IPS e.max® ZirCAD

INSTRUCTIONS FOR USE

CE 0123

ivoclar vivadent® technical

TABLE OF CONTENTS

IPS e.max® System –
ALL YOU NEED

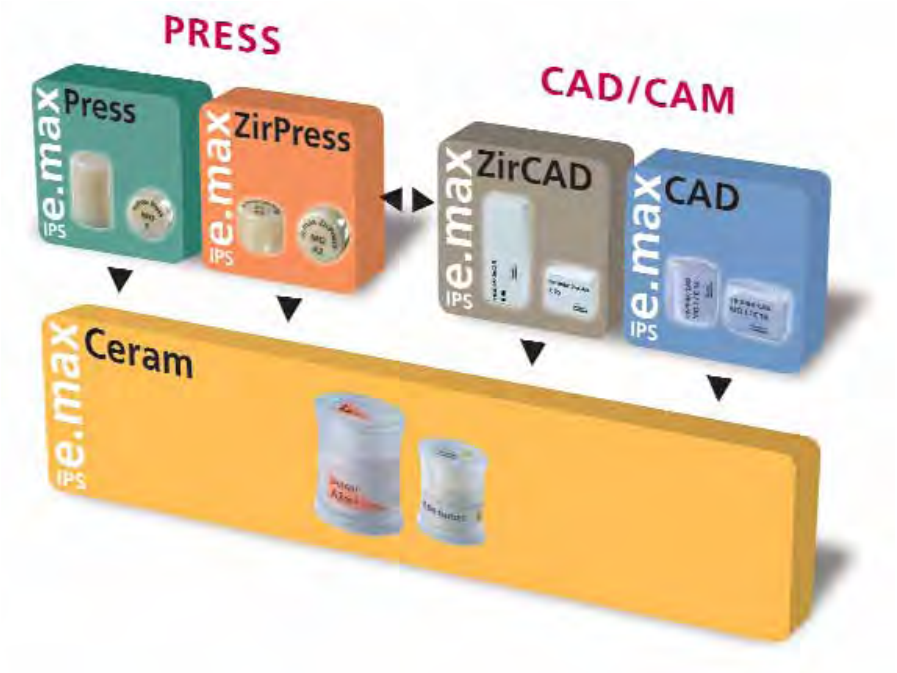
Your purchase of IPS e.max means you have chosen more than simply an all-ceramic system. You have taken the decision to benefit from the unlimited possibilities of all-ceramic. IPS e.max delivers high-strength and highly aesthetic materials for the PRESS and the CAD/CAM technologies.

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 IPS e.max Press glass-ceramic ingots and the IPS e.max ZirPress glass-ceramic 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.



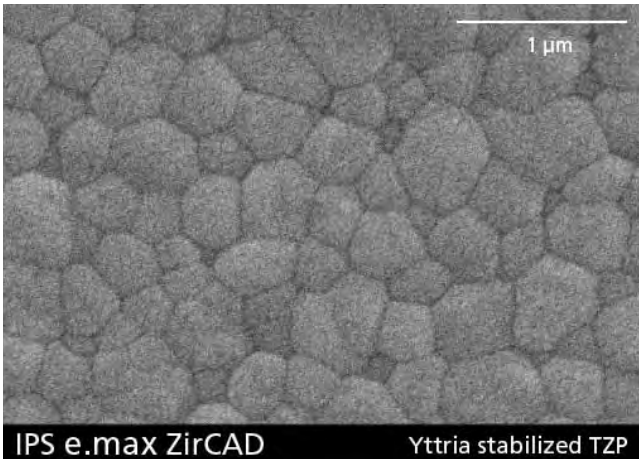
IPS e.max® ZirCAD – PRODUCT INFORMATION

MATERIAL

IPS e.max ZirCAD are pre-sintered, 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 a flexural strength of more than 900 MPa, 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 ZrO_2 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. Either IPS e.max ZirPress is pressed onto the high-strength IPS e.max ZirCAD frameworks and/or the framework is veneered using IPS e.max Ceram.



CTE (100 - 400 °C) [10^{-6} /K]	10.8
CTE (100 - 500 °C) [10^{-6} /K]	10.8
Flexural strength (biaxial) [MPa]*	900
Fracture toughness [MPa $m^{0.5}$]	6
Vickers hardness [MPa]	13000
Chem. solubility [µg/cm^2]*	1
Sintering temperature [°C]	1500

*according to ISO 6872

USAGE

Indications

- Crown frameworks for the anterior and posterior regions
- 3- to 6-unit bridge frameworks for the anterior and posterior regions
- Inlay-retained bridges
- Primary telescope crowns
- Implant superstructures (single tooth and bridge frameworks)

Contraindications

- More than two connected bridge units in the posterior region
- Very deep subgingival preparations
- Patients with severely reduced residual dentitions
- Bruxism

Important processing restrictions

Failure to observe the following restrictions may compromise the results achieved with IPS e.max 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: ZrO_2
  Additional contents: HfO_2, Al_2O_3, Y_2O_3 and other oxides

- **IPS e.max ZirCAD Colouring Liquid**
  Components: Water, ethanol, dyeing salts, additives

- **IPS Contrast Spray Labside**
  Components: Pigment suspension in ethanol; a propane-butane mixture acts as the propellant

- **IPS Natural Die Material**
  Components: Polyester urethane dimethacrylate, paraffin oil, SiO_2 and copolymer

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

PRODUCT OVERVIEW AND DESCRIPTION

IPS e.max ZirCAD for inLab® Basic Kit

The IPS e.max ZirCAD for inLab Basic Kit contains blocks for the Sirona inLab System, as well as the necessary processing accessories. The Basic Kit is supplied in a material box and can be combined with any other IPS e.max kit.

Delivery form:

IPS e.max ZirCAD for inLab Basic Kit

- 1x 5 IPS e.max ZirCAD for inLab Blocks C15
- 1x 5 IPS e.max ZirCAD for inLab Blocks C15 L
- 1x 3 IPS e.max ZirCAD for inLab Blocks B40
- 1x 3 IPS e.max ZirCAD for inLab Blocks B40 L
- 1x 200 ml IPS Contrast Spray Labside

IPS e.max ZirCAD for inLab® Blocks

IPS e.max ZirCAD for inLab Blocks are non-shaded and available in 5 sizes: C15, C15 L, B40, B40 L and B55.

Delivery form:

IPS e.max ZirCAD for inLab Blocks Refill

- 1x 5 IPS e.max ZirCAD for inLab Blocks C15
- 1x 5 IPS e.max ZirCAD for inLab Blocks C15 L
- 1x 3 IPS e.max ZirCAD for inLab Blocks B40
- 1x 3 IPS e.max ZirCAD for inLab Blocks B40 L
- 1x 1 IPS e.max ZirCAD for inLab Blocks B55

Delivery form:

IPS e.max ZirCAD for inLab Blocks Refill (bulk package)

- 1x 25 IPS e.max ZirCAD for inLab Blocks C15
- 1x 25 IPS e.max ZirCAD for inLab Blocks C15 L
- 1x 9 IPS e.max ZirCAD for inLab Blocks B40
- 1x 9 IPS e.max ZirCAD for inLab Blocks B40 L
- 1x 3 IPS e.max ZirCAD for inLab Blocks B55

sirona
The Dental Company

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www.sirona.com

Sirona - inLab® and inLab MCXL

inLab® is a registered trademark of Sirona Dental Systems GmbH

IPS e.max ZirCAD Colouring Kit

The IPS e.max ZirCAD Colouring Kit contains four Colouring Liquids for shading the IPS e.max ZirCAD frameworks prior to sintering, as well as the necessary accessories. The Kit is supplied in a material box and can be combined with any other IPS e.max kit.

Delivery form:

IPS e.max ZirCAD Colouring Kit

– 4x 250 ml IPS e.max ZirCAD Colouring Liquid; Shades: 1, 2, 3, 4
– Var. accessories

IPS e.max ZirCAD Colouring Liquids

The IPS e.max ZirCAD Colouring Liquids are used for shading IPS e.max ZirCAD frameworks prior to sintering and are available in four shades. The Refill contains one Colouring Liquid and a Colouring Jar.

Delivery form:

IPS e.max ZirCAD Colouring Liquid

– 4x 250 ml IPS e.max ZirCAD Colouring Liquid; Shades: 1, 2, 3, 4
– Var. accessories

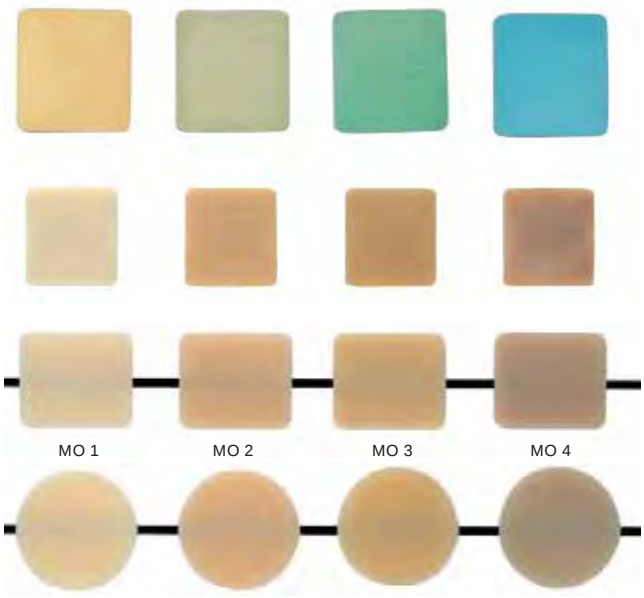
With the IPS e.max ZirCAD Colouring Liquids, the framework shade can be easily adjusted to the IPS e.max shade concept. Consequently, it is possible to ideally adjust the IPS e.max ZirCAD frameworks to IPS e.max CAD or Press.

IPS e.max ZirCAD shaded prior to sintering

IPS e.max ZirCAD shaded after sintering

IPS e.max CAD

IPS e.max Press



Caution when working with the IPS e.max ZirCAD Colouring Liquids!
The solution is irritating to eyes and skin. If the material should accidentally come in contact with the skin or eyes, immediately wash with copious amounts of water. Use suitable protective clothing, gloves, and goggles when working. Contamination on skin, clothes or laboratory equipment might be impossible to remove.

IPS® Contrast Spray Labside

IPS Contrast Spray Labside is used for optimal imaging of CAD/CAM restorations. The IPS Contrast Spray Labside evens out the different optical properties 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 Labside

– 1x 200 ml [275 ml] IPS Contrast Spray Labside

IPS Contrast Spray Labside must not be used intra-orally.

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)

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

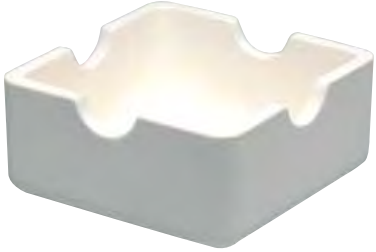
The Sintramat is a high-temperature furnace for sintering oxide ceramics. The temperature course and the sintering process have been optimized for frameworks made of IPS e.max ZirCAD. The Sintramat is distinguished by its easy operating concept, quick sintering process, a special cleaning program, and 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:

Sintramat

– 1x Sintramat
– 1x Warranty Card
– 1x Operating Instructions
– 1x Firing Sagger with ZrO_2 beads
– 1x Ventilation Tube
– 1x Tongs
– 1x Allen Key
– 1x Ventilation Tube Cover

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:

Firing Sagger

– 1x Firing Sagger

Sintramat ZrO_2 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. Make sure that no beads are trapped in the connector area.

Delivery form:

Sintramat ZrO_2 Beads

– 1x 100 g Sintramat ZrO_2 Beads

IPS e.max® ZirCAD – PRACTICAL USE

SHADE DETERMINATION

The correct tooth shade is the basis for true-to-nature restorations. After tooth cleaning, the tooth shade of the non-prepared tooth and/or the adjacent teeth is determined. 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 as lifelike results as possible, shade determination should be carried out at daylight. Furthermore, the patient should not wear clothes of intensive colours and/or lipstick.
Basically, it has to be kept in mind that the final shade of the restoration is the result of the following individual shades:

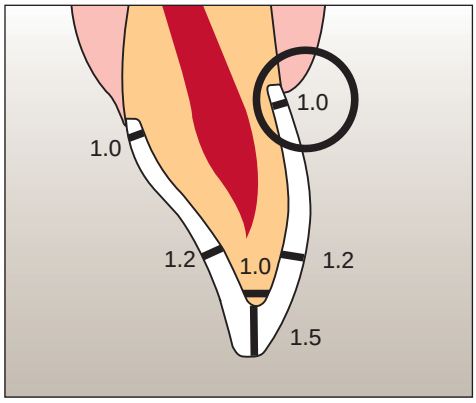
– Shade of the prepared tooth
– Shade of the layering ceramic
– Shade of the cementation material

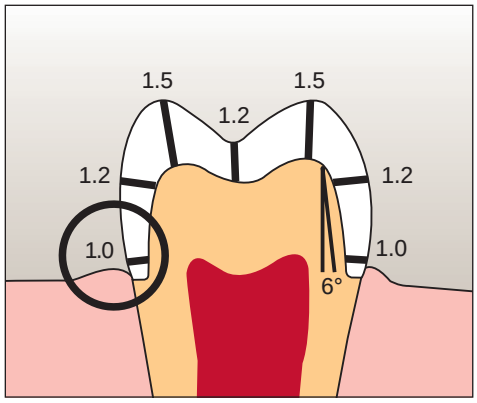
PREPARATION GUIDELINES AND MINIMUM THICKNESSES

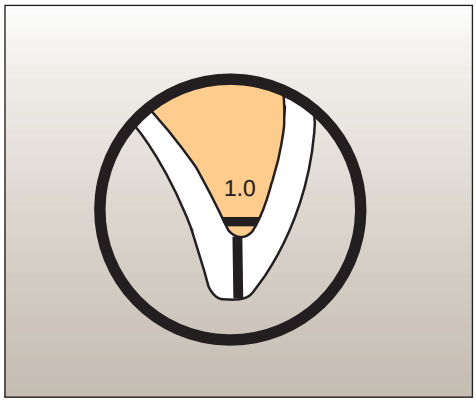
Successful results can only be achieved with IPS e.max ZirCAD if the guidelines and framework thicknesses are strictly observed.

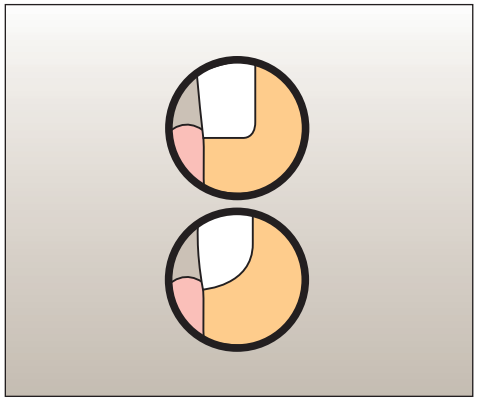
Single crowns and 3-unit bridges

Evenly reduce the anatomical shape and observe the stipulated minimum thicknesses. Prepare a circular shoulder with rounded inner edges or chamfer at an angle of approx. 10-30°. The width of the circular shoulder/chamfer is approx. 1 mm. Reduction of the crown third - incisal or occlusal areas - by approx. 1.5 mm. For anterior crowns, the labial and palatal/lingual part of the tooth should be reduced by 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 edge during CAD/CAM processing.

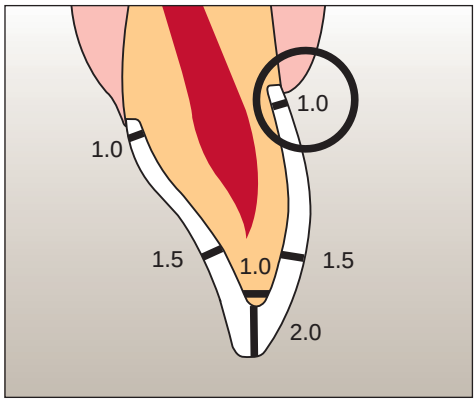


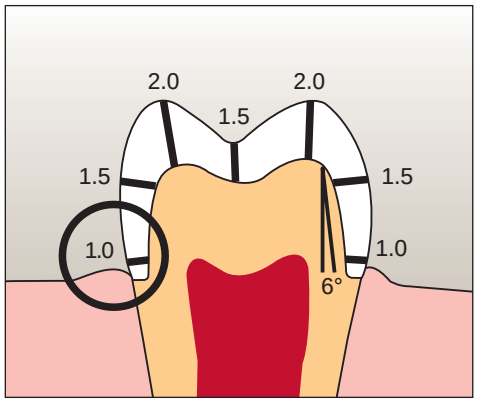






Multi-unit bridges





CRITERIA FOR FRAMEWORK DESIGN

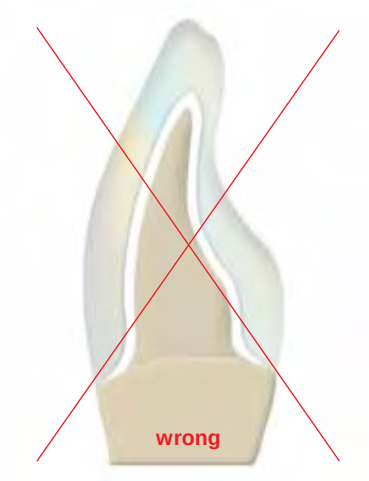
The framework design is the key to the success of durable all-ceramic restorations. The more attention given to the framework design, the better the final results and the clinical success will turn out to be. The following basic guidelines have to be observed:

- **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-cervival) direction.
- **Reducing the framework thickness always relates to a reduction in strength.**
- The integrated parameters in the software are basic recommendations. Depending on the overall thickness of the restoration it can be necessary to adjust the parameters.

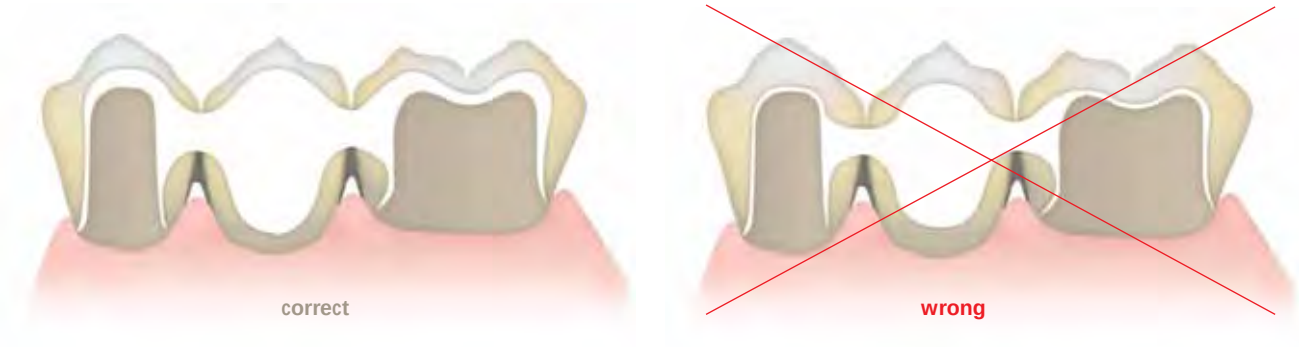
Anterior region		**Crowns**	**Splinted crowns**	**3-unit bridges**	**4- to 6-unit bridges with max. 2 connected pontics**	**Cantilever bridges with 1 pontic**
Minimum framework thickness	circular	0.5 mm	0.5 mm	0.5 mm	0.7 mm	0.7 mm
	incisal	0.7 mm	0.7 mm	0.7 mm	1.0 mm	1.0 mm
Connector dimensions		-	7 mm²	7 mm²	9 mm²	12 mm²
Design		supporting the tooth shape				

Posterior region		**Crowns**	**Splinted crowns**	**3-unit bridges**	**4- to 6-unit bridges with 2 pontics**	**Cantilever bridges with 1 pontic**
Minimum framework thickness	circular	0.5 mm	0.5 mm	0.5 mm	0.7 mm	0.7 mm
	occlusal	0.7 mm	0.7 mm	0.7 mm	1.0 mm	1.0 mm
Connector dimensions		-	9 mm²	9 mm²	12 mm²	12 mm²
Design		supporting the tooth shape				

Anterior and posterior crowns



Bridges



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 choose between the tried-and-tested adhesive and self-adhesive luting composites from the coordinated assortment of Ivoclar Vivadent.

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

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

Multilink® Sprint
The new self-adhesive, dual-curing universal resin cement is even easier to use than a conventional cement. At the same time, it offers the additional advantages of a luting composite, such as higher bond strength and translucency, as well as lower water solubility.

	Variolink® Aesthetic luting composites		**Multilink®** Universal luting composites	
	Variolink II	**Variolink Veneer**	**Multilink Automix**	**Multilink Sprint**
IPS **e.max Press**	✓	✓	✓	✓
IPS **e.max ZirPress** Veneers	✓	✓	–	–
IPS **e.max ZirCAD**	–	–	✓	✓
IPS **e.max CAD**	✓	✓	✓	✓
IPS **e.max Ceram** Veneers	✓	✓	–	–

✓ recommended product combination
– not recommended/product combination not possible

IPS e.max® ZirCAD – CROWNS AND BRIDGES – **Framework design**

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 model with detachable segments is used as a working model.

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.

Sirona - inLab® and inLab MCXL

Milled IPS e.max ZirCAD framework

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.
- Do not use fine rubber polishers for finishing frameworks to be shaded, since this will seal the surface and result in uneven shading.
- 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 with separating disks. 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 Al_2O_3 or polishing jet medium.
- The framework **must be** dry prior to the sintering procedure. Moist frameworks must not be sintered. Therefore, the framework **must be** dried either in a drying cabinet (at approximately 80-120 °C / 176 - 248 °F) or under an infrared lamp for 2 hours.

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

Use suitable grinding tools to finish/adjust the non-sintered framework.

Round out sharp angles and edges created during the milling procedure.

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.

Shading (optional)

For shading the IPS e.max ZirCAD frameworks, four Colouring Liquids (CL1-CL4) are available. The liquids are shaded according to the group shades. The classification according to the tooth shade (A-D, Chromascop and Bleach BL) is listed in the combination table.

Note:

- Thoroughly rinse milling dust from the framework under running water. Use a brush, if required. **Do not** clean with steam!
- If the Colouring Liquid shows white streaks during shading, the framework was not adequately cleaned after the milling process.
- The framework **must be dry** prior to the shading procedure. Moist frameworks cannot be shaded, since the Colouring Liquid cannot be absorbed by the zirconium oxide.
- Therefore, the framework must be dried either in a drying cabinet (at approximately 80–120 °C / 176–248 °F) or under an infrared lamp for 2 hours.

Finished IPS e.max ZirCAD framework

Thoroughly rinse milling dust from the framework under running water. Use a brush, if required.

The following procedure must be observed when shading the frameworks:

- Select the required IPS e.max ZirCAD Colouring Liquid (observe the combination tables) and fill the working cup up to approximately 2 cm.
- Place the IPS e.max ZirCAD framework in the sieve insert of the working cup.
- In order to avoid air entrapments, position the occlusal surface towards the bottom.
- Carefully dip the framework in the sieve insert into the Colouring Liquid.
- Slightly swivel the cup to remove small air bubbles from the surface of the framework.
- A resting time of the framework in the Colouring Liquid of 2 min. ensures a penetration of a wall thickness of 0.7 mm.
- After the resting time in the Colouring Liquid, remove the framework from the sieve insert using the plastic tweezers.
- Briefly rinse off residues of the Colouring Liquid with water. If several restorations are shaded at the same time, they can be rinsed together in the sieve insert.
- Blow dry the framework with oil-free compressed air.
- The framework must be dried prior to the sintering procedure. Moist frameworks must not be sintered, since this will impair the sintering of the zirconium oxide.
- Therefore, the framework must be dried either in a drying cabinet (at approximately 80–120 °C / 176–248 °F) or under an infrared lamp for 1 hour. Place the framework on the occlusal surface for drying.
- The Colouring Liquid may remain in the closed working cup until the next application. It is not necessary to pour the liquid into another container.
- If the Colouring Liquid shows severe contamination (precipitation), it should be replaced.

Caution when working with the IPS e.max ZirCAD Colouring Liquids!
The solution is irritating to eyes and skin. If the material should accidentally come in contact with the skin or eyes, immediately wash with copious amounts of water. Use suitable protective clothing, gloves, and goggles when working. Contamination on skin, clothes or laboratory equipment might be impossible to remove.

Fill the working cup up to approximately 2 cm with Colouring Liquid and place the dry IPS e.max ZirCAD framework with the occlusal surface facing down in the sieve insert.

Dip the framework into the Colouring Liquid for 2 minutes to ensure a penetration of a wall thickness of 0.7 mm.

Remove the framework from the sieve insert using tweezers and briefly rinse it under running water.

Blow dry the framework with oil-free air.

Comparison: unshaded and shaded IPS e.max ZirCAD framework prior to 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. The Sintramat high-temperature furnace is recommended for the sintering procedure.
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 ZrO_2 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 a 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.

Firing sagger filled with 100 g ZrO_2 beads.

Make sure that the framework is adequately supported.

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.

Comparison of a non-sintered and sintered IPS e.max ZirCAD framework.

Note:

- Carefully remove any sintering beads adhering 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.
- Are the heating elements corroded, run the cleaning program with an empty firing sagger several times by pressing "Clean" until the heating elements are free from any contamination. Do not cover the ventilation tube and ensure adequate ventilation of the sinter furnace during the cleaning program.
- If the heating elements cannot be regenerated, they must be replaced.
- Corrosion of the heating elements is mainly caused by not adequately pre-dried zirconium oxide frameworks.
- The firing saggers with ZrO_2 beads are exclusively intended for the sintering of dental restorations.
- Many large-volume ceramic objects or overlapped 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.

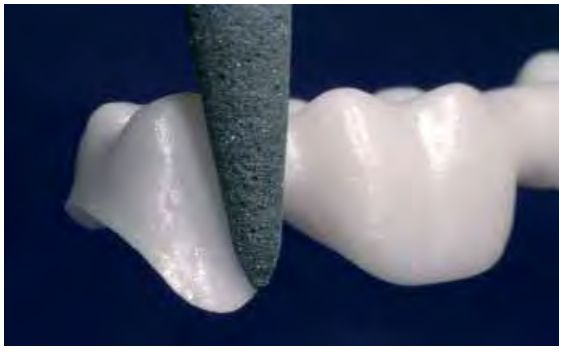
Contaminated, severely corroded heating element

Corroded heating element (left). Repeat the cleaning program several times until the surface of the heating element is free from contamination and appears glassy (right).

Treatment of the framework after sintering

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

– Carefully remove adhering ZrO_2 beads using a suitable instrument.
– Finishing of sintered IPS e.max ZirCAD frameworks should be kept to a minimum (e.g. fine adjustment of margins).
– For selecting the grinding instruments, please observe the recommendations for grinding instruments!
– 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 with separating disks after sintering, 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 a steam jet cleaner and dry.
– The framework **must not** be blasted with Al_2O_3 or polishing jet medium, since this would damage the surfaces.



Use grinding instruments which have been especially developed for ZrO_2 for required adjustments.

Sintered and finished IPS e.max ZirCAD framework

Regeneration firing (optional)

Basically, finishing of sintered IPS e.max ZirCAD frameworks should be kept to a minimum.

A Regeneration firing is **only recommended after**:

– Extensive finishing of the IPS e.max ZirCAD framework (e.g. grinding of cusps, reduction of the layer thickness)
– Use of grinding instruments which are not listed in the IPS e.max recommendations for grinding instruments.
– Grinding with diamond grinding instruments (grain size > 100 ?m).

Note:
Fractures or cracks in the IPS e.max ZirCAD framework caused by rough finishing, e.g. blasting with high pressure, cannot be "healed" by a Regeneration firing.

A Regeneration firing should be conducted in order to reverse changes in the sintered ZrO_2 due to an unscheduled finishing (see above). Please observe the following procedure for conducting the Regeneration firing:

– Clean and dry the framework with a steam jet.
– Position the framework on metal pins on a honey-combed tray.
– Conduct the Regeneration firing in a ceramic furnace (e.g. Programat P700) using the respective parameters.
– As an option, repeat the regular sinter firing in the Sintramat (Program 1).

Firing parameters IPS e.max ZirCAD Regeneration firing in the ceramic furnace

Furnace	B °C/°F	S min	t_1↗ °C/°F	T_1 °C/°F	H_1 min	L °C/°F	t↘ °C/°F
P300 P500 P700 EP5000	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	—

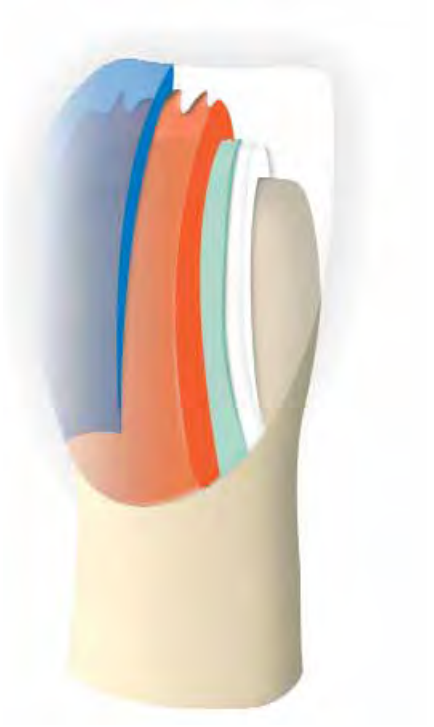
– Do **not** grind the framework after the Regeneration firing.
– The framework **must not** be blasted with Al_2O_3 or polishing jet medium prior to veneering, since this would damage the surfaces.
– Before veneering, clean IPS e.max ZirCAD framework under running water or with a steam jet.

Clean the IPS e.max ZirCAD framework with steam before veneering

Do **not** blast the framework with Al_2O_3 or polishing jet medium.

IPS e.max® ZirCAD –
VENEERING WITH IPS e.max Ceram

The following paragraphs will explain the most important veneering steps of IPS e.max ZirCAD with IPS e.max Ceram. 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 (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.
– To achieve adequate heating of the individual restorations the heating rate should be lowered by 5–10 °C (9–18 °F) and the holding time extended by 30 seconds.
– 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.

ZirLiner firing

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

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.

- 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 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 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.
- 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 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

IPS e.max Ceram ZirLiner on IPS e.max ZirCAD	B °C/°F	S min	t↗ °C/°F	T °C/°F	H min	V_1 °C/°F	V_2 °C/°F
ZirLiner firing	403/ 757	4:00 4:00	60/ 108	960/ 1760	1:00 1:00	450/ 842	959/ 1758

Optional

1st Margin firing

A ceramic shoulder is applied to the reduced bridge after the ZirLiner firing. Please 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-green, 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 firing tray, and fire.

2nd Margin firing

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

- Isolate the die 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 carefully applied into the space.
– Carefully remove the framework with the completed and dried shoulder material from the die, place it on a firing tray, and fire.
– After the 2nd firing, the shoulder may require minor adjustments to achieve very good accuracy of fit.

Place the framework on the isolated die and apply IPS e.max Ceram Margin in drop-shaped increments.

Completed ceramic shoulder after firing.

Firing parameters for the 1st and 2nd Margin firing – note the temperature control

IPS e.max Ceram on IPS e.max ZirCAD	B °C/°F	S min	t↗ °C/°F	T °C/°F	H min	V_1 °C/°F	V_2 °C/°F
1st + 2nd Margin firing	403/ 757	4:00 4:00	50/ 90	800/ 1472	1:00 1:00	450/ 842	799/ 1471

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.

Wash firing (Foundation)

The low heat conductivity of zirconium oxide requires a Wash firing. The Wash firing 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 Dentin or Deep Dentin material with the IPS e.max Ceram Build-Up Liquids allround or soft. If another consistency of the ceramic is desired, the liquids may also be mixed with each other at any mixing ratio.
– Provide a thin even coverage of the Dentin or Deep Dentin material on the entire veneering surface.
– Position the restoration on the firing tray and fire it according to the stipulated parameters.

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

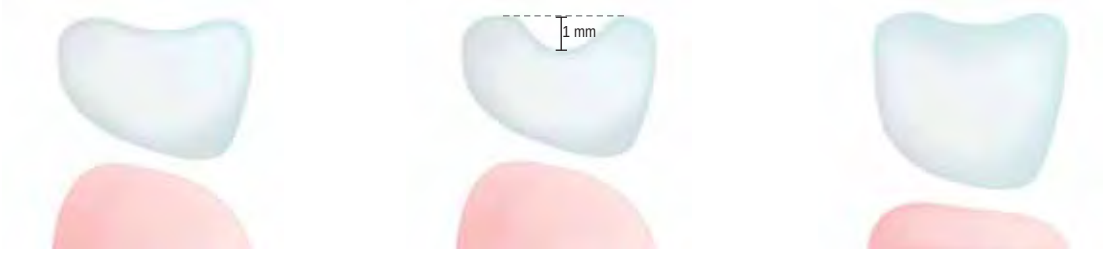
Firing parameters for Wash firing (Foundation) – note the temperature control

IPS e.max Ceram on IPS e.max ZirCAD	B °C/°F	S min.	t↗ °C/°F/min.	T °C/°F	H min.	V_1 °C/°F	V_2 °C/°F
Wash firing (Foundation)	403/ 757	4:00 4:00	50/ 90	750/ 1382	1:00 1:00	450/ 842	749/ 1380

1st Dentin and Incisal firing

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

- Before layering, apply IPS Model Sealer and allow it to dry. After that, isolate the corresponding areas using IPS Ceramic Separating Liquid.
- Place the framework on the model 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 another consistency of the ceramic is desired, the liquids may also be mixed with each other at any mixing 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 heat 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 an optimal sintering behaviour and results in a uniform shrinkage that is easily corrected during the 2nd Dentin and Incisal firing.



Normal occlusal surface | Deep occlusal surface | Massive bridge pontic

- 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 restoration 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 it according to the stipulated firing parameters.

Isolate the model and place the ZirCAD framework in the correct position.

Build up the tooth shape using Dentin materials.


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

Firing parameters for the 1st Dentin and Incisal firing – note the temperature control

IPS e.max Ceram on IPS e.max ZirCAD	B °C/°F	S min.	t↗ °C/°F/min.	T °C/°F	H min.	V_1 °C/°F	V_2 °C/°F
1st Dentin/Incisal firing	403/ 757	4:00 4:00	50/ 90	750/ 1382	1:00 1:00	450/ 842	749/ 1380

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

IPS e.max Ceram on IPS e.max ZirCAD	B °C/°F	S min.	t↗ °C/°F/min.	T °C/°F	H min.	V_1 °C/°F	V_2 °C/°F
2nd Dentin/Incisal firing	403/ 757	4:00 4:00	50/ 90	750/ 1382	1:00 1:00	450/ 842	749/ 1380

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

Stain and Glaze firing

Stain firing is conducted with IPS e.max Ceram 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

IPS e.max Ceram on IPS e.max ZirCAD	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 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


Completely veneered and characterized IPS e.max ZirCAD restorations.

IPS e.max® ZirCAD – PRESS-ON
PROCEDURE WITH IPS e.max ZirPress

The following paragraphs will explain the most important steps for pressing IPS e.max ZirPress onto IPS e.max ZirCAD. Detailed information about the fluorapatite press ceramic and its possible processing techniques are contained in the IPS e.max ZirPress Instructions for Use.

ZirLiner firing

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

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.

- IPS e.max Ceram ZirLiner must always be applied prior to the press-on procedure in order to achieve a sound bond, as well as an in-depth shade effect and fluorescence.
- Direct press-on procedures 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 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 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.
- 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 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

IPS e.max Ceram ZirLiner on IPS e.max ZirCAD	B °C/°F	S min	t↗ °C/°F	T °C/°F	H min	V_1 °C/°F	V_2 °C/°F
ZirLiner firing	403/ 757	4:00 4:00	60/ 108	960/ 1760	1:00 1:00	450/ 842	959/ 1758

Wax-up

The wax-up is fabricated directly on the fired ZirLiner. For this purpose, use a wax that fires without leaving residue. Observe the wax thicknesses of at least 0.7 mm, as otherwise miscasts - e.g. incomplete pressing - may be the result.

Design a fully anatomical wax-up on the framework. Observe the wax thickness.

Sprueing, investing, pressing

Always place the sprues in the direction of flow of the ceramic and at the thickest part of the wax-up in order to ensure unimpeded flow of the viscous ceramic. Depending on the number of objects to be invested, either the 100-g or 200-g investment ring base is selected. Bridges must be pressed using the 200-g investment ring system.
Investing is carried out using either IPS PressVEST (e.g. overnight) or IPS PressVEST Speed (during the day).

Provide sprues on the IPS e.max ring base always in the direction of flow of the ceramic and at the thickest spot.

Once the preheating cycle has been completed, the press procedure is conducted in the press furnace. Subsequently, place the investment ring on the cooling grid and allow it to cool to room temperature. Rough divestment is carried out with glass polishing beads at 4 bar (60 psi) pressure. As soon as the restoration becomes visible, use glass polishing beads at 2 bar (30 psi) pressure for fine divestment.

After the preheating cycle, place the **cold** ingot into the **hot** investment ring and conduct the press procedure.

Rough divestment is carried out with glass polishing beads at 4 bar (60 psi) pressure until the objects are visible. For fine divestment, apply 2 bar (30 psi) pressure.

Stain and Characterization firing

After finishing the restoration, the Stain and Characterization firing is conducted using the IPS e.max Ceram Shades and Essence materials.

Finish the restoration using suitable instruments, low speed, and little pressure.

Conduct Stain and Characterization firing with IPS e.max Ceram Shades and Essence materials.

Firing parameters for the Stain and Characterization firing – note the temperature control

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**
Stain and Characterization firing	403/ 757	6:00 6:00	60/ 108	770/ 1418	1:00 1:00	450/ 842	769/ 1416

Additional Stain and Characterization firing cycles can be conducted with the same firing parameters.

Glaze firing

Glaze firing is conducted either with IPS e.max Ceram Glaze Powder, Paste or Spray.

Glaze firing with
IPS e.max Ceram Glaze Paste or Powder

Glaze firing with
IPS e.max Ceram Glaze Spray

Evenly apply the glazing material to the surface of the restoration and fire it according to the stipulated firing parameters.

Coat the restoration with an even layer of Glaze Spray. If Glaze Spray accidentally reaches the inner aspects of the restoration, remove it with a dry brush and conduct Glaze firing according to the firing parameters.

Firing parameters for Glaze firing – note the temperature control

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
Glaze firing	403/ 757	6:00 6:00	60/ 108	770/ 1418	1:00 1:00	450/ 842	769/ 1416

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

Glazed IPS e.max ZirPress restoration fabricated in the Staining Technique.

View of the restoration on a mirror – IPS e.max ZirPress HT pressed to precision specifications

IPS e.max® ZirCAD – GENERAL INFORMATION

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 working procedure should be observed for conditioning IPS e.max ZirCAD:

- 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.
- The glass-ceramics of inlay-retained bridges fabricated in the press-on technique - with contact of the glass-ceramic to the tooth structure - have to be etched with hydrofluoric acid (IPS Ceramic Etching Gel), silanized with Monobond-S and subsequently cemented using the adhesive technique.

	IPS e.max ZirCAD		
Indication	**Inlay-retained bridges**	**Crowns and bridges ***	
Cementation method	Adhesive cementation	Adhesive cementation	Self-adhesive cementation
Sandblasting	–	Cleaning with Al_2O_3 at max. 1 bar (15 psi) pressure	
Etching	20 sec. with IPS Ceramic Etching Gel	–	
Conditioning / Silanization	Monobond-S	Metal/Zirconia Primer	–
Cementation system	Multilink Automix	Multilink Automix	Multilink Sprint

* Crowns and bridges can also be conventionally cemented using glass ionomer cements (e.g. Vivaglass® CEM). For this purpose, there is no need for the Metal/Zirconia Primer.

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

Observe the Instructions for Use if the IPS Ceramic Etching Gel is used.

FIRING PARAMETERS

Firing of zirconium oxide-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.
– To achieve adequate heating of the individual restorations the heating rate should be lowered by 5–10 °C (9–18 °F) and the holding time extended by 30 seconds.
– 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.

Firing parameters

IPS e.max Ceram on IPS e.max ZirCAD	**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 4:00	60/ 108	960/ 1760	1:00 1:00	450/ 842	959/ 1758
1st Margin firing	403/ 757	4:00 4:00	50/ 90	800/ 1472	1:00 1:00	450/ 842	799/ 1471
2nd Margin firing	403/ 757	4:00 4:00	50/ 90	800/ 1472	1:00 1:00	450/ 842	799/ 1471
Wash firing (Foundation)	403/ 757	4:00 4:00	50/ 90	750/ 1382	1:00 1:00	450/ 842	749/ 1380
1st Dentin / Incisal firing	403 757	4:00 4:00	50/ 90	750/ 1382	1:00 1:00	450/ 842	749/ 1380
2nd 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

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**
ZirLiner firing – before wax-up and pressing	403/ 757	4:00 4:00	60/ 108	960/ 1760	1:00 1:00	450/ 842	959/ 1758
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

– The firing parameters listed represent standard values and apply to the P300, P500, P700, EP 600 and EP5000 furnaces from Ivoclar Vivadent. 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.

Crowns and bridges - unshaded IPS e.max ZirCAD framework

A–D	A1	A2	A3	A3.5	A4	B1	B2	B3	B4	C1	C2	C3	C4	D2	D3	D4
IPS e.max Ceram ZirLiner	ZL 1	ZL 1	ZL 2	ZL 2	ZL 4	ZL 1	ZL 1	ZL 3	ZL 3	ZL 1	ZL 4	ZL 4	ZL 4	ZL 4	ZL 4	ZL 4
IPS e.max Ceram Intensive ZirLiner	yellow, orange, brown, incisal															
IPS e.max Ceram Dentin	D A1	D A2	D A3	D A3.5	D A4	D B1	D B2	D B3	D B4	D C1	D C2	D C3	D C4	D D2	D D3	D D4
IPS e.max Ceram Transpa Incisal	TI 1	TI 1	TI 2	TI 2	TI 3	TI 1	TI 1	TI 1	TI 2	TI 1	TI 3	TI 3	TI 3	TI 3	TI 3	TI 3

Chromascop	110	120	130	140	210	220	230	240	310	320	330	340	410	420	430	440	510	520	530	540
IPS e.max Ceram ZirLiner	ZL 1				ZL 2				ZL 3				ZL 4				ZL 4			
IPS e.max Ceram Intensive ZirLiner	yellow, orange, brown, incisal																			
IPS e.max Ceram Dentin	D 110	D 120	D 130	D 140	D 210	D 220	D 230	D 240	D 310	D 320	D 330	D 340	D 410	D 420	D 430	D 440	D 510	D 520	D 530	D 540
IPS e.max Ceram Incisal	I 1	I 1	I 1	I 2	I 2	I 2	I 3	I 3	I 3	I 3	I 3	I 3	I 3	I 3	I 3	I 3	I 3	I 3	I 3	I 3

Bleach BL	BL1	BL2	BL3	BL4
IPS e.max Ceram ZirLiner	ZL clear			
IPS e.max Ceram Intensive ZirLiner	yellow, orange, brown, incisal			
IPS e.max Ceram Dentin	D BL1	D BL2	D BL3	D BL4
IPS e.max Ceram Incisal	BL			

Crowns and bridges - shaded IPS e.max ZirCAD framework

A-D	A1	A2	A3	A3.5	A4	B1	B2	B3	B4	C1	C2	C3	C4	D2	D3	D4
IPS e.max ZirCAD Colouring Liquid	CL 1	CL 1	CL 2	CL 2	CL 4	CL 1	CL 1	CL 3	CL 3	CL 1	CL 4	CL 4	CL 4	CL 4	CL 4	CL 4
IPS e.max Ceram ZirLiner	ZL clear															
IPS e.max Ceram Intensive ZirLiner	yellow, orange, brown, incisal															
IPS e.max Ceram Dentin	D A1	D A2	D A3	D A3.5	D A4	D B1	D B2	D B3	D B4	D C1	D C2	D C3	D C4	D D2	D D3	D D4
IPS e.max Ceram Transpa Incisal	TI 1	TI 1	TI 2	TI 2	TI 3	TI 1	TI 1	TI 1	TI 2	TI 1	TI 3	TI 3	TI 3	TI 3	TI 3	TI 3

Chromascop	110	120	130	140	210	220	230	240	310	320	330	340	410	420	430	440	510	520	530	540
IPS e.max ZirCAD Colouring Liquid	CL 1				CL 2				CL 3				CL 4				CL 4			
IPS e.max Ceram ZirLiner	ZL clear																			
IPS e.max Ceram Intensive ZirLiner	yellow, orange, brown, incisal																			
IPS e.max Ceram Dentin	D 120	D 120	D 130	D 140	D 210	D 220	D 230	D 240	D 310	D 320	D 330	D 340	D 410	D 420	D 430	D 440	D 510	D 520	D 530	D 540
IPS e.max Ceram Incisal	I 1	I 1	I 1	I 2	I 2	I 2	I 3	I 3	I 3	I 3	I 3	I 3	I 3	I 3	I 3	I 3	I 3	I 3	I 3	I 3

QUESTIONS AND ANSWERS

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 Al_2O_3 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 80–120 °C / 176–248 °F) or under an infrared lamp for 2 hours.*

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, unshaded 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.*

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

A suitable shaded IPS e.max Ceram ZirLiner must always be applied. The IPS e.max Ceram ZirLiner generates an out-standing bond and gives the restoration an effect of depth with regard to colour and fluorescence.

Why do the IPS e.max ZirCAD Colouring Liquids have a code colour?

The code colour helps to identify if and with which shade a framework was coloured. For productivity-oriented laboratories in particular, this increases the process reliability and helps to check the procedures. Furthermore, the even shading of the framework prior to sintering indicates the correct shading procedure. Handle the liquids with care in order to avoid contamination of skin, clothes or laboratory equipment.

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 Ceram 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 colour appears too pale, the layer is too thin. After firing, however, the IPS e.max Ceram ZirLiner demonstrates a layer thickness of approximately 0.1 mm.

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

For shaded zirconium oxide frameworks, use the fluorescent IPS e.max Ceram ZirLiner clear. It enables a strong bond with the zirconium oxide and endows the framework with a lifelike fluorescence.

In which cases is it necessary to conduct a Regeneration firing for IPS e.max ZirCAD?

The need for a Regeneration firing depends on the grinding instrument used for finishing the sintered IPS e.max ZirCAD framework. For selecting the grinding instruments, please observe the recommendations for grinding instruments. Basically, the following rule applies: The finer the grinding instrument, the less damages on the zirconium oxide framework. A Regneration firing is required if diamond grinding instruments (grain size > 100 µm) are used.

Is it possible to control the thickness of the ZirLiner?

If the ZirLiner is applied correctly, the shade effect of the fired IPS e.max Ceram ZirLiner corresponds to the IPS e.max Ceram ZirLiner shade guide. If the ZirLiner was applied too thick, the shade effect is too intensive, which may result in shade distortion of the completed restoration.

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 sand-blasted with Al_2O_3 prior to veneering?

Clean the framework under running water or with a steam jet prior to veneering. The framework ***must not*** *be blasted with Al_2O_3, 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, appropriately retentive preparation design must be observed. If this is not possible, adhesive cementation, e.g. with Multilink® Automix should be used. Vivaglass® CEM is available for conventional cementation.
The new self-adhesive, dual-curing universal resin cement Multilink Sprint is even easier to use than a conventional cement. At the same time, it offers the additional advantages of a luting composite. We advise against the use of conventional phosphate cements, since they negatively influence the light transmission through the all-ceramic and compromise the aesthetic appearance of the all-ceramic restorations. Inlay-retained bridges fabricated in the press-on technique have to be adhesively cemented.

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