate good accuracy of fit after sintering.

Do not exceed the maximum amount of abrasive agent. Before milling IPS e.max ZirCAD blocks the milling fluid should be changed to avoid cross contaminations (e.g. milling dust) from other materials. Contaminations can cause discolouration of the frameworks during sintering.

Please refer to the Instructions for Use and/or Manual of the respective CAD/CAM System regarding the processing steps. The instructions of the corresponding manufacturer must be observed.

![Milled IPS e.max ZirCAD framework.](image)
**Finishing and preparing for sintering**

The correct grinding instruments are indispensable for finishing and adjusting milled and non-sintered zirconium oxide frameworks. If inappropriate grinding instruments are used, marginal chipping, among other flaws, may occur (please observe the corresponding Ivoclar Vivadent recommendations).

The following procedure is recommended for finishing IPS e.max ZirCAD frameworks:

– Non-sintered zirconium oxide frameworks are susceptible to damage and fractures. This fact must always be kept in mind during the entire working procedure.
– Rinse the milled framework under slightly running water to remove all milling residue.
– All adjustments by grinding should always be carried out while the framework is still in its non-sintered stage, if possible. Do not use water/oil cooling or contact media (e.g. occlusion sprays).
– Only finish frameworks using suitable grinding instruments, low speed, and little pressure, since otherwise, flaking or chipping may occur, particularly in the marginal area.
– Carefully separate the milled framework from the holder using a fine diamond disk and smooth out the attachment area with suitable grinding instruments.
– Rough tungsten carbide burs and/or grinding instruments with large diameters are only suitable to a certain extent, since they may cause vibrations during finishing, which may result in chipping. Therefore, only small tungsten carbide burs and/or grinding instruments with small diameters should be used.
– Do not ‘post-separate’ the bridge framework using separating disks, since this may result in undesired predetermined breaking points, which will subsequently compromise the stability of the all-ceramic restoration.
– Make sure that the minimum thicknesses are maintained even after finishing.
– In the non-sintered state, the marginal areas must be given special attention. Too thinly ground margins are unsuitable for sintering, since the marginal area is rounded out during sintering and will become too short.
– After finishing, clean the framework with compressed air to remove grinding dust. If the framework is still moist, additionally clean it under running water.
– Make sure that all grinding residue (e.g. grinding dust) is removed. Adhering grinding dust may get fused to the framework during sintering and result in inaccuracy of fit.
– The framework must not be cleaned with ultrasound in a water bath or with a steam jet.
– The framework must not be blasted with Al₂O₃ or polishing jet medium.
– The framework must be dry prior to the sintering procedure. Moist frameworks must not be sintered. Therefore, the framework may be dried either in a drying cabinet (at approximately 80 °C / 176 °F) or under an infrared lamp.

Carefully separate the milled framework from its holder using a separating disk.

Use suitable grinding tools to finish/adjust the non-sintered framework.
Smooth out adjusted areas keeping the minimum thicknesses in mind.

Comparison of a milled and a finished IPS e.max ZirCAD framework.

Finished IPS e.max ZirCAD framework ready for sintering.
Sintering

Once the framework is completely dry, the sintering procedure may be conducted. During the sintering process, the approximately 20% enlarged, milled IPS e.max ZirCAD framework will shrink to its final size. As a result, good accuracy of fit is achieved. For the sintering process, the following points should be observed:

- For the sintering of IPS e.max ZirCAD frameworks, exclusively use the firing sagger and sintering beads intended for this purpose.
- Fill the firing sagger with max. 100 g of ZrO₂ sintering beads and place the framework in the center of the firing sagger.
- Place anterior crown and bridge frameworks on the sintering beads with the labial surfaces facing the beads.
- Place posterior crown and bridge frameworks on the sintering beads with the occlusal surfaces facing the beads.
- Lightly press the frameworks into the bead bed. Do not push them in too deeply or the beads may get fused to the IPS e.max ZirCAD frameworks during sintering (e.g. in the interdental area to the pontic)! Make sure that the entire length of the restoration is adequately supported.
- Place the loaded firing sagger in the center of the firing chamber (room temperature) of the Sintramat. The positioning pins will guide the firing sagger into the ideal position.
- For larger number of frameworks, the ‘drawer’ principle is applied, by stacking the firing saggers on top of each other. A maximum of 3 firing saggers may be stacked in the Sintramat.
- Close furnace door once the firing sagger has been placed in the furnace. Pressing the P1 key starts the program and the furnace door is locked. The sintering program runs automatically and takes approximately 8 hours including cooling.
- The sintering temperature is 1500 °C (2732 °F).
- The furnace door can only be opened once the temperature has dropped below 97 °C (206 °F). Please note that there is still a burn hazard at 97 °C (206 °F). Wear the corresponding protective clothing.
- Remove the firing sagger from the furnace after the sintering process. Always allow the frameworks to cool to room temperature before proceeding.
Align the firing sagger with the positioning pins. Press P1. The sintering program starts automatically and the furnace door is locked.

After completion of the sintering process, allow the firing sagger to cool to room temperature and remove it from the Sintramat.

Ideal support of the sintered restoration after the sintering process. Comparison of sintered and non-sintered IPS e.max ZirCAD frameworks.

Note:
- Carefully remove any sintering beads which have adhered to the framework. After the first few sintering procedures, the beads still strongly adhere to each other after firing. However, they are easily separated manually in the firing sagger. After approximately 3–4 sintering procedures, the adherence is reduced and the desired effect is achieved.
- If the frameworks show yellow discoloration and the heating elements are corroded, run the cleaning program with an empty firing sagger several times by pressing ‘Clean’. Do not cover the ventilation tube and ensure adequate ventilation of the sinter furnace during the cleaning program.
- The firing saggers with ZrO2 beads are exclusively intended for the sintering of dental restorations.
- Many large-volume ceramic objects or overloaded firing saggers may damage the sagger.
- If the ‘drawer’ principle with 2 or 3 firing saggers is applied, the individual saggers must be adequately supported. Load the sintering furnace carefully to avoid damage to the heating elements.
Preparing for veneering

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

– Carefully remove adhering ZrO₂ beads using a suitable instrument.

– Even though adjustment by grinding of sintered IPS e.max ZirCAD frameworks is possible, it should be kept to a minimum.

– Make adjustment either with a water-cooled turbine or with grinding instruments especially developed for ZrO₂ (dry grinding).

– Work only with low pressure, since there is a risk of marginal chipping and local phase transition. The instructions of the manufacturer of the grinding instruments must be observed.

– Place the IPS e.max ZirCAD framework on the model, check fit, 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 predetermined breaking points, which will subsequently compromise the stability of the all-ceramic restoration.

– Check marginal area and carry out slight adjustments, if necessary.

– Make sure that the minimum thicknesses are maintained even after the minor adjustments.

– Before veneering, clean framework under running water or with the a steam jet cleaner and dry.

– The framework must not be blasted with Al₂O₃ or polishing jet medium, since this would damage the surfaces.

Before veneering, clean framework under running water or with the steam jet

Do not blast the framework with Al₂O₃ or polishing jet medium

Sintered and finished IPS e.max ZirCAD framework prepared for veneering
Optional

Die fabrication with IPS Natural Die Material

The light-curing IPS Natural Die Material simulates the shade of the prepared tooth. A control die is fabricated using the shade information provided by the dentist (shade determination). This control die represents the optimum basis for a true-to-nature shade reproduction of the given oral situation.

– Coat the inner surfaces of the ceramic restorations with IPS Natural Die Material Separator and allow it to react for a short time.
– Apply die IPS Natural Die Material in the corresponding shade to the inner surfaces of the restoration using the IPS Condenser and adapt so that the entire inner surface is coated and filled.
– Completely fill the restoration cavity and insert an IPS Die Holder into the material and adapt excess material around the holder. Make sure that the Die Material is well adapted to the restoration margins and that no gaps are present.
– Polymerize the IPS Natural Die Material die with a commercial polymerization light, e.g. Lumamat 100, for 60 seconds.
– After polymerization, the die can be finished and or smoothed, if required.

Veneering with IPS e.max Ceram

The following paragraphs will explain the most important veneering steps. Detailed information about the nano-fluorapatite ceramic and its processing are contained in the IPS e.max Ceram Instructions for Use.

Firing of zirconium oxide-supported restorations

– Several units (eg 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.
– To achieve adequate heating of the individual restorations the heating rate should be lowered by 5–10 ºC (41–50 °F) as well as the holding time should be extended by 30 seconds.
– The parameters listed in the Instructions for Use apply to Ivoclar Vivadent furnaces (temperature tolerance ± 10 ºC/50 °F).
– If furnaces other than those from Ivoclar Vivadent are used, temperature adjustments may be necessary.
ZirLiner firing

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

– 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 frameworks without using IPS e.max Ceram ZirLiner results in a poor bond and may lead to delamination.
– 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 and soft) and the IPS e.max Ceram Glaze and Stain Liquids (allround and 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, 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.

Mix the corresponding IPS e.max Ceram ZirLiner with the respective liquid to a creamy consistency and cover the entire framework with it.

Make sure that an even, greenish shade effect is achieved.

Shade difference between IPS e.max ZirCAD frameworks with and without ZirLiner.

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

<table>
<thead>
<tr>
<th>IPS e.max Ceram ZirLiner on IPS e.max ZirCAD</th>
<th>B</th>
<th>S</th>
<th>t</th>
<th>T</th>
<th>H</th>
<th>V₁</th>
<th>V₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZirLiner firing</td>
<td>403°C</td>
<td>60°C</td>
<td>960°C</td>
<td>450°C</td>
<td>959°C</td>
<td>1'</td>
<td>1'</td>
</tr>
<tr>
<td></td>
<td>757°F</td>
<td>108°F</td>
<td>1760°F</td>
<td>842°F</td>
<td>1758°F</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 homogenous 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 and soft. If a more plastic consistency is desired, IPS e.max Ceram Glaze and Stain Liquids (allround or carving) can be used to mix with the Build-Up Liquids in any ratio.
- Provide a thin even coverage of the Dentin or Deep Dentin material on the entire veneering surface.
- After surface is completely covered, position the restoration on the firing tray and fire.

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

<table>
<thead>
<tr>
<th>IPS e.max Ceram on ZrO₂</th>
<th>B</th>
<th>S</th>
<th>t°C</th>
<th>T</th>
<th>H</th>
<th>V₁</th>
<th>V₂</th>
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<tbody>
<tr>
<td>1st + 2nd Margin firing</td>
<td>403°C</td>
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<td>50°C</td>
<td>800°C</td>
<td>1'</td>
<td>450°C</td>
<td>799°C</td>
</tr>
<tr>
<td></td>
<td>757°F</td>
<td>4'</td>
<td>90°F</td>
<td>1472°F</td>
<td>1'</td>
<td>842°F</td>
<td>1471°F</td>
</tr>
</tbody>
</table>

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

- Before layering, apply IPS Model Sealer 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 and soft. If a different consistency of the ceramic is desire, the Liquids may also be mixed with each other in any ratio.
- 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.
- 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.
Stain and Glaze firing
Stain firing is conducted with Essence and Shades, while Glaze firing is carried out with Glaze powder or paste.

**Firing parameters for the Stain and Glaze firing (note the temperature control)**

<table>
<thead>
<tr>
<th>IPS e.max Ceram on IPS e.max ZirCAD</th>
<th>B</th>
<th>S</th>
<th>t</th>
<th>T</th>
<th>H</th>
<th>V1</th>
<th>V2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stain firing</td>
<td>403°C</td>
<td>6'</td>
<td>60°C</td>
<td>108°F</td>
<td>725°C</td>
<td>1'</td>
<td>842°F</td>
</tr>
<tr>
<td>Glaze firing</td>
<td>403°C</td>
<td>6'</td>
<td>60°C</td>
<td>108°F</td>
<td>725°C</td>
<td>1'</td>
<td>842°F</td>
</tr>
</tbody>
</table>

Complete the layering using Incisal and Transparent materials. Completely separate the interdental area prior to firing.

2nd dentin and incisal firing (corrective firing)
Complete the missing areas and compensate for the shrinkage.

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

<table>
<thead>
<tr>
<th>IPS e.max Ceram on IPS e.max ZirCAD</th>
<th>B</th>
<th>S</th>
<th>t</th>
<th>T</th>
<th>H</th>
<th>V1</th>
<th>V2</th>
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</thead>
<tbody>
<tr>
<td>2nd dentin/incisal firing</td>
<td>403°C</td>
<td>6'</td>
<td>60°C</td>
<td>108°F</td>
<td>725°C</td>
<td>1'</td>
<td>842°F</td>
</tr>
</tbody>
</table>

Depending on the furnace type, the firing temperature can be reduced by 5 °C, max. 10 °C (41 °F to max. 50 °F) for the 2nd dentin and incisal firing.

Stain and Glaze firing
Stain firing is conducted with Essence and Shades, while Glaze firing is carried out with Glaze powder or paste.

**Firing parameters for the 1st dentin and incisal firing (note the temperature control)**

<table>
<thead>
<tr>
<th>IPS e.max Ceram on IPS e.max ZirCAD</th>
<th>B</th>
<th>S</th>
<th>t</th>
<th>T</th>
<th>H</th>
<th>V1</th>
<th>V2</th>
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<tbody>
<tr>
<td>1st dentin/incisal firing</td>
<td>403°C</td>
<td>4'</td>
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<td>750°C</td>
<td>1'</td>
<td>842°F</td>
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</table>

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

<table>
<thead>
<tr>
<th>IPS e.max Ceram on IPS e.max ZirCAD</th>
<th>B</th>
<th>S</th>
<th>t</th>
<th>T</th>
<th>H</th>
<th>V1</th>
<th>V2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd dentin/incisal firing</td>
<td>403°C</td>
<td>4'</td>
<td>50°C</td>
<td>90°F</td>
<td>750°C</td>
<td>1'</td>
<td>842°F</td>
</tr>
</tbody>
</table>
PREPARING FOR CEMENTATION

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

The following steps must be observed:
- High-strength zirconium oxide ceramics are generally not etched with hydrofluoric acid (IPS Ceramic Etching Gel), as it does not produce an etching pattern.
- Zirconium oxide supported-restorations may be blasted at max. 1 bar (15 psi) pressure to clean the surfaces prior to cementation.

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

<table>
<thead>
<tr>
<th>IPS e.max ZirCAD</th>
<th>Crowns and bridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indication</td>
<td>Crowns and bridges</td>
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<tr>
<td>Cementation method</td>
<td>Adhesive Cementation</td>
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<tr>
<td>Sandblasting</td>
<td>Cleaning with Al2O3 at max. 1 bar (15 psi) pressure</td>
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<tr>
<td>Etching</td>
<td>Metal / Zirconia Primer</td>
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<tr>
<td>Conditioning / Silanization</td>
<td>Metal / Zirconia Primer</td>
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<tr>
<td>Cementation system</td>
<td>Multilink</td>
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</table>

For the cementation of IPS e.max ZirCAD restorations, you may choose between the tried-and-tested luting composites and cements of the coordinated assortment from Ivoclar Vivadent.
FIRING PARAMETERS

Firing of zirconium oxide-supported restorations

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– The parameters listed in the Instructions for Use apply to Ivoclar Vivadent furnaces (temperature tolerance ± 10 °C/50 °F).
– If furnaces other than those from Ivoclar Vivadent are used, temperature adjustments may be necessary.

Firing parameters

<table>
<thead>
<tr>
<th>IPS e.max Ceram on IPS e.max ZirCAD</th>
<th>B</th>
<th>S</th>
<th>t</th>
<th>T</th>
<th>H</th>
<th>V₁</th>
<th>V₂</th>
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</thead>
<tbody>
<tr>
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<td>60°C</td>
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<td></td>
<td>842 °F</td>
<td>1758 °F</td>
</tr>
<tr>
<td>1st Margin firing</td>
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<tr>
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<td>50°C</td>
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<td>90°F</td>
<td>1472°F</td>
<td></td>
<td>842°F</td>
<td>1471°F</td>
</tr>
<tr>
<td>Wash firing (Foundation)</td>
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<td>50°C</td>
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<td></td>
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<td>1380°F</td>
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<td>4'</td>
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<tr>
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<tr>
<td>Stain firing</td>
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<td>60°C</td>
<td>725°C</td>
<td>1'</td>
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</table>

– The parameters listed represent standard values and apply to the Ivoclar Vivadent furnaces: P200, P300, P500, PX1 and EP 600 Combi. The temperatures indicated also apply to furnaces of older generations, such as the P20, P90, P95, P80, and P100. If one of these furnaces is used, however, the temperatures may deviate by ± 10 °C/50 °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.
## CROWNS AND BRIDGES

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Date information prepared: 03/2006

Caution: US Federal Law restricts the sale of this device by or on the order of a licensed dentist.

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