

**e.max<sup>®</sup>**  
**IPS**

# ZirCAD

**LABSIDE**

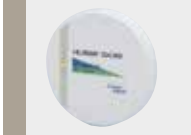


Instructions for Use



all ceramic  
all you need

**ivoclar**  
**vivadent**<sup>®</sup>  
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 used all-ceramic system throughout the world.

It consists of a reliable lithium disilicate glass-ceramic (IPS e.max Press and CAD), an innovative zirconium oxide ceramic (IPS e.max ZirCAD) and a coordinated veneering ceramic (IPS e.max Ceram). The press-on ceramic IPS e.max ZirPress supplements the versatile system.

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**.



## 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 100 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 growing 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. 2". Further scientific data (i.e. strength, wear, biocompatibility) are listed in the Scientific Documentations for the individual 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. More detailed information on the luting composite Variolink® Esthetic can be found in the "Ivoclar Vivadent Report No. 22" and the "Variolink Esthetic Scientific Documentation", while details on Multilink® Automix are contained in the "Multilink Automix Scientific Report 2/2016".



## Material

### IPS e.max® ZirCAD

IPS e.max® ZirCAD are materials for the universal fabrication of zirconium oxide restorations. A coordinated product portfolio and the fabrication with the modern CAD/CAM technology lead to efficient fabrication processes and reproducible esthetic results.



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

- discs with shade and translucency gradation, same as in natural teeth
- eight A–D shades (BL1, A1, A2, A3, B1, B2, C2, D2)
- variable incisal area, depending on the positioning in the disc
- good esthetics and high efficiency during fabrication
- individual characterization with the staining technique
- good reproducibility of the A-D shades
- disc thicknesses: 16 mm, 20 mm



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

- non-shaded MTBL discs for the brush infiltration technique
- pre-shaded discs according to the A-D shade guide (A1, A2, A3, B1, B2, C2, D2)
- pre-shaded MT A–D discs as an efficient solution for the staining technique
- good esthetics and high efficiency during fabrication
- individual characterization with the infiltration technique (MTBL), cut-back and staining techniques
- good reproducibility of the A-D shades
- disc thicknesses: 14 mm, 18 mm



#### IPS e.max® ZirCAD LT (Low Translucency)

- discs in seven group shades, one Bleach shade and seven A–D shades (LT0, LT 1, LT2, LT3, LT4, LTsun, LTsun chroma, BL, A1, A2, A3, B1, B2, C2, D2)
- individual esthetics with the brush infiltration technique, cut-back, layering and staining techniques
- blocks in A–D shades (BL, A1, A2, A3, B1, B2, C2, D2) for the staining technique
- good optical properties combined with high strength
- suitable for crowns and up to multi-unit bridge restorations
- multi-unit framework structures and full-contour restorations as well as combinations of monolithic, partially and fully veneered restorations
- disc thicknesses: 10 mm, 12 mm, 14 mm, 16 mm, 18 mm, 20 mm, 25 mm; block sizes C17, B45 for PrograMill (Ivoclar Digital) and CEREC/inLab (Dentsply Sirona)



#### IPS e.max® ZirCAD MO (Medium Opacity)

- discs and blocks in group shades (MO0, MO1, MO2, MO3, MO4)
- suitable for the layering, press-on and CAD-on techniques
- enhanced opacity to mask discoloured preparations and metal structures
- disc thicknesses: 10 mm, 14 mm, 18 mm, 20 mm, 25 mm; block sizes C13, C15, C15L, B40, B40L, B55, B65L-17 and B85L-22 for CEREC/inLab (Dentsply Sirona)



### IPS e.max® ZirCAD MT Colouring Liquids

- Shading for IPS e.max ZirCAD MTBL by way of brush infiltration before the sintering process
- Colouring liquids for shade infiltration in 16 A–D tooth shades
- Five Effect liquids for the individual shade infiltration in shades blue, violet, grey, orange, brown



### IPS e.max® ZirCAD LT Colouring Liquids

- Shading for IPS e.max ZirCAD LT full-contour restorations by way of brush infiltration before the sintering process
- Colouring liquids for shade infiltration in 16 A–D tooth shades
- Five Effect liquids for the individual shade infiltration in shades blue, violet, grey, orange, brown



### IPS e.max® ZirCAD Colouring Liquid Indicator

- Marking colours to shade IPS e.max ZirCAD LT/MT Colouring Liquids. With brush infiltration, the infiltrated areas are made visible by means of IPS e.max ZirCAD Colouring Liquid Indicator.
- Available in three colours red, blue, yellow

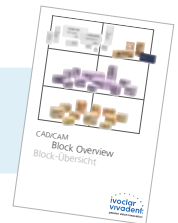


### IPS e.max® ZirCAD Colouring Liquid Diluter

- Liquid to dilute the IPS e.max ZirCAD MT or IPS e.max ZirCAD LT Colouring Liquids



Detailed information on the available discs, block sizes and shades can be found in the "CAD/CAM Block Overview" at [www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)!



## Technical data

### Composition

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

### Properties

	Specification	Typical mean value	Specification	Typical mean value	Specification	Typical mean value	Specification	Typical mean value
CTE (25–500°C) [10 <sup>-6</sup> /K]	10.4 ± 0.5	–	10.4 ± 0.5	–	10.5 ± 0.5	–	10.5 ± 0.5	–
Flexural strength [MPa]	≥ 700	850	≥ 700	850	≥ 900	1200	≥ 900	1150
Chemical solubility [µg/cm <sup>2</sup> ]	< 100	–	< 100	–	< 100	–	< 100	–
Type / Class (ISO 6872:2015)	Type II / Class 4		Type II / Class 4		Type II / Class 5		Type II / Class 5	

## Uses and safety information

### IPS e.max® ZirCAD discs and blocks

#### Indications

Translucency level	Indications				
	Full-contour crowns	Full-contour 3-unit bridges	Full-contour, 4- to multi-unit bridges with max. 2 pontics	Crown frameworks	3- to multi-unit bridge frameworks with max. 2 pontics
<b>MT Multi</b> Medium Translucency with shade gradation	✓	✓*			
<b>MT</b> Medium Translucency	✓	✓*			
<b>LT</b> Low Translucency	✓	✓	✓**	✓	✓**
<b>MO</b> Medium Opacity				✓	✓**

\* IPS e.max ZirCAD MT and IPS e.max ZirCAD MT Multi are discs for the fabrication of restorations consisting of a maximum of three units.

\*\* In Canada, bridge indications are limited to 6 units with a maximum of 2 connected pontics.

#### Contraindications

##### IPS e.max ZirCAD MT / MT Multi

- Bridge reconstructions consisting of more than 3 units
- Patients with severely reduced residual dentition
- Bruxism
- Any other use not listed in the indications
- Temporary seating

##### IPS e.max ZirCAD LT / MO

- Bridge constructions with more than two connected bridge pontics
- Patients with severely reduced residual dentition
- Bruxism, for veneered IPS e.max ZirCAD LT/MO restorations
- Two or more connected extension units
- Any other use not listed in the indications
- Temporary insertion



### Additional processing restrictions

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

- Failure to observe the necessary minimum wall thicknesses and connector dimensions
- Milling the discs and blocks in a non-compatible CAD/CAM system
- Sintering in a non-compatible high-temperature furnace

### Side effects / warnings

If patients are known to be allergic to any of the ingredients, IPS e.max ZirCAD restorations should not be used. The processing of IPS e.max ZirCAD discs and blocks produces dust which may irritate the skin and eyes and which may result in lung damage. Make sure that your suction equipment of your milling 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.

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

### General notes on handling

IPS e.max ZirCAD discs and blocks are delivered in their pre-sintered state. In this state, the material is easy to process, but does not yet have the known qualities, which it has as a finished restoration. Therefore, carefully 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 discs and blocks, 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. Tap water, 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 zirconium oxide discs or blocks from the packaging. They contain important information regarding processing, which are conducive to your safety and that of your patients. If not all the points in these Instructions for Use are observed, IPS e.max ZirCAD discs and blocks must not be used for the fabrication of dental restorations.

## IPS e.max® ZirCAD Colouring Liquids

### Indications

IPS e.max ZirCAD Colouring Liquids are ready-to-use, aqueous metallic salt solutions to colour unsintered restorations made of IPS e.max ZirCAD MTBL and LT in the brush infiltration technique.

### Contraindications / usage restrictions

Any other use not listed in the indications.

### General notes on handling

#### **Please verify the delivery immediately upon receipt with regard to:**

- Integrity of the packaging
- Integrity of the product (clear liquid without cloudiness or sedimentation)
- 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 Colouring Liquids are best stored ...**

- in the original packaging.
- at temperature between 2°C and 28°C (36 and 83 °F)
- protected from direct sunlight

#### **When handling IPS e.max ZirCAD Colouring Liquids, the following points should be observed:**

- The restoration must be free of dust and grinding residue.
- The Colouring Liquids must only come into contact with liquids that have been approved for the product. Tap water or liquids from other manufacturers, for example, are not suitable.
- The Colouring Liquids must not be contaminated.
- If there is cloudiness, the Colouring Liquids should no longer be used. Contamination promotes cloudiness (precipitation) or sedimentation of the Colouring Liquids.
- Do not decant and/or store the Colouring Liquids in metal containers. In general, contact with metal must be prevented.
- IPS e.max ZirCAD Colouring Liquids are applied with a clean, metal-free brush to the restoration.

### Warnings

The usual increased care and hygiene required when handling chemicals must also be applied when handling the Colouring Liquids.

Prevent direct skin contact, particularly in case of an allergy to one of the ingredients.

After accidental skin contact, rinse with plenty of water. After eye contact, immediately rinse with plenty of water whilst holding the eyelid open and consult a physician.

We recommend wearing gloves, protective goggles and suitable protective clothing.

IPS e.max ZirCAD Colouring Liquids may cause stains on clothing and other surfaces.

## IPS e.max® ZirCAD Colouring Liquid Indicator

IPS e.max ZirCAD Colouring Liquid Indicator are colour batches in red, blue and yellow to dye the IPS e.max ZirCAD Colouring Liquids.

IPS e.max ZirCAD Colouring Liquids dyed with IPS e.max ZirCAD Colouring Liquid Indicator are used to verify the shading of zirconium oxide restorations in the brush infiltration technique before sintering. This makes it easier to achieve reproducible shade results.

### Indications

IPS e.max ZirCAD Colouring Liquid Indicators are used for the temporary shading of IPS e.max ZirCAD Colouring Liquids.

### Contraindications / usage restrictions

IPS e.max ZirCAD Colouring Liquid Indicators mixed with IPS e.max ZirCAD Colouring Liquids are not permanently colour stable. Therefore, IPS e.max ZirCAD Colouring Liquid Indicators should only be added immediately before application with the Colouring Liquids. They must not be used undiluted.

### Warnings

The usual increased care and hygiene required when handling chemicals must also be applied when handling the Colouring Liquids.

Prevent direct skin contact, particularly in case of an allergy to one of the ingredients.

After accidental skin contact, rinse with plenty of water. After eye contact, immediately rinse with plenty of water whilst holding the eyelid open and consult a physician.

We recommend wearing gloves, protective goggles and suitable protective clothing.

IPS e.max ZirCAD Colouring Liquids may cause stains on clothing and other surfaces.

## IPS e.max® ZirCAD Colouring Liquid Diluter

The IPS e.max ZirCAD Colouring Liquid Diluter is a liquid to dilute the IPS e.max ZirCAD MT/LT Colouring Liquids. This allows the creation of colouring liquids with a lower shading power which results in lighter hues.



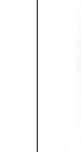


### Indications

- IPS e.max ZirCAD MT Colouring Liquids
- IPS e.max ZirCAD LT Colouring Liquids

### Contraindications / usage restrictions

Any other use not listed in the indications.

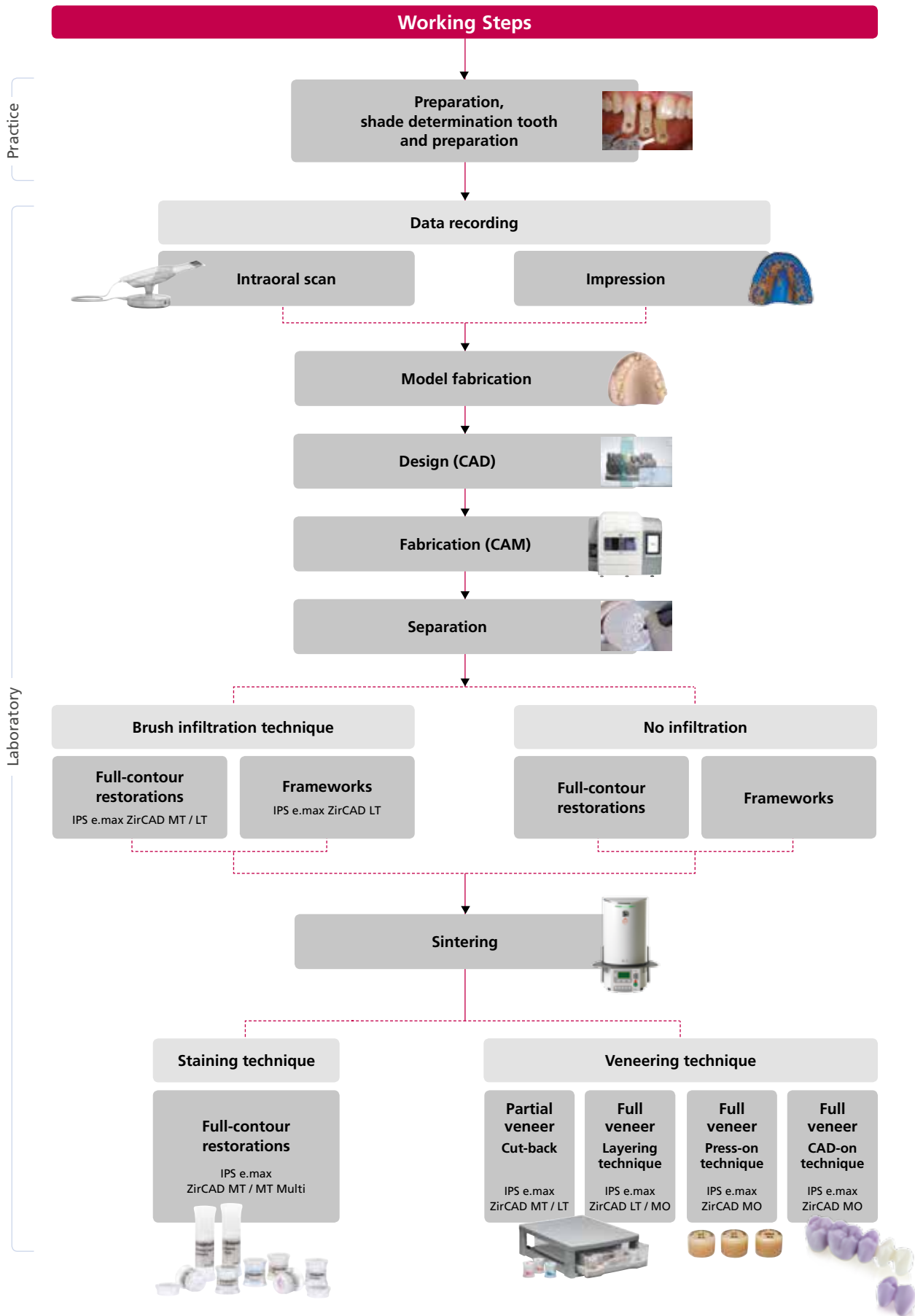
## Material concept

Translucency level	Processing technique				
	Staining technique	Cut-back technique	Layering technique	Press-on technique	CAD-on technique
					
<b>MT Multi</b> Medium Translucency with shade gradation	✓				
<b>MT</b> Medium Translucency	✓	✓			
<b>LT</b> Low Translucency	✓	✓	✓	✓	
<b>MO</b> Medium Opacity			✓	✓	✓

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



# Overview of the Clinical Working Steps, Fabrication Process



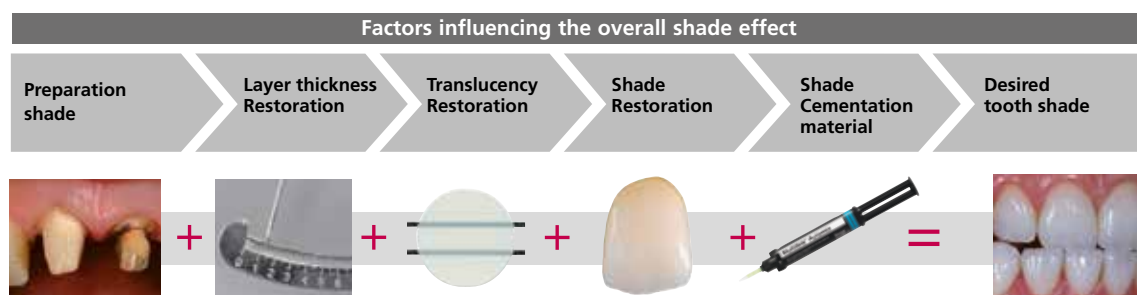
# Shade determination – tooth shade, preparation shade

## 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 discs and 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 disc/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

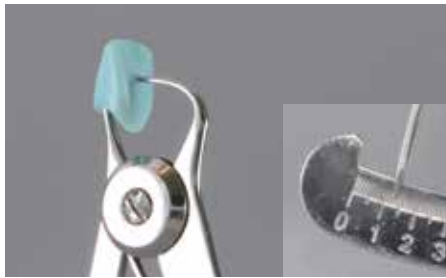
## Enter the layer thickness

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

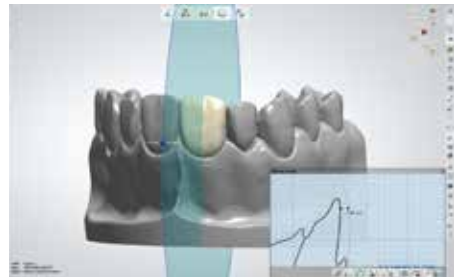


### Tips on determining the layer thickness:

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 recognize any necessary shade adjustments well in advance.



More detailed information on the function and the procedure can be found under [www.ipsemax.com/sna](http://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 restoration. Successful results can only be achieved with IPS e.max ZirCAD if the guidelines and minimum layer thicknesses are strictly observed.

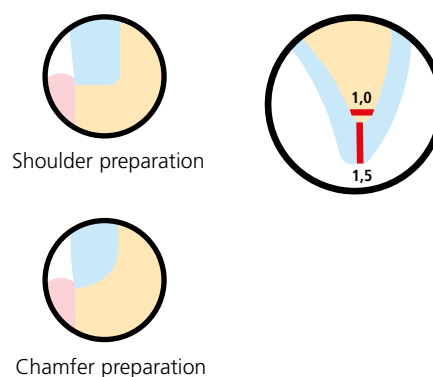
### Basic preparation guidelines for all-ceramic restorations

- Do not prepare any angles and edges
- The ideal preparation is a shoulder preparation with rounded inner edges or a chamfer preparation.
- Anatomical tooth preparation with rounded edges
- The indicated dimensions reflect the minimum thickness for IPS e.max ZirCAD restoration.
- The radius of the edges of the prepared tooth, particularly in anterior teeth, must be at least as large as the radius of the smallest grinding instrument to ensure optimum grinding by the CAD/CAM unit.

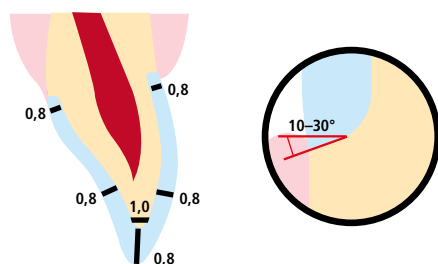


### General preparation rules

- The anatomical shape of the tooth has to be evenly reduced according to the stipulated minimum wall thickness of the material used.
- For veneered restorations, the tooth structure must be reduced by another 1-2 mm in addition to the minimum wall thickness of the framework material used, depending on the intended veneering technique.
- The ideal preparation is a shoulder preparation with rounded inner edges or a chamfer preparation with a shoulder and/or chamfer width of 1 mm.
- For conventional and/or self-adhesive cementation, the preparation must demonstrate a retentive shape and sufficient preparation height.
- Preparation angles: 4 – 8° for conventional and semi-adhesive cementation, >6° for adhesive cementation

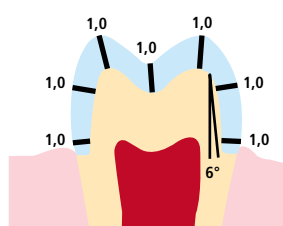


### Preparation guidelines for restorations made of IPS e.max ZirCAD MT / MT Multi



#### Monolithic anterior crowns

- Incisal and/or occlusal reduction of the tooth structure by at least 0.8 mm
- Reduction in the labial or lingual area and in the cervical area by at least 0.8 mm

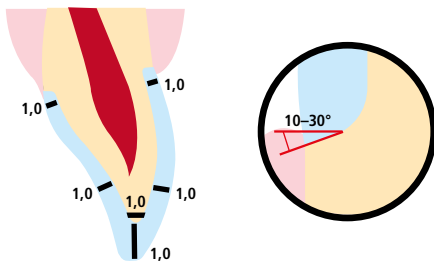


#### Monolithic posterior crowns

- Occlusal reduction of the tooth structure by at least 1.0 mm
- Reduction in the vestibular or lingual area and in the cervical area by at least 1.0 mm

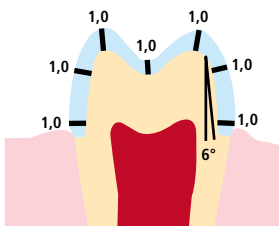


**When veneering IPS e.max ZirCAD MT crowns using the cut-back technique, the tooth structure has to be reduced by another 1.0 mm in the area of the intended veneer.**

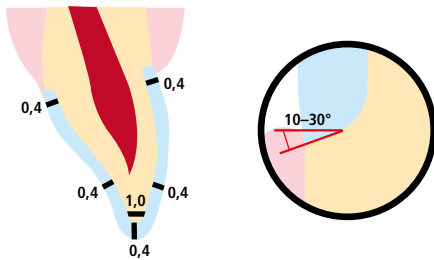


### Monolithic crowns as bridge abutments in the anterior and posterior region

- Incisal and/or occlusal reduction of the tooth structure by at least 1.0 mm
- Reduction in the vestibular or lingual area and in the cervical area by at least 1.0 mm

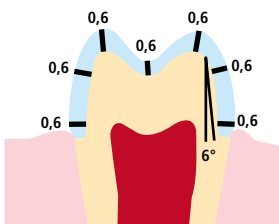


### Preparation guidelines for monolithic restorations made of IPS e.max ZirCAD LT



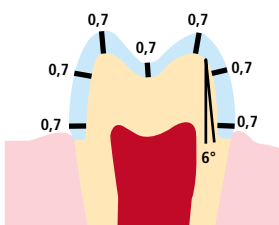
### Monolithic anterior crowns

- Incisal and/or occlusal reduction of the tooth structure by at least 0.4 mm
- Reduction in the labial or lingual area and in the cervical area by at least 0.4 mm



### Monolithic posterior crowns

- Incisal and/or occlusal reduction of the tooth structure by at least 0.6 mm
- Reduction in the vestibular and/or lingual area and in the cervical area by at least 0.6 mm



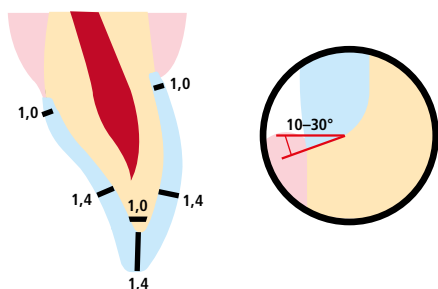
### Monolithic bridge abutments in the anterior and posterior region

- Incisal and/or occlusal reduction of the tooth structure by at least 0.7 mm
- Reduction in the vestibular and/or lingual area and in the cervical area by at least 0.7 mm



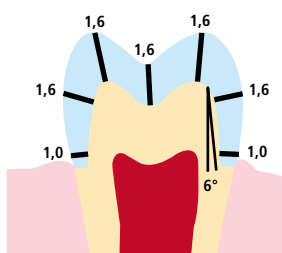
When veneering IPS e.max ZirCAD LT crowns using the cut-back technique, the tooth structure has to be reduced by another 1.0 mm in the area of the intended veneer.

### Preparation guidelines for veneer frameworks made of IPS e.max ZirCAD LT and IPS e.max ZirCAD MO



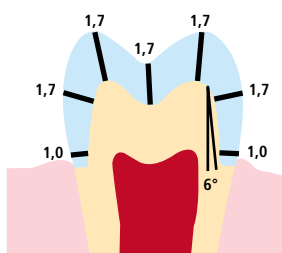
#### Anterior crown frameworks / cut-back crowns

- Incisal and/or occlusal reduction of the tooth structure by at least 1.4 mm
- Reduction in the labial and/or lingual area by at least 1.4 mm
- Reduction in the cervical area by at least 1 mm



#### Bridge abutment frameworks for 3-unit bridges and 4- and multi-unit bridges in the anterior region

- Incisal and/or occlusal reduction of the tooth structure by at least 1.6 mm
- Reduction in the vestibular and/or lingual area by at least 1.6 mm
- Reduction in the cervical area by at least 1 mm



#### Bridge abutment frameworks for 4- and multi-unit bridges in the posterior region

- Occlusal reduction of the tooth structure by at least 1.7 mm
- Reduction in the vestibular and/or lingual area by at least 1.7 mm
- Reduction in the cervical area by at least 1 mm

### Model and tooth preparation

If a model with detachable segments is fabricated as the working base, the recommendations of the CAD/CAM system manufacturer have to be observed regarding the use of the stone.



#### Important for die preparation:

- Check the radius of the incisal/occlusal edge on the prepared dies.
- The radius of the edges of the prepared die, particularly with incisal edges, must be at least as large as the radius of the smallest grinding instrument to ensure optimum grinding by the CAD/CAM unit.
- If the incisal edge of the prepared die is thinner than the diameter of the cutter, the incisal edge has to be blocked out accordingly.
- Also observe the information provided by the manufacturer of the CAD/CAM system regarding the die geometry.

## Design criteria

High-quality materials as well as professional preparation and processing are the prerequisites for producing high-quality restorations, which fulfil the patient's requirements long-term. The design is an important key element of success for esthetic, durable and clinically successful all-ceramic restorations. Therefore, the following basic rules should be observed:

### Framework design

Strive for an anatomical shape when designing frameworks. The design should support the veneering ceramic in the area of the cusps so that they can be build-up with an even layer thickness of 1–2 mm. The Instructions for Use of the respective layering ceramic have to be observed.



### Minimum layer thicknesses and connector dimensions

To achieve clinical success, the following minimum wall thicknesses and connector dimensions should not be underscored when processing IPS e.max ZirCAD discs/blocks:

IPS e.max ZirCAD MT IPS e.max ZirCAD MT Multi	Anterior region		Posterior region		Design type
	Minimum layer thickness in mm	Connector dimensions in mm <sup>2</sup>	Minimum layer thickness in mm	Connector dimensions in mm <sup>2</sup>	
Crowns	0.8	–	1.0	–	supports the tooth shape and the gingiva shape (incisal, occlusal and/or basal)
3-unit bridges	1.0	12*	1.0	16	

\* Height: 4 mm, Width: 3 mm

IPS e.max ZirCAD LT IPS e.max ZirCAD MO	Anterior region		Posterior region		Design type
	Minimum layer thickness in mm	Connector dimensions in mm <sup>2</sup>	Minimum layer thickness in mm	Connector dimensions in mm <sup>2</sup>	
Crowns	0.4	–	0.6	–	supports the tooth shape and the gingiva shape (incisal, occlusal and/or basal)
3-unit bridges	0.6	7	0.6	9	
4- to multi-unit bridges with 2 pontics *	0.6	9	0.7	12	
Cantilever bridges with one pontic	0.7	12	0.7	12	

\* In Canada, bridge indications are limited to 6 units with a maximum of 2 connected pontics.

### Framework design parameters for IPS e.max CAD Veneering Solutions (CAD-on technique)

IPS e.max ZirCAD MO	Minimum layer thickness in mm	Connector dimensions in mm <sup>2</sup>
Crowns	0.5	–
3-unit bridges	0.5	9
4- to multi-unit bridges	0.5	12



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

#### Connector dimensions

- 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. Therefore, IPS e.max ZirCAD MT/ MT Multi must not be used for bridge constructions with more than one pontic, while bridge constructions made of IPS e.max ZirCAD LT/MO must not have more than two pontics.



## CAD/CAM process



IPS e.max ZirCAD must be processed with an authorized CAD/CAM system.  
Additional information is available on the Internet from [www.ivoclarvivadent.com](http://www.ivoclarvivadent.com).

### **Positioning of IPS e.max ZirCAD MT Multi restorations within the disc (CAM 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 within the disc in the CAM software. As a reference: the restoration should be placed approximately 1 mm below the upper edge of the disc in the CAM software.

### **Positioning of the IPS e.max ZirCAD MT Multi disc in the milling machine**

The discs have to be positioned in the milling machine in such a way that the imprinted side is oriented towards the incisal/occlusal area of the restoration. The imprinted side thus corresponds with the incisal/occlusal area.

### **Positioning of 12 mm discs in the milling machine**

Discs with a thickness of 12 mm only feature one circumferential notch. They have to be positioned in the milling machine in such a way that the circumferential notch is pointing upwards.

### **Using sintering support structures**

For bridge constructions made of IPS e.max ZirCAD LT/MO with more than five units, a sintering support structure must be designed at the object to be milled already at the CAM processing stage. Sintering support structures are divided into sintering drops, sintering frames and sintering tongues. The type of design for the sintering support structures depends on the sinter furnace used, the sintering base and the selected sintering program. If no adequate sintering support structure is attached to multi-unit bridges, there is a risk of distortion during the final sintering process and thus the risk that the completed restoration will not fit precisely.

# Practical Procedure

## Processing Techniques

### General Processing

#### Working steps after milling

The correct choice of grinding instruments is imperative for finishing the restorations. This is true for both sintered and non-sintered objects. The use of unsuitable milling and grinding instruments may lead to local overheating of the material or to damage.

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

- Non-sintered zirconium oxide restorations are susceptible to damage and fractures. This fact has to be kept in mind during the entire working procedure.
- Any post-processing should be carried out in the non-sintered state.
- In the non-sintered state, any contact with unsuitable liquids and liquids not approved for zirconium oxide (e.g. unpurified water and/or lubricant coolant) and/or contact media (e.g. occlusion spray) must be prevented.
- Use only light pressure for finishing.
- Do not, under any circumstances, post-separate bridge constructions with a separating disc. This may lead to predetermined breaking points in the area of the connectors and reduce the strength of the all-ceramic restoration.
- Make sure that the minimum wall thicknesses of the restorations are maintained during finishing.



Wear protective gloves before separating the milled restorations. This is particularly recommended for restorations intended to be infiltrated with IPS e.max ZirCAD Colouring Liquids in a further processing step. Contaminated hands may leave a grease film or contaminations on the restorations, which may lead to an undesired shade result.

Fine tungsten carbide burs or diamond grinding instruments are recommended for separating the restorations. The holding bars have to be notched on one side before the restoration is completely separated.



Separating the restoration whilst wearing protective gloves

Smooth out the attachment points of the holding bars with suitable grinding instruments.

Rough tungsten carbide burs and/or grinding instruments are not suitable, as they may cause vibrations during finishing, which may result in chipping, among other things. Therefore, fine tungsten carbide burs and/or diamond grinding instruments are to be used. Do not use rubber polishers, as they condense the surface and lead to contaminations.



Smoothing out the holding bar attachment points

- Clean the restoration thoroughly after finishing. To remove zirconium oxide dust, carefully clean it with a soft brush and then blast with oil-free compressed air.
- Adhering zirconium oxide dust may be sintered to the restoration and lead to fitting inaccuracies.
- The non-sintered restoration must not be cleaned in an ultrasonic bath or with the steam jet.
- The non-sintered restoration must not be blasted.

## Brush infiltration of full-contour restorations

IPS e.max ZirCAD MT Colouring Liquids are available for the infiltration of full-contour IPS e.max ZirCAD MT restorations and IPS e.max ZirCAD LT Colouring Liquids for IPS e.max ZirCAD LT restorations.

Allocation of zirconium oxide and colouring liquids:

Zirconium oxide	Disc shades for infiltration	Colouring liquid, shades
IPS e.max ZirCAD MT	BL	IPS e.max ZirCAD MT Colouring Liquid, 16 A-D and 5 Effect shades 
IPS e.max ZirCAD LT	See table (Pages 52-53)	IPS e.max ZirCAD LT Colouring Liquid, 16 A-D and 5 Effect shades 

To visualize the colouring liquids, the indicator liquid IPS e.max ZirCAD Colouring Liquid Indicator is available.



### General notes on brush infiltration

- The restoration must be free of dust and grinding residue.
- Restorations fabricated by means of wet processing have to be completely dried before infiltration.
- The colouring liquids must not be contaminated.
- The colouring liquids have to be sealed when not in use.
- If there is cloudiness or precipitation (e.g. sediments), the colouring liquids should no longer be used. Cloudiness or precipitation of the colouring liquids is promoted by contamination.
- Do not decant and/or store the colouring liquids in metal containers.
- Apply IPS e.max ZirCAD Colouring Liquids with a clean, metal-free brush on the restoration.
- Do not use IPS e.max ZirCAD Colouring Liquid Indicator in an unmixed state.
- IPS e.max ZirCAD Colouring Liquid Indicator colour is not stable for longer periods of time.
- Store mixed solutions in a sealed container and use them within 4 hours. After longer storage, the reproducibility of the tooth shade in the sintered state is no longer ensured.
- Infiltrated restorations must be completely dried before sintering.



### Mixing of IPS e.max ZirCAD Colouring Liquids and IPS e.max ZirCAD Colouring Liquid Indicator

In order to visualize the colouring liquids during the application on the restoration, the colouring liquids are dyed with the IPS e.max ZirCAD Colouring Liquid Indicator (red, blue, yellow). For the dyeing of IPS e.max ZirCAD Colouring Liquids, it is recommended to follow the shade concept of the veneering ceramics. The red indicator liquid is recommended for the infiltration of the dentin area, the blue one for the incisal area. The IPS e.max ZirCAD Colouring Liquid Indicator yellow can be used for individual characterizations. Individual colours can be achieved by mixing the indicator colours. For example, blue and yellow result in a deep green.

The IPS e.max ZirCAD Colouring Liquid Jars are suitable for mixing the colouring liquids.



IPS e.max ZirCAD Colouring Liquid Indicator



- It is advisable to wear protective gloves during the infiltration process. They help prevent skin irritation caused by the colouring liquids and the formation of a grease film on the restoration, which may compromise the infiltration of the colouring liquids.
- **The IPS e.max ZirCAD MT Colouring Liquids and IPS e.max ZirCAD LT Colouring Liquids must not be mixed or combined. They may only be used on the intended zirconium oxide.**
- A higher concentration of IPS e.max ZirCAD Colouring Liquid Indicator dilutes the IPS e.max ZirCAD Colouring Liquids further and reduces their shading effect.

### Please observe the following notes for brush infiltration:

- For the shading of the restorations according to A-D shades, there are shade allocation tables (on Pages 50, 52 and 53).
- The area designations used, e.g. inside, occlusal etc., are schematically represented in the following images.
- Three different brushes (IPS e.max ZirCAD Colouring Liquid Brush) are available for the liquid infiltration. They come in sizes 1, 3 and 5.



IPS e.max ZirCAD Colouring Liquid Brushes in sizes 1, 3 and 5 (from left to right)

The mixing ratio of the IPS e.max ZirCAD Colouring Liquid and IPS e.max ZirCAD Colouring Liquid Indicator is as follows:



#### Mixing ratio:

25 drops of IPS e.max ZirCAD Colouring Liquid with 1 drop of IPS e.max ZirCAD Colouring Liquid Indicator



IPS e.max ZirCAD Colouring Liquid



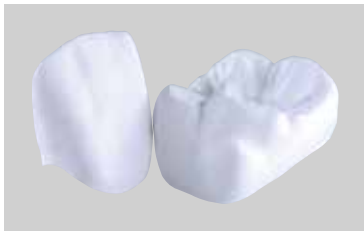
IPS e.max ZirCAD Colouring Liquid Indicator

- Brush infiltration is suitable for the individual shading of restorations made of IPS e.max ZirCAD MT and IPS e.max ZirCAD LT using the corresponding colouring liquids.
- The infiltration of full-contour restorations made of IPS e.max ZirCAD MT is only possible with MT BL.
- The infiltration of IPS e.max ZirCAD LT can be used for frameworks and full-contour restorations. For optimum shade match with the A-D shade guide, the infiltration of IPS e.max ZirCAD LT 0 and LT BL is recommended.
- To enhance the efficiency, optional infiltration of preshaded IPS e.max ZirCAD LT 1 and LT 2 is possible.



Restorations made of IPS e.max ZirCAD MT and LT cannot be shaded by means of dip-infiltration, as the colouring liquids were designed for brush infiltration. This is the case for both monolithic restorations and frameworks.

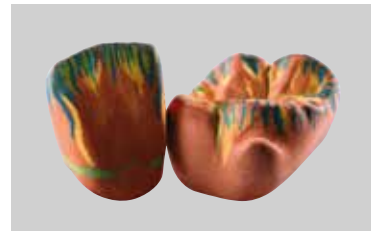
- A distinction is made between basic and advanced brush infiltration.
- BASIC brush infiltration is used for the shading of the restorations in A-D shades according to the shade guide. The IPS e.max ZirCAD Colouring Liquids in A-D shades are used for this purpose.
- ADVANCED brush infiltration is individualized shading. IPS e.max ZirCAD Colouring Liquids in shades blue, violet, grey, orange and brown are used in addition to the BASIC application.



Milled and finished crowns



Crowns infiltrated according to the Basic diagram.



Crowns infiltrated according to the Advanced diagram.

The following infiltration diagram applies to both the IPS e.max ZirCAD MT Colouring Liquids and the IPS e.max ZirCAD LT Colouring Liquids.

## BASIC liquid infiltration (A-D shades)

### BASIC infiltration

1. Infiltrate the colouring liquid (A-D shades) once (1x) with an even liquid quantity over the entire restoration using brush No. 5 . If a lighter incisal area is desired, infiltration may begin approximately 1 mm below the incisal edge. Posterior teeth are infiltrated in the same way as anterior teeth.

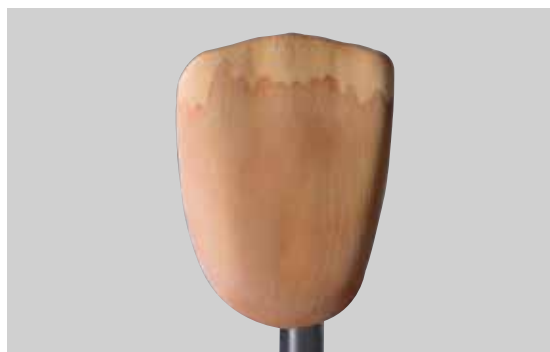


Even infiltration over the labial surface



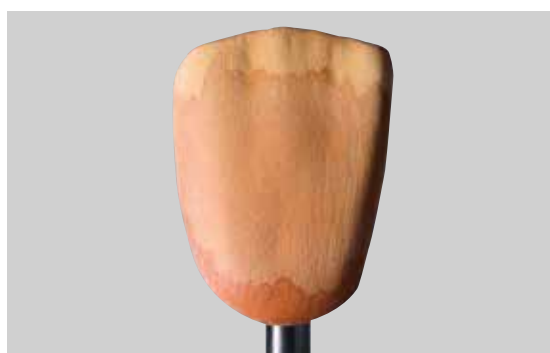
Crown after the first infiltration step

2. Apply the colouring liquid with an even liquid quantity once (1x) on the dentin and cervical area using brush No. 5. In the incisal area of the anterior teeth, mamelons may be indicated by irregular gradation. The incisal edge and the cusp tips are not shaded in the second infiltration step.



Crown after the second infiltration step

3. Infiltrate the colouring liquid once (1x) with an even liquid quantity in the cervical area of the restoration using brush No. 5.

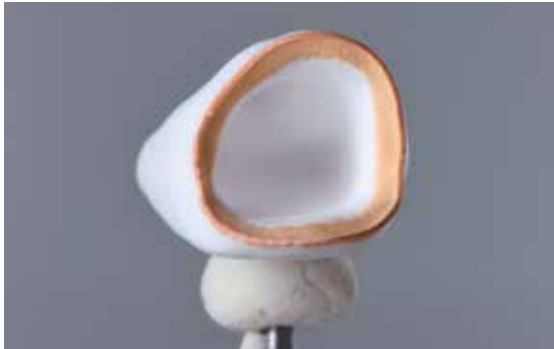


Crown after the third infiltration step



For lighter tooth shades, waiving the third infiltration step is recommended, as the restorations may turn out to be too intensively shaded.

4. Finally, the inner surfaces of the crowns are infiltrated with a liquid application using brush No. 5. The inner incisal edges and the occlusal areas of the restorations are not shaded.



Infiltration in the cervical area



Infiltration of the inner dentin area

### ADVANCED liquid infiltration

ADVANCED liquid infiltration is used for the individual characterization of monolithic crowns in the infiltration technique. This infiltration technique can be applied after BASIC infiltration. IPS e.max ZirCAD Colouring Liquids in shades blue, violet, grey, orange and brown are available for this purpose.

Blue, violet and grey are mainly used for the individualization of the incisal or occlusal areas. Orange and brown can be used for the characterization of fissures, cervical and interdental areas. Orange can also be applied to outline mamelon structures in anterior teeth.



Before ADVANCED infiltration, the restorations must be predried for 10 minutes at 70°C/158°F.



- ADVANCED infiltration is performed after BASIC infiltration
- The Effect shades must be applied very subtly.

A trial firing is recommended before the first application of the Effect shades. Sample crowns or specifically fabricated shade tabs made of zirconium oxide are suitable for this purpose.



Shade tabs infiltrated with brown, orange, violet, grey and blue (from left to right).

The IPS e.max ZirCAD Colouring Liquids can be diluted with the IPS e.max ZirCAD Colouring Liquid Diluter to diminish their shade effect. This is particularly recommended for the Effect shades.



Left: violet applied undiluted; right: violet applied diluted

For ADVANCED infiltration, the IPS e.max ZirCAD Colouring Liquid Brushes in sizes 1 and 3 are recommended.

1. Incisal effects may be achieved by the one-time application of shades blue, violet or grey using brush No. 1.



Application of violet or grey in the incisal area

2. Additional shade effects may be achieved by applying other Effect shades. It is recommended to dye them with different IPS e.max ZirCAD Colouring Liquid Indicator colours.



Additional shade effects with blue, grey and orange in the incisal area, as well as in the dentin and cervical area.

The individual infiltration of posterior restorations is performed in the same way as anterior restorations.



Individually infiltrated molar crown according to the ADVANCED infiltration diagram



If ADVANCED infiltration is too intensive, the shade effect of the BASIC infiltration may be diminished.

### Liquid infiltration of IPS e.max ZirCAD LT frameworks

Frameworks are infiltrated using the BASIC infiltration technique. As an option, the frameworks can be individualized using the ADVANCED infiltration technique.



Infiltration of a framework



Sintered IPS e.max ZirCAD LT framework

### Notes on cleaning the IPS e.max ZirCAD Colouring Liquid Brushes

- After every infiltration or before every shade change, the infiltration brushes should be cleaned to prevent the shade result from being affected by shade residue of the previous infiltration.
- Clean the brushes under running water or in a glass of water. Subsequently, blot the brushes with an absorbent cloth.



Cleaning and blotting the brushes



### Drying of the infiltrated restorations

IPS e.max ZirCAD restorations infiltrated with IPS e.max ZirCAD Colouring Liquids have to be dried before sintering. Either a infrared lamp or a drying cabinet can be used for drying. The drying time depends on the temperature and the size of the object. Low temperatures and large objects delay the drying process. Drying at temperatures above 140°C/284 °F may results in defects. The following table contains the recommended drying times.



Drying of the infiltrated restorations under an infrared lamp

	Temperature 70°C/158°F	Temperature up to 140°C/284°F
Single tooth restorations	≥ 15 min	5 – 10 min
2–4-unit restorations	≥ 40 min	≥ 25 min
Bridges with 5 or more units	≥ 50 min	≥ 25 min

## Sintering

Sintering is one of the most important processes during the fabrication of IPS e.max ZirCAD 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 translucency. 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 programs of the Programat S1/S1 1600 sinter furnace from Ivoclar Vivadent are ideally coordinated with the optical and mechanical properties of IPS e.max ZirCAD restorations and lead to the best possible results.



Notes to be observed for sintering:







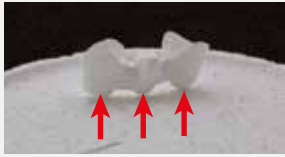

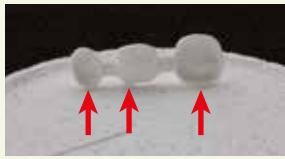
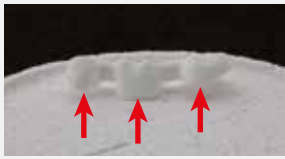

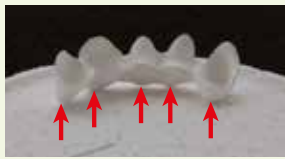
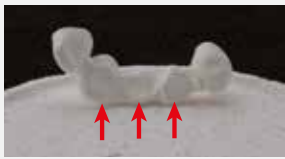







- Restorations infiltrated with colouring liquid must be completely dry to prevent damage to the furnace and/or the object.
- In principle, sintering beads are not recommended for the Programat S1/S1 1600 sinter furnace from Ivoclar Vivadent.
- The restorations must not come into contact with each other during sintering.
- The correct program selection must be observed.
- Always keep the sintering accessories clean and free of dust so that no contamination of the sintered restorations occurs.
- **Make sure that the appropriate sintering support structure is selected for the respective furnace system.**

### Sintering in the Programat S1/S1 1600 sinter furnace

The following points must be observed for sintering in the Programat S1/S1 1600:

- The sinter tray can be fully loaded with restorations
- Simultaneous sintering of crown and bridge frameworks as well as restorations with a sintering support structure is possible.
- For sintering without distortions, the restorations must be evenly supported.
- Bridge constructions should not be exclusively supported by the final abutment crowns. Preferably provide support to the pontics. The abutment crowns do not necessarily have to come into contact with the sinter tray.
- Ideally, bridge constructions should be positioned in concentric circles on the sinter tray. **Note:** Do not place any restorations over the groove in the sinter tray!
- Place the loaded sinter tray in the intended position in the centre of the Programat S1/S1 1600 using the sinter fork.



	✓ correct	o.k.	✗ incorrect
<b>Single-tooth anterior restorations</b>	 <p>Place the restorations on their labial surface.</p>	 <p>Place the restorations on their oral surface.</p>	 <p>Do <b>not</b> place the restorations on the crown margins.</p>
<b>Single-tooth posterior restorations</b>	 <p>Place the restorations on their occlusal surface.</p>		 <p>Do <b>not</b> place the restorations on the crown margins.</p>
<b>Three-unit anterior restorations</b>	 <p>Place the restorations on their labial surface and provide support to the pontic. If the restoration "tilts", select an alternative position.</p>	 <p>Positioning on the incisal edges. The pontic must also rest on the sinter tray.</p>	 <p>Do <b>not</b> support the restorations exclusively at the marginal edges.</p>
<b>Three-unit posterior restorations</b>	 <p>Place the restorations on the buccal or oral surfaces depending on the curvature. Abutment crowns do not have to come into contact with the sinter tray. The pontic must be supported.</p>	 <p>Do <b>not</b> support the restorations exclusively at the crown margins. The pontic must be supported on the basal side.</p>	 <p>If the pontic does not support the restoration, the restoration must <b>not</b> be positioned on the occlusal surface.</p>
<b>Anterior restorations with 4 units and more</b>	 <p>Place the restorations on their incisal surfaces. Make sure the pontics are supported.</p>	 <p>Depending on the curvature, the framework can be placed on its labial surfaces. All the pontics must come into contact with the sinter tray. Abutment crowns do not have to come into contact with the sinter tray.</p>	 <p>Do not support the restorations exclusively at the marginal edges on the sinter tray.</p>
<b>Posterior restorations with 4 units and more</b>	 <p>Depending on the curvature, the framework can be placed on its buccal surfaces. All the pontics must come into contact with the sinter tray. Abutment crowns do not have to be supported on the sinter tray.</p>	 <p>Do not support the restorations exclusively at the crown margins. The pontics must be supported on the basal side.</p>	 <p>If the pontics do not support the restoration, the restoration must not be positioned on the occlusal surface.</p>
<b>Restoration with sintering support structure</b>	 <p>Place the restoration upright on the sinter tray with the sintering support structures resting on the tray.</p>	 <p>The restoration can also be placed on the sintering support structure and/or the incisal or occlusal surfaces of the pontics. Align the sintering support structure with the centre of the sinter tray.</p>	 <p>Do not support the restoration at the crown margins.</p>

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



## Processing after sintering

After sintering, the restorations can be finished using suitable instruments. If diamond grinding instruments are used for finishing the restoration, water cooling is required to prevent local overheating. Observe the recommendations for grinding instruments suitable for zirconium oxide from Ivoclar Vivadent.



**Please observe the Ivoclar Vivadent Flow Chart "Recommended grinding tools for IPS e.max zirconium oxide".**

The following recommendations apply for the further processing of densely sintered, cooled restorations.

- Finishing of sintered IPS e.max ZirCAD restorations should be kept to a minimum.
- The restoration should only be mechanically processed if it is absolutely necessary.
- Place IPS e.max ZirCAD restorations on the model, check fit and make slight adjustments, if necessary.
- Check marginal areas and finish, if necessary.
- Use only light pressure and low speed to adjust the restoration.
- Prevent sharp edges when finishing frameworks.
- Bridge connectors must not be post-separated with a separating disc.
- The material-specific minimum wall thicknesses and connector dimensions must not be underscored during processing.
- Use only immaculate grinding instruments.
- Check the restoration for defects and cracks before and after finishing.
- Remove zirconium oxide dust sintered to the restoration with suitable grinding instruments. As an alternative, zirconium oxide dust sintered to the restoration may be removed by blasting with a jet medium with a grain size of 50–110 µm at a maximum pressure of 1.5 bar.
- Clean frameworks under running water or with the steam jet and dry before veneering.

Polishing the occlusal surfaces of monolithic restorations is very important. Good polishing protects the antagonist from undesired abrasion. Make sure that the occlusal surfaces are carefully polished after functional adjustment by grinding. Commercially available polishers and polishing agents for oxide ceramics are recommended for polishing. Polish contact surfaces to the antagonist to a high gloss and subsequently clean them with the steam jet.



Polishing of functional contact surfaces

## Staining technique

With the staining technique, restorations made of IPS e.max ZirCAD MT Multi, MT and LT may be individually characterized after sintering with very little effort by means of staining and glazing.

The correct combination of disc or block shade and the stains to achieve the desired tooth shade can be easily determined with the help of the corresponding shade allocation table. The combination tables for the IPS Ivocolor stains can be found on Pages 58 and 59.

As an option, labial or vestibular surfaces may be polished with rubber burs before glazing to achieve enhanced translucency and shade intensity.

### **Fabricate dies using IPS Natural Die Material before staining the restorations.**

The light-curing IPS Natural Die Material simulates the shade of the preparation. Fabricate a die according to the shade information supplied by the dentist (shade selection), which serves as the optimum basis for a true-to-nature shade reproduction of the given oral situation.



Die made of IPS Natural Die Material.



**Refer to the IPS Natural Die Material Short Instructions for information regarding die fabrication.**



### Stain and Characterization firing with IPS Ivocolor

Below, the steps for staining and characterization with IPS Ivocolor are explained. For further information, refer to the IPS Ivocolor Instructions for Use.

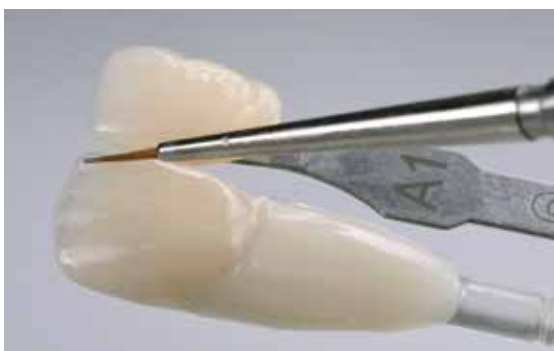


Before the Stain and Characterization firing, the restoration must be free of dirt and grease. Clean the objects with a steam cleaner to remove any contaminations and grease residue. Any contamination after cleaning must be prevented.



Wet the restoration surface with a little stains liquid to enhance the wettability.

Mix the pastes or powders with the IPS Ivocolor Mixing Liquid allround or longlife to the desired consistency.



To imitate the incisal area and translucency in the incisal or occlusal third, incisal stains (e.g. IPS Ivocolor Shade Incisal) can be used.



The cusps and fissures of posterior teeth may be individually characterized with IPS Ivocolor Essence stains, such as mahogany, hazel or sunset.



Conduct **the Stain and Characterization firing** using the stipulated **firing parameters (Page 59)** .



More intensive shades are achieved by repeated staining and firing, rather than by applying thicker layers. A more intensive application of stains results in inhomogeneous shading.

### Glaze firing

Glaze firing is conducted with a powder or paste glaze (IPS Ivocolor Glaze Powder/Paste FLUO). The fluorescent particles of these glazing materials result in a true-to-nature appearance of the final restoration. Observe the IPS Ivocolor Instructions for Use when using these glazing materials.

- Apply the glazing material in an evenly covering layer on the restoration.
- Too weak or missing proximal contacts may be applied with IPS Ivocolor Glaze.
- If the glazing material 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 (Page 59) using the firing accessories of the respective furnace.
- Once the firing cycle is completed, remove the restoration from the furnace and allow it to cool to room temperature still on the firing tray in a place protected from draft.
- Do not touch the restoration with metal tongs.



Glazing with IPS Ivocolor Glaze Paste FLUO







Conduct the **Glaze firing with IPS Ivocolor** using the stipulated **firing parameters (Page 59)**.



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

## Veneering technique

Veneering technique			
Partial veneer / cut-back	Full veneer		
Layering technique (IPS e.max ZirCAD MT/LT)	Layering technique (IPS e.max ZirCAD LT/MO)	Press-on technique (IPS e.max ZirCAD LT/MO)	CAD-on technique (IPS e.max ZirCAD MO)
			

## Veneering in the layering technique

The layered ceramic build-up using IPS e.max Ceram can be carried out on IPS e.max ZirCAD MT, IPS e.max ZirCAD LT and IPS e.max ZirCAD MO.

### Partial veneer and cut-back veneer

(IPS e.max ZirCAD LT and IPS e.max ZirCAD MT)

In the cut-back technique, mainly the incisal or occlusal areas of monolithic anterior and posterior teeth are reduced. The reduced shape is then built-up with veneering ceramics in the layering technique. With this technique, the esthetic appearance of the restorations can be improved with little effort in a few working steps.



Restoration with cut-back



Application of the veneering ceramic for the Wash firing. After that, the Wash firing is conducted.



Individual characterization of the Wash (optional) with an additional firing cycle.



Restoration with Wash firing



Veneering with IPS e.max Ceram layering materials



Completely layered restoration before the 1<sup>st</sup> Dentin firing



Completed restoration, stained and glazed.



Shade allocation tables for the combination of framework shade, veneering ceramic and the desired tooth shade can be found on Page 55.

### Full veneer in the layering technique

(IPS e.max ZirCAD MO and IPS e.max ZirCAD LT)

Restorations made of IPS e.max ZirCAD LT and IPS e.max ZirCAD MO are suitable for a full veneer in the layering technique. IPS e.max ZirCAD MO is very well suited for masking discoloured preparations or abutments. IPS e.max ZirCAD LT is predestined for the fabrication of restorations, for which combinations of full-contour, partially veneered and/or fully veneered restoration units are required. To ensure even thickness of the veneer, the zirconium oxide framework has to be given a cusp-supporting design.

Unshaded and preshaded material versions are available for the veneering of IPS e.max ZirCAD LT and MO.

Application and firing of the IPS e.max Ceram ZirLiner is recommended before veneering unshaded IPS e.max ZirCAD MO 0. It provides the framework with a tooth shade. IPS e.max ZirLine is available in four shades. Please refer to the IPS e.max Ceram Instructions for Use for further information.



An allocation table of the desired tooth shade and the IPS e.max Ceram veneering ceramic can be found on Page 55.



Framework structures with reduced anatomical shade (anterior tooth, posterior bridge)



Application of IPS e.max ZirLiner on the anterior framework (optional with MO 0). Subsequent ZirLiner firing.

There are two options for the application of the Wash:

**1. Wash applied in the sprinkle technique**



Wash applied in the sprinkle technique (optional). If space is limited or to enhance the in-depth chroma, the sprinkle technique can be applied. For that purpose, IPS Ivocolor Shade, Essence and Glaze are mixed with the respective IPS Ivocolor Liquids to the desired consistency and applied in a covering layer on the entire framework. This is carried out after the ZirLiner has been fired.



After that, the corresponding IPS e.max Ceram material (e.g. Dentin) is sprinkled on the restoration using a dry brush. Carefully remove excess with blown air or tap it off. After that, the Wash firing is conducted.



Wash surface after firing

## 2. Wash applied with an instrument



If there is an ideal amount of space available, conduct the Wash firing with the required IPS e.max Ceram Deep Dentin, Dentin, Transpa Incisal and/or Impulse material. Use the IPS Build-Up Liquids allround or soft to mix the materials. Apply the Wash in a thin, covering coat on the entire framework.



Wash surface after firing



Layering the restoration



Completely fired restoration



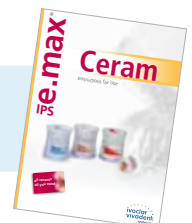
Completed restoration after Stain and Glaze firing.



The IPS e.max Ceram Power Dentin and Power Incisal materials are recommended for veneering IPS e.max ZirCAD LT restorations. They were developed specifically for the veneering of translucent zirconium oxide materials and enable sufficient brightness of the restoration to be achieved.



Please refer to the IPS e.max Ceram Instructions for Use for detailed information regarding the technique.





## Veneering in the press technique

### Press technique

(IPS e.max ZirCAD LT and IPS e.max ZirCAD MO)



Apply IPS e.max ZirLiner and fire



Modelling a full-contour wax-up



Spruing and investing the restoration



Pressing and subsequent divesting of the restoration



Finished and completed restoration.



Please refer to the IPS e.max ZirPress Instructions for Use for detailed information regarding the technique.

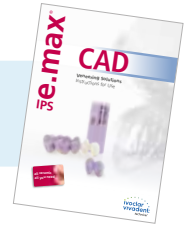
## Veneering in the CAD-on technique

### Veneering of IPS e.max ZirCAD MO

In the IPS e.max CAD-on technique, a zirconium oxide framework is fused with a milled IPS e.max CAD veneering structure and crystallized.



Please refer to the IPS e.max CAD Veneering Solution Instructions for Use for detailed information regarding the technique.



IPS e.max CAD Veneering Solution restoration in its non-crystallized state



IPS e.max CAD Veneering Solution restoration, crystallized and completed.

## Frequently Asked Question

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

*The translucent layer is on the imprinted side of the disc. The disc must be clamped into the milling machine with this side facing up.*

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

*The restoration has to be placed as high in the upper area of the disc as possible. Ideally, approximately one millimetre below the upper edge of the disc.*

**Can IPS e.max ZirCAD MT Multi restorations be infiltrated with IPS e.max ZirCAD Colouring Liquids?**

*Infiltration of IPS e.max ZirCAD MT Multi for individual characterization is possible. It has to be carried out with the IPS e.max ZirCAD MT Colouring Liquid.*

**Can IPS e.max ZirCAD MT Multi restorations be veneered?**

*Veneering with layering ceramics has not been approved for IPS e.max ZirCAD MT Multi.*

**Can IPS e.max ZirCAD MT restorations be infiltrated with IPS e.max ZirCAD LT Colouring Liquids?**

*The IPS e.max ZirCAD MT/LT Colouring Liquids can only be used on zirconium oxide of the same translucency level. If restorations are shaded with colouring liquid of the other translucency level, the desired tooth shade is not achieved. Colouring liquids with different translucency levels must not be mixed.*

**Can restorations of different translucency levels be sintered in one furnace program?**

*With program No. 3 of the Programat S1 1600, restorations of all translucency levels can be sintered together.*

**Can moist frameworks be sintered?**

*Restorations must be fully dried before they are sintered. The drying time depends on the temperature and the size of the restoration. For drying the objects, a temperature of 140°C / 284 °F must not be exceeded. If moist frameworks are sintered, there is a risk that tears and cracks are formed in the restoration.*

**Can IPS e.max ZirCAD restorations be sandblasted with Al<sub>2</sub>O<sub>3</sub> prior to veneering?**

*The restorations may only be blasted with Al<sub>2</sub>O<sub>3</sub> (50–110 µm) at max. 1.5 bar to remove milling dust sintered to the restoration.*

*Intensive blasting with high pressure may lead to surface damage and interfere with the bond between framework and layering ceramic. The surface must be cleaned to enable a good bond. Therefore, the restoration should be cleaned under running water or with the steam jet before veneering. After cleaning, the surface should not be contaminated with foreign substances (e.g. skin lipids, saliva).*

**Does the surface of monolithic restorations have to be polished before being inserted in the patient's mouth?**

*If occlusal contacts are adjusted by grinding in the patient's mouth, polishing is imperative. Failure to observe this instruction may cause damage to the antagonist.*

**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.*

## Cementation and Aftercare

### Cementation options

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

Depending on the indication, IPS e.max 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 bond is also created by static friction, but primarily by the chemical and/or micro-mechanical bond between the cementation material and the restoration, as well as between the cementation material and the preparation. Given the chemical and/or micromechanical bond, retentive preparation is not required.

Depending on the cementation material, specific adhesive systems are used on prepared teeth in order to achieve the micro-mechanical bond to dentin or enamel. Adhesive cementation results in enhanced "(overall) strength" of the seated all-ceramic restoration.

#### – 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 micromechanical 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.

### 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.

#### Conditioning of 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 the IPS e.max ZirCAD restoration with Al<sub>2</sub>O<sub>3</sub> at max. 1 bar pressure 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
- For adhesive cementation, condition the bonding surface using Monobond® Plus.

	IPS e.max ZirCAD MT Multi/MT/LT/MO	
<b>Indication</b>	Crowns and bridges with/without pressed-on shoulder	
<b>Cementation method</b>	adhesive	self-adhesive/conventional
<b>Blasting</b>	Cleaning with Al <sub>2</sub> O <sub>3</sub> at a maximum pressure of 1 bar (15psi).	
<b>Cleaning after try-in</b>	Ivoclean	
<b>Conditioning</b>	with Monobond® Plus for 60 s	–
<b>Cementation system</b>	Multilink® Automix	SpeedCEM®, Vivaglass® CEM PL

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

If adjustment by grinding in the oral cavity of the patient is necessary, the ground-in surfaces have to be smoothed and polished.



Please observe "Recommended grinding instruments for ceramics in the dental practice"!



More detailed information are part of the **Cementation Navigation System** ([www.cementation-navigation.com](http://www.cementation-navigation.com)).



### 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<sup>®</sup> 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 programs

### Sintering programs Programat S1 1600

Program	Name	Description	Duration	Programat® Dosto Tray
1	IPS e.max ZirCAD MT Multi crown/bridge	Program for the fast sintering of IPS e.max ZirCAD MT Multi	4h 25 min	
2	IPS e.max ZirCAD MT crown/bridge	Program for the fast sintering of IPS e.max ZirCAD MT	2h 30 min	
3	IPS e.max ZirCAD MT Multi/MT/LT Standard	Standard program for the sintering of IPS e.max ZirCAD MT Multi/MT/LT.	9 h 50 min	✓
4	IPS e.max ZirCAD LT crown	Program for the fast sintering of IPS e.max ZirCAD LT crowns	2 h 55 min	
5	IPS e.max ZirCAD LT bridge (up to 14 units)	Program for the fast sintering of IPS e.max ZirCAD LT bridges with up to 14 units	4 h 30 min	
6	IPS e.max ZirCAD MO crown	Program for the fast sintering of IPS e.max ZirCAD MO crown frameworks	75 min	
7	IPS e.max ZirCAD MO bridge (up to 4 units)	Program for the fast sintering of IPS e.max ZirCAD MO bridge frameworks with up to 4 units	90 min	
8	IPS e.max ZirCAD MO bridge (up to 14 units)	Program for the fast sintering of IPS e.max ZirCAD MO bridge frameworks with up to 14 units	2 h 45 min	
9	IPS e.max ZirCAD MO Standard	Standard program for the sintering of IPS e.max ZirCAD MO frameworks.	7 h 20 min	✓
10	Zenostar MT crown/bridge	Program for the fast sintering of Zenostar MT	2 h 30 min	
11	Zenostar MT/T Standard	Standard program for the sintering of Zenostar MT/T.	9 h 50 min	✓
12	Zenostar T crown	Program for the fast sintering of Zenostar T crowns	2 h 55 min	
13	Zenostar T bridge (up to 14 units)	Program for the fast sintering of Zenostar T bridges with up to 14 units.	4 h 30 min	
14	Zenostar MO crown	Program for the fast sintering of Zenostar MO crown frameworks	75 min	
15	Zenostar MO bridge (up to 4 units)	Program for the fast sintering of Zenostar MO bridge frameworks with up to 4 units.	90 min	
16	Zenostar MO bridge (up to 14 units)	Program for the fast sintering of Zenostar MO bridge frameworks with up to 14 units.	2 h 45 min	
17	Zenostar MO Standard	Standard program for the sintering of Zenostar MO frameworks	7 h 20 min	✓
18	Zenotec Zr Bridge crown	Program for the fast sintering of Zenotec Zr Bridge crown frameworks	75 min	
19	Zenotec Zr Bridge bridges (up to 4 units)	Program for the fast sintering of Zenotec Zr Bridge bridge frameworks with up to 4 units.	90 min	
20	Zenotec Zr Bridge bridges (up to 14 units)	Program for the fast sintering of Zenotec Zr Bridge bridge frameworks with up to 14 units.	2 h 45min	
21	Zenotec Zr Bridge Standard	Standard program for the sintering of Zenotec Zr Bridge frameworks	9 h 50 min	✓
22	Regeneration firing	Program for the regeneration of IPS e.max ZirCAD frameworks after excess working	60 min	
23 – 50	Individual programs			

### Sintering programs Zenotec® sinter furnaces

For the sintering process in the Zenotec® high-temperature furnaces, the following points should be observed:

- If a standard program is used, it is recommended to sinter the restorations on a sintering support base plate under a high-purity Al<sub>2</sub>O<sub>3</sub> cover. All standard sintering programs are matched to this equipment.
- Fast sintering programs may only be conducted with a special sintering support base plate without cover. The fast sintering programs are only approved for IPS e.max ZirCAD LT and MO single-tooth restorations.
- Check sintering equipment regularly to make sure that they are clean and work properly.

### Sintering programs for the Zenotec® Fire P1 sinter furnace

#### Standard programs for IPS e.max® ZirCAD MT Multi / MT/ LT / MO (1450°C/2642°F)

	Temperature 1 [°C]	Temperature 2 [°C]	Heating rate [°C/h]	Holding time [h]
Heating phase	20	900	600	–
Holding phase	900	900	–	0.5
Heating phase	900	1450	200	–
Holding phase	1450	1450	–	2
Cooling phase	1450	900	600	–
Cooling phase	900	300	500	–
– switch-off –				

#### Fast sintering program for IPS e.max® ZirCAD LT / MO (only for single-tooth restorations)

	Temperature 1 [°C]	Temperature 2 [°C]	Heating rate [°C/h]	Holding time [h]
Heating phase	20	1520	1500	–
Holding phase	1520	1520	–	0.5
Cooling phase	1520	300	800	–
– switch-off –				

### Sintering programs for the Zenotec® Fire Cube sinter furnace

#### Standard programs for IPS e.max® ZirCAD MT Multi / MT / LT / MO (1500°C/2732°F)

	Temperature 1 [°C]	Temperature 2 [°C]	Heating rate [°C/h]	Holding time [h]
Heating phase	20	900	600	–
Holding phase	900	900	–	0.5
Heating phase	900	1500	200	–
Holding phase	1500	1500	–	2
Cooling phase	1500	900	600	–
Cooling phase	900	300	500	–
– switch-off –				

#### Fast sintering program Zenotec® Fire Cube (only for single-tooth restorations)

	Temperature 1 [°C]	Temperature 2 [°C]	Heating rate [°C/h]	Holding time [h]
Heating phase	20	1550	1500	–
Holding phase	1550	1550	–	0.5
Cooling phase	1550	300	800	–
– switch-off –				



## Combination tables

IPS e.max® ZirCAD MT Multi – Staining technique (monolithic restorations)

Tooth shade	IPS e.max ZirCAD MT Multi	Staining technique with IPS Ivocolor	
BL1	MT Multi BL	Shade Dentin 0	Shade Incisal 1/2/3
BL2	MT Multi BL	Shade Dentin 0	
BL3	MT Multi BL	Shade Dentin 2	
BL4	MT Multi BL	Shade Dentin 2	
A1	MT Multi A1	Shade Dentin 1	
A2	MT Multi A2	Shade Dentin 2	
A3	MT Multi A3	Shade Dentin 2	
A3.5	MT Multi A3	Shade Dentin 2	
B1	MT Multi B1	Shade Dentin 4	
B2	MT Multi B2	Shade Dentin 4	
B3	MT Multi B2	Shade Dentin 5	
C1	MT Multi B1	Shade Dentin 6	
C2	MT Multi C2	Shade Dentin 6	
C3	MT Multi C2	Shade Dentin 6	
D2	MT Multi D2	Shade Dentin 7	
D3	MT Multi D2	Shade Dentin 7	

IPS e.max® ZirCAD MT BL – Infiltration technique and/or staining technique (monolithic restorations)

Tooth shade	IPS e.max ZirCAD MT	BASIC infiltration with IPS e.max ZirCAD MT Colouring Liquids	1x complete (leave incisal area somewhat uncovered for lighter shades)	1x dentin infiltration (inside and outside)	1x cervical*	ADVANCED infiltration with IPS e.max ZirCAD MT Colouring Liquids	Staining technique with IPS Ivocolor	
BL1	MT BL	–	–	–	–	–	Shade Dentin 0	Shade Incisal 1/2/3
BL2	MT BL	–	–	–	–	–	Shade Dentin 0	
BL3	MT BL	–	–	–	–	–	Shade Dentin 2	
BL4	MT BL	–	–	–	–	–	Shade Dentin 2	
A1	MT BL	A1	1x outside	1x inside 1x outside	1x outside	Individual infiltration with blue, violet, grey, orange, brown	Shade Dentin 1	
A2	MT BL	A2	1x outside	1x inside 1x outside	1x outside		Shade Dentin 2	
A3	MT BL	A3	1x outside	1x inside 1x outside	1x outside		Shade Dentin 2	
A3.5	MT BL	A3.5	1x outside	1x inside 1x outside	1x outside		Shade Dentin 2	
A4	MT BL	A4	1x outside	1x inside 1x outside	1x outside		Shade Dentin 3	
B1	MT BL	B1	1x outside	1x inside 1x outside	1x outside		Shade Dentin 4	
B2	MT BL	B2	1x outside	1x inside 1x outside	1x outside		Shade Dentin 4	
B3	MT BL	B3	1x outside	1x inside 1x outside	1x outside		Shade Dentin 5	
B4	MT BL	B4	1x outside	1x inside 1x outside	1x outside		Shade Dentin 5	
C1	MT BL	C1	1x outside	1x inside 1x outside	1x outside		Shade Dentin 6	
C2	MT BL	C2	1x outside	1x inside 1x outside	1x outside		Shade Dentin 6	
C3	MT BL	C3	1x outside	1x inside 1x outside	1x outside		Shade Dentin 6	
C4	MT BL	C4	1x outside	1x inside 1x outside	1x outside		Shade Dentin 6	
D2	MT BL	D2	1x outside	1x inside 1x outside	1x outside		Shade Dentin 7	
D3	MT BL	D3	1x outside	1x inside 1x outside	1x outside		Shade Dentin 7	
D4	MT BL	D4	1x outside	1x inside	1x outside		Shade Dentin 6	

\*For lighter tooth shades, it is recommended not to infiltrate the cervical area of the restoration, as it may turn out too intensively shaded.

## IPS e.max ZirCAD MT preshaded – Staining technique (monolithic restorations)

Tooth shade	IPS e.max ZirCAD MT	Staining technique with IPS Ivocolor
BL1	MT BL	Shade Dentin 0
BL2	MT BL	Shade Dentin 0
BL3	MT BL	Shade Dentin 2
BL4	MT BL	Shade Dentin 2
A1	MT A1	Shade Dentin 1
A2	MT A2	Shade Dentin 2
A3	MT A3	Shade Dentin 2
A3.5	MT A3	Shade Dentin 2
A4	MT A3	Shade Dentin 3
B1	MT B1	Shade Dentin 4
B2	MT B2	Shade Dentin 4
B3	MT A3	Shade Dentin 5
B4	MT A3	Shade Dentin 5
C1	MT B1	Shade Dentin 6
C2	MT C2	Shade Dentin 6
C3	MT C2	Shade Dentin 6
C4	MT C2	Shade Dentin 6
D2	MT D2	Shade Dentin 7
D3	MT D2	Shade Dentin 7
D4	MT C2	Shade Dentin 6

Shade Incisal 1/2/3

IPS e.max ZirCAD LT 0/LT BL – Infiltration technique and/or staining technique (monolithic restorations)

Tooth shade	IPS e.max ZirCAD LT	BASIC infiltration with IPS e.max ZirCAD LT Colouring Liquids	1x complete (leave incisal area somewhat uncovered for lighter shades)	1x dentin infiltration (inside and outside)	1x cervical*	ADVANCED infiltration with IPS e.max ZirCAD LT Colouring Liquids	Staining technique with IPS Ivocolor
BL1	LT 0/LT BL	–	–	–	–	–	Shade Dentin 0
BL2	LT 0/LT BL	–	–	–	–	–	Shade Dentin 0
BL3	LT 0/LT BL	–	–	–	–	–	Shade Dentin 2
BL4	LT 0/LT BL	–	–	–	–	–	Shade Dentin 2
A1	LT 0/LT BL	A1	1x outside	1x inside 1x outside	1x outside	Individual infiltration with blue, violet, grey, orange, brown	Shade Dentin 1
A2	LT 0/LT BL	A2	1x outside	1x inside 1x outside	1x outside		Shade Dentin 2
A3	LT 0/LT BL	A3	1x outside	1x inside 1x outside	1x outside		Shade Dentin 2
A3.5	LT 0/LT BL	A3.5	1x outside	1x inside 1x outside	1x outside		Shade Dentin 2
A4	LT 0/LT BL	A4	1x outside	1x inside 1x outside	1x outside		Shade Dentin 3
B1	LT 0/LT BL	B1	1x outside	1x inside 1x outside	1x outside		Shade Dentin 4
B2	LT 0/LT BL	B2	1x outside	1x inside 1x outside	1x outside		Shade Dentin 4
B3	LT 0/LT BL	B3	1x outside	1x inside 1x outside	1x outside		Shade Dentin 5
B4	LT 0/LT BL	B4	1x outside	1x inside 1x outside	1x outside		Shade Dentin 5
C1	LT 0/LT BL	C1	1x outside	1x inside 1x outside	1x outside		Shade Dentin 6
C2	LT 0/LT BL	C2	1x outside	1x inside 1x outside	1x outside		Shade Dentin 6
C3	LT 0/LT BL	C3	1x outside	1x inside 1x outside	1x outside		Shade Dentin 6
C4	LT 0/LT BL	C4	1x outside	1x inside 1x outside	1x outside		Shade Dentin 6
D2	LT 0/LT BL	D2	1x outside	1x inside 1x outside	1x outside		Shade Dentin 7
D3	LT 0/LT BL	D3	1x outside	1x inside 1x outside	1x outside		Shade Dentin 7
D4	LT 0/LT BL	D4	1x outside	1x inside 1x outside	1x outside		Shade Dentin 6

Shade Incisal  
1/2/3

\*For lighter tooth shades, it is recommended not to infiltrate the cervical area of the restoration, as it may turn out too intensively shaded.

## IPS e.max® ZirCAD LT 1 and LT 2 – Infiltration technique and staining technique (monolithic restorations)

Tooth shade	IPS e.max ZirCAD LT	BASIC infiltration with IPS e.max ZirCAD LT Colouring Liquids	1x dentin infiltration of the crown	1 x cervical infiltration	ADVANCED infiltration with IPS e.max ZirCAD LT Colouring Liquids	Staining technique with IPS Ivocolor	
A1	LT 1	A1	1x outside	1x outside 1x inside	Individual infiltration with blue, violet, grey, orange, brown	Shade Dentin 1	Shade Incisal 1/2/3
A2	LT 1	A2	2x outside	1x outside 1x inside		Shade Dentin 2	
A3	LT 2	A3	2x outside	1x outside 1x inside		Shade Dentin 2	
A3.5	LT 2	A3.5	2x outside	1x outside 1x inside		Shade Dentin 2	
A4	LT 2	A4	2x outside	1x outside 1x inside		Shade Dentin 3	
B1	LT 1	B1	1x outside	1x outside 1x inside		Shade Dentin 4	
B2	LT 1	B2	2x outside	1x outside 1x inside		Shade Dentin 4	
B3	LT 2	B3	1x outside	1x outside 1x inside		Shade Dentin 5	
B4	LT 2	B4	2x outside	1x outside 1x inside		Shade Dentin 5	
C1	LT 1	C1	2x outside	1x outside 1x inside		Shade Dentin 6	
C2	LT 1	C2	2x outside	1x outside 1x inside		Shade Dentin 6	
C3	LT 1	C3	2x outside	1x outside 1x inside		Shade Dentin 6	
D3	LT 2	D3	2x outside	1x outside 1x inside		Shade Dentin 7	

IPS e.max ZirCAD LT – Staining technique (monolithic restorations)

Tooth shade	IPS e.max ZirCAD LT	Staining technique with IPS Ivocolor	
BL1	LT 0	Shade Dentin 0	Shade Incisal 1/2/3
BL2	LT 0	Shade Dentin 0	
BL3	LT 0	Shade Dentin 2	
BL4	LT 1	Shade Dentin 2	
A1	LT 1	Shade Dentin 3	
	LT sun		
A2	LT 1	Shade Dentin 2	
	LT sun		
A3	LT 2	Shade Dentin 3	
	LT sun		
A3.5	LT 4	Shade Dentin 2	
	LT sun chroma		
A4	LT 4	Shade Dentin 6	
	LT sun chroma		
B1	MT B1	Shade Dentin 4	
B2	LT 1	Shade Dentin 4	
	LT sun		
B3	LT 3	Shade Dentin 7	
	LT sun		
B4	LT 3	Shade Dentin 5	
	LT sun		
C1	MT B1	Shade Dentin 8	
C2	MT C2	Shade Dentin 8	
C3	MT C2	Shade Dentin 8	
C4	MT C2	Shade Dentin 8	
D2	LT 2	Shade Dentin 8	
	LT sun		
D3	LT 2	Shade Dentin 7	
	LT sun		
D4	LT 2	Shade Dentin 8	

## IPS e.max® ZirCAD LT/MO – Layering technique

Tooth shade	IPS e.max ZirCAD Disc	IPS e.max Ceram Dentin/ Power Dentin	IPS e.max Ceram Transpa Incisal/ Power Incisal
BL1	MO 0	D BL1	I BL
	LT 0	PD BL1	PI BL
BL2	MO 0	D BL2	I BL
	LT 0	PD BL2	PI BL
BL3	MO 0	D BL3	I BL
	LT 0	PD BL3	PI BL
BL4	MO 0	D BL4	I BL
	LT 0	PD BL4	PI BL
A1	MO 1	D A1	TI 1
	LT 1	PD A1	PI 1
A2	MO 1	D A2	TI 1
	LT 1	PD A2	PI 1
A3	MO 2	D A3	TI 2
	LT 2	PD A3	PI 2
A3.5	MO 2	D A3.5	TI 2
	LT 2	PD A3.5	PI 2
A4	MO 4	D A4	TI 3
	LT 4	PD A4	PI 3
B1	MO 1	D B1	TI 1
	LT 1	PD B1	PI 1
B2	MO 1	D B2	TI 1
	LT 1	PD B2	PI 1
B3	MO 3	D B3	TI 1
	LT 3	PD B3	PI 1
B4	MO 3	D B4	TI 2
	LT 3	PD B4	PI 2
C1	MO 1	D C1	TI 1
	LT 1	PD C1	PI 1
C2	MO 4	D C2	TI 2
	LT 4	PD C2	PI 2
C3	MO 4	D C3	TI 3
	LT 4	PD C3	PI 3
C4	MO 4	D C4	TI 3
	LT 4	PD C4	PI 3
D2	MO 2	D D2	TI 3
	LT 2	PD D2	PI 3
D3	MO 4	D D3	TI 3
	LT 4	PD D3	PI 3
D4	MO 4	D D4	TI 3
	LT 4	PD D4	PI 3

IPS e.max® ZirCAD LT/MO – Press-on technique

Tooth shade	IPS e.max ZirCAD Disc	IPS e.max ZirLiner	IPS e.max ZirPress
BL1	MO 0	ZL clear	BL1
	LT 0		
BL2	MO 0	ZL clear	BL2
	LT 0		
BL3	MO 0	ZL clear	BL3
	LT 0		
BL4	MO 0	ZL clear	BL4
	LT 0		
A1	MO 1	ZL clear	A1
	LT 1		
A2	MO 1	ZL clear	A2
	LT 1		
A3	MO 2	ZL clear	A3
	LT 2		
A3.5	MO 2	ZL clear	A3.5
	LT 2		
A4	MO 4	ZL clear	A4
	LT 4		
B1	MO 1	ZL clear	B1
	LT 1		
B2	MO 1	ZL clear	B2
	LT 1		
B3	MO 3	ZL clear	B3
	LT 3		
B4	MO 3	ZL clear	B4
	LT 3		
C1	MO 1	ZL clear	C1
	LT 1		
C2	MO 4	ZL clear	C2
	LT 4		
C3	MO 4	ZL clear	C3
	LT 4		
C4	MO 4	ZL clear	C4
	LT 4		
D2	MO 2	ZL clear	D2
	LT 2		
D3	MO 4	ZL clear	D3
	LT 4		
D4	MO 4	ZL clear	D4
	LT 4		

When using IPS e.max ZirCAD LT in combination with IPS e.max ZirPress HT, the shape of the framework must be ideally supported to prevent a decrease in brightness in bulky restorations. In such cases, an ingot with a lower translucency, e.g. LT is recommended.



Shade combination table for the staining of veneered IPS e.max ZirCAD with IPS Ivocolor

- IPS e.max ZirCAD LT and MO restorations veneered with IPS e.max Ceram
- IPS e.max ZirCAD LT and MO restorations pressed-over with IPS e.max ZirPress

IPS Ivocolor Shade	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	
Shade 0	Shade 0																				
Shade 1		Shade 1																			
Shade 2			Shade 2																		
Shade 3								Shade 3													
Shade 4										Shade 4											
Shade 5											Shade 5										
Shade 6												Shade 6									
Shade 7																		Shade 7			
Shade 8																					

## Firing parameters

### Firing of restorations made of IPS e.max® ZirCAD MT Multi/MT/LT and MO

To achieve optimum firing results for the restorations, the following points have to be observed:



- In order to ensure an even thickness of the veneer, the zirconium oxide framework must be designed in such a way that it supports the cusps. Depending on the clinical situation, the results are different wall thicknesses and dimensions of the restorations
- Since zirconium is a poor heat conductor compared to other materials, a low temperature increase rate is required. This ensures even heat distribution in the bonding area between the framework and the veneer, as well as the outer surfaces of the restoration even with different wall thicknesses. In this way, an optimum bond, as well as even sintering of the layering materials are achieved.
- During cooling of the restorations after firing, stress occurs as a result of the different cooling speeds both outside and within the material. With long-term cooling for the final firing cycle, this stress can be reduced and the risk of delamination minimized, particularly in ZrO<sub>2</sub>-supported restorations.
- Several units (e.g. multi-unit bridges with bulky pontics) in the furnace impede even and thorough heating of the objects to be fired.
- Even temperature distribution in the firing chamber depends on the type of furnace, as well as the size of the firing chamber.
- The parameters stipulated in the Instructions for Use are coordinated with Ivoclar Vivadent furnaces (tolerance range +/- 10°C/18 °F).
- If a non-Ivoclar Vivadent furnace is used, temperature adjustments may be necessary.
- At the beginning of the firing procedure, open the furnace and wait for the acoustic signal. Subsequently, place the firing tray with the objects in the centre of the firing table and start the program.

#### Notes on cooling after completion of the firing program

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

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

### Firing parameters for IPS e.max® ZirCAD in combination with IPS e.max Ceram and IPS Ivocolor in the layering, cut-back and press technique

	Stand-by temperature <b>B</b> [°C/°F]	Closing time * <b>S</b> [min]	Heating rate <b>t</b> [°C/°F/min]	Firing temperature <b>T<sub>1</sub></b> [°C/°F]	Holding time <b>H<sub>1</sub></b> [min]	Heating rate <b>t</b> [°C/°F/min]	Firing temperature <b>T<sub>2</sub></b> [°C/°F]	Holding time <b>H<sub>2</sub></b> [min]	Vacuum 1 <b>1<sub>1</sub></b> <b>1<sub>2</sub></b> [°C/°F]	Vacuum 2 <b>2<sub>1</sub></b> <b>2<sub>2</sub></b> [°C/°F]	Long-term cooling ** <b>L</b> [°C/°F]	Cooling rate <b>t<sub>t</sub></b> [°C/°F/min]
ZirLiner firing <sup>1)</sup>	403/757	IRT/ 04:00	40/72	960/1760	01:00	–	–	–	450/842	959/1758	0	0
Wash firing (foundation)	403/757	IRT/ 04:00	90/162	650/1202	00:00	20/36	730/1346	02:00 	400/752 650/1202	650/1202 729/1344	0	0
1 <sup>st</sup> Dentin/Incisal firing	403/757	IRT/ 04:00	90/162	650/1202	00:00	20/36	730/1346	02:00 	400/752 650/1202	650/1202 729/1344	0	0
2 <sup>nd</sup> Dentin/Incisal firing	403/757	IRT/ 04:00	90/162	650/1202	00:00	20/36	730/1346	02:00 	400/752 650/1202	650/1202 729/1344	0	0
Stain firing with IPS Ivocolor	403/757	IRT/ 06:00	60/108	710/1310	01:00	–	–	–	450/842	709/1308	450/842	0
Glaze firing with IPS Ivocolor	403/757	IRT/ 06:00	60/108	710/1310	01:00	–	–	–	450/842	709/1308	450/842	0
Add-On with Glaze firing	403/757	IRT/ 06:00	60/108	710/1310	01:00	–	–	–	450/842	709/1308	450/842	0
Add-On after Glaze firing	403/757	IRT/ 06:00	50/90	700/1292	01:00	–	–	–	450/842	699/1290	450/842	0

\* IRT standard mode

\*\* Long-term cooling for the last firing cycle

1) before wax-up and pressing with IPS e.max ZirPress



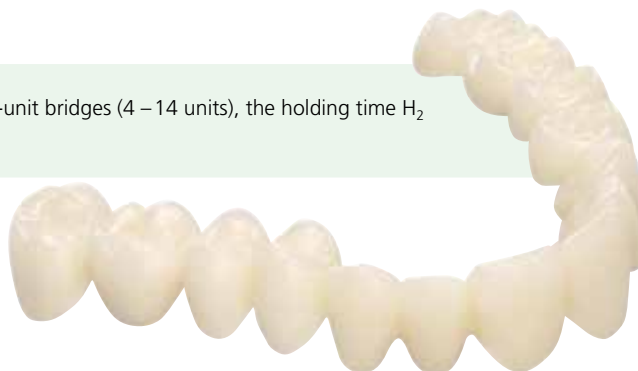
Depending on the furnace type, the firing temperature may be adjusted by  $\pm 5^{\circ}\text{C}$ , max.  $\pm 10^{\circ}\text{C}$ .



For multi-unit  $\text{ZrO}_2$  bridges with solid pontics, the heating rate must be reduced to  $45^{\circ}\text{C}/\text{min}$  for the Glaze firing with IPS Ivocolor.



To achieve an optimum firing result for multi-unit bridges (4 – 14 units), the holding time  $\text{H}_2$  should be increased to 3 min.



#### Firing parameters for IPS e.max ZirCAD in combination with IPS Ivocolor in the staining technique

	Stand-by temperature <b>B</b> [ $^{\circ}\text{C}/^{\circ}\text{F}$ ]	Closing time* <b>S</b> [min]	Heating rate <b>t</b> [ $^{\circ}\text{C}/^{\circ}\text{F}/\text{min}$ ]	Firing temperature <b>T<sub>1</sub></b> [ $^{\circ}\text{C}/^{\circ}\text{F}$ ]	Holding time <b>H<sub>1</sub></b> [min]	Vacuum 1 <b>1<sub>1</sub></b> <b>1<sub>2</sub></b> [ $^{\circ}\text{C}/^{\circ}\text{F}$ ]	Vacuum 2 <b>2<sub>1</sub></b> <b>2<sub>2</sub></b> [ $^{\circ}\text{C}/^{\circ}\text{F}$ ]	Long-term cooling <b>L</b> [ $^{\circ}\text{C}/^{\circ}\text{F}$ ]
Stain and Glaze firing	403/757	IRT/ 06:00	45/15 81/27	710/1310	01:00	450/842	709/1308	450/842

\* IRT standard mode



- Monolithic IPS e.max ZirCAD single crowns are fired with a heating rate of  $45^{\circ}\text{C}/\text{min}$ .
- Monolithic IPS e.max ZirCAD bridges with solid pontics or restorations with a gingiva mask are fired with a heating rate of  $15^{\circ}\text{C}/\text{min}$  and cooled at lower speed. Depending on the volume of the restoration, the cooling time should be at least 15-25 minutes.



**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.

# Ivoclar Vivadent – worldwide

**Ivoclar Vivadent AG**  
Bendererstrasse 2  
9494 Schaan  
Liechtenstein  
Tel. +423 235 35 35  
Fax +423 235 33 60  
[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

**Ivoclar Vivadent Pty. Ltd.**  
1 – 5 Overseas Drive  
P.O. Box 367  
Noble Park, Vic. 3174  
Australia  
Tel. +61 3 9795 9599  
Fax +61 3 9795 9645  
[www.ivoclarvivadent.com.au](http://www.ivoclarvivadent.com.au)

**Ivoclar Vivadent GmbH**  
Tech Gate Vienna  
Donau-City-Strasse 1  
1220 Vienna  
Austria  
Tel. +43 1 263 191 10  
Fax: +43 1 263 191 111  
[www.ivoclarvivadent.at](http://www.ivoclarvivadent.at)

**Ivoclar Vivadent Ltda.**  
Alameda Caiapós, 723  
Centro Empresarial Tamboré  
CEP 06460-110 Barueri – SP  
Brazil  
Tel. +55 11 2424 7400  
Fax +55 11 3466 0840  
[www.ivoclarvivadent.com.br](http://www.ivoclarvivadent.com.br)

**Ivoclar Vivadent Inc.**  
1-6600 Dixie Road  
Mississauga, Ontario  
L5T 2Y2  
Canada  
Tel. +1 905 670 8499  
Fax +1 905 670 3102  
[www.ivoclarvivadent.us](http://www.ivoclarvivadent.us)

**Ivoclar Vivadent Shanghai Trading Co., Ltd.**  
2/F Building 1, 881 Wuding Road,  
Jing An District  
200040 Shanghai  
China  
Tel. +86 21 6032 1657  
Fax +86 21 6176 0968  
[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

**Ivoclar Vivadent Marketing Ltd.**  
Calle 134 No. 7-B-83, Of. 520  
Bogotá  
Colombia  
Tel. +57 1 627 3399  
Fax +57 1 633 1663  
[www.ivoclarvivadent.co](http://www.ivoclarvivadent.co)

**Ivoclar Vivadent SAS**  
B.P. 118  
74410 Saint-Jorioz  
France  
Tel. +33 4 50 88 64 00  
Fax +33 4 50 68 91 52  
[www.ivoclarvivadent.fr](http://www.ivoclarvivadent.fr)

**Ivoclar Vivadent GmbH**  
Dr. Adolf-Schneider-Str. 2  
73479 Ellwangen, Jagst  
Germany  
Tel. +49 7961 889 0  
Fax +49 7961 6326  
[www.ivoclarvivadent.de](http://www.ivoclarvivadent.de)

**Ivoclar Vivadent Marketing (India) Pvt. Ltd.**  
503/504 Raheja Plaza  
15 B Shah Industrial Estate  
Veera Desai Road, Andheri (West)  
Mumbai, 400 053  
India  
Tel. +91 22 2673 0302  
Fax +91 22 2673 0301  
[www.ivoclarvivadent.in](http://www.ivoclarvivadent.in)

**Ivoclar Vivadent Marketing Ltd.**  
The Icon  
Horizon Broadway BSD  
Block M5 No. 1  
Kecamatan Cisauk Kelurahan Sampora  
15345 Tangerang Selatan – Banten  
Indonesia  
Tel. +62 21 3003 2932  
Fax +62 21 3003 2934  
[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

**Ivoclar Vivadent s.r.l.**  
Via Isonzo 67/69  
40033 Casalecchio di Reno (BO)  
Italy  
Tel. +39 051 6113555  
Fax +39 051 6113565  
[www.ivoclarvivadent.it](http://www.ivoclarvivadent.it)

**Ivoclar Vivadent K.K.**  
1-28-24-4F Hongo  
Bunkyo-ku  
Tokyo 113-0033  
Japan  
Tel. +81 3 6903 3535  
Fax +81 3 5844 3657  
[www.ivoclarvivadent.jp](http://www.ivoclarvivadent.jp)

**Ivoclar Vivadent Ltd.**  
12F W-Tower  
54 Seocho-daero 77-gil, Seocho-gu  
Seoul, 06611  
Republic of Korea  
Tel. +82 2 536 0714  
Fax +82 2 596 0155  
[www.ivoclarvivadent.co.kr](http://www.ivoclarvivadent.co.kr)

**Ivoclar Vivadent S.A. de C.V.**  
Calzada de Tlalpan 564,  
Col Moderna, Del Benito Juárez  
03810 México, D.F.  
México  
Tel. +52 (55) 50 62 10 00  
Fax +52 (55) 50 62 10 29  
[www.ivoclarvivadent.com.mx](http://www.ivoclarvivadent.com.mx)

**Ivoclar Vivadent BV**  
De Fruittuinen 32  
2132 NZ Hoofddorp  
Netherlands  
Tel. +31 23 529 3791  
Fax +31 23 555 4504  
[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

**Ivoclar Vivadent Ltd.**  
12 Omega St, Rosedale  
PO Box 303011 North Harbour  
Auckland 0751  
New Zealand  
Tel. +64 9 914 9999  
Fax +64 9 914 9990  
[www.ivoclarvivadent.co.nz](http://www.ivoclarvivadent.co.nz)

**Ivoclar Vivadent Polska Sp. z o.o.**  
ul. Jana Pawla II 78  
00-175 Warszawa  
Poland  
Tel. +48 22 635 5496  
Fax +48 22 635 5469  
[www.ivoclarvivadent.pl](http://www.ivoclarvivadent.pl)

**Ivoclar Vivadent LLC**  
Prospekt Andropova 18  
Korp. 6 / Office 10-06  
115432 Moscow  
Russia  
Tel. +7 499 418 0300  
Fax +7 499 418 0310  
[www.ivoclarvivadent.ru](http://www.ivoclarvivadent.ru)

**Ivoclar Vivadent Marketing Ltd.**  
Qlaya Main St.  
Siricon Building No.14, 2<sup>nd</sup> Floor  
Office No. 204  
P.O. Box 300146  
Riyadh 11372  
Saudi Arabia  
Tel. +966 11 293 8345  
Fax +966 11 293 8344  
[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

**Ivoclar Vivadent S.L.U.**  
Carretera de Fuencarral nº24  
Portal 1 – Planta Baja  
28108-Alcobendas (Madrid)  
Spain  
Tel. +34 91 375 78 20  
Fax +34 91 375 78 38  
[www.ivoclarvivadent.es](http://www.ivoclarvivadent.es)

**Ivoclar Vivadent AB**  
Dalvägen 14  
169 56 Solna  
Sweden  
Tel. +46 8 514 939 30  
Fax +46 8 514 939 40  
[www.ivoclarvivadent.se](http://www.ivoclarvivadent.se)

**Ivoclar Vivadent Liaison Office**  
Tevsikiye Mahallesi  
Sakayik Sokak  
Nisantas' Plaza No:38/2  
Kat:5 Daire:24  
34021 Sisli – Istanbul  
Turkey  
Tel. +90 212 343 0802  
Fax +90 212 343 0842  
[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

**Ivoclar Vivadent Limited**  
Compass Building  
Feldspar Close  
Warrens Business Park  
Enderby  
Leicester LE19 4SD  
United Kingdom  
Tel. +44 116 284 7880  
Fax +44 116 284 7881  
[www.ivoclarvivadent.co.uk](http://www.ivoclarvivadent.co.uk)

**Ivoclar Vivadent, Inc.**  
175 Pineview Drive  
Amherst, N.Y. 14228  
USA  
Tel. +1 800 533 6825  
Fax +1 716 691 2285  
[www.ivoclarvivadent.us](http://www.ivoclarvivadent.us)

**CE 0123**



Manufacturer:  
Ivoclar Vivadent AG, 9494 Schaan/Liechtenstein  
[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

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