





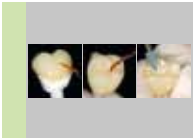


IPS **e.max**[®]

ZirCAD Chairside Instructions for Use

All ceramic,
all you need.


ivoclar
vivadent[®]
passion vision innovation

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IPS e.max® System

Given its versatility, its clinical long-term success and its wide range of indications, the IPS e.max® system is the most successful and most widely used all-ceramic system throughout the world.

With the highly esthetic high-strength IPS e.max materials, all indications for fixed restorations, ranging from thin veneers to multi-unit bridges, can be realized. Hybrid restorations are also possible.

The coordinated shade concept within the system and the individual products enable flexible working procedures from the shade determination up to the material selection.

The ideal restoration shade is optimally reproduced by means of the IPS e.max Shade Navigation App. It facilitates the material selection, leads to results that feature optimum shade match and thus provides efficiency and reliability.

IPS e.max is the comprehensive high-quality all-ceramic system for all indications, esthetic requirements and patient cases: it is **all ceramic, all you need**.



IPS e.max® CAD / IPS e.max® ZirCAD

For maximum flexibility

 <p>IPS e.max® CAD Lithium disilicate glass-ceramic (LS₂)</p> <p>For: Crowns, bridges, inlays, onlays, veneers, partial crowns and implant-supported hybrid restorations</p> <p>Strength: 530 MPa⁽¹⁾</p> 	 <p>IPS e.max® ZirCAD Zirconium oxide ceramic (ZrO₂)</p> <p>For: Full-contour crowns and bridges</p> <p>Strength: 850 MPa⁽²⁾ MT Multi 1,200 MPa⁽²⁾ LT</p> 
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IPS e.max® CAD Crystall./Shades/Stains and Glaze Universal Stains and Glazes

For: IPS e.max CAD, IPS e.max ZirCAD and IPS Empress CAD

⁽¹⁾ Average biaxial flexural strength over 10 years

⁽²⁾ Typical average value for the biaxial strength of IPS e.max ZirCAD LT
Source: R&D Ivoclar Vivadent AG, Schaan, Liechtenstein

IPS e.max CAD is the innovative lithium disilicate glass-ceramic (LS₂) for the CAD/CAM technology. It is unique and combines an outstanding esthetic appearance with high user friendliness. The digitally fabricated restoration is selected from a comprehensive range of indications, which is only offered by IPS e.max CAD. A multitude of translucency levels, shades and block sizes enables flexible working. Proven and coordinated cementation materials ideally supplement the range of products.

IPS e.max ZirCAD permits processing the popular zirconium oxide material easily and quickly by means of the speed sintering procedure to lead to esthetically pleasing results at chairside. The IPS e.max ZirCAD blocks are indicated for monolithic crowns and 3-unit bridges. The high strength of IPS e.max ZirCAD permits thin wall thicknesses and tooth structure-preserving preparation. Moreover, the restorations can be seated using conventional and self-adhesive cementation, e.g. with the self-adhesive resin cement SpeedCEM® Plus.

IPS e.max CAD Crystall./Shades/Stains and Glaze is the universal system of stains and glazes for IPS e.max CAD, IPS e.max ZirCAD and IPS Empress CAD. The glazing material is available with or without fluorescent effect.

There are separate Instructions for Use for **IPS e.max CAD Monolithic Solutions**, **IPS e.max CAD Veneering Solutions** and **IPS e.max CAD Abutment Solutions**.

Material

IPS e.max ZirCAD are presintered yttrium oxide-stabilized zirconium oxide blocks for the CAD/CAM technology. The blocks are available as **MT Multi (with shade and translucency gradation)** or monochromatic as **LT (Low Translucency)**.

The materials feature excellent mechanical properties with a typical mean flexural strength value of 850 MPa (MT Multi) and 1,200 MPa (LT) and surpass glass-infiltrated ceramic with their fracture toughness. IPS e.max ZirCAD can be processed very easily in a suitable CAD/CAM unit in its partly sintered, "chalk-like" state.



IPS e.max ZirCAD MT Multi consists of two different raw materials: On the one hand, of 4Y-TZP with medium translucency (MT) and, on the other hand, of 5Y-TZP with a high translucency (HT). The combination of the two materials enables optimum brightness in the dentin area and a high translucency in the incisal area. What is more, a special, even shade and translucency gradation was developed. It is composed of a 60% dentin zone, a 20% transition zone and a 20% incisal zone. This division is modelled according to the natural dentin/incisal progression and thus results in a lifelike esthetic appearance.

Milling is carried out with an enlargement of the restoration of approximately 20-25%. Given the controlled manufacturing process of the blocks, the shrinkage of the enlarged, fabricated restoration can be controlled in a targeted fashion during sintering, e.g. in the Programat® CS4. In this way, an excellent accuracy of fit can be achieved. The specific properties of zirconium oxide are achieved after sintering.

The result is a structure with a density of over 99%. The high fracture resistance in combination with the high fracture toughness permits thinner wall thicknesses as well as conventional cementation.

Finishing: The restorations may either be polished or, after pre-polishing, e.g. with OptraFine, finished with IPS e.max Crystall./ Glaze, which is available with or without fluorescent effect. For individual characterization, the universal staining system IPS e.max CAD Crystall./Shades/Stains can be used.

MT Multi Medium Translucency Multi			LT Low Translucency	
Raw material mixture		Lifelike shade and translucency gradation	Raw material mixture	
Incisal area	HT 5Y-TZP			
Dentin area	MT 4Y-TZP			
		IPS e.max ZirCAD MT Multi	IPS e.max ZirCAD LT	
Properties	Specifications	Typical average value	Specifications	Typical average value
CTE (25–500°C) [10 ⁻⁶ /K]	10.4 ± 0.5	–	10.5 ± 0.5	–
Flexural strength (biaxial) [MPa]	≥ 700	850	≥ 900	1,200
Chemical solubility [µg/cm ²]	< 100	–	< 100	–
Type/Class	Type II / Class 4	–	Type II / Class 5	–

according to ISO 6872:2015

Uses

Indications

- Full-contour crowns in the anterior and posterior region
- Full-contour 3-unit bridges in the anterior and posterior region

Suitable for wet and dry processing



Contraindications

- Veneering of IPS e.max ZirCAD MT Multi with IPS e.max Ceram
- Bruxism for IPS e.max ZirCAD MT Multi restorations
- Patients with severely reduced residual dentition
- Any other use not listed in the indications
- Temporary seating



Important processing restrictions

Failure to observe the following restrictions may compromise the results achieved with IPS e.max ZirCAD:

- Falling short of the required minimum connector dimensions
- Milling the blocks in a non-compatible CAD/CAM system
- Sintering in a non-compatible sintering furnace
- Do not mix IPS e.max CAD Crystall./Glaze, Shades and Stains with other dental ceramics (e.g. IPS Ivocolor Glaze, Shades and Essences).



Side effects / warnings

If a patient is known to be allergic to any of the components of the material, IPS e.max ZirCAD must not be used. The processing of IPS e.max ZirCAD produces dust which may irritate the skin and eyes and which may result in lung damage. Make sure that your suction equipment of your CAM machine and at your workplace works flawlessly. Do not inhale grinding dust during finishing and wear a dust mask (particle class FFP2) as well as protective goggles and gloves.

Observe the information in the Safety Data Sheet (SDS).



General notes on handling

IPS e.max ZirCAD blocks are delivered in their pre-sintered state. In this state, the material is easy to process, but does not yet demonstrate its known properties, which it shows when present as completed restoration. Therefore, careful handling is required.

Please verify the delivery immediately upon receipt with regard to:

- Integrity of the packaging
- Integrity of the product (no disruptions, cracks or shade irregularities must be noticeable).
- The presence of the manufacturer's name, Ivoclar Vivadent, on the packaging as well as the presence of the CE marking.

IPS e.max ZirCAD is best stored...

- in the original packaging
- in a dry place.

When handling the IPS e.max ZirCAD blocks or unsintered restorations, make sure that they...

- are not exposed to any blows or vibrations.
- are not touched with wet hands.
- only come into contact with liquids that have been approved for the product. Adhesives or pens etc., for example are unsuitable.
- are not contaminated with foreign particles (e.g. glass-ceramic dusts, metal grinding dust).



Safety information

Carefully read these Instructions for Use before you remove the IPS e.max ZirCAD blocks from the packaging. They contain important information regarding processing, which serve your safety and that of your patients.

If not all the points in these Instructions for Use are observed, IPS e.max ZirCAD blocks must not be used for the fabrication of dental restorations.

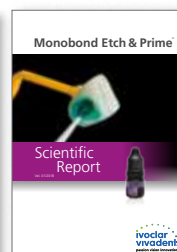
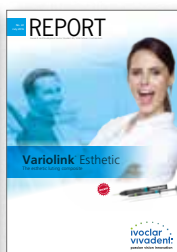
Composition

	IPS e.max ZirCAD MT Multi	IPS e.max ZirCAD LT
Zirconium oxide (ZrO ₂)	86.0 – 93.5 %	88.0 – 95.5 %
Yttrium oxide (Y ₂ O ₃)	> 6.5 % – ≤ 8.0 %	> 4.5 % – ≤ 6.0 %
Hafnium oxide (HfO ₂)	≤ 5.0 %	≤ 5.0 %
Aluminium oxide (Al ₂ O ₃)	≤ 1.0 %	≤ 1.0 %
Other oxides	≤ 1.0 %	≤ 1.0 %

Scientific data

Since the beginning of the development, the IPS e.max system has been monitored by the scientific community. Many renowned experts have contributed to an excellent data base with their studies. The worldwide success story, the ever growing demand, as well as over 150 million fabricated restorations are testament to the success and the reliability of the system. More than 20 clinical *in-vivo* studies to date and even more *in-vitro* studies, as well as the continuously rising number of clinical studies throughout the world show the long-term success of the IPS e.max system in the oral cavities of the patients. The most important study results are compiled in the "IPS e.max Scientific Report Vol. 03". Further scientific data (i.e. strength, wear, biocompatibility) are contained in the Scientific Documentations of the IPS e.max products. They can be obtained from Ivoclar Vivadent.

For further information about all-ceramics and IPS e.max, please refer to the Ivoclar Vivadent Report No. 16 and 17. Detailed information about the luting composite Variolink® Esthetic can be found in the "Ivoclar Vivadent Report No. 22" and the "Variolink Esthetic Scientific Documentation", while Multilink® Automix is described in detail in the "Multilink Automix Scientific Report 2/2016" and Monobond Etch & Prime in the "Monobond Etch & Prime Scientific Report 01/2018".

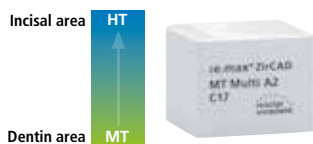


More information is available on the Internet from www.ivoclarvivadent.com.

Block concept

IPS e.max ZirCAD blocks are available as **MT Multi** and in translucency level **LT** as well as in two sizes. We recommend the following processing techniques:

Translucency level	Processing technique			Indications	
	Glazing technique	Staining technique	Polishing technique	Full-contour crowns	Full-contour 3-unit bridges
MT Multi Medium Translucency Multi	✓	✓	✓	✓	✓
LT Low Translucency	✓	✓	✓	✓	✓



IPS e.max® ZirCAD MT Multi (Medium Translucency Multi)

The MT Multi blocks feature a lifelike shade and translucency gradation and are available in **7 A–D shades (A1, A2, A3, B1, B2, C2, D2)** and **1 Bleach shade (BL1)** as well as in **block sizes C17 and B45**.

The LT blocks are ideal for monolithic restorations and can be used in the glazing technique with/without staining/characterization or the polishing technique.



Marking recess in the block: The dentin area is marked by a recess in the block, i.e. the MT layer. The incisal area is located on the opposite side, i.e. the translucent HT layer.



IPS e.max® ZirCAD LT (Low Translucency)

The LT blocks are monochromatic, pre-shaded and are available in **7 A–D shades (A1, A2, A3, B1, C2, D2)** as well as **1 Bleach (BL) shade** and in **block sizes C17 and B45**.

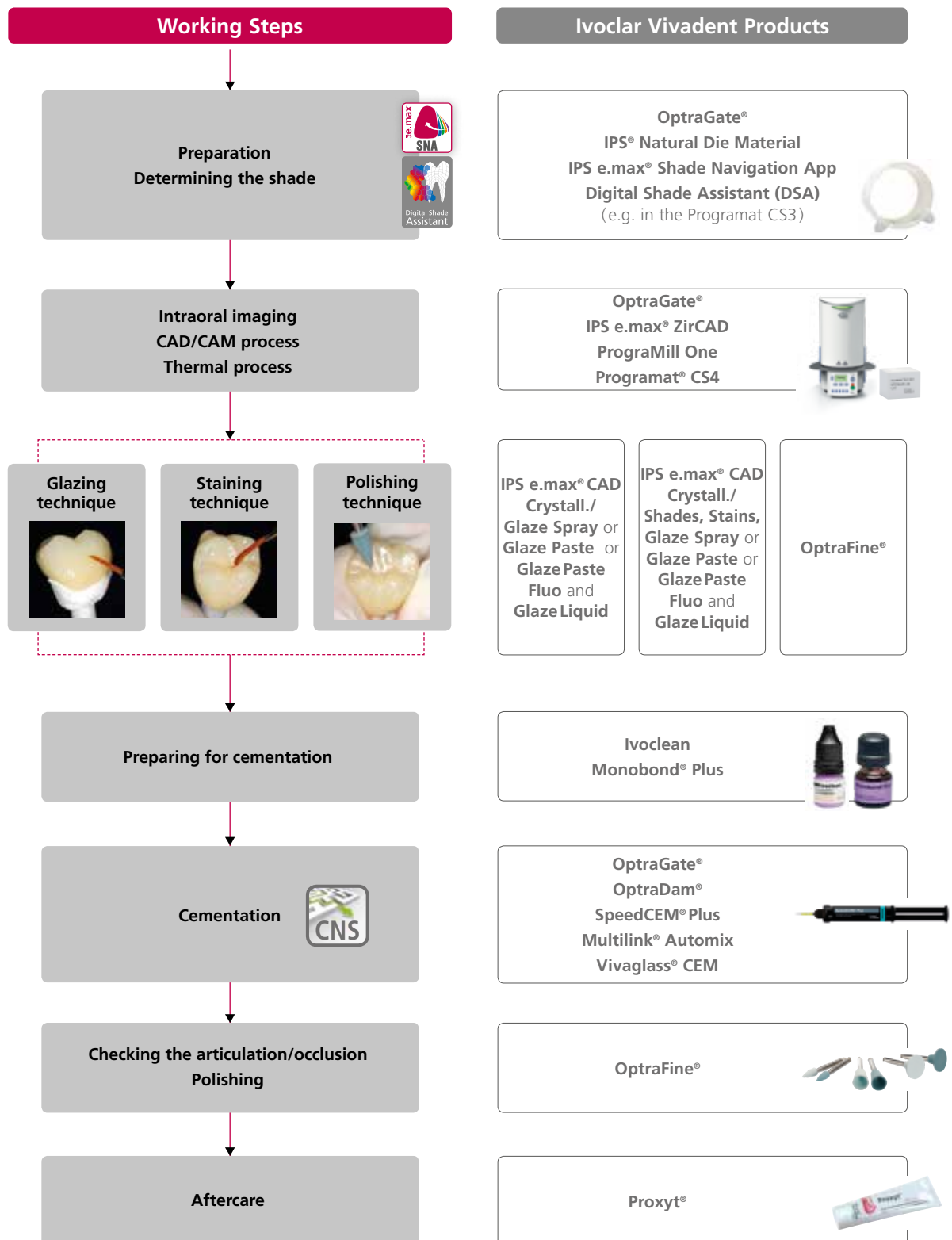
The LT blocks are ideal for monolithic restorations and can be used in the glazing technique with/without staining/characterization or the polishing technique.



Detailed information on the available blocks sizes and shades can be found in the "CAD/CAM Block Overview" at www.ivoclarvivadent.com!



Overview of the Clinical Working Steps, Fabrication Process



The range of available products may vary from country to country

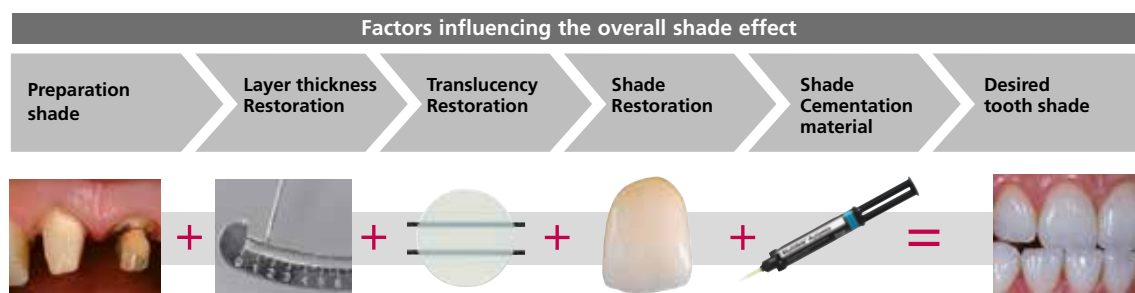
Shade determination – tooth shade, preparation shade

Block selection using the IPS e.max® Shade Navigation App

Optimum shade and shape integration in the oral cavity of the patient is the prerequisite for a true-to-nature all-ceramic restoration. Shade differences between the restoration and the natural residual dentition in particular, disturb the esthetic appearance. To achieve optimum shade integration, the following guidelines and notes must be observed.

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

- **Shade of the prepared tooth** (natural tooth structure, die build-up, abutment, implant)
- **Shade, translucency and layer thickness of the restoration** (A1, A2, A3..., HT, MT, LT..., veneer, characterization)
- **Shade of the cementation material.**



Upon the fabrication of high-quality esthetic restorations, these influencing factors must be taken into consideration. After all, only their interplay results in the overall shade effect. As the shade of the preparation and the layer thickness are usually difficult of control, and the shade of the cementation material only minimally affects the overall shade effect, the selection of the suitable translucency and shade of the IPS e.max block is of critical important.

The **IPS e.max Shade Navigation App** is used to determine the suitable blocks.



The IPS e.max Shade Navigation App is the intelligent block/ingot/disc selection app for Android or iOS smartphones and tablets. The app takes all the important influential factors into account and thus enables a very precise translucency and shade recommendation.



5 steps to find the suitable IPS e.max block:

1

Enter the tooth shade

(Determined/desired tooth shade according to the A-D Shade Guide)



Tips on shade determination:

The tooth shade is determined on the non-prepared tooth or adjacent teeth after cleaning. Individual characteristics have to be considered when determining the tooth shade. In order to achieve as lifelike results as possible, shade determination should be carried out at daylight. Furthermore, the patient should not wear clothes with intensive colours and/or lipstick. For a flawless reproduction of the determined tooth shade, taking an additional digital photograph of the starting situation is recommended.



Another option for shade determination is provided by the Programat® furnaces equipped with DSA function (Digital Shade Assistant). The integrated image processing software compares three preselected shade guide teeth with the tooth to be analyzed and automatically indicates the closest matching tooth shade. You can find additional information about this topic in the corresponding Programat Operating Instructions.



2

Enter the indication

(Veneer, inlay, etc.)



Tips on selecting the indication:

Not all possible indications are listed in the app. However, the following alternative indications can be used to define a suitable block:

Non-listed indications	Alternative indications
Bridge	Crown
Partial crown	Onlay
Occlusal veneer (table top)	Onlay

There are no alternative indications available for hybrid abutment and hybrid abutment crown. The material to be selected can be found in the corresponding Instructions for Use.

3

Enter the die shade

(Shade of the preparation defined with the IPS Natural Die Material shade guide)



Tips on determining the die shade:

The die shade is determined with the IPS Natural Die Material shade guide at the largest, most discoloured area of the tooth stump. If you are torn between two shades, always choose the darker one.

The IPS Natural Die Material enables the fabrication of a model die similar to the preparation of the patient, on the basis of which the correct shade and brightness values of the all-ceramic restorations may be selected.



Example of the die shade effect



Restoration: Veneer (0.5 mm, IPS e.max® CAD HT B1)

Cementation material: Variolink® Esthetic neutral

Preparation shade: IPS® Natural Die Material, ND 1 – ND 9

4

Enter the layer thickness

(Preparation depth and/or wall thickness of the restoration to be fabricated)

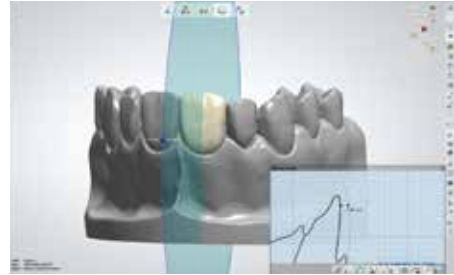


Tips on determining the layer thickness:

Determine the layer thickness either manually with calipers or digitally with of the CAD software. Crowns, veneers and copings are measured in the centre of the thinnest vestibular point. Inlays and onlays at the thinnest occlusal point.



Manual determination of the layer thickness, in the centre of the thinnest, vestibular area



Digital determination of the layer thickness, in the centre of the thinnest, vestibular area

Example - Influence of layer thickness and translucency:



Restoration: left: Veneer (0.5 mm, IPS e.max® CAD HT B1);
right: Crown (1.5 mm, IPS e.max® CAD LT B1)
Cementation material: Variolink® Esthetic neutral
Preparation shade: IPS® Natural Die Material, ND 6

5

Enter the material

(IPS e.max CAD, IPS e.max Press, IPS e.max ZirCAD)



Tips on material selection:

If a field is highlighted in grey in the material selection, the material is not suitable for the respective indication or layer thickness.

=

Result for the suitable block



Tips on the result:

The visual presentation of the result, permits the comparison of the restoration shade with the A–D shade guide to recognized any necessary shade adjustments well in advance.



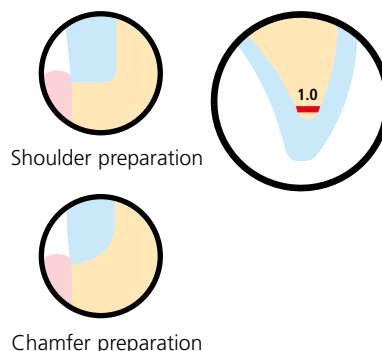
More detailed information on the function and the procedure can be found under www.ipsemax.com/sna or directly in the app.

Preparation guidelines

Before you begin with the actual construction, however, please ensure that the preparation is adequate for a ceramic restorations. Successful results can only be achieved with IPS e.max ZirCAD if the guidelines and minimum layer thicknesses are strictly observed.

Basic preparation guidelines for all-ceramic restorations

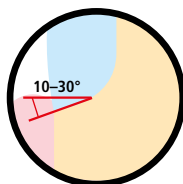
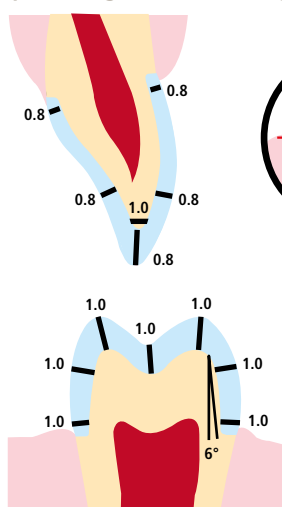
- No angles or edges
- The ideal preparation is a shoulder preparation with rounded inner edges and/or a chamfer preparation.
- The indicated dimensions reflect the minimum thicknesses for IPS e.max ZirCAD restorations.
- The diameter of the edges of the preparation should be at least 1.0 mm (milling tool geometry) in order to permit optimum milling during CAD/CAM processing.



General preparation rules

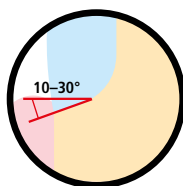
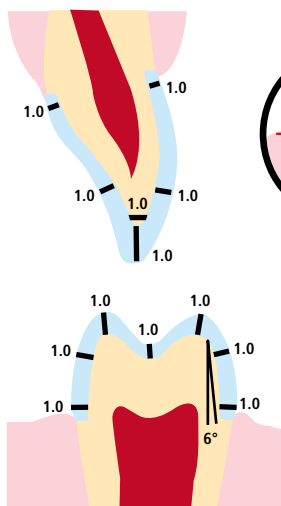
- Evenly reduce the anatomical shape while observing the stipulated minimum wall thicknesses.
- For conventional and/or self-adhesive cementation, the preparation must demonstrate retentive surfaces (preparation height at least 4 mm).
- Preparation angles: 4–8° for conventionally and self-adhesive cementation, >6° for adhesive cementation

Preparation guidelines for single crowns made of IPS e.max ZirCAD MT Multi



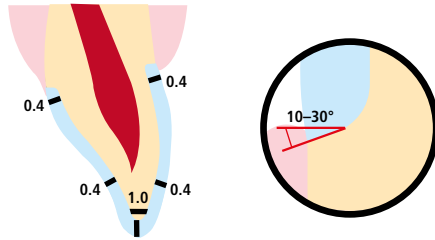
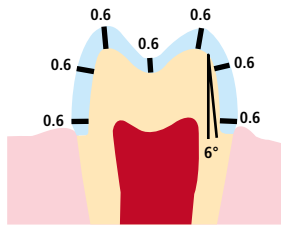
- The ideal preparation is a shoulder preparation with rounded inner edges and/or a chamfer preparation with a shoulder /chamfer width of 1.0 mm for posterior crowns and 0.8 mm for anterior crowns.
- For posterior crowns, the reduction in the incisal/occlusal area is at least 1.0 mm for anterior crowns 0.8 mm.
- For anterior crowns, the reduction in the labial/lingual area is at least 0.8 mm and for posterior crowns 1.0 mm.

Preparation guidelines for 3-unit bridges made of IPS e.max ZirCAD MT Multi – the crown as bridge abutment



- The ideal preparation is a shoulder preparation with rounded inner edges and/or a chamfer preparation with a shoulder /chamfer width of 1.0 mm for posterior crowns and 1.0 mm for anterior crowns.
- For posterior crowns, the reduction in the incisal/occlusal area is at least 1.0 mm for anterior crowns 1.0 mm.
- For anterior crowns, the reduction in the labial/lingual area is at least 1.0 mm and for posterior crowns 1.0 mm.

Preparation guidelines for single crowns and 3-unit bridges made of IPS e.max ZirCAD LT



- The ideal preparation is a shoulder preparation with rounded inner edges and/or a chamfer preparation with a shoulder /chamfer width of 0.6 mm for posterior crowns and 0.4 mm for anterior crowns.
- For posterior crowns, the reduction in the incisal/occlusal area is at least 0.6 mm and for anterior crowns 0.4 mm.
- For anterior crowns, the reduction in the labial/lingual area is at least 0.4 mm and for posterior crowns 0.6 mm.

Design criteria

The restoration design is key to the success of durable all-ceramic restorations.

The more attention given to the design, the better the final results and the clinical success will turn out to be.



The following **minimum layer thicknesses** have to be observed to achieve the tooth shade of the shade guide and to fulfil the **requirements stipulated in the preparation guidelines**.
The minimum layer thicknesses thus refer to the layer thickness of IPS e.max ZirCAD.

Connector dimensions



If possible the **connector dimensions** of bridges should be extended in the **vertical direction** rather than in the horizontal direction. Especially in anterior bridges, it is not always possible to achieve the necessary connector dimensions in the sagittal (lingual-vestibular) direction. In such cases, the connector dimensions must always be extended in the vertical (incisal-cervical) direction.

- Aim for the largest possible dimensions when designing the connectors.
- The height of the connector is more important for the stability than the width. Doubling the width only results in double the stability, while doubling the height results in up to four times the stability.
- The greater the distance between the abutment teeth, the higher the mechanical stress on the construction and the exerted masticatory forces are going to be.



Wall thicknesses / connector dimensions of the sintered restoration

IPS e.max ZirCAD MT Multi (sintered)	Anterior region		Posterior region		Design type
	Minimum wall thickness in mm	Connector dimensions in mm ²	Minimum wall thickness in mm	Connector dimensions in mm ²	
Crowns	0.8	–	1.0	–	Supporting the tooth shape and/or the gingiva
3-unit bridges	1.0	12 ^(a, b)	1.0	16 ^(b)	(incisal, occlusal and/or basal)

a) Height: 4 mm, Width: 3 mm

b) The indicated minimum connector dimensions must be positioned in the dentin area of the block.

IPS e.max ZirCAD LT (sintered)	Anterior region		Posterior region		Design type
	Minimum wall thickness in mm	Connector dimensions in mm ²	Minimum wall thickness in mm	Connector dimensions in mm ²	
Crowns	0.4	–	0.6	–	Supporting the tooth shape and/or the gingiva
3-unit bridges	0.6	7	0.6	12	(incisal, occlusal and/or basal)



Failure to observe the stipulated **minimum wall thicknesses** and **connector dimensions** may result in clinical failures, such as cracks, delamination, and fracture of the restoration.

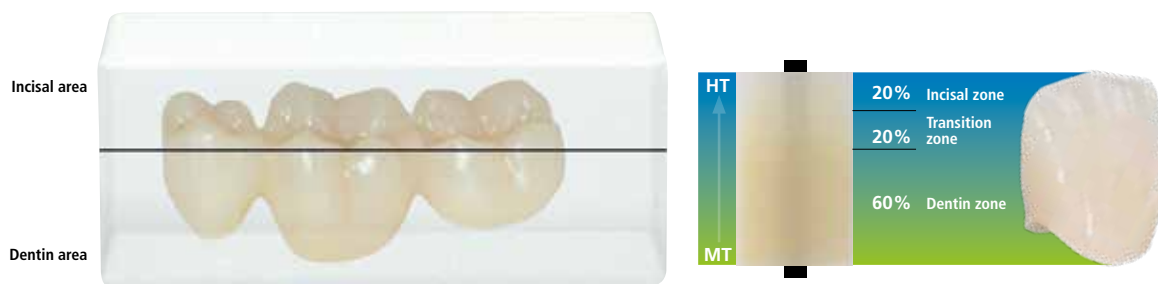
CAD/CAM processing

Since the IPS e.max ZirCAD shrinks by approximately 20-25% during sintering, the shrinkage factor of the respective batch, which is included in the code on the material block, must be read into the software or manually entered. The shrinkage factor then ensures that the milled IPS e.max ZirCAD restorations demonstrate optimum accuracy of fit after sintering.

For the wet processing of IPS e.max ZirCAD, a dedicated milling fluid container should be used to avoid cross-contamination (e.g. milling dust). Do not exceed the maximum amount of milling fluid for wet processing. Contamination may result in discolouration of the restorations during sintering. **For dry processing**, make sure that the chamber of the CAM unit is clean and dry.

Positioning of the IPS e.max ZirCAD MT Multi restoration (CAD software)

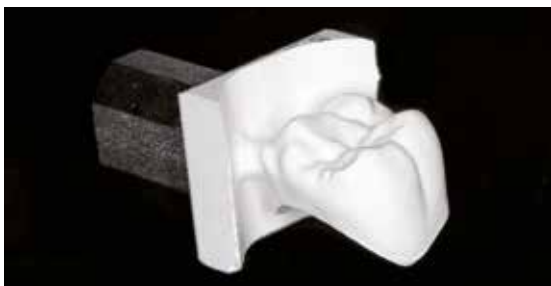
To ensure that restorations made of IPS e.max ZirCAD MT Multi show a clearly visible enamel area, they must be positioned as highly as possible in the block in the CAD software. For single tooth restorations, it is recommended to place the restoration approximately 1 mm below the top edge of the block to obtain a clearly visible incisal portion. Bridge restorations must be placed in such a way that the connections are largely positioned below the auxiliary line or in the dentin area.



Make sure that the indicated minimum connector dimensions are positioned in the dentin area of the block.



Marking recess in the block: The dentin area is marked by a recess in the block, i.e. the MT layer. The incisal area is located on the opposite side, i.e. the translucent HT layer.



Milled IPS e.max ZirCAD restorations



CAD/CAM partners

IPS e.max ZirCAD has to be processed with an authorized CAD/CAM system.

For questions regarding the different CAD/CAM systems, please contact the respective cooperation partners.

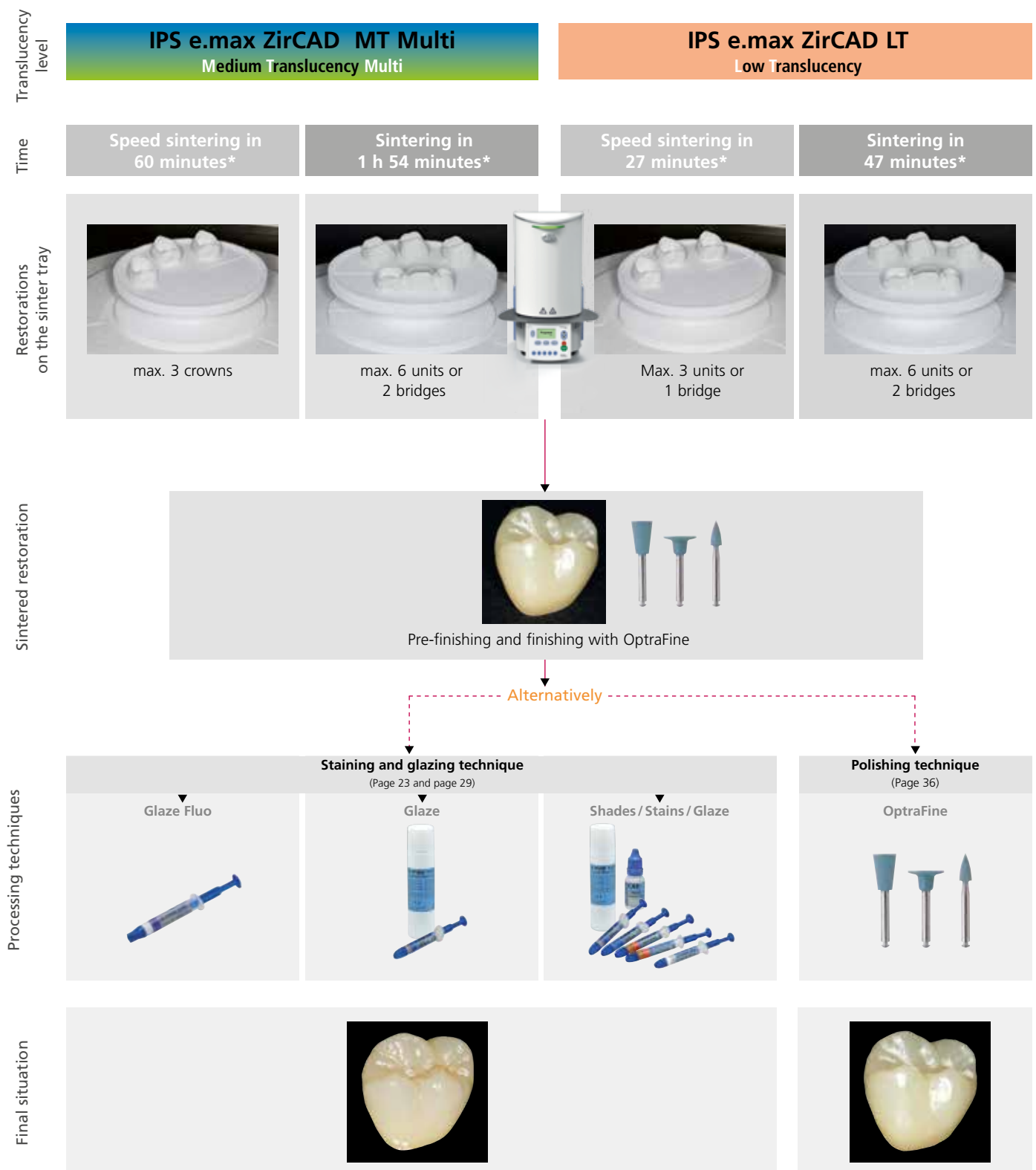


More information is available on the Internet from www.ivoclarvivadent.com.



Practical Procedure

Overview of the Processing Techniques



- Select the longer sintering program to achieve higher translucency.
- With the “polishing technique”, the shade effect may differ from that of the shade guide. Depending on the degree of polishing, the shade effect/intensity is increased. If necessary, it is recommended to select a block shade that is one shade brighter than the target shade.
- *The indicated time is without predrying in the Programat CS4. In general, a predrying time of 8-10 minutes is integrated in the Programat CS4 sintering program. Predrying can be skipped and sintering started immediately by closing the furnace head and pressing the start button. This applies only to dry-milled restorations. For wet-milled restorations, predrying is required.

Practical Procedure

Fabrication process

Finishing after the fabrication process

It is of critical importance to use the correct grinding instruments for adjusting and finishing IPS e.max ZirCAD restoration. This applies to non-sintered as well as sintered objects. If unsuitable grinding instruments are used, chipping of the edges and local overheating may occur.



Please observe Ivoclar Vivadent's recommendations regarding grinding instruments.



The following general aspects should be taken into consideration when separating the restorations:

General information on IPS e.max ZirCAD restorations

- Non-dense-sintered zirconium oxide restorations are susceptible to damage and fractures. This fact has to be kept in mind during the entire working procedure.
- If possible, any necessary post-processing procedure should be carried out while the restoration is still in its non-dense-sintered state (observe the recommendations regarding grinding instruments).
- In the non-dense-sintered state, the contact with liquids (e.g. water and/or contact media, e.g. occlusal spray) must be prevented. Use only suitable grinding instruments at low speed and light pressure to prevent delamination and chipping, particularly in the marginal area (observe the recommendations regarding grinding instruments).
- The non-sintered restoration must not be cleaned in an ultrasonic bath or with the steam jet.

Wet-milled IPS e.max ZirCAD restorations

- Carefully separate the restoration from the holder using a separating disc or suitable grinding instruments. Smooth out the attachment points of the holding bars with suitable grinding instruments.
- After finishing, clean the restoration thoroughly.
To remove any adhering zirconium oxide dust, rinse the restoration with slowly running water.

In order to prevent damage to the restorations during sintering, the IPS e.max ZirCAD restoration must be completely dry. Moist restorations must not be sintered.

- The restoration must be free of dust and grinding residue.
- The Programat CS4 can be used for drying (integrated in the sintering process). As an alternative, an infrared lamp or drying cabinet can also be used.
- Place the restorations on the occlusal surface for drying.
- Note: With infrared lamps (250W), the distance (5–20 cm) to the object directly influences the temperature exerted on the object.
- The drying time depends on the temperature and the size of the object.
At low temperatures, the drying times are prolonged.
Large object delay the drying process.
- Drying at temperatures above 140°C / 284°F may result in defects.
The following table contains the recommended drying times.



Drying times for IPS e.max ZirCAD depending on the restoration size and temperature

	Temperature 70°C / 158°F	Temperature 140°C / 284°F	Programat CS4
Single tooth restorations	≥ 15 min	5 – 10 min	8–10 min (Integrated in the sintering program)
3-unit bridges	≥ 40 min	≥ 25 min	



Dry-milled IPS e.max ZirCAD restorations

Carefully separate the restoration from the holder using a separating disc or suitable grinding instruments. Smooth out the attachment points of the holding bars with suitable grinding instruments. After finishing, clean the restoration thoroughly. Blast with oil-free compressed air and carefully clean with a soft brush to remove any zirconium oxide dust adhering to the restoration.



Separate the restoration



Smooth out the attachment points



Smooth out the attachment points



Design/contour of the connector



Individualize the fissures



Finished IPS e.max ZirCAD framework ready for sintering

General notes on finishing IPS e.max ZirCAD

Rough tungsten carbide burs and/or grinding instruments are only suitable to a certain extent, since they may cause vibrations during finishing, which may result in chipping. Therefore, only fine tungsten carbide burs and/or grinding instruments should be used.

Do not "post-separate" the connector area of bridge constructions using a separating disc as this leads to predetermined breaking points. Make sure that the minimum wall thicknesses and connector dimensions are maintained during finishing. Also, remove any adhering zirconium oxide dust before sintering. Adhering zirconium oxide particle may be sintered to the restoration and result in inaccuracies of fit.

The restoration must not be blasted with Al_2O_3 or glass polishing beads.

Sintering

Sintering is one of the most important processes during the fabrication of zirconium oxide restorations. During this process, the porous white body is turned into a densely sintered restoration by the effect of high temperatures.

Only this fabrication step creates the final properties, such as the high strength and light transmission. To achieve optimum mechanical and optical properties, it is absolutely mandatory that the defined sintering temperatures and times are observed at all times. Too low or too high sintering temperatures and/or too short or too long sintering times negatively affect the above properties.

The sintering furnaces Programat CS4 and CEREC SpeedFire* are especially coordinated with IPS e.max ZirCAD. The different furnace programs are optimally coordinated with the optical and mechanical properties.

Notes to be observed for sintering:

- Basically, sintering beads are not recommended for the Programat CS4 sintering furnace from Ivoclar Vivadent.
- The restorations must not come into contact with each other during sintering.
- The correct program selection must be observed.

* not a registered trademark of Ivoclar Vivadent AG

- Always keep the sintering accessories clean and free of dust so that no contamination may be sintered to the restoration.
 - The sinter programs for the Programat CS4 are represented below.
- For detailed information on the furnaces, refer to the Operating Instructions of the corresponding system.



Correct placement of the restorations in the furnace is imperative.



Please observe the Ivoclar Vivadent flow chart "CEREC SpeedFire*" for sintering in the CEREC SpeedFire.

* not a registered trademark of Ivoclar Vivadent AG

Before sintering, wet restorations must be thoroughly dried. The adequate drying time depends on the size of the restoration (see table on page 18). Restorations that are sintered while wet may be damaged by the high temperature increase rate during sintering.



Please observe the following points for sintering in the Programat CS4:

- Basically, no ZrO₂ sinter beads are to be used.
- The sinter tray can be loaded as described on page 21. Make sure that the restorations do not touch each other.
- The correct program selection must be observed.
- For sintering without distortions, the restorations must be evenly supported in the correct area.
- Bridge constructions should not be exclusively supported by the final abutment crowns. Preferably support the restoration in the area of the pontics. The abutment crowns do not absolutely have to come into contact with the sinter tray.
- Ideally, particularly bridge constructions should be positioned in concentric circles on the sinter tray.
- Note: Do not place any restorations over the separation in the sinter tray.
- Position the loaded sinter tray in the intended position using the centre of the Programat CS4 using the sinter fork.



Position the loaded sinter tray in the centre of the Programat CS4 using the sinter fork.

IPS e.max ZirCAD MT Multi

Medium Translucency Multi

IPS e.max ZirCAD LT

Low Translucency

Speed sintering in
60 minutes*

Sintering in
1 h 54 minutes*

Speed sintering in
27 minutes*

Sintering in
47 minutes*



max. 3 Crowns



max. 6 units or
2 bridges



Max. 3 units or
1 bridge



max. 6 units or
2 bridges

Arrange the restorations in concentric circles on the sinter tray. This ensures even temperature distribution within the restoration during heating and cooling. The restorations must not touch each other. Do not place any restoration over the separation in the sinter tray.

*The indicated time is without predrying in the Programat CS4. In general, a predrying time of 8-10 minutes is integrated in the Programat CS4 sintering program. Predrying can be skipped and sintering started immediately by closing the furnace head and pressing the start button.

Observe the following points when positioning the restorations on the sinter tray:

	✓ correct	ok	✗ incorrect
Single-tooth restorations Anterior region	 Place the restorations on their labial surface.	 Place the restorations on their oral surface.	 Do not place the restorations on the crown margins.
Single-tooth restorations Posterior region	 Place the restorations on their occlusal surface.		 Do not place the restorations on the crown margins.
Three-unit anterior bridge	 Place the restorations on their labial surface and provide support to the pontic. If the restoration "tilts", select an alternative position.	 Position the restorations on the incisal edges. The pontic must also rest on the sinter tray.	 Do not support the restorations exclusively at the marginal edges.
Three-unit posterior bridge	 Place the restorations on their buccal or oral surfaces, depending on the curvature. Abutment crowns do not necessarily need contact to the sinter tray. The pontic must be supported.	 Do not support the restorations exclusively at the crown margins. The pontic must be supported on the basal side.	 If the pontic does not support the restoration, the restoration must not be positioned on the occlusal surface.

↑ Points of contact of the restoration with the sinter tray.



The following programs are recommended for the Programat CS4:

Program	Description	Program Speed sintering*	Program Sintering*
MT Multi Medium Translucency Multi	Programs for the sintering of full-contour IPS e.max ZirCAD restorations	60 minutes* (max. 3 crowns)	1 h 54 minutes* (max. 6 units or 2 bridges)
LT Low Translucency		27 minutes* (max. 3 units or 1 bridge)	47 minutes* (max. 6 units or 2 bridges)

*The indicated time is without predrying in the Programat CS4. In general, a predrying time of 8-10 minutes is integrated in the Programat CS4 sintering program. Predrying can be skipped and sintering started immediately by closing the furnace head and pressing the start button.



Remove the sinter tray from the furnace after the sintering process using the sinter tray fork. Always allow the restorations to cool to room temperature before proceeding.

- Do not touch the hot objects with metal tongs.
- Do not blast or quench the objects.



Detailed information on the Programat CS4 can be found on the Internet at www.ivoclarvivadent.com!

Finishing after sintering

After sintering, the restorations can be adjusted using suitable instruments. If diamond grinding instruments are used for adjustment, the restoration must be cooled with water. As an alternative, other grinding instruments may be used in conjunction with a dental-lab handpiece.



Restoration after sintering



Please observe the manufacturer's grinding tool recommendations.

Use the following procedure for adjusting densely sintered, cooled IPS e.max ZirCAD restorations:

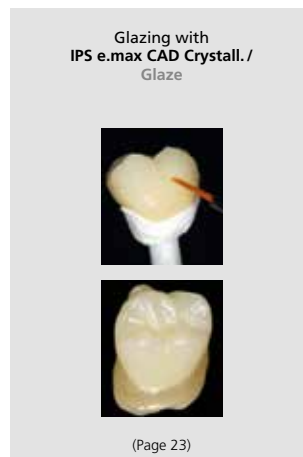
- Finishing of sintered IPS e.max ZirCAD restorations should be kept to a minimum.
- The restoration should only be mechanically finished if it is absolutely necessary.
- Check marginal areas and slightly finish, if necessary.
- Use only low pressure for finishing.
- When finishing IPS e.max ZirCAD restorations, avoid designing sharp edges, aim for rounded ones.
- Do not use a separating disc to separate interdental areas.
- Make sure the minimum wall thicknesses are maintained during finishing.
- Use only immaculate grinding instruments.
- Check the restoration for defects and tears before and after further finishing.
- Zirconium oxide dust sintered to the restoration must be removed before glazing.
- Then clean the restoration with running water or the steam jet and dry.

Practical Procedure

Glazing technique

Pre-finish/finish before applying the glaze

1. Pre-finishing
Use OptraFine® F dry at low speed to create a fine overall surface.
2. Finishing
Finish functional areas using OptraFine P.



Required materials

- **PS e.max CAD Crystall./Glaze Paste Fluo** is a ready-to-use fluorescing glazing paste.
- **IPS e.max CAD Crystall./Glaze Paste** is a ready-to-use glazing paste.
- **IPS e.max CAD Crystall./Glaze Spray** is a ready-to-use glazing spray.
- **IPS e.max CAD Crystall./Glaze Liquid** is a special liquid for mixing with Shades, Stains and Glaze.
- **IPS e.max CAD Crystallization Tray** is a silicon nitride firing tray for IPS e.max CAD, IPS e.max ZirCAD and IPS Empress CAD restorations.
- **IPS e.max CAD Crystallization Pins** are pins in different sizes.
- **IPS Object Fix Putty** and **IPS Object Fix Flow** are auxiliary firing pastes with different viscosities to support all-ceramic restorations during firing and crystallization.



Preparation

Glaze firing is conducted with IPS e.max CAD Crystall./ Glaze pastes or spray glaze.

Depending on the type of restoration, they must be placed on an IPS e.max CAD Crystallization Pin before the Glaze are applied.

Either IPS Object Fix Putty or Flow are recommended to secure the restoration on the pin. The Putty demonstrates a denser consistency and thus higher stability. Given its lower viscosity, Flow is suitable for smaller restorations.



The following procedure has to be observed for crowns and bridges:

- Select the largest possible IPS e.max CAD Crystallization Pin (S, M, L) that best “fills” the inside of the restoration, but does not come into contact with the circular crown walls.
- Fill the inside of the restoration with IPS Object Fix Putty or Flow up to the restoration margin. Immediately reseal the IPS Object Fix Putty/Flow syringe after extruding the material. Once removed from the aluminium bag, the syringe is ideally stored in a re-sealable plastic bag or a container with a humid atmosphere.
- Press the selected IPS e.max CAD Crystallization Pin deeply into the IPS Object Fix Putty or Flow material so that it is adequately secured.
- Smooth out displaced auxiliary firing paste using a plastic spatula so that the pin is securely in place and the restoration margins are optimally supported.
- Prevent contamination of the outer restoration surface.
- Clean off any possible contamination with a brush dampened with water and then dry.

Crown



IPS Object Fix Flow and IPS Object Fix Putty



Select the largest possible IPS e.max CAD Crystallization Pin.



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



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



Smooth out displaced IPS Object Fix Putty or Flow with a plastic spatula from the margin towards the support pin so that the pin is secured in the paste and the restoration wall is exactly supported



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

Bridge



Select the largest possible IPS e.max CAD Crystallization Pin.



Fill the inner aspects of the crowns of the cleaned bridge with IPS Object Fix Putty or Flow and press the suitable IPS e.max CAD Crystallization Pin into them.



Immediately place the bridge on the IPS e.max CAD Crystallization Tray.



Smooth out displaced IPS Object Fix Putty or Flow with a plastic spatula from the margin towards the support pins so that the pins are secured in the paste and the crown margins are exactly supported



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

The following steps must be observed when applying the glaze:

- Apply the glazing material in an evenly covering layer on the restoration.
- If a slight thinning is desired, the glaze may also be mixed with a little IPS e.max CAD Crystall./Glaze Liquid.
- Avoid applying too thick a glaze layer. Avoid pooling, especially on the occlusal surface.
- Too thin a glaze layer may lead to an unsatisfactory gloss.



- If the IPS e.max CAD Crystall./Glaze accidentally reaches the inner aspects of the restoration, remove it with a dry short-hair brush before firing.
- Conduct the Glaze firing with the stipulated firing parameters using the firing equipment suitable for the respective ceramic furnace.
- A maximum of 6 units can be positioned on the firing tray and fired in the Glaze firing with IPS e.max CAD Crystall./Glaze Paste.



Conduct the Glaze firing, e.g. in the Programat CS4. Place the crystallization tray directly on the sinter table.

- After the firing process has been completed, remove the restoration from the furnace. Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.



Conduct the Glaze firing on the IPS e.max CAD Crystallization Tray using the stipulated firing parameters. Firing parameters see page 47.

The following steps must be observed when applying the spray glaze to the crown:

- Hold the restoration by the IPS e.max CAD Crystallization Pin. Do not spray the restoration while it is placed on the IPS e.max CAD Crystallization Tray, as it would then also be coated with glaze.
- Shake the Glaze spray well immediately before use until the mixing ball in the container is moving freely (approximately 20 seconds). If the can is not shaken sufficiently, the spray will contain mainly propellant. This means there will be an insufficient coverage of glazing powder.
- Observe a distance of approx. 10 cm between the nozzle and the surface to be sprayed.
- Hold the spray can as upright as possible during spraying.
- Spray the restoration from all sides with short bursts while simultaneously rotating the restoration so that an even layer is created. Shake the spray can again between individual bursts.
- Spray the restoration a second time from all sides with short bursts while simultaneously rotating the restoration so that an even, covering layer is created. Shake the spray can again between individual bursts.
- Wait briefly until the glaze layer is dry and has assumed a whitish colour.
- Areas that do not show an even layer have to be sprayed again.
- Place the restoration in the centre of the IPS e.max CAD Crystallization Tray and fire using the stipulated firing parameters.



Thoroughly shake the Glaze Spray can immediately before application.



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



Spray the IPS e.max CAD Crystall./Glaze Spray directly on the unfired IPS e.max ZirCAD restoration. Spray the restoration from all sides while simultaneously rotating it.



Shake the spray can again between individual bursts.



Spray an even layer onto the restoration.



Allow the IPS e.max CAD Crystall./Glaze Spray to dry briefly until a whitish layer has formed. Spray again, if necessary, to achieve a smooth, even layer on the restoration.









Place the restoration in the centre of the IPS e.max CAD Crystallization Tray and fire using the stipulated parameters.



Smooth glaze surface after application and drying. This will result in an even gloss after firing.



Conduct the Glaze firing on the IPS e.max CAD Crystallization Tray using the stipulated firing parameters. Firing parameters see page 47.

<div>  Example of incorrect Glaze Spray application </div>		
Problem/Cause	Before Firing Application of the Glaze Spray	After Firing Detailed view of the surface
Problem: Not enough Glaze Spray applied on the restoration Possible cause: <ul style="list-style-type: none"> Distance between the spray can and the restoration too big Spraying too short Spray can is not shaken sufficiently Spray can not held upright during spraying 	 <p>Insufficient application of IPS e.max CAD Crystall./ Glaze Spray.</p>	 <p>Insufficient gloss or incomplete glaze layer.</p>
Problem: Too much Glaze Spray applied on the restoration Possible cause: <ul style="list-style-type: none"> Distance between the spray can and the restoration too small Too much Glaze Spray applied 	 <p>Too much IPS e.max CAD Crystall./Glaze Spray was applied.</p>	 <p>Loss of texture and too glossy surface.</p>
Problem: Uneven surface of the restoration Possible cause: <ul style="list-style-type: none"> Distance between the restoration and the spray can too big Spray can is not shaken sufficiently Spraying too dry (liquid needs to dry slowly on the restoration) Can almost empty or nozzle obstructed Can held at the wrong angle to the restoration (too upright or with the nozzle upside down) Restoration not held in the centre of the spray jet Insufficient application 	 <p>Uneven, "pimply" surface after incorrect application of IPS e.max CAD Crystall./Glaze Spray.</p>	 <p>Rough spray particles on the surface result in a dull and rough surface after firing.</p>

Cleaning the restoration after incorrect application

- Remove the dried spray from the surface using a soft brush until no white powder remains visible (applied Shades and Stains might also be removed)
- Then carefully blast the restoration with compressed air
- Spray the restoration again (if desired, apply Shades and Stains prior to spraying)

Optional:

- If additional characterizations or adjustments are required after Glaze firing, a Corrective firing using IPS e.max CAD Crystall./Shades and Stains and Glaze/Fluo can be conducted. Conduct the Corrective firing also on the IPS e.max CAD Crystallization Tray.
- For minor shape adjustments (e.g. proximal contact points), IPS e.max CAD Crystall./Add-On is available. Adjustments can be made using the corrective firing (does not apply to the Programat CS4, CEREC SpeedFire*).
- The detailed procedure is described on page 37.



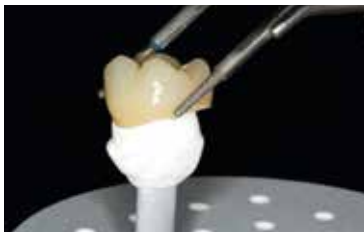
- Remove the ceramic structure from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.
- Remove the cool restoration from the set IPS Object Fix Putty or Flow.
- Remove any adhering residue with ultrasound in a water bath and/or with the steam jet.
- **If grinding adjustments are required, make sure that no overheating of the ceramic occurs.**



Please observe the corresponding firing programs.



Conduct the Add-On firing under vacuum (e.g. Programat CS2, Programat CS3) on an IPS e.max CAD Crystallization Tray using the stipulated firing parameters. **Firing parameters see page 47.**



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



Remove adhering residue with ultrasound in a water bath....



... or with the steam jet.



Completed IPS e.max ZirCAD MT Multi restoration after Glaze firing.

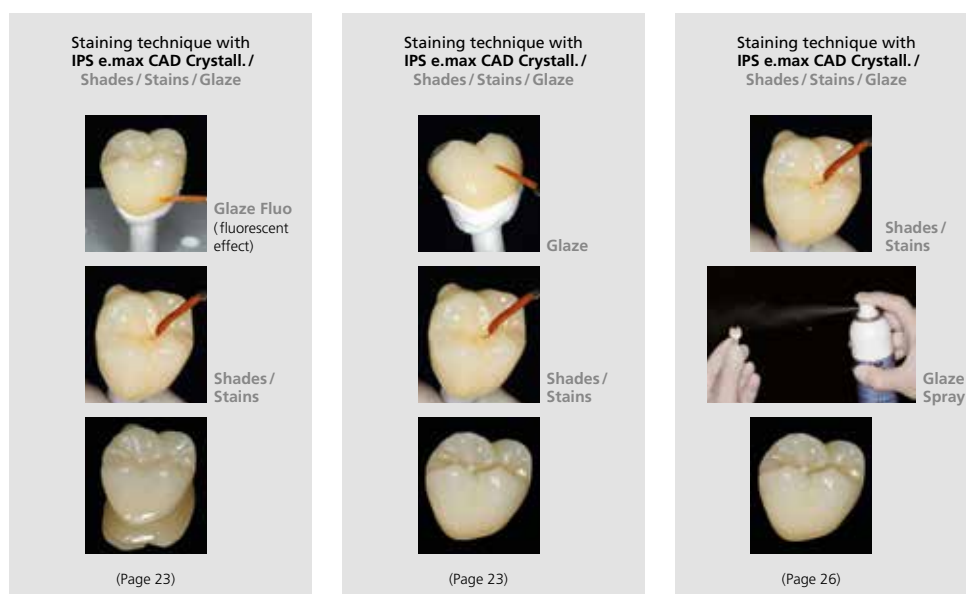
* not a registered trademark of Ivoclar Vivadent AG

Practical Procedure Staining technique

The following paragraphs will explain the steps for staining and glazing with IPS e.max CAD Crystall./Shades, Stains and Glaze paste. Pre-finish/finish before the procedure.

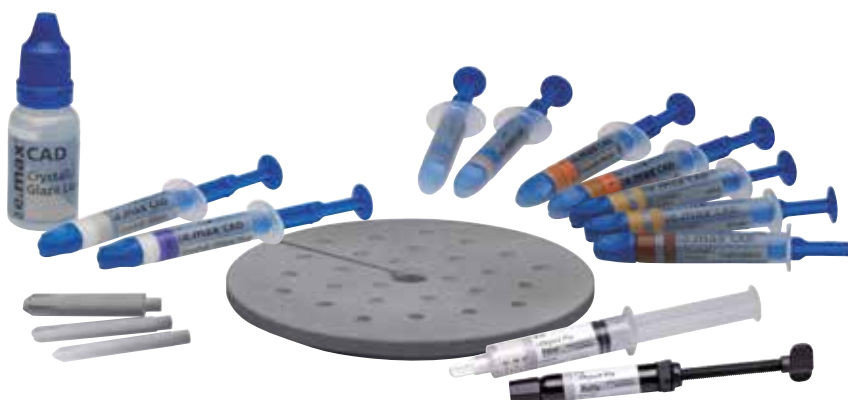
1. Pre-finishing
Use OptraFine F dry at low speed to create a fine overall surface.
2. Finishing
Finish functional areas using OptraFine P.

In this processing technique, Stains/Glaze firing are performed in one step. Characterizations are applied using IPS e.max CAD Crystall./Shades and Stains.



Required materials

- **IPS e.max CAD Crystall./Glaze Paste Fluo** is a ready-to-use fluorescing glazing paste.
- **IPS e.max CAD Crystall./Glaze Paste** is a ready-to-use glazing paste.
- **IPS e.max CAD Crystall./Glaze Liquid** is a special liquid for mixing with Shades, Stains and Glaze.
- **IPS e.max CAD Crystall./Shades** are ready-to-use "Dentin" shades in syringes.
- **IPS e.max CAD Crystall./Stains** are ready-to-use intensive stains in syringes.
- **IPS e.max CAD Crystallization Tray** is a silicon nitride firing tray for IPS e.max CAD, IPS e.max ZirCAD and IPS Empress CAD restorations.
- **IPS e.max CAD Crystallization Pins** are pins in different sizes.
- **IPS Object Fix Putty** and **IPS Object Fix Flow** are auxiliary firing pastes with different viscosities to support all-ceramic restorations during firing and crystallization.



Preparation

Depending on the type of restoration, they must be placed on an IPS e.max CAD Crystallization Pin before the Stains and Glaze are applied. Either IPS Object Fix Putty or Flow are recommended to secure the restoration on the pin. The Putty demonstrates a denser consistency and thus higher stability. Given its lower viscosity, Flow is suitable for smaller restorations. For details see page 24.

The following procedure has to be observed for crowns and bridges:

- Hold the restoration by the firing pin and apply IPS e.max CAD Crystall./Glaze Paste evenly on the entire restoration using a brush.
- If a slight thinning is desired, the glaze may also be mixed with a little IPS e.max CAD Crystall./Glaze Liquid.
- Avoid applying too thick a glaze layer. Avoid pooling, especially on the occlusal surface.
- Too thin a glaze layer may lead to an unsatisfactory gloss.
- If characterizations are desired, the restoration can be individualized using IPS e.max CAD Crystall./Shades or Stains.
- Extrude Shades and Stains from the syringe and mix thoroughly.
- The Shades and Stains may be slightly thinned using IPS e.max CAD Crystall./Glaze Liquid. However, the consistency should still remain pasty.
- Apply mixed Shades and Stains directly into the unfired glaze layer using a fine brush.

Crown



Apply IPS e.max CAD Crystall./Glaze paste evenly on the restoration.



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



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

Bridge



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

Characterization Guide

With the IPS e.max CAD Crystall./Shades and IPS e.max CAD Crystall./Stains, it is possible to characterize the restoration. The following Shades and Stains are available for characterization:

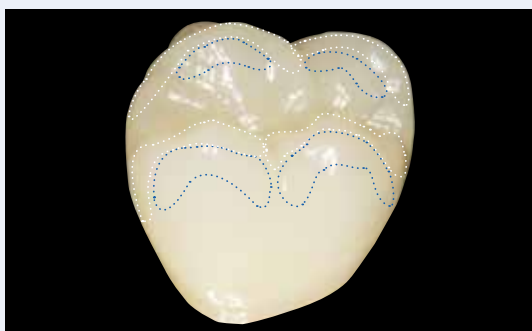
IPS e.max CAD Crystall./Shades



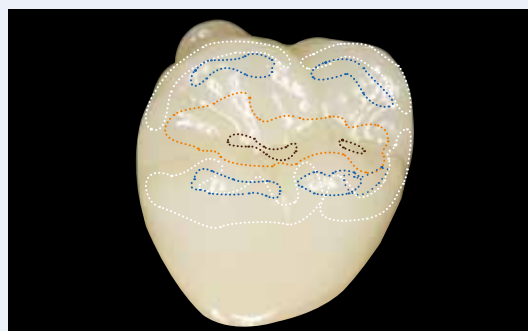
IPS e.max CAD Crystall./Stains



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



Minor characterizations on the buccal surface using IPS e.max CAD Crystall./Shade Incisal and Stains.



Occlusal characterizations using IPS e.max CAD Crystall./Shades and Stains.

- Cusp slopes: Shade Incisal I1
- Fissures: Stains mahogany
- Cusps, marginal ridges: Stains white/cream
- Enhancing the chroma: Stains sunset/copper

Example of IPS e.max CAD Crystall./Shades and Stains applied too thickly



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

After glazing and staining, the Stains/Glaze firing is conducted in a compatible ceramic furnace (e.g. Programat® CS4). When placing the objects into the furnace and setting the firing parameters, observe the following points:

- Place the restoration in the centre of the IPS e.max CAD Crystallization Tray.
- A maximum of 6 units can be positioned on the firing tray for the Stains and Glaze firing with IPS e.max CAD Crystall./Glaze Paste.



Place the restoration in the centre of the IPS e.max CAD Crystallization Tray and fire using the stipulated firing program. In case of the Programat CS4, place the restoration on the sinter tray.



Please observe the firing programs for IPS e.max ZirCAD.



Conduct the **Stains and Glaze firing** on the IPS e.max CAD Crystallization Tray using the stipulated firing parameters. **Firing parameters see page 47.**

Optional:

If additional characterizations or adjustments are required, a corrective firing using IPS e.max CAD Crystall./Shades and Stains and Glaze/Fluo can be conducted. Conduct the Corrective firing also on the IPS e.max CAD Crystallization Tray.

- For minor shape adjustments (e.g. proximal contact points), IPS e.max CAD Crystall./Add-On is available. Adjustments can be made using the Corrective firing (does not apply to the Programat CS4 and CEREC SpeedFire*).
- The detailed procedure is described on page 37.



- Remove the restoration from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.
- Remove the cool restoration from the set IPS Object Fix Putty or Flow.
- Remove any adhering residue with ultrasound in a water bath and/or with the steam jet.
- **If grinding adjustments are required, make sure that no overheating of the ceramic occurs.**



Please observe the corresponding firing programs.



Conduct the Add-On firing under vacuum (e.g. Programat CS2, Programat CS3) on an IPS e.max CAD Crystallization Tray using the stipulated firing parameters. **Firing parameters see page 47.**



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



Remove adhering residue with ultrasound in a water bath...



... or with the steam jet.



Completed IPS e.max ZirCAD MT Multi restoration after Stains and Glaze firing.

Observe the following procedure for the crown staining technique with spray application:

In this processing technique IPS e.max CAD Crystall./Glaze Spray is used instead of the IPS e.max CAD Crystall./Glaze Paste. Stains/Glaze firing is conducted in one step. Characterizations are applied using IPS e.max CAD Crystall./Shades and Stains. The spray should only be used if IPS Object Fix auxiliary firing paste is adapted up to the margins.

Required materials

- **IPS e.max CAD Crystall./Glaze Spray** is a ready-to-use glazing spray.
- **IPS e.max CAD Crystall./Shades** are ready-to-use "Dentin" shades in syringes.
- **IPS e.max CAD Crystall./Stains** are ready-to-use intensive stains in syringes.
- **IPS e.max CAD Crystallization Tray** is a silicon nitride firing tray for IPS e.max CAD, IPS e.max ZirCAD and IPS Empress CAD restorations.
- **IPS e.max CAD Crystallization Pins** are pins in different sizes.
- **IPS Object Fix Putty and IPS Object Fix Flow** are auxiliary firing pastes with different viscosities to support all-ceramic restorations during firing and crystallization.



Please observe the following procedure for crowns:

Preparation

If IPS e.max CAD Crystall./Glaze Spray is used, all the restorations, irrespective of their geometry, have to be placed on the IPS e.max CAD Crystallization Pin with the help of IPS Object Fix Putty or Flow.

Procedure

Secure the restoration on a suitable IPS e.max CAD Crystallization Pin as described on page 24.



Adapt IPS Object Fix Putty or Flow exactly up to the restoration margin so that the glazing spray does not touch the inner aspects.

Stains/Glaze firing in one step

- Before starting the characterization and glazing procedure, make sure the outside of the restoration is dry and free of firing paste.
- If characterizations are desired, the restoration can be individualized using IPS e.max CAD Crystall./Shades and IPS e.max CAD Crystall./Stains.
- Extrude the ready-to-use Shades and Stains from the syringe and mix thoroughly.
- The Shades and Stains may be slightly thinned using IPS e.max CAD Crystall./Glaze Liquid. However, the consistency should still remain pasty.
- Apply mixed Shades and Stains directly on the restoration using a brush.



Please observe the following procedure for the application of the IPS e.max CAD Crystall./Glaze Spray: See page 26.



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



Apply the mixed Shade and Stains.



Even Glaze spray layer.



Please observe the firing programs for IPS e.max ZirCAD.



Conduct the Stains and Glaze firing on an IPS e.max CAD Crystallization Tray using the stipulated firing parameters. **Firing parameters see page 47.**

Optional:

- If additional characterizations or adjustments are required after Stains firing, a Corrective firing using IPS e.max CAD Crystall./Shades and Stains and Glaze/Fluo can be conducted. Conduct the Corrective firing also on the IPS e.max CAD Crystallization Tray.
- For minor shape adjustments (e.g. proximal contact points), IPS e.max CAD Crystall./Add-On is available. Adjustments can be made using the Corrective firing (does not apply to the Programat CS4 and CEREC SpeedFire*).
- The detailed procedure is described on page 37.



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- Remove the restoration from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.
- Remove the cool restoration from the set IPS Object Fix Putty or Flow.
- Remove any adhering residue with ultrasound in a water bath and/or with the steam jet.
- **If grinding adjustments are required, make sure that no overheating of the ceramic occurs.**



Please observe the firing programs for IPS e.max ZirCAD.



Conduct the Add-On firing under vacuum (e.g. Programat CS2, Programat CS3) on an IPS e.max CAD Crystallization Tray using the stipulated firing parameters. **Firing parameters see page 47.**



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



Remove adhering residue with ultrasound in a water bath...



... or with the steam jet.



Completed IPS e.max ZirCAD MT Multi restoration after Stains and Glaze firing.

Practical Procedure

Polishing technique

Polishing the surfaces of monolithic restorations is very important. Well polished surfaces particularly in the occlusal region help to protect the opposing teeth from undesired wear.

When doing this, make sure that the surface of the ground occlusal surfaces are carefully polished after functional adjustment by grinding, and that the original condition is restored. We recommend using the OptraFine® assortment.



Please observe Ivoclar Vivadent's recommendations regarding grinding instruments.



With the polishing technique, the shade effect may differ from that of the shade guide. Depending on the degree of polishing, the shade effect/intensity is increased. If necessary, it is recommended to select a block shade that is one shade brighter than the target shade.

Polishing



Pre-polishing with OptraFine F



Occlusal high-gloss polishing with OptraFine P



Completed IPS e.max ZirCAD MT Multi restoration after polishing.

Required materials

- **OptraFine light-blue diamond finishers (F)** available in shapes flame, cup and disc.
- **OptraFine dark-blue diamond polishers (P)** available in shapes flame, cup and disc.



Practical Procedure

Adjustments

Optional:

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

For minor adjustments (e.g. proximal contact points), IPS e.max CAD Crystall./Add-On is available.

Procedure:

- Mix IPS e.max CAD Crystall./Add-On with IPS e.max CAD Crystall./Add-On Liquid to an easy-to-contour consistency.
- Ensure even mixing of the Add-On material and the liquid in order to achieve an optimum firing result.
- Apply the mixed add-on material directly on the unfired Glaze paste and/or Shades and Stains in the areas to be adjusted and fire.
- If the Glaze Spray is used, apply the Shades and Stains first. Subsequently, supplement the missing areas using Add-On. Apply the Glaze Spray immediately after the application of the Add-On material and fire.
- Conduct the Corrective firing after application of the Add-On material.



Mix IPS e.max CAD Crystall./Add-On with IPS e.max CAD Crystall./Add-On Liquid to an easy-to-contour consistency.



Apply the mixed Add-On material.



Completed crown



Please observe the firing programs for IPS e.max ZirCAD.



Conduct the Add-On firing under vacuum (e.g. Programat CS2, Programat CS3) on an IPS e.max CAD Crystallization Tray using the stipulated firing parameters (not with CS4 and CEREC SpeedFire*). **Firing parameters see page 47.**

Frequently Asked Question

Why is it important to determine the die shade according to the shade of the preparation?

Depending on the translucency level of the block used, the shade of the preparation influences the seated all-ceramic restoration. Therefore, knowing the shade of the preparation is imperative. A corresponding tooth-coloured die is then fabricated with the help of IPS Natural Die Material, on which the optimum adjustment of the restoration shade to the clinical situation can occur.

How do I recognize on which side the translucent layer for the incisal area is located in IPS e.max ZirCAD MT Multi?

The translucent layer is on the opposite side of the recess.



How does a restoration have to be positioned within an IPS e.max ZirCAD MT Multi block so that it shows the desired shade and translucency gradation?

The restoration has to be placed as high in the upper area of the block as possible. Ideally, approximately one millimetre below the top edge of the block. With bridges, the connector dimensions must be located in the dentin area.

Which processing mode is to be used in CEREC® MC*, CEREC® MC X* or CEREC® MC XL*?

Given its optimized properties, IPS e.max ZirCAD is excellently suitable to be milled with tungsten carbide tools with a defined cutting edge. Therefore, milling is to be preferred to grinding, if possible.

If there is a choice between wet and dry milling, wet milling is recommended for small milling units, as the efficient discharge allows less milling dust to settle on the restoration.

The higher number of holding bars attached for milling during nesting, increase the security upon handling in the pre-sintered stage and prevent fracture of the restoration upon removal from the machine as well as during further processing at the workplace.

May IPS e.max ZirCAD MT Multi restorations be veneered?

IPS e.max ZirCAD Multi has not been approved for the veneering with layering ceramics.

May IPS e.max ZirCAD MT Multi and IPS e.max ZirCAD LT restorations be infiltrated?

Infiltration of IPS e.max ZirCAD MT Multi and IPS e.max ZirCAD LT for individual characterization is possible. It must be performed with the IPS e.max ZirCAD MT Colouring Liquids for IPS e.max ZirCAD MT Multi and the IPS e.max ZirCAD LT Colouring Liquids for IPS e.max ZirCAD LT restorations. The block shade "BL" is used for IPS e.max ZirCAD LT.

How can the accuracy of fit of IPS e.max ZirCAD restorations be adjusted?

If the accuracy of fit has to be adjusted, this can be achieved by changing the parameters in the corresponding CAD software. Additionally, there is the possibility to change the dimensions of the occlusal and proximal contacts.

When should manual adjustment with grinding instruments be performed?

All manual adjustments by grinding of milled IPS e.max ZirCAD restorations should be made in the pre-sintered (white) state. It is important to note that the restoration in its pre-sintered state should be ground only with suitable grinding instruments, low speed and light pressure to prevent delamination and chipping, particularly at the margins.

Do IPS e.max ZirCAD restoration have to be pretreated prior to sintering?

It is important to clean the restoration before sintering and remove any adhering milling dust. However, the restoration must not be cleaned in an ultrasonic bath or with a steam cleaner and it must not be blasted with Al₂O₃ or glass polishing beads. If the restoration has come into contact with liquids, it must be dried before it is sintered.

What is the easiest way to remove zirconium oxide dust adhering to the restoration after the CAM process?

Cleaning of the unsintered restoration in its wet state: Rinsing under running water possible.

Cleaning of the unsintered restoration in its dry state: Carefully remove zirconium oxide dust with a soft brush and then carefully blast the restoration with oil-free compressed air.

Adhering zirconium oxide dust may be sintered to the restoration and lead to inaccuracies of fit. Do not inhale grinding dust.

Can moist frameworks be sintered?

The restorations must be fully dried before they are sintered. Moist restorations must not be sintered. The drying time depends on the temperature and the size of the restoration. For drying the objects, a temperature of 70–140 °C must not be exceeded. If moist restorations are sintered, there is a high risk of cracking. In the Programat CS4, the drying program is integrated in the sintering time. Its duration is approximately 8–10 minutes.

May crowns and bridges be sintered at the same time?

Our recommendation is as follows:

- For LT:
 - Yes. In the standard sintering program, max 6 units or two 3-unit bridges can be sintered.
 - No. In the Speed sintering program, max 3 units or a 3-unit bridge can be sintered.
- For MT Multi:
 - Yes. In the standard sintering program, max 6 units or two 3-unit bridges can be sintered.
 - No. In the Speed sintering program, max 3 crowns can be sintered

May restorations made of MT and LT be sintered in one furnace program?

No, the sintering parameters are different.

Why do bridge pontics have to be supported during sintering?

At the high sintering temperatures, the bridge attains a self-deforming state. To guard the bridge from distortion, the pontic with the biggest volume and/or mass should always be supported to prevent any warpage.

Can other sintering furnaces be used for sintering?

The sintering furnaces Programat CS4 and CEREC Speed Fire (Dentsply Sirona) are tested for and coordinated with IPS e.max ZirCAD. Other high-temperature furnaces may thus only be used for sintering under certain conditions. Please contact Ivoclar Vivadent to learn more about compatible furnaces.*

How does the surface of the sintered restoration have to be further treated?

IPS e.max ZirCAD surfaces can be completed by polishing or by a combination of polishing and glazing. IPS e.max Crystall./Shades/Stains are available for individualization.

Why may glazed and polished restorations appear different in direct comparison?

Polishing all-zirconium oxide restorations results only partially in a mother-of-pearl-type shiny surface, which thus appears to be different.

What is a mother-of-pearl effect?

The mother-of-pearl effect is the iridescent effect of a polished surface in incident light. The same effect that occurs in sea shells. A similar phenomenon can be observed in well-polished zirconium oxide. Zirconium oxide demonstrates a high refractive index and, when polished well, a high reflection factor. At the interfaces, part of the incident white light is transmitted and part is reflected so that incident and reflected light beams may overlap, which has the effect that certain parts of the white light spectrum are cancelled and any possibly differing hues remain. As the shade effect/shade intensity increases depending on the degree of polishing, it is recommended, if necessary, to select a block shade that is one shade brighter than the target shade.

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Must the surface be polished before seating the restoration?

We recommend polishing the occlusal surface before glazing, as the glaze layer may have only limited durability when it comes into contact with the antagonists. If the cusp of the antagonist has contact with a smooth surface after the glaze has worn off, polishing counteracts the wear of the antagonist cusp.

It is not imperative that IPS e.max ZirCAD is glazed. The material is easy to polish with suitable ceramic polishing systems.

What does affect the abrasion wear behaviour of ZrO₂ restorations?

Several laboratory studies have shown that the wear behaviour of zirconium oxide is not affected by the hardness, but the surface texture. Rule: The smoother the surfaces, the lower the wear of the enamel antagonists will be. Study results have shown anyway that the wear of antagonists of all-zirconium oxide crowns is not to be classified as critical.

Does the high flexural strength affect the TMJ?

Several clinical studies with monolithic zirconium oxide crowns and bridges examined whether or not the restorations negatively affect the TMJ, masticatory muscles, periodontal ligament of the antagonists (increased tooth mobility) and/or their integrity. Over a period of up to five years, no connection between the occurrence of various clinical phenomena and the incorporation of monolithic zirconium oxide restorations was found.

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

They support the restoration in an optimum manner and thus ensure easy handling, e.g. during staining of the restoration.

Can auxiliary firing pastes other than IPS Object Fix Putty or Flow be used?

The expansion behaviour of IPS Object Fix Putty and Flow is optimally coordinated with IPS e.max CAD and IPS e.max ZirCAD. Furthermore, the consistency allows the paste to be easily applied and cleanly removed without any cumbersome cleaning. Given their composition, pastes of other manufacturers may cause damage to IPS e.max ZirCAD. Moreover, easy removal may not always be possible.

How are contaminations with IPS Object Fix Putty or Flow on the outer surface of the restorations best removed before firing?

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

How can premature drying out of the IPS Object Fix Putty or Flow in the syringe be prevented?

In order to avoid a premature loss of moisture of the firing pastes, remove the syringe from the aluminium bag only directly before initial use. Close the syringe immediately after usage. Once removed from the aluminium bag, the syringe is ideally stored in a re-sealable plastic bag (e.g. Minigrip) or a container with a humid atmosphere.

Can other ceramic furnaces be used for firing?

The firing process of IPS e.max ZirCAD is especially adjusted to the Ivoclar Vivadent ceramic furnaces (e.g. Programat CS4, CS3, CS2) or the CEREC SpeedFire (Dentsply Sirona). If you would like to use other, untested ceramic furnaces, please consult Ivoclar Vivadent about their compatibility with IPS e.max ZirCAD.*

Important: In the Programat CS4, place the IPS e.max CAD Crystallization Tray on the sintering table.

Can IPS Empress Universal Shades, Stains and Glaze be used for IPS e.max ZirCAD?

IPS Empress Universal Shades, Stains and Glaze were specially developed for and coordinated with the IPS Empress System and are therefore not suitable for IPS e.max products.

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May IPS e.max ZirCAD restorations be blasted with Al_2O_3 or polishing beads?

Sintered zirconium oxide restoration surfaces have to be sand blasted prior to incorporation.

Non-sintered zirconium oxide restorations must not be blasted with Al_2O_3 or polishing beads.

How must the inner aspect of the IPS e.max ZirCAD restorations be conditioned before cementation?

The inner aspect of the IPS e.max ZirCAD restoration must be blasted with Al_2O_3 , 25–70 μm , at 1 bar or Al_2O_3 , 70–110 μm , at 1.5 bar, regardless if it is cemented with a conventional, self-adhesive or adhesive protocol.

For adhesive cementation, condition the bonding surface using Monobond Plus. With conventional, self-adhesive cementation, conditioning is not necessary.

What happens if sandblasting before seating the restoration is omitted?

Sandblasting activates the surface of zirconium oxide. Omitting the sandblasting step may result in an insufficient bond between the adhesive or cementation material and zirconium oxide.

















Can IPS e.max ZirCAD restorations be conventionally cemented?

IPS e.max ZirCAD restorations can be cemented adhesively, self-adhesively, or conventionally. For conventional cementation, however, an appropriately retentive preparation design must be observed.

If this is not possible, adhesive or self-adhesive cementation should be preferred, e.g. with Multilink® Automix or SpeedCEM® Plus. Vivaglass® CEM is available for conventional cementation. It is not advisable to use traditional phosphate cements, as they would negatively influence the light transmission of the all-ceramic and therefore compromise the esthetic appearance of the all-ceramic restorations.

Shade combination table

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

A-D tooth shade	BL1	BL2	BL3	BL4	A1	A2	A3	A3.5	A4	B1	B2	B3	B4	C1	C2	C3	C4	D2	D3	D4
IPS e.max CAD Crystall./ Shades		 0					 1				 2				 3				 4	
IPS e.max CAD Crystall./ Shade Incisal			 I1					 I2			 I1					 I2				
IPS e.max CAD Crystall./ Stains			 white		 cream		 sunset		 copper		 olive		 khaki		 mahogany					

Cementation and Aftercare

Cleaning

For optimum cementation, cleaning the bonding surfaces after try-in is recommended.

Ivoclean is the efficient and universal cleaning paste for bonding surfaces of prosthetic restorations after try-in.



Cementation options

Esthetic cementation options are decisive for the harmonious shade effect of an all-ceramic restoration.

Depending on the indication, IPS e.max ZirCAD restorations can be seated using either adhesive, self-adhesive or conventional cementation.

- For the adhesive cementation of IPS e.max ZirCAD restorations, Multilink® Automix is the ideal composite.
- For the self-adhesive cementation of IPS e.max ZirCAD restorations, SpeedCEM® Plus is available.
- We recommend using Vivaglass® CEM glass-ionomer cement for the conventional cementation of IPS e.max ZirCAD.

Short definition of the different cementation methods:

– Adhesive cementation

With adhesive cementation, the tooth surface is chemically conditioned with a highly liquid bonding agent, which results in a micro-mechanical and chemical bond between the tooth structure and the cementation material after curing.

Therefore, retentive preparation, which results in a higher loss of tooth substance, can be waived. The chemical bond between the composite and the restoration can be achieved with the help of a corresponding primer, depending on the cementation material.

– Self-adhesive cementation

The cementation material features self-adhesive properties on the tooth, which is why no additional special conditioning of the tooth surface is necessary. Hence, the adhesion of the restoration is partially achieved by a micro-mechanical and/or chemical bond. In order to achieve sufficient bonding strength values, retentive preparation (preparation angle 4 – 8°, preparation height at least 4mm) is recommended. Self-adhesive cementation does not result in enhanced "(overall) strength" of the seated all-ceramic restoration.

– Conventional cementation

With conventional cementation, the bond is almost entirely created by static friction between the cementation material and the restoration, as well as between the cementation material and the preparation. In order to obtain the necessary mechanical friction, a retentive preparation showing a preparation angle of approximately 4 – 8° is required. Conventional cementation does not result in enhanced "(overall) strength" of the seated all-ceramic restoration.

Cementation possibilities for the different indications

		Adhesive cementation	Self-adhesive cementation	Conventional cementation
IPS e.max MT Multi Medium Translucency Multi	Crowns and bridges	✓	✓	✓
IPS e.max LT Low translucency	Crowns and bridges	✓	✓	✓



More detailed information are part of the **Cementation Navigation System**
(www.cementation-navigation.com).



Preparing for cementation

Conditioning of the restoration and preparation depends on the cementation method used, as well as the cementation material. The following paragraphs describe the basic working steps to prepare for cementation.



Please refer to the Instructions for Use of the corresponding cementation material regarding the detailed procedure.

Conditioning the restoration

Conditioning of the ceramic surface in preparation for cementation is decisive for a sound bond between the cementation material and the all-ceramic restoration. Observe the following procedure for IPS e.max ZirCAD restorations:

- Clean the surface of IPS e.max ZirCAD restorations with Al_2O_3 , 25–70 μm , at 1 bar or Al_2O_3 , 70–110 μm , at 1.5 bar before cementation.
- Thoroughly clean the IPS e.max ZirCAD restoration with water and blow dry.
- Saliva can easily be removed from the restoration by means of Ivoclean.
- If adhesive cementation is used, condition the bonding surface using Monobond® Plus.

	IPS e.max ZirCAD MT Multi/LT	
Indication	Crowns and bridges	
Cementation method	adhesive	self-adhesive/conventional
Blasting	Al_2O_3 , 25–70 μm , 1 bar or Al_2O_3 , 70–110 μm , 1.5 bar	
Cleaning after try-in	Ivoclean	
Conditioning	60 s with Monobond® Plus	–
Cementation system	Multilink® Automix	SpeedCEM® Plus, Vivaglass® CEM PL

Conditioning the preparation

Before it is conditioned, the restoration is tried-in and the occlusion and articulation are checked.

If adjustments of the restoration are required, the restoration must be polished extraorally in these areas before final seating. Any saliva can easily be removed from the restoration by means of Ivoclean.

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

Care notes

Same as natural teeth, high-quality IPS e.max ZirCAD restorations require regular professional care. This is not only beneficial to the health of the gingiva and teeth, but also to the overall esthetic appearance.

The pumice-free Proxyl® pink polishing paste is used to care for the surfaces without causing any wear. The low RDA* value = 7 (*Relative Dentin Abrasion) is a reliable confirmation that a low-abrasion cleaning paste is used. Scientific investigations and long-term clinical experience have proved the gentle effect compared to other pastes.



Sintering and firing programs

The following points should be observed for **ceramic furnaces** used for the **sintering** of IPS e.max ZirCAD:

- Use Ivoclar Vivadent ceramic furnaces (e.g. Programat CS4) to conduct the sintering procedure.
- If you would like to use other, untested ceramic/sintering furnaces, please consult Ivoclar Vivadent about their compatibility with IPS e.max ZirCAD.
- Before the first sintering and every six months after that, the ceramic furnace must be calibrated.
- Depending on the mode of operation, more frequent calibration should be required. Follow the instructions of the manufacturer.

The following aspects should be observed **for conducting the sintering procedure**:

- The restoration must be thoroughly cleaned.
- Place restorations directly onto the sinter table. The restorations must not touch each other (see page 21).
 - For Speed sintering MT Multi: max 3 crowns and for LT: max 3 crowns or 1 bridge.
 - For standard sintering: MT Multi, max 6 units or 2 bridges. For LT: max 6 units or 2 bridges.
- Do not use any sinter beads.
- Remove IPS e.max ZirCAD objects from the sintering furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.
- Do not blast or quench the objects.

The following aspects should be observed **for conducting the Stains/Glaze firing**:

- Use only IPS Object Fix Putty or Flow as an auxiliary firing paste to place the restoration directly on the IPS e.max CAD Crystallization Tray. Place the tray directly on the sinter table when working with the Programat CS4.
- IPS e.max ZirCAD restorations must not be directly placed on the IPS e.max CAD Crystallization Tray and Pins without auxiliary firing paste.
- Use exclusively the IPS e.max CAD Crystallization Tray and the corresponding pins.
- Remove IPS e.max ZirCAD objects from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.
- Do not blast or quench the objects.

The following aspects should be observed **for conducting the Add-on firing**:

- Always conduct the Add-on firing under vacuum (e.g. Programat CS2, CS3, the Programat CS4 and the CEREC SpeedFire* are not equipped with a vacuum function).



These firing parameters are guidance values. They are valid for the Programat furnaces from Ivoclar Vivadent. If furnaces from other manufacturers are used, the firing parameters have to be adjusted accordingly, as the case may be.

Deviations may occur:






- Depending on the furnace generation
- In case of regional differences in the power supply or if several electrical devices are operated on the same circuit.

Due to the IPS e.max Crystallization Tray, the firing temperatures vary depending on the furnace used.

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Sintering



IPS e.max ZirCAD MT Multi and LT

Furnace Programat	Material	Speed sintering	Sintering
Programat CS4 	IPS e.max MT Multi Medium Translucency Multi	 max 3 Crowns	 max 6 units or 2 bridges
	IPS e.max LT Low Translucency	 max 3 units or 1 bridge	 max 6 units or 2 bridges

Firing parameters



IPS e.max ZirCAD MT Multi and LT

Stains/Glaze firing with IPS e.max CAD Crystall./ materials

Furnace Programat		Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t ↗ [°C/°F/min]	Firing temperature T₁ [°C/°F]	Holding time H₁ [min]	Heating rate t ↗ [°C/°F/min]	Firing temperature T₂ [°C/°F]	Holding time H₂ [min]	Vacuum 1 1₁ [°C/°F]	Vacuum 2 2₁ [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t_i [°C/°F/min]
CS4*		180/356** 230/446**	0:00 3:00** 3:00**	60/108	400/752	0:00	95/171 45/81***	840/1544 900/1652***	0 3***	–	–	890/1634	-70/-126
CS3		403/757	6:00	90/162	830/1526	0:10	30/54	870/1598	3:00	450/842 830/1526	830/1526 869/1596	0	0
CS2		403/757	6:00	90/162	830/1526	0:10	30/54	870/1598	3:00	450/842 830/1526	830/1526 869/1596	0	0
CS		403/757	6:00	90/162	820/1508	0:10	30/54	860/1580	3:00	450/842 820/1508	820/1508 859/1578	0	0


IPS e.max ZirCAD MT Multi and LT

Corrective/Stains/Glaze firing with IPS e.max CAD Crystall./ materials

Furnace Programat		Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t ↗ [°C/°F/min]	Firing temperature T₁ [°C/°F]	Holding time H₁ [min]	Heating rate t ↗ [°C/°F/min]	Firing temperature T₂ [°C/°F]	Holding time H₂ [min]	Vacuum 1 1₁ [°C/°F]	Vacuum 2 2₁ [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t_i [°C/°F/min]
CS4*		180/356** 230/446**	0:00 3:00** 3:00**	60/108	400/752	0:00	95/171 45/81***	840/1544 900/1652***	0 3***	–	–	890/1634	-70/-126
CS3		403/757	6:00	90/162	830/1526	0:10	30/54	870/1598	3:00	450/842 830/1526	830/1526 869/1596	0	0
CS2		403/757	6:00	90/162	830/1526	0:10	30/54	870/1598	3:00	450/842 830/1526	830/1526 869/1596	0	0
CS		403/757	6:00	90/162	820/1508	0:10	30/54	860/1580	3:00	450/842 820/1508	820/1508 859/1578	0	0

IPS e.max ZirCAD MT Multi and LT

Corrective/Stains/Glaze firing with IPS e.max CAD Crystall./ Add-On

Furnace Programat		Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t ↗ [°C/°F/min]	Firing temperature T₁ [°C/°F]	Holding time H₁ [min]	Heating rate t ↗ [°C/°F/min]	Firing temperature T₂ [°C/°F]	Holding time H₂ [min]	Vacuum 1 1₁ [°C/°F]	Vacuum 2 2₁ [°C/°F]	Long-term cooling L [°C/°F]	Cooling rate t_i [°C/°F/min]
CS4	–	–	–	–	–	–	–	–	–	–	–	–	–
CS3		403/757	6:00	90/162	830/1526	0:10	30/54	850/1562	3:00	550/1022 830/1526	830/1526 850/1562	710/1310	0
CS2		403/757	6:00	90/162	830/1526	0:10	30/54	850/1562	3:00	550/1022 830/1526	830/1526 850/1562	710/1310	0
CS		403/757	6:00	90/162	820/1508	0:10	30/54	840/1544	3:00	550/1022 820/1508	820/1508 840/1544	700/1292	0

* Place the IPS e.max CAD Crystallization Tray on the sintering table, max 6 units

** Values for predrying

*** Third heating stage

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