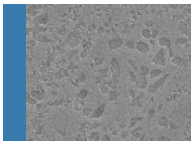







# IPS Empress® CAD

Monolithic Solutions LABSIDE  
Instructions for Use



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## Symbols in the Instructions for Use



Important



Information



Tips & Tricks



Contraindication



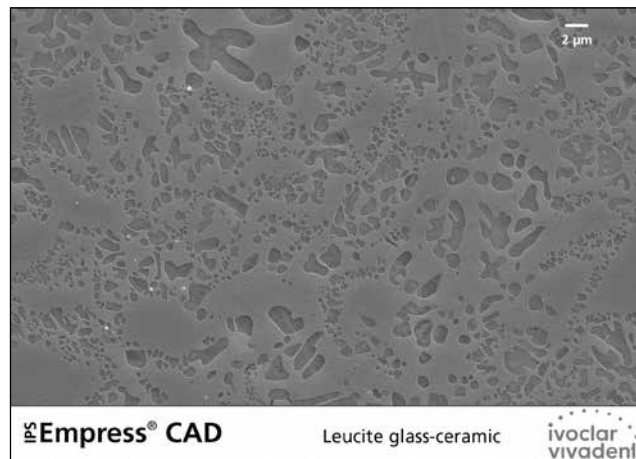
Note on firing

# IPS Empress® CAD

## Material

IPS Empress® CAD is suitable for the fabrication of highly esthetic, full-contour single tooth restorations using the CAD/CAM technology. IPS Empress CAD blocks are made of a leucite-reinforced glass-ceramic which consists of a glass and a crystal phase. Leucite crystals of few microns evenly grow in a multi-stage process directly from the amorphous glass phase. During the fabrication of the blocks, the semi-finished product in powder form is pressed to blocks in a fully automated procedure, which enables a maximum of homogeneity. Given the difference in the coefficients of thermal expansion (CTE) between the glass phase and the crystal phase (leucite), cooling after sintering produces compressive stress in the glass phase. This mechanism results in an increase in strength and enables IPS Empress CAD to achieve an average flexural strength of 185 MPa. This type of material has been successful, as well as proven for decades. The milled restorations exhibit an outstanding accuracy of fit and a homogeneous surface structure.

The restorations can be individually veneered using IPS Empress Esthetic Veneer, if required. The "labside" IPS Ivoclar is used for individual characterization and glaze.



Property	Specification	Typical average value
CTE (25–500°C) [10 <sup>-6</sup> /K]	17.5 ± 0.5	–
Flexural strength (biaxial) [MPa]	≥ 100	185
Chemical solubility [µg/cm <sup>2</sup> ]	< 100	–
Type/Class	Type II/Class 2a	

according to ISO 6872:2015

## Uses

### Indications

- Veneers
- Inlays
- Onlays
- Partial crowns
- Crowns in the anterior and posterior region
- If desired, restorations can be partially reduced (cut-back technique) and individualized using IPS Empress Esthetic Veneer layering materials.

### Contraindications

- Bridge reconstructions
- Fully veneered (circular) anterior and posterior crowns with IPS Empress Esthetic Veneer
- Conventional cementation
- Temporary cementation
- Very deep subgingival preparations
- Patients with severely reduced residual dentition
- Bruxism
- Any other use not listed in the indications

### Important processing restrictions

Failure to observe the following restrictions may compromise the results achieved with IPS Empress CAD:

- The required minimum thickness for IPS Empress CAD full-contour restorations must be observed
- IPS Empress CAD restorations must not be stained or glazed using other materials than the approved ones
- Do not mix IPS Empress Universal Shades, Stains, Glaze with IPS Ivocolor
- The blocks must not be milled in a non-compatible CAD/CAM system
- Powder materials must not be mixed with paste materials

### Side effects

If patients are known to be allergic to any of the components of IPS Empress CAD, the material must not be used.

### Warnings

- IPS Natural Die Material Separator contains hexane. Hexane is highly flammable and detrimental to health. Avoid contact of the material with skin and eyes. Do not inhale vapours and keep away from sources of ignition.
- Do not inhale ceramic grinding dust during finishing.
- Use suction equipment and a face mask.
- Observe the Safety Data Sheet (SDS).

## Scientific data

Since the beginning of the development, IPS Empress has been monitored by the scientific community. The most important study results and additional scientific data (e.g. strength, wear, biocompatibility) are compiled in the Scientific Documentation about IPS Empress CAD. This 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.



## CAD/CAM partners

IPS Empress CAD has to be processed with an authorized CAD/CAM system. For questions regarding the different CAD/CAM systems, please contact the respective system manufacturer.



Further information is available on the Internet from [www.ivoclarvivadent.com](http://www.ivoclarvivadent.com).

## Block concept

IPS Empress CAD blocks are available in **three translucency levels (Multi, HT, LT)** and in different sizes.



### IPS Empress® CAD Multi

Because of the smooth shade transition between the dentin and incisal areas, restorations made of IPS Empress CAD Multi blocks thus provide maximum esthetics and true-to-nature appearance. The translucency and fluorescence transition enable a multitude of esthetic possibilities. Given the combination of true-to-nature transition of shade, translucency, and fluorescence, highly esthetic restorations are fabricated in an easy way.



### IPS Empress® CAD HT (High Translucency)

Given their high translucency that is similar to that of natural enamel, HT blocks are ideal for the fabrication of small restorations (e.g. inlays, onlays). Restorations made from HT blocks convince users with their true-to-nature chameleon effect and the exceptional adaption to the remaining tooth structure. Restorations made from HT blocks are ideally suitable for the "polishing technique" and "staining technique".



### IPS Empress® CAD LT (Low Translucency)




Given their low translucency that is similar to that of natural dentin, LT blocks are ideal for the fabrication of larger restorations (e.g. posterior crowns). Restorations made from LT blocks convince users with their lifelike brightness value and chroma. This prevents the incorporated restorations from graying. LT blocks are ideally suitable for processing in the "cut-back technique", but they can also be used in the "polishing technique" and the "staining technique".



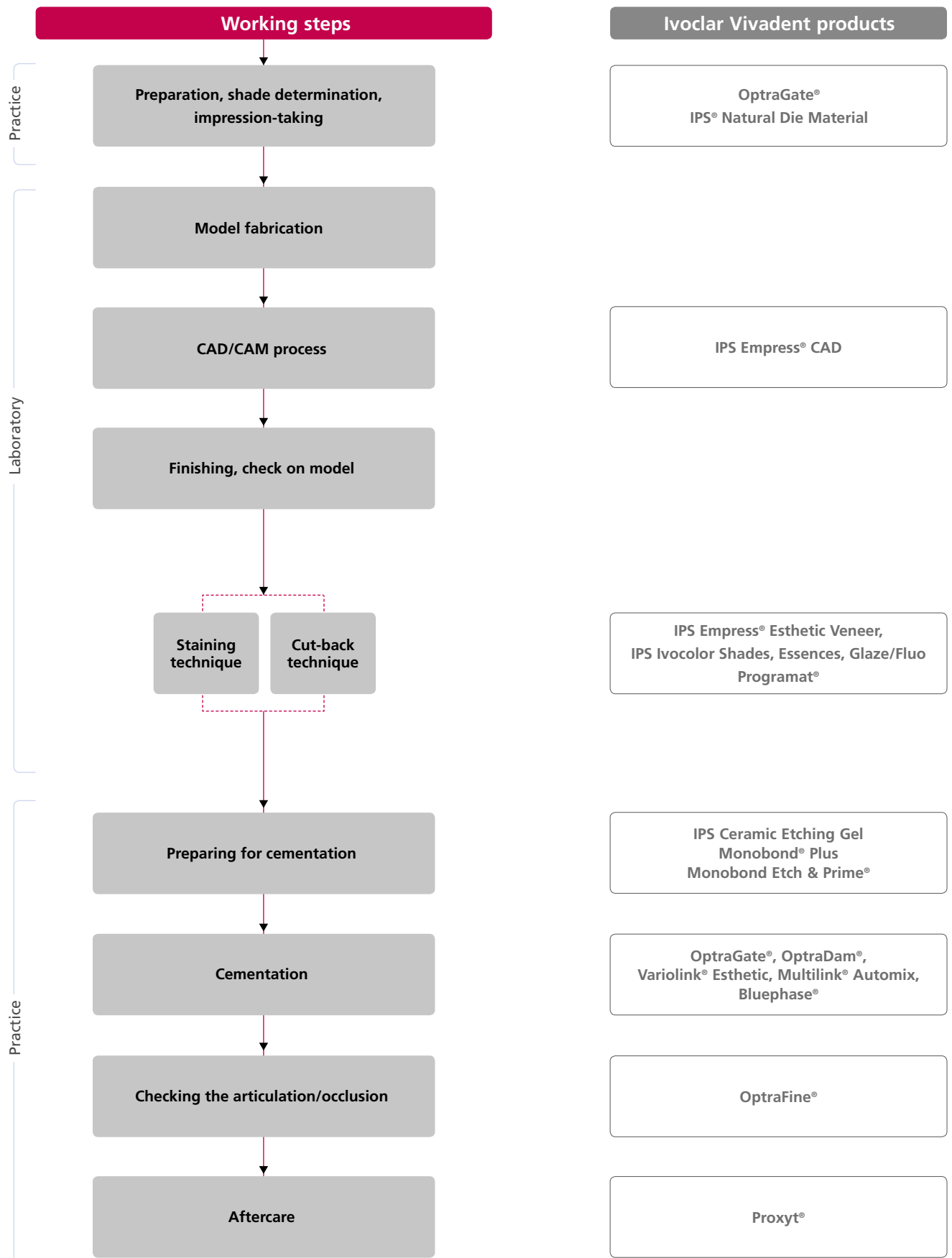
Detailed information on the available block sizes and shades can be found in the "CAD/CAM Block Overview" at [www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)!



Basically, all blocks are made of the same material and feature the same outstanding properties. For reasons of esthetics, however, the following processing technique and indication are recommended for the individual blocks (translucency levels):

Translucency level	Processing technique			Indications			
	Polishing technique 	Staining technique 	Cut-back technique 	Veneer	Inlay and onlay	Partial crown	Anterior and posterior crown
<b>Multi</b>	✓	✓		✓		✓	✓
<b>HT</b> High Translucency	✓	✓		✓	✓		
<b>LT</b> Low Translucency	✓	✓	✓	✓		✓	✓

# Overview of the Clinical Working Steps, Fabrication Process



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



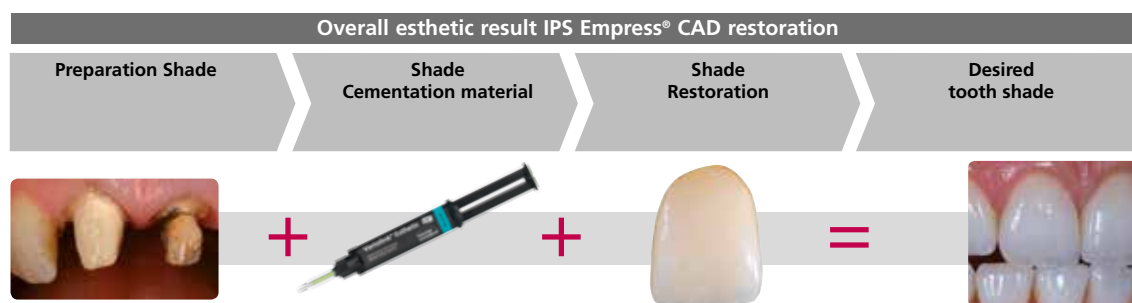
## Shade determination – Tooth shade, preparation shade

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

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

- **Shade of prepared tooth** (natural preparation, core build-up, abutment, implant)
- **Shade of the restoration** (framework shade, veneer, characterization)
- **Shade of the cementation material**

The optical effect of the preparation shade must not be underestimated during the fabrication of highly esthetic restorations. For that reason, the shade of the preparation should be determined together with the desired tooth shade in order to select the suitable block. Especially with severely discoloured preparations or non-tooth-shaded build-ups, this is of utmost importance.



### Shade determination of the natural tooth

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. If a crown preparation is planned, for example, the cervical shade should also be determined. In order to achieve as lifelike results as possible, shade determination should be carried out at daylight. Furthermore, the patient should not wear clothes of intensive colours and/or lipstick. 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® P710 or CS3. The integrated image processing software DSA (Digital Shade Assistant) 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 Operating Instructions for Programat P710 and CS3.



## Die shade selection

In order to facilitate the reproduction of the desired tooth shade, the shade of the preparation is determined with the help of the IPS Natural Die Material shade guide.

This enables the technician to fabricate a model die similar to the preparation of the patient, on the basis of which the correct shade and brightness values of the all-ceramic restorations may be selected.

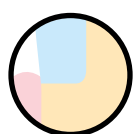


## Preparation guidelines

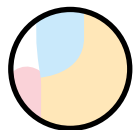
Successful results can only be achieved with IPS Empress CAD if the guidelines and minimum layer thicknesses are strictly observed.

### Basic preparation guidelines for all-ceramic restorations

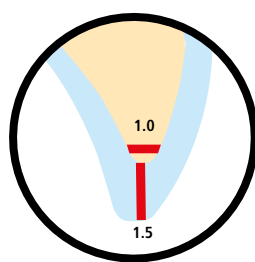
- No angles or edges
- Shoulder preparation with rounded inner edges and/or chamfer preparation
- The indicated dimensions reflect the minimum layer thickness for IPS Empress CAD restorations
- The thickness of the preparation edge, particularly for anterior teeth, should be at least 1.0 mm in order to permit optimum milling during CAD/CAM processing.



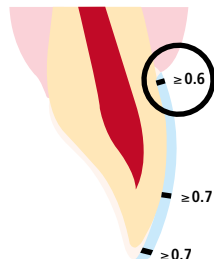
Shoulder preparation



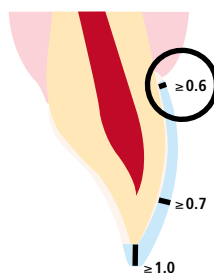
Chamfer preparation



### Veneer

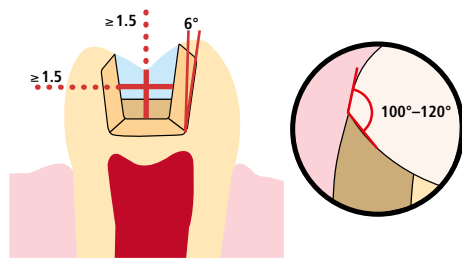


- If possible, the preparation should be located in the enamel.
- The incisal preparation margins should not be located in the area of abrasion surfaces or dynamic occlusal surfaces.
- Reduce the cervical area by at least 0.6 mm, the labial area by at least 0.7 mm and the incisal edge by at least 0.7 mm.



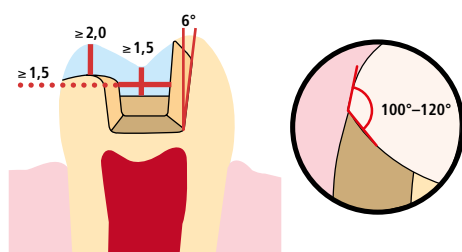
- For preparations with reduction of the incisal edge (labial/incisal reduction), the preparation depth should be at least 0.6 mm in the cervical area and 0.7 mm in the labial area.
- The incisal edge must be reduced by 1.0 mm.
- The extent of the incisal reduction depends on the desired translucency of the incisal area to be built up.
- The more transparent the incisal edge of the intended veneer, the more extensive the reduction should be.

### Inlay



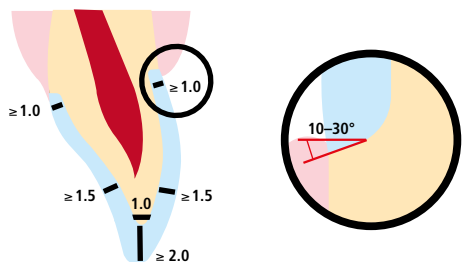
- Static and dynamic antagonist contacts must be taken into consideration.
- The preparation margins must not be located on centric antagonist contacts.
- A preparation depth of at least 1.5 mm and an isthmus width of at least 1.5 mm must be observed in the fissure area.
- Prepare the proximal box with slightly diverging walls (preparation angle 6°) and observe an angle of 100°–120° between the proximal cavity walls and the prospective proximal surfaces of the inlay. For inlays with pronounced convex proximal surfaces without adequate support by the proximal shoulder, marginal ridge contacts should be avoided.
- Round out internal edges and transitions in order to prevent stress concentration within the ceramic material.
- Do not prepare slice-cuts or feather edges.

### Onlay



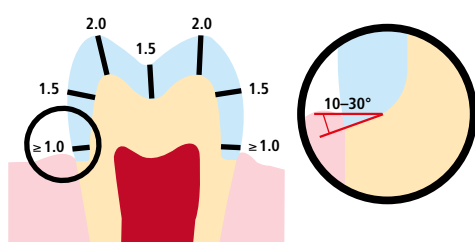
- Static and dynamic antagonist contacts must be taken into consideration.
- The preparation margins must not be located on centric antagonist contacts.
- A preparation depth of at least 1.5 mm and an isthmus width of at least 1.5 mm must be observed in the fissure area.
- Prepare the proximal box with slightly diverging walls (preparation angle 6°) and observe an angle of 100°–120° between the proximal cavity walls and the prospective proximal surfaces of the onlay.
- For onlays with pronounced proximal surfaces walls without adequate support by the proximal shoulder, marginal ridge contacts should be avoided.
- Round out internal edges and transitions in order to prevent stress concentration within the ceramic material.
- Do not prepare slice-cuts or feather edges.
- Provide at least 2.0 mm of space in the cusp areas.

### Anterior crown



- Reduce the anatomical shape and observe the stipulated minimum layer thickness. Prepare a circular shoulder with rounded inner edges or a chamfer at an angle of approximately 10°–30°.
- Width of the circular shoulder/chamfer at least 1.0 mm.
- Reduce the incisal crown third by 2.0 mm.
- Reduce the vestibular and/or oral area by at least 1.5 mm.
- The thickness of the preparation edge, particularly for anterior teeth, should be at least 1.0 mm (milling tool geometry) in order to permit optimum milling during CAD/CAM processing.

### Posterior crown



- Reduce the anatomical shape and observe the stipulated minimum layer thickness.
- Prepare a circular shoulder with rounded inner edges or a chamfer at an angle of approximately 10°–30°.
- Width of the circular shoulder/chamfer at least 1.0 mm.
- Reduce the occlusal crown third by 2.0 mm.
- Reduce the vestibular and/or oral area by at least 1.5 mm.


## Minimum layer thicknesses

The restoration design is key to the success of durable all-ceramic restorations. The more attention given to the design, the better the final results and the clinical success will turn out to be. The following minimum layer thicknesses must be observed to meet the requirements put forth in the preparation guidelines (page 11 et seq.).

### Staining technique

In the staining technique, no layering materials are applied on the IPS Empress CAD restoration. Therefore, the minimum layer thickness refers to the layer thickness of IPS Empress CAD.

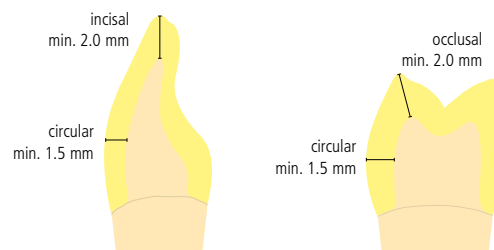
### Minimum layer thicknesses for IPS Empress® CAD restorations (depending on the indication) in the staining technique

		Veneer without reduction of the incisal edge	Veneer with reduction of the incisal edge	Inlay	Onlay	Crown	
						Anterior tooth	Molar
 Minimum layer thickness IPS Empress CAD <b>Staining technique</b>	incisal/occlusal	0.7	1.0	1.5 Fissure depth	2.0 Cusp area	2.0	2.0
	circular	0.7	0.7	1.5 Isthmus width	1.5 Fissure depth	1.5	1.5

Dimensions in mm

### Example:

Minimum layer thicknesses for anterior and posterior crowns in the staining technique




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.

### Cut-back technique

In order to individualize restorations in the incisal area so that they correspond with their natural model, the IPS Empress CAD restoration is additionally veneered using opalescent IPS Empress Esthetic Veneer ceramic materials. The cut-back technique is very efficient if the full-contour anterior crown or the veneer are first designed according to the definite final shape. After that, the incisal third is reduced and subsequently provided with an individualized esthetic veneer.

**!** In large preparations and for veneered or partially veneered restorations, the excess available space must be compensated by the corresponding dimensions of the IPS Empress CAD component and not by the IPS Empress Esthetic Veneer layering material.

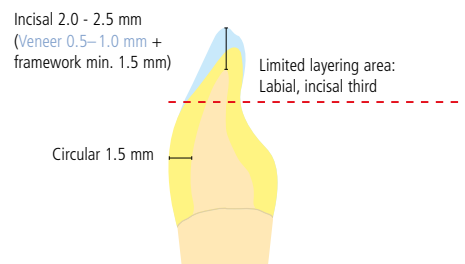
### Minimum layer thicknesses veneer, anterior crown made of IPS Empress CAD in the cut-back technique

		Veneer	Anterior crown	Posterior crown
 Minimum layer thickness IPS Empress CAD <b>Cut-back technique</b>	Incisal third	0.5	1.5	contraindicated
	circular	0.7	1.5	
Layer thickness veneer	Incisal third	0.5–1.0	0.5–1.0	

Dimensions in mm

#### Example:

Minimum layer thicknesses anterior crown in the cut-back technique



**!** 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.

# Overview of the Processing Techniques (labside)

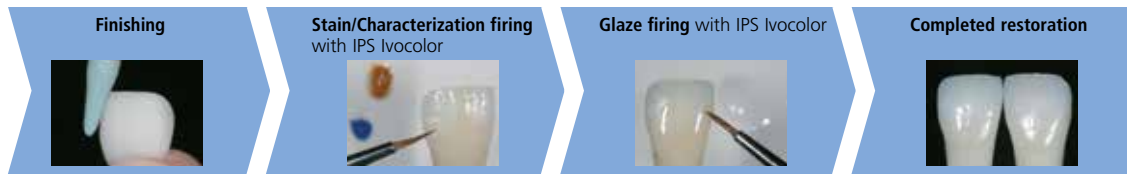
	Efficiency	Esthetics
Technique	<b>Staining technique</b>	<b>Cut-back technique</b>
Description	 <ul style="list-style-type: none"><li>- Finishing</li><li>- Characterization/ Glaze with IPS Ivocolor</li></ul>	 <ul style="list-style-type: none"><li>- Finishing</li><li>- Manual cut-back</li><li>- Incisal firing with IPS Empress Esthetic Veneer materials</li><li>- Stain/Glaze firing with IPS Ivocolor materials.</li></ul>

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Page 16

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Page 22

# Practical Procedure

## Staining technique

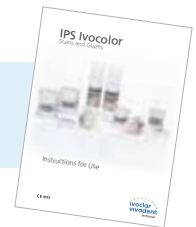


In the staining technique, the milled full-contour restorations are completed by applying Stains and Glaze materials. By using translucent IPS Empress CAD blocks, highly esthetic restorations can be fabricated easily on only slightly or non-discoloured preparations.

The **Stain/Characterization firing** and the **Glaze firing** are conducted with the universal stains and glaze assortment IPS Ivocolor.



Detailed information on the application of IPS Ivocolor Shade, Essence and Glaze can be found in the IPS Ivocolor Instructions for Use.



If more intensive and excessive shade adjustments are desired, we recommend conducting them in several working steps. To reproduce the tooth shade easily and reliably, an individual control die may be fabricated using the IPS Natural Die Material.

### Finishing

It is of critical importance to use the correct grinding instruments for finishing and adjusting glass-ceramic materials. If unsuitable grinding instruments are used, chipping of the edges and local overheating may occur.

Observe the following procedure for finishing IPS Empress CAD restorations:

- Only use suitable, fine-grained (grain size < 60  $\mu\text{m}$ ), ceramic-bonded grinding instruments or diamonds at a speed of up to 20,000 rpm and little pressure.
- Overheating the glass-ceramic must be prevented.
- Smooth out the attachment point of the holder and take the proximal contact points into account.
- If necessary, carry out individual shape adjustments.
- Design the surface structure somewhat more pronounced, if necessary, since it will be toned down by the glazing procedure.



Adjusting the individual shape and natural surface structure



## Optional:

### Die fabrication with IPS Natural Die Material

The light-curing IPS Natural Die Material simulates the shade of the preparation. Fabricate a control die of the selected shade. This control die supports the optimum shade adaptation of the restoration to reproduce the given oral situation.

- Coat the inner surfaces of the ceramic restoration with IPS Natural Die Material Separator and allow it to react for a short time.
- Apply die IPS Natural Die Material in the corresponding shade to the inner aspects of the restoration using the IPS Condenser and adapt so that the entire inner aspect is coated and filled.
- Completely fill the restoration cavity and insert an IPS Die Holder into the material and adapt excess material around the holder. Make sure that the die material is well adapted along the restoration margins and that there is no gap.
- Cure the IPS Natural Die Material die with a commercial curing light for 60 seconds.
- After polymerization, the die can be finished and or smoothed, if required.



A die made of IPS Natural Die Material provides the optimum basis for true-to-nature all-ceramic restorations.

### Stain/Characterization firing with IPS Ivocolor

Nine IPS Ivocolor Shade Dentin shades are available as ready-made pastes for the staining of restorations in the desired A–D tooth shade (see Shade Combination Table on page 33). Three IPS Ivocolor Shade Incisal materials are available for staining the enamel area.

- **IPS Ivocolor Essences** are intensively shaded stains in powder form.
- **IPS Ivocolor Shades** are ready-to-use pastes in jars.
- **IPS Ivocolor Mixing Liquids (allround, longlife)** to mix the materials in powder form (Essences, Glaze), as well as to thin paste materials (Shades, Glaze).
- **IPS Ivocolor Essence Fluid** to mix the Essences in powder form to a pasty consistency



#### IPS Ivocolor Shades



#### IPS Ivocolor Essence



### Preparing for Stain and Glaze firing

Before the Stain and Characterization firing, the restoration must be free of dirt and grease. Any contamination after cleaning must be prevented.

The following working procedure should be observed:

- Clean the restoration with ultrasound in a water bath or blast with  $Al_2O_3$  at max. 0.5 bar pressure (caution: abrasive) and clean under running water or using the steam jet.
- Certain blasting devices require different settings for the intended blasting procedure.



Clean the restoration with the steam jet prior to staining.

The following working procedures for the Stain/Characterization firing with **IPS Ivocolor materials** should be observed:

- Prior to staining, wet the finished and cleaned restoration with a little IPS Ivocolor Mixing Liquid. This facilitates the application of the IPS Ivocolor Shade pastes.
- Mix IPS Ivocolor Shades and Essences with the corresponding IPS Ivocolor Liquids to the desired consistency.
- Apply a thin layer of IPS Ivocolor Shade Dentin on the dentin area.
- Intensive shades are achieved by several staining procedures and repeated firing, not by applying thicker layers.
- To imitate the incisal area and translucency of the crown in the incisal and/or occlusal third, IPS Ivocolor Shades Incisal may be used.
- The cusps and fissures can be individualized using Essences.
- Secure the restoration on the firing pin of the honey-comb tray with a little IPS Object Fix Putty or Flow for firing.



Conduct the **Stain/Characterization firing** for IPS Ivocolor using the stipulated firing parameters with a honey-comb tray suitable for the furnace. **Firing parameters see page 35.**



Wet the cleaned restoration with a little IPS Ivocolor Mixing Liquid.



Apply a thin layer of IPS Ivocolor Shade Dentin on the dentin area.



The enamel areas are stained with IPS Ivocolor Shade Incisal.



The tooth shade of the completely stained crown is verified with the help of the A-D Shade Guide before firing.



Secure the restoration on the firing pin of the honey-comb tray with a little IPS Object Fix Putty or Flow for firing.

- Remove IPS Empress CAD objects from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.
- Do not blast or quench the objects.

## Optional:

### Shade check

In order to check the tooth shade after the first Stain/Characterization firing, proceed as follows:

- Wet inner aspects of the restoration with IPS Ivocolor Mixing Liquid using a brush.
- Place the restoration on the individual shade die.
- Also wet the surface of the restoration with IPS Ivocolor Mixing Liquid and check the tooth shade.
- If adjustments are required, apply the corresponding stains and fire them using the above firing program.



Shade check. If necessary, the shade intensity can be increased by additional staining.

## Glaze firing with IPS Ivocolor

Required materials:

- **IPS Ivocolor Glaze Paste** are glazing materials in paste form.
- **IPS Ivocolor Mixing Liquid** (allround, longlife) to thin paste materials.



Please observe the following procedure for the Glaze firing:

- The use of IPS Ivocolor Glaze Paste is recommended in the staining technique.
- Like all IPS Ivocolor pastes, IPS Ivocolor Glaze Paste features a gel-type consistency and has to be mixed with the IPS Ivocolor Mixing Liquids allround or longlife before they are applied.
- The reduction of the gel structure and thus the stability as well as the flow and application behaviour of the glazing material can be influenced by the degree of dilution.

**The following general rule applies:** Excessive dilution reduces the stability of the glazing material and the glaze might even become runny. At the same time, the degree of gloss of the fired restoration is reduced if the glazing material is applied while strongly diluted. In an undiluted state, the gel-type consistency of the pastes renders the application of an even layer difficult. However, this property may also be used for the partial accentuation of the surface.

- Apply the glazing paste in an even layer on the entire restoration.
- Secure the restoration on the firing pin of the honey-comb tray with a little IPS Object Fix Putty or Flow for firing.
- Position the loaded honey-comb tray in the ceramic furnace and conduct the Glaze firing.



Conduct the **Glaze firing** for IPS Ivocolor using the stipulated firing parameters with a honey-comb firing tray suitable for the furnace. **Firing parameters see page 35.**



Mix the IPS Ivocolor Glaze Paste with an agate spatula before removing it from the jar.



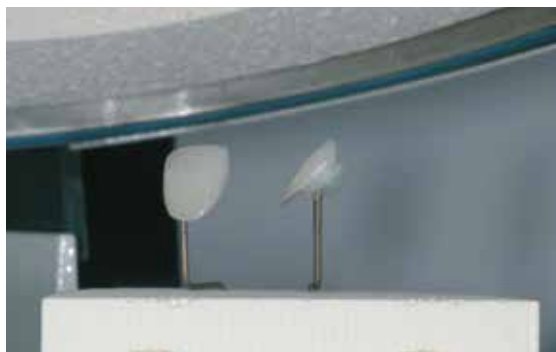
Mixing of the IPS Ivocolor Glaze paste with IPS Ivocolor Mixing Liquid allround or longlife



If mixed correctly, the consistency of the glazing material must not be too liquid.



Apply the glazing paste in an even layer on the entire restoration.



Position the loaded honey-comb tray in the ceramic furnace and conduct Glaze firing.

- Remove IPS Empress CAD objects from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.
- Do not blast or quench the objects.



Completely stained and glazed IPS Empress CAD crown and veneer

## Optional:

### Adjustments

Further adjustments (of e.g. the contact points) may be necessary after the restoration has been completed. For that purpose, IPS Empress Add-On 770 °C/1418 °F is available.

Procedure:

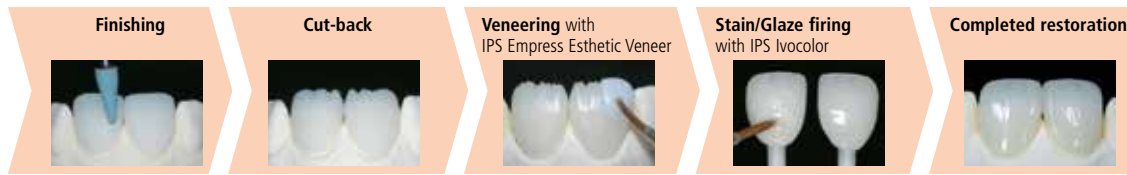
- Before the adjustment, the restoration must be free from dirt and grease. For that purpose, clean the restoration thoroughly with a steam jet.
- Mix IPS Empress Add-On 770 °C / 1418 °F with IPS Empress Esthetic Veneer Modelling Liquid to a workable consistency. Make sure that the add-on material and liquid are evenly mixed so that an optimum firing result can be achieved.
- Apply the mixed add-on material on the cleaned, desired areas using a brush and slightly blot them with an absorbent cloth.
- Position the adjusted restoration on the firing tray and fire in the ceramic furnace.
- After firing, manually polish the supplemented areas to a high gloss.



Conduct the **Corrective firing** for IPS Empress Add-On 770°C using the stipulated firing parameters with a honey-comb firing tray suitable for the furnace. **Firing parameters see page 35.**

# Practical Procedure

## Cut-back technique



In order to individualize restorations in the incisal area so that they correspond with their natural model, the IPS Empress CAD restoration is additionally veneered using opalescent IPS Empress Esthetic Veneer ceramic materials. The cut-back technique is very efficient if the full-contour anterior crown or the veneer are first designed according to the definite final shape. After that, the incisal third is reduced and subsequently provided with an individualized esthetic veneer.

Prior to the cut-back, the following points have to be observed:

- Only use suitable, fine-grained (grain size < 60 µm), ceramic-bonded grinding instruments or diamonds at a speed of up to 20,000 rpm and little pressure.
- Carefully finish the restoration margins using rubber and silicone polishers (Speed:<10,000 rpm).
- If unsuitable grinding instruments are used, chipping at the edges and local overheating may occur.
- Smooth out attachment point of the holder and take the proximal contact points into account.
- Before the cut-back, the veneer or anterior crown should correspond with the final tooth shape.
- The incisal length must be exactly defined and the occluding surfaces taken into account.
- A palatal silicone key is used as a reference for the cut-back.
- The silicone key should slightly embrace the incisal edge.



Before the cut-back, the veneer or anterior crown should correspond with the final tooth shape.



Fabricate a palatal silicone key



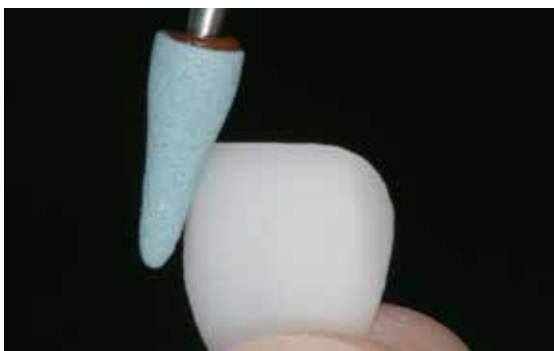
A die made of IPS Natural Die Material provides the optimum basis for shade reproduction.



Information on how to fabricate a die using IPS Natural Die Material can be found on page 17.

The cut-back is conducted in 3 steps. Only in this way is a targeted and controlled reduction possible. The following working procedure should be observed:

- Use only suitable grinding instruments for the cut-back (e.g. ceramic-bonded grinding instruments and diamonds) at low speed.
- Too much pressure and excess heat development during grinding must be prevented.
- The thickness of the reduced IPS Empress CAD restoration must not fall below the required minimum of 0.5 mm.
- Step 1: Proximal cut-back – the mesial and distal ridges are reduced.
- Step 2: Labial/incisal cut-back – volume and length are tapered and reduced.
- Step 3: Mamelon cut-back – design lifelike mamelons using abrasive silicone wheels at low pressure.
- Refrain from designing too extreme mamelons with undercuts.



Too much pressure and excess heat development during cut-back must be prevented.



Step 1: Proximal cut-back – the mesial and distal ridges are reduced.



Step 2: Labial/incisal cut-back – volume and length are tapered and reduced.



Step 3: Mamelon cut-back – design lifelike mamelons using abrasive silicone wheels at low pressure. Refrain from designing too extreme mamelons with undercuts.



Completed cut-back of the incisal third.

### Preparation for veneering

Before veneering, the restoration must be free of dirt and grease. Any contamination after cleaning must be prevented. The following working procedure should be observed:

- Prior to veneering, blast the restoration with  $\text{Al}_2\text{O}_3$  at max. 0.5 bar pressure (Caution: abrasive) and clean with ultrasound in a water bath or using the steam jet
- Certain blasting devices require different settings for the intended blasting procedure.



Carefully blast the restoration with  $\text{Al}_2\text{O}_3$  at 0.5 bar pressure (Caution: abrasive).



Clean restoration with ultrasound in a water bath or using the steam jet.

### Veneering IPS Empress® CAD with IPS Empress® Esthetic Veneer

The IPS Empress CAD restoration is veneered and finished in 3 steps:

#### Step 1: Wash firing

- **IPS Empress Esthetic Veneer Wash Pastes** are ready-to-use Wash pastes in syringes.
- **IPS Empress Universal Glaze and Stain Fluid** to thin Wash pastes.

#### Step 2: 1<sup>st</sup>/2<sup>nd</sup> Incisal/Transpa firing

- **IPS Empress Esthetic Veneer layering materials**
- **IPS Empress Esthetic Veneer modelling liquid** to mix the layering materials

#### Step 3: Stain/Glaze firing IPS Ivocolor

- **IPS Ivocolor Essences** are intensively shaded stains in powder form.
- **IPS Ivocolor Shades** are ready-to-use pastes in jars.
- **IPS Ivocolor Mixing Liquids (allround, longlife)** to mix the materials in powder form (Essences, Glaze), as well as to thin paste materials (Shades, Glaze).
- **IPS Ivocolor Essence Fluid** to mix the Essences in powder form to a pasty consistency





### Step 1: Wash firing using the IPS Empress Esthetic Veneer Wash Pastes

The Wash firing enables an optimum bond to the reduced IPS Empress CAD restoration. The following working procedure should be observed:

- Extrude IPS Empress Esthetic Veneer Wash Paste neutral from the syringe and thin it with a small amount of IPS Empress Universal Glaze and Stain Liquid, if required.
- Apply IPS Empress Esthetic Veneer Wash Paste neutral thinly on the entire surface to be veneered, in order to enable an optimum bond.
- Depending on the individual patient situation, design mamelons.
- Apply internal effects using Modifier (pure or diluted).
- The mamelons and internal effects are applied on the unfired Wash Paste neutral layer.
- **Note:** The shade intensity will not be noticeably changed during firing.
- Place veneers and anterior crowns on the honey-comb firing tray with the help of metal pins. Additionally support the veneers with a small amount of IPS Object Fix.



Apply IPS Empress Esthetic Veneer Wash Paste neutral thinly on the entire surface to be veneered, in order to enable an optimum bond.



Apply mamelons and internal effects.



Conduct the **Wash firing** using the stipulated firing parameters with a honey-comb firing tray suitable for the furnace. **Firing parameters see page 35.**



Position the restorations on the honey-comb firing tray and fire.



- Remove IPS Empress CAD objects from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.
- Do not blast or quench the objects.

### Step 2: 1<sup>st</sup> Incisal/Transpa firing with IPS Empress Esthetic Veneer

The incisal third is built-up according to the silicone key. The suitable layering materials can be found in the combination table on page 33 et. seq. The following working procedure should be observed:

- Mix IPS Empress Esthetic Veneer ceramic materials with the IPS Empress Esthetic Veneer modelling liquid.
- The mixed material should demonstrate good stability. If this is not the case, either too much or too little liquid was added.
- Build up the materials in accordance with the reduction using a ceramic brush.
- If a lifelike incisal third is desired, various materials may be combined and layered.
- Once the tooth shape has been completed, allow the ceramic material to dry for a short period of time.
- Place veneers and anterior crowns on the honey-comb firing tray with the help of metal pins. Additionally support veneers with a small amount of IPS Object Fix.



Build up the materials in accordance with the reduction



If a lifelike incisal third is desired, various materials may be combined and layered.



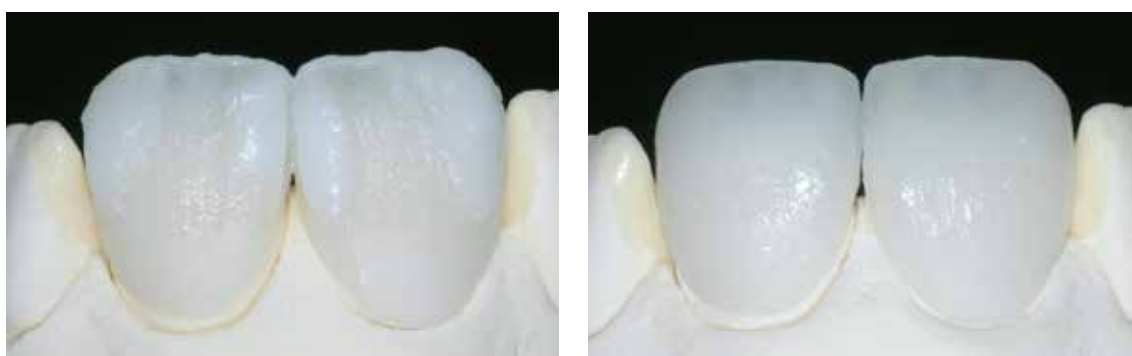
Conduct the **Incisal/Transpa firing** using the stipulated firing parameters with a honey-comb firing tray suitable for the furnace. **Firing parameters see page 35.**

- Remove IPS Empress CAD objects from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.
- Do not blast or quench the objects.

### 2<sup>nd</sup> Incisal/Transpa firing (Corrective firing) with IPS Empress Esthetic Veneer

After firing, carefully place the restoration on the model and rework using diamonds. Proceed as follows for the 2<sup>nd</sup> firing:

- Clean the restoration with ultrasound in a water bath or with the steam jet and completely dry it.
- Already mixed ceramic material may be rewetted with distilled water, or mix fresh IPS Empress Esthetic Veneer materials with the modelling liquid.
- Complete the missing areas taking the final tooth shape into account.
- Once the tooth shape has been completed, allow the ceramic material to dry for a short period of time.
- Place veneers and anterior crowns on the honey-comb firing tray with the help of metal pins. Additionally support veneers with a small amount of IPS Object Fix.



Complete the tooth shape with the 2<sup>nd</sup> firing and fire using the firing parameters below.



Conduct the **Incisal/Transpa firing** using the stipulated firing parameters with a honey-comb firing tray suitable for the furnace. **Firing parameters see page 35.**

- Remove IPS Empress CAD objects from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.
- Do not blast or quench the objects.

### Finishing and preparing for Stain and Glaze firing

Prior to the Stain/Glaze firing, the restorations are finished as follows:

- Finish the restoration using diamonds and give it a true-to-nature shape and surface structure, such as growth lines and convex/concave areas.
- The surface structure may have to be worked out more strongly, since it has been weakened by the glazing procedure.



Finish the restoration with diamonds and give it a true-to-nature shape and surface structure.

### Step 3: Stain/Glaze firing with IPS Ivocolor

Conduct the Stain/Glaze firing with IPS Ivocolor. Depending on the situation, they can be conducted together or one after the other (see page 35 for further details). Detailed information on IPS Ivocolor can be found in the IPS Ivocolor Instructions for Use.

The following working procedure should be observed:

- Before staining and glazing, clean the restoration with ultrasound in a water bath or using the steam jet. Any contamination after cleaning must be prevented.
- To check the shade, wet the inner aspects of the restoration with IPS Ivocolor Mixing Liquid, position the restoration on the control die, and check shade and effects.
- Like all IPS Ivocolor pastes, IPS Ivocolor Glaze Paste features a gel-type consistency and has to be mixed with the IPS Ivocolor Mixing Liquid allround or longlife before they are applied. The reduction of the gel structure and thus the stability as well as the flow and application behaviour of the glazing material can be influenced by the degree of dilution. **The following general rule applies:** Excessive dilution reduces the stability of the glazing material and the glaze might even become runny. At the same time, the degree of gloss of the fired restoration is reduced if the glazing material is applied while strongly diluted. In an undiluted state, the gel-type consistency of the pastes renders the application of an even layer difficult. However, this property may also be used for the partial accentuation of the surface.
- Apply the glazing paste in an even layer on the entire restoration.
- To intensify the dentin shade in the cervical and central crown third, mix the corresponding IPS Ivocolor Shade material with IPS Ivocolor Mixing Liquid and apply it directly into the unfired glazing material layer.
- If required characterize with IPS Ivocolor Essences. For this purpose mix IPS Essences with IPS Ivocolor Mixing Liquid or IPS Ivocolor Essence Fluid to the desired consistency.
- Secure the restoration on the firing pin of the honey-comb tray with a little IPS Object Fix Putty or Flow for firing.
- Position the loaded honey-comb firing tray in the ceramic furnace and conduct the Stain/Glaze firing.





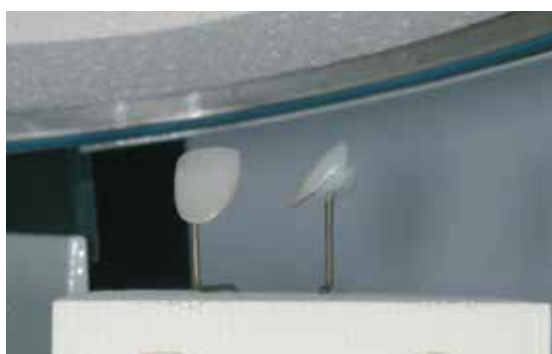
Clean the restoration with ultrasound in a water bath and/or with the steam jet.



Evenly apply the IPS Ivocolor Glaze Paste on the entire outer surfaces of the restoration.



To intensify the dentin shade in the cervical and central crown third, mix the corresponding IPS Ivocolor Shade material and apply it directly into the unfired glazing material layer.



Position the loaded honey-comb tray in the furnace and conduct the Glaze firing.



Conduct the **Stain/Glaze firing** on a suitable honey-comb firing tray using the stipulated firing parameters. **Firing parameters see page 35.**

- Remove IPS Empress CAD objects from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.
- Do not blast or quench the objects.



IPS Empress CAD cut-back and layered – the ideal combination for highly esthetic CAD/CAM-fabricated restorations

## Frequently Asked Questions

### **What CAD/CAM systems are suitable for processing IPS Empress CAD?**

*IPS Empress CAD has to be processed with an authorized CAD/CAM system. Information on cooperation partners can be found at [www.ivoclarvivadent.com](http://www.ivoclarvivadent.com).*

### **Which materials can be used to characterize IPS Empress CAD restoration if necessary?**

*Use IPS Ivocolor for characterization and glaze in the dental laboratory. Please note: IPS Empress Universal and IPS Ivocolor materials must not be mixed with each other.*

### **What possibilities are there to condition IPS Empress CAD restoration prior to adhesive cementation?**

*To prepare the IPS Empress CAD restoration for adhesive cementation, it must be conditioned. You can either use the single-component ceramic primer Monobond Etch & Prime or the combination of IPS Ceramic Etching Gel/Monobond Plus.*

### **Where can I find detailed information on the procedure for adhesive cementation?**

*Detailed information on how to adhesively cement restorations can be found in the Instructions for Use of the conditioning and luting materials in use.*

### **What firing tray must be used to conduct the Stain/Glaze firing with IPS Ivocolor?**

*A honey-comb firing tray suitable for the furnace must be used to fire IPS Ivocolor.*

### **Do IPS Empress CAD restorations require occlusal adjustment after the CAD/CAM process?**

*Use fine diamonds to smooth out possible surface structures created by the CAD/CAM process, particularly taking into account the functional occlusal areas with antagonist contact.*

### **How can the accuracy of fit of IPS Empress CAD restorations be adjusted?**

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

### **What must be considered after the firing of IPS Empress CAD?**

*In order to prevent tension within the ceramic, remove the restoration from the furnace only after the firing cycles have been completed (wait for the acoustic signal of the ceramic furnace). Allow the objects to cool to room temperature in a place protected from draft and do not touch them with metal tongs during that time. Do not blast or quench the objects.*

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

*In order to avoid a premature loss of moisture of the firing pastes, remove the syringe from the aluminium bag only directly before initial use. Close the syringe immediately after usage. If the syringe is not used for a longer period of time, it can be stored in a resealable plastic bag together with a moist paper tissue.*

### **Can IPS Empress CAD restorations also be conventionally cemented?**

**No.** *IPS Empress CAD restorations must be inserted using the adhesive cementation technique.*

## Cementation

Possibilities for esthetic cementation are decisive for the harmonious shade effect of an all-ceramic restoration.

IPS Empress CAD restorations must be inserted using the adhesive cementation technique.

For the adhesive cementation of IPS Empress CAD restorations, Variolink® Esthetic or Multilink® Automix are the ideal cementation composites depending on the indication.

### Short definition of the different cementation methods

#### – Adhesive cementation

With adhesive cementation, the bond is also created by static friction, but primarily by the chemical and/or micro-mechanical bond between the luting material and the restoration, as well as between the luting material and the preparation. Given the chemical and/or micromechanical bond, retentive preparation is not required. Depending on the cementation material, special adhesive systems are used on the preparation to establish the micromechanical bond to the dentin and/or enamel. Adhesive cementation results in enhanced “(overall) strength” of the seated all-ceramic restoration.

#### – Self-adhesive cementation

The cementation material features self-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 4 mm) is recommended. Self-adhesive cementation does not result in enhanced “(overall) strength” of the seated all-ceramic restoration.

#### – Conventional cementation

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

### Cementation recommendation depending on the indication for IPS Empress® CAD with Variolink® Esthetic or Multilink® Automix

Adhesive cementation			
Cementation material	Variolink® Esthetic LC	Variolink® Esthetic DC	Multilink® Automix
Curing method	LC – light-cure	DC – dual-cure	Self-cure with light option
<b>IPS Empress® CAD</b>			
Veneer	✓	–	–
Inlay, Onlay	✓	–	–
Partial crown	✓	–	–
Crown	✓	✓	✓

✓ Recommended product combination

– Not recommended



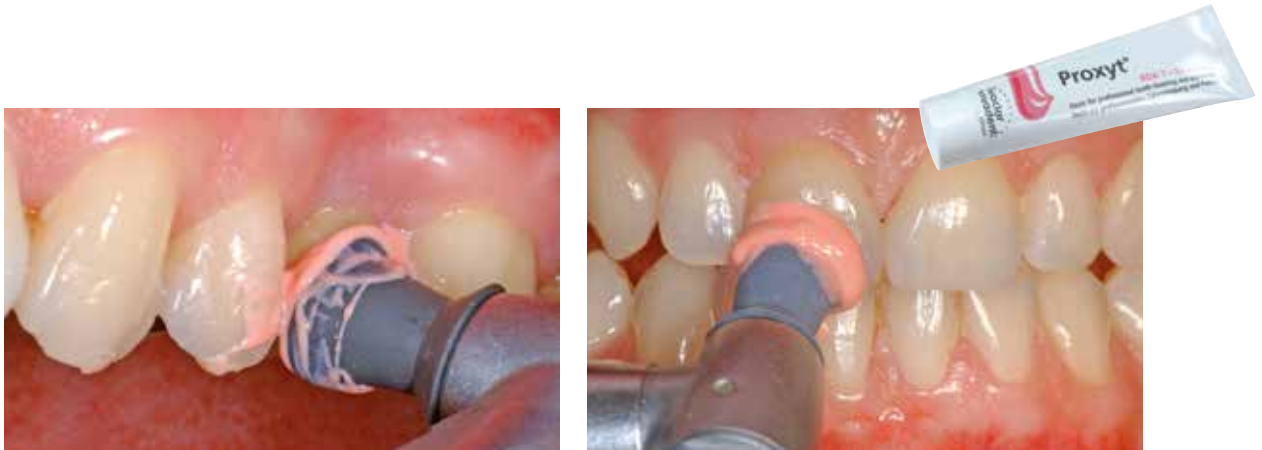
Further information on how to find the suitable cementation materials and their use can be found in the multimedia application CNS (Cementation Navigation System, Ivoclar Vivadent).



[www.cementation-navigation.com](http://www.cementation-navigation.com)

## Aftercare

Same as natural teeth, high-quality IPS Empress CAD restorations require regular professional care. This is beneficial for both the health of the gingiva and teeth, as well as the overall appearance. The pumice-free 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.


























## Shade Combination Tables

The data contained in the table are approximate values. For shades which are not available as blocks, please observe the following procedure:

- Choose the next (lighter) block shade
- Staining and intensifying of the dentin shade using IPS Ivocolor

A–D tooth shade	BL1	BL2	BL3	BL4	A1	A2	A3	A3.5	A4	B1	B2	B3	B4	C1	C2	C3	C4	D2	D3	D4
IPS Empress Esthetic Veneer Wash Paste	neutral																			
IPS Empress Esthetic Veneer Wash Paste Value	low value, high value																			
IPS Empress Esthetic Veneer Wash Paste Mamelon	MM I-s, MM Y-o, MM r-o																			
IPS Empress Esthetic Veneer Wash Paste Modifier	copper, orange, sky blue, basic yellow, basic red																			
IPS Empress Esthetic Veneer Incisal Opal	HT, MT, LT																			
IPS Empress Esthetic Veneer Transpa	T neutral, T blue																			
IPS Empress Esthetic Veneer Incisal	I white, I grey, I orange, I edge, I yellow, I orange-pink																			
IPS Empress Esthetic Veneer Incisal Chroma Modifier	110/A1, 210/A3																			
IPS Empress Esthetic Veneer Brightener	Brightener																			
IPS Ivocolor Shade Dentin																				
IPS Ivocolor Shade Incisal																				
IPS Ivocolor Shade Essence	E 01 white, E 02 creme, E 03 lemon, E 04 sunset, E 05 copper, E 06 hazel, E 07 olive, E 08 khaki, E 09 terracotta, E 10 mahogany, E 11 cappuccino, E 12 espresso, E 13 terra, E 14 profundo, E 15 ocean, E 16 sapphire, E 17 anthracite, E 18 black, E 19 rose, E 20 coral, E 21 basic red, E 22 basic yellow, E 23 basic blue																			

Chromascope	110	120	130	140	210	220	230	240	310	320	330	340	410	420	430	440	510	520	530	540
IPS Empress Esthetic Veneer Wash Paste	neutral																			
IPS Empress Esthetic Veneer Wash Paste Value	low value, high value																			
IPS Empress Esthetic Veneer Wash Paste Mamelon	MM I-s, MM Y-o, MM r-o																			
IPS Empress Esthetic Veneer Wash Paste Modifier	copper, orange, sky blue, basic yellow, basic red																			
IPS Empress Esthetic Veneer Incisal Opal	HT, MT, LT																			
IPS Empress Esthetic Veneer Transpa	T neutral, T blue																			
IPS Empress Esthetic Veneer Incisal	I white, I grey, I orange, I edge, I yellow, I orange-pink																			
IPS Empress Esthetic Veneer Incisal Chroma Modifier	110/A1, 210/A3																			
IPS Empress Esthetic Veneer Brightener	Brightener																			
IPS Ivocolor Shade Dentin																				
IPS Ivocolor Shade Incisal																				
IPS Ivocolor Shade Essence	E 01 white, E 02 creme, E 03 lemon, E 04 sunset, E 05 copper, E 06 hazel, E 07 olive, E 08 khaki, E 09 terracotta, E 10 mahogany, E 11 cappuccino, E 12 espresso, E 13 terra, E 14 profundo, E 15 ocean, E 16 sapphire, E 17 anthracite, E 18 black, E 19 rose, E 20 coral, E 21 basic red, E 22 basic yellow, E 23 basic blue																			

## Firing Parameters

- Use a honey-comb firing tray to fire IPS Empress CAD restorations.
- Place all restorations on the metal pins suitable for the honey-comb firing tray and position them on the honey-comb firing tray.
- To secure the restorations on the metal pins, a small amount of IPS Object Fix can be used. Inner surfaces must not be entirely filled.
- The firing temperatures must be observed at all times. An increase in the firing temperature results in severe vitrification between the framework and the veneering ceramic, which may lead to delayed cracks.
- A decrease in the firing temperature causes the ceramic to be underfired and very brittle, which may lead to delamination.
- The parameters stipulated in the Instructions for Use are coordinated with Ivoclar Vivadent furnaces (tolerance range +/- 10 °C).
- When using IPS Empress Add-On 770°C, a ceramic furnace with vacuum function must be used.
- Remove IPS Empress CAD objects from the furnace after completion of the firing cycle (wait for the acoustic signal of the furnace).
- Allow the objects to cool to room temperature in a place protected from draft.
- Do not touch the hot objects with metal tongs.
- Do not blast or quench the objects.



**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.



### Firing parameters for the staining technique

with IPS Ivocolor Shade, Essence, Glaze



	Furnaces Programat	Stand-by temperature B [°C]	Closing time S (min)	Heating rate t <sub>1</sub> [°C/min]	Firing temperature T <sub>1</sub> [°C]	Holding time H <sub>1</sub> (min)	Heating rate t <sub>2</sub> [°C/min]	Firing temperature T <sub>2</sub> [°C]	Holding time H <sub>2</sub> (min)	Vacuum 1 1 <sub>1</sub> [°C] 2 <sub>1</sub> [°C]	Vacuum 2 1 <sub>2</sub> [°C] 2 <sub>2</sub> [°C]	Long-term cooling L [°C]	Cooling rate t <sub>1</sub> [°C/min]
Stain/ Glaze firing IPS Ivocolor	P300 P500 P700	403	06:00	60	710	01:00	–	–	–	450/709	–	0	0
Corrective firing IPS Empress Add-on	P310 P510 P710	403	04:00	60	770	02:00	–	–	–	450/769	–	0	0

### Firing parameters for the cut-back technique

with IPS Empress Esthetic Veneer, IPS Ivocolor Shades, Essences, Glaze



	Furnaces Programat	Stand-by temperature B [°C]	Closing time S (min)	Heating rate t <sub>1</sub> [°C/min]	Firing temperature T <sub>1</sub> [°C]	Holding time H <sub>1</sub> (min)	Heating rate t <sub>2</sub> [°C/min]	Firing temperature T <sub>2</sub> [°C]	Holding time H <sub>2</sub> (min)	Vacuum 1 1 <sub>1</sub> [°C] 2 <sub>1</sub> [°C]	Vacuum 2 1 <sub>2</sub> [°C] 2 <sub>2</sub> [°C]	Long-term cooling L [°C]	Cooling rate t <sub>1</sub> [°C/min]
Wash firing	P300 P500 P700 P310 P510 P710	403	04:00	60	840	02:00	–	–	–	450/839	–	0	0
1 <sup>st</sup> /2 <sup>nd</sup> Incisal/Transpa firing		403	04:00	60	830	02:00	–	–	–	450/829	–	0	0
Stain firing IPS Ivocolor		403	06:00	60	710	01:00	–	–	–	450/709	–	0	0
Glaze firing IPS Ivocolor		403	06:00	60	710	01:00	–	–	–	450/709	–	0	0
Corrective firing IPS Empress Add-On		403	04:00	60	770	02:00	–	–	–	450/769	–	0	0

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