Technical Guide

IPS InLine®

Metal-ceramic materials
for more flexibility in your lab

Making People Smile

ivoclar

IPS InLine®

With the IPS InLine metal-ceramic, you will have the flexibility required for today's everyday laboratory work - from simple layering up to customized esthetic veneers. IPS InLine permits the fabrication of restorations shaded according to A-D and Bleach shade guides.

After the application of the paste opaquer or powder opaquer, you can choose the product and corresponding processing procedure according to your personal preferences and the type of restoration you are fabricating:

- ✓ **IPS InLine One:** Straightforward one-layer ceramic for quick and efficient layering
- ✓ **IPS InLine:** Conventional metal-ceramic for traditional, individualized layering using the multiple-layer technique

Please observe the regulatory Instructions for Use (www.ivoclar.com/eIFU).

IPS InLine

IPS InLine One for the one-layer technique	IPS InLine for the multi-layer technique
IPS InLine System Opaquer (Paste) IPS InLine System Oqaquer Liquid (Paste) IPS InLine System Powder Opaquer IPS InLine System Powder Opaquer Liquid	
IPS InLine One Dentcisal	IPS InLine Margin IPS InLine Deep Dentin IPS InLine Dentin IPS InLine Transpa Incisal IPS InLine Add-On
	IPS InLine Impulse IPS InLine Gingiva
IPS InLine Margin Build-Up Liquid IPS InLine System Build-Up Liquid L/P	
IPS Ivocolor Essence / Shade / Glaze	
IPS InLine System Add-On (690°C/1274°F)	

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Explanation of symbols

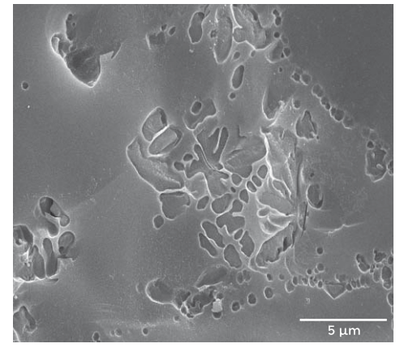
Symbol	Explanation
	Important
	Information
	Tips and tricks
	Note on firing
	See Instructions for Use

Product information

IPS InLine®

Material

IPS InLine is a ceramic veneering material containing leucite. It is suitable for the fabrication of metal-ceramic restorations at firing temperatures higher than 900 °C (1652 °F). With IPS InLine, alloys in the CTE range of 13.8–15.0 x 10^{-6}/K (25–500 °C) can be veneered, irrespective of the metal composition. These ceramics are based on leucite-forming glasses, some of which are produced from naturally sourced, raw feldspar materials. Given their composition, they demonstrate excellent chemical resistance. With the corresponding mixture and targeted heat treatment of these glasses, leucite crystals with a defined grain size distribution are released in the glass matrix. This gives the veneering material a homogeneous structure, which is not only extremely gentle to antagonists, but also provides the high strength and convincing optical properties of the IPS InLine veneering ceramic materials.



Types of restorations

- Crowns
- 3- to 14-unit bridges
- Veneers

Techniques

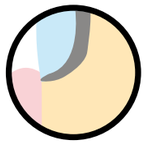
- Characterization with IPS Ivocolor Shade and Essence
- Glazing with IPS Ivocolor Glaze

Practical procedure

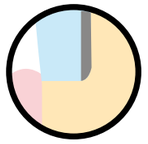
Preparation guidelines and minimum thicknesses

The preparation must provide sufficient space in order to achieve stable and esthetic metal-ceramic restorations.

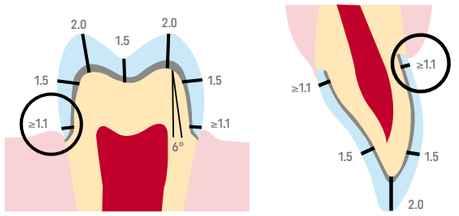
For the IPS InLine veneering ceramic, the usual preparation guidelines for metal-ceramics apply.
As usual for metal-supported restorations, dentists may use a conventional cementation protocol.



A chamfer preparation is suitable for tapered metal margins.



For esthetically pleasing single crowns and bridge abutment crowns, a ceramic margin should be provided. For that purpose, a shoulder preparation is recommended. With adhesive cementation, the margin can be designed in the ceramic. However, the margin should not be bevelled in such cases, since thinly tapering, non-metal-supported margins demonstrate a fracture risk.



Example of a preparation; dimensions in mm

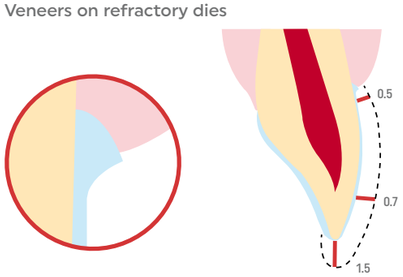
Minimum dimensions for metal frameworks:
– Crowns min. 0.3 mm
– Bridge abutments min. 0.5 mm

Minimum ceramic layer thickness:
– IPS InLine min. 0.8 mm

Maximum layer thickness of the ceramic:
– IPS InLine max. 1.7 mm

– With conventional cementation, a minimum height of 3 mm of the prepared tooth and a convergence angle of approx. 6° must be observed.
– The minimum connector dimensions must be observed for bridge restorations. The connector dimensions depend on the selected alloy and the pontic width (see framework design criteria).

Veneers on refractory dies



– If possible, the preparation margins of veneers should be entirely in the enamel. The incisal preparation margins should not be located in the area of the abrasion surfaces or dynamic occlusal surfaces. Prepare a chamfer in the cervical area.
– Please observe the required minimum thickness of 0.5 mm.

Practical procedure

Framework fabrication and preparation

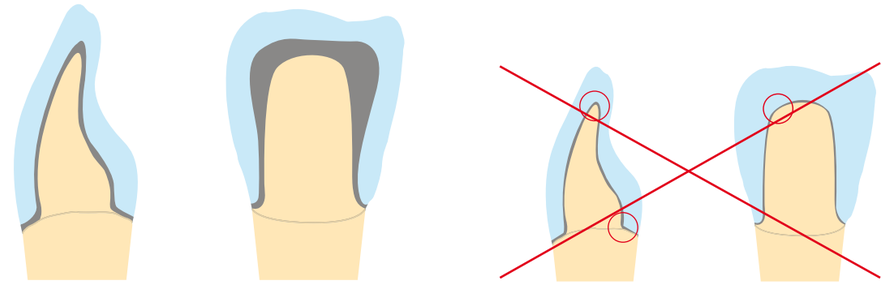
Framework design criteria

The framework design is key to the success of durable metal-ceramic restorations. The more attention is given to the framework design, the better the final results and the clinical success will turn out to be.

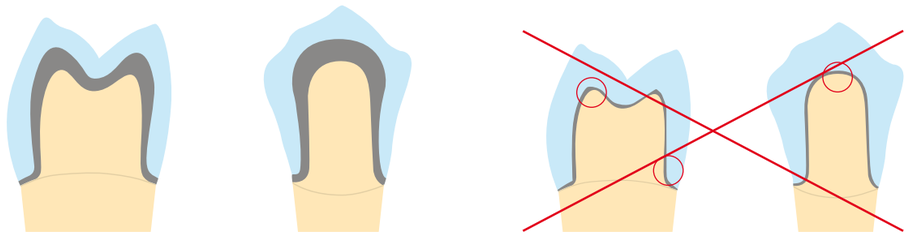
Functional support of the veneering ceramic

The framework reflects the shape of the tooth in a reduced form. It should be designed in such a way that it supports the cusps and incisal edges resulting in a virtually even layer thickness of the veneering ceramic in the cusp-fissure area. In this way, the masticatory forces occurring during functional chewing are exerted on the framework rather than on the veneering ceramic. Therefore, the framework must not show any angles and edges (see diagram) so that the masticatory forces do not result in tension peaks, which may cause delamination and cracks. Any sharp angles or edges should be removed in the wax-up rather than grinding the metal framework. The wall thickness of the metal framework for single crowns must not be less than 0.3 mm and for bridge abutments 0.5 mm after finishing (see diagram).
For further information, please refer to the Instructions for Use of the corresponding alloy.

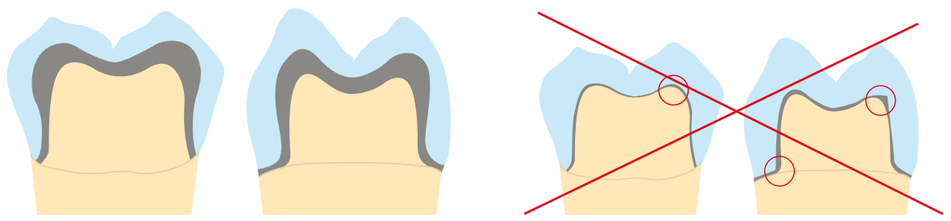
Anterior crowns



Premolar crowns

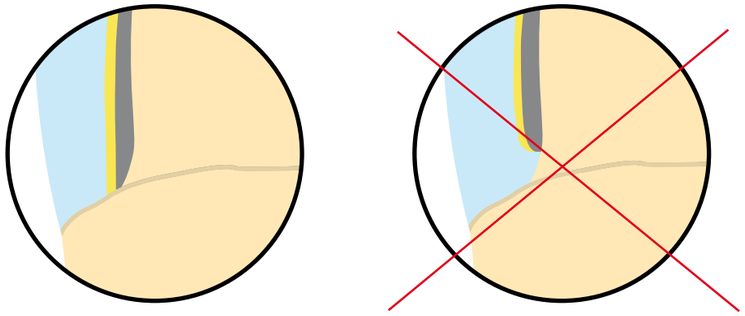


Molar crowns



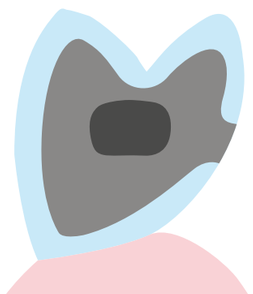
Framework design for fired ceramic margins

With fused ceramic margins, make sure that the framework rather than the veneer is supported by the prepared tooth. The framework is thus reduced exactly to the inner edge of the chamfer or shoulder preparation. In this way, functional support of the framework on the preparation is achieved. Excellent accuracy of fit on the preparation is essential to ensure that the Margin material may not reach the inner aspects of the framework during subsequent application.

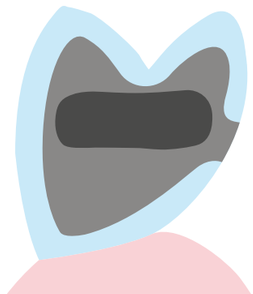


Framework stability

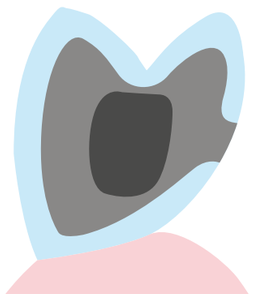
The dimensions and shape of the interdental connector surfaces decisively influence the stability of the restoration during processing, as well as the clinical long-term success after incorporation. Therefore, the dimensions of the interdental connector surface must be designed in accordance with the alloy used (take 0.2% proof stress into account)! The thermal behaviour of the selected alloy during processing has to be considered when designing the framework.



Single connector width
= single stability



Double the width of the connector
= double the stability



Double the height of the connector with single width
= eightfold stability

Framework design for bridges

Thermal stress during firing and masticatory forces after cementation affect metal frameworks. Therefore, these forces must be transferred to the framework rather than the veneer. Particularly in the connector areas between bridge abutments and bridge pontics in bridge reconstructions, the stability must be ensured with the help of the framework design and adequate framework material thickness. The framework design and framework thickness must therefore meet all the optical and functional requirements, as well as the aspects of periodontal hygiene. A full wax-up (analog or digital) with the corresponding reduction of the ceramic provides the best restoration framework.

During veneering with ceramic materials, the bridge framework is exposed to high temperatures several times. With an inappropriate framework design or insufficient framework thickness, the high temperatures during firing may result in distortion or inaccuracy of fit of the framework. A collar margin design with e.g. interproximal reinforcements, counteracts this development. Additionally, this framework design (e.g. with cooling grooves) ensures more even cooling of the restoration during the cooling phase. This is particularly important if high gold alloys are used.

In order to enable optimum oral hygiene with bridge restorations, the design of the interdental spaces should be given special attention. Adequate opening of the interdental area without creating black triangles should be considered when designing the framework in order to ensure proper periodontal hygiene with interdental brushes and dental floss.

Design of bridge pontics

Bridge pontics are designed taking esthetic and functional aspects into account, as well as oral hygiene. The area of the pontic that contacts the alveolar ridge should be made of ceramic.

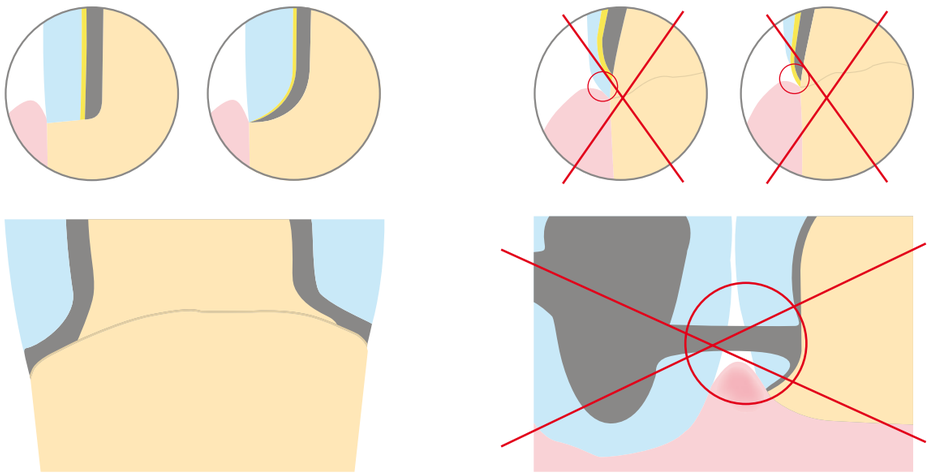
In order to ensure adequate stability between the bridge pontic and the bridge abutments, a palatal and/or lingual collar is recommended. Furthermore, to ensure even cooling of the bridge pontic that absorbs the most heat, additional cooling grooves are advantageous.

Design of the bridge pontic – ovate pontic

Design of the bridge pontic – saddle-type pontic

Transition between metal and ceramic

The transition between the metal framework and the veneering ceramic must be clearly defined. If possible, incorporate a right angle finish line. The junctures between the metal framework and the veneering ceramic must not be located in the contact area nor on surfaces involved in masticatory functions. The transition in the interdental area should be designed in such a way that cleaning of these difficult-to-access areas is possible.



Holding pins

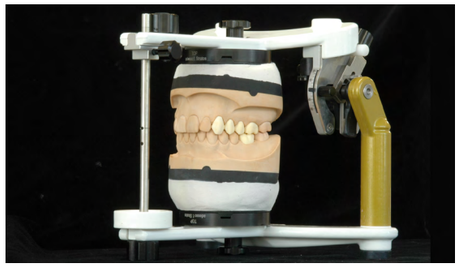
In order not to damage the crown margin during processing, the crown and bridge frameworks are provided with holding pins. These holding pins are either created in wax or in the CAD software and attached to the framework. Dimensions of Ø 0.5–1.0 mm for the holding pins have proven to be useful. They can be used to secure the framework by means of holding clips. Furthermore, the holding pins also act as cooling grooves during casting and firing.

The holding pins must be placed in such a way that they do not interfere during try-in or in the articulator. They should only be removed without causing overheating once the restoration has been completed.

Please refer to the "Framework design manual for metal-ceramic restorations" for additional information on framework design. The manual is available available in the download centre at www.ivoclar.com or can be ordered from your Ivoclar contact.

Framework fabrication

Starting situation



Maxillary and mandibular model articulated in the "Stratos 200"

Starting situation for metal-supported IPS InLine restorations

Framework design

Design the framework with a reduced anatomical shape taking the planned layering into account. The wall thickness should be at least 0.3 mm for single crowns and at least 0.5 mm for abutment crowns. Make sure to provide sufficient stability of shape for the framework. Avoid sharp transitions and edges. Design the connector areas between the individual units in such a stable way that they meet the requirements for interdental hygiene and the alloy used.

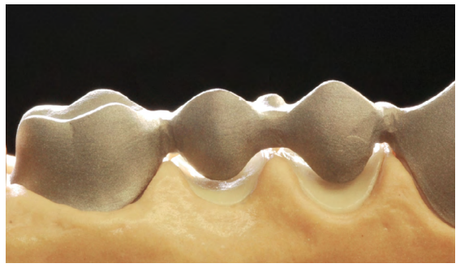
The framework is designed according to the indicated framework design criteria either conventionally in wax or digitally on the computer.

- Undersized metal frameworks result in increased shrinkage of the veneering ceramic and require additional corrective firings.
- If the metal framework is too small, the veneering ceramic is not adequately supported, which may lead to cracks and delamination, particularly with very thick ceramic layers.
- When selecting the alloy, the CTE range of IPS InLine must be considered.

Framework preparation

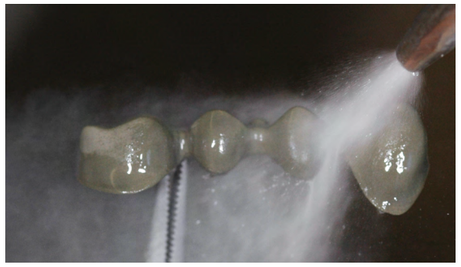
Finishing the metal framework / Oxide firing

The framework is finished using tungsten carbide burs or ceramic-bonded grinding instruments.

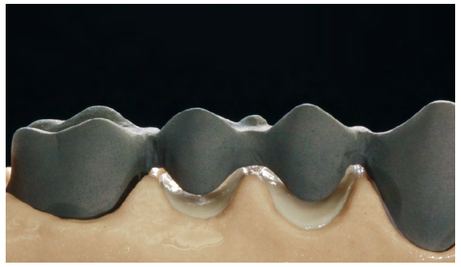


Carefully blast the framework with aluminium oxide Al_2O_3 50–100 µm (observe the instructions of the alloy manufacturer).

In order to prevent inclusions of jet medium particles, we recommend blasting the alloy at the pressure indicated by the alloy manufacturer while keeping the nozzle at a flat angle to the object surface. A contaminated metal surface may result in the formation of bubbles in the ceramic material during firing.



After blasting, clean the metal framework with a steam jet and allow to dry thoroughly. Conduct the Oxide firing according to the instructions of the manufacturer.

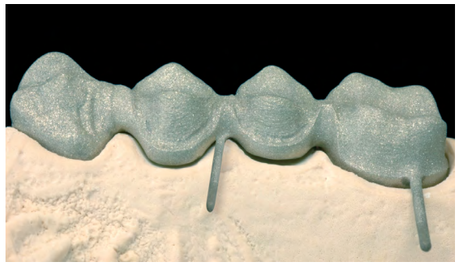


After the Oxide firing, the framework should exhibit an evenly oxidized surface.

Further processing to create a ceramic margin

To apply a ceramic margin, reduce the marginal area of the framework (labial or circular) to the inner angle of the chamfer or shoulder preparation.






Please observe the Instructions for Use of the respective alloy.

- Work in one direction only to avoid overlapping and inclusions in the metal surface.
- Do not use diamond grinding instruments. Diamond particles may be trapped in the alloy and cause bubbles in the ceramic material during firing.
- Use only pure Al_2O_3 as a disposable blasting medium to blast the alloy surface.

The surface enlargement and microretentions achieved by blasting will improve the mechanical retention and thus the quality of the restoration.

Practical procedure

Ceramic layering and processing

IPS InLine offers two ways of applying the opaquer. The completed framework can either be coated with the IPS InLine System Powder Opaquer, or as an option, the IPS Inline System Opaquer paste can be used. The powder opaquer can either be applied conventionally with a brush, or it can be applied using the spray-on technique. The paste opaquer is applied directly, as it is ready for use.

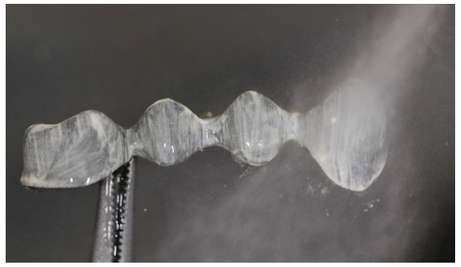
1st Paste Opaquer firing (Wash firing)

Select the IPS InLine System Opaquer paste in the corresponding tooth shade. If required, homogenize the opaquer paste by agitating it before taking it from its container. Extrude the desired amount from the syringe or jar and mix thoroughly on the mixing pad. Thin it, if required.

1st Powder Opaquer firing (Wash firing)

Select the IPS InLine System Powder Opaquer in the corresponding tooth shade. Remove the amount of powder opaquer required for the Wash firing from the container and mix it to the desired consistency with the **IPS InLine System Powder Opaquer Liquid** on a mixing pad.

Apply the first opaquer layer thinly and agitate it into the alloy surface. After having fired and cooled the opaqued metal framework, clean it thoroughly and then dry with oil-free air.

The consistency of the paste opaquer can be individually adjusted using the IPS InLine System Opaquer Liquid.

2nd Opaquer firing

Apply the second opaquer layer in an even, covering layer. After firing, the IPS InLine System Opaquer (paste) and the IPS InLine System Powder Opaquer should show a covering, silky-mat shiny surface. After the Opaquer firing, the conditioned surfaces of the alloy framework must be entirely covered with opaquer.

2nd Opaquer firing (individualization with IPS InLine System Intensive Opaquer)

During the second Opaquer firing, users have the possibility of customizing the opaquer layer by using the intensive opaquer.

IPS InLine® System Opaquer F

The Opaquer F can be used to intensify the in-depth fluorescence.

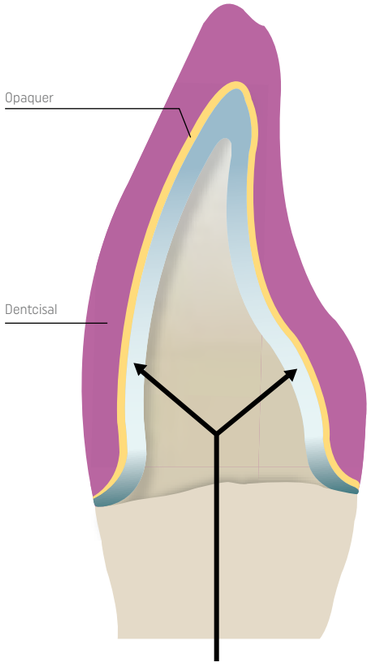
- **Either** apply Opaquer F as a thin **third** opaquer layer and fire (930°C/1706°F).
- **Or:** Mix up to 20% of Opaquer F with the conventional IPS InLine System Opaquer before applying the second layer and fire at 930 °C/1706 °F.

The firing tray with the opaqued metal framework should only be placed in the firing chamber / removed from the firing chamber after firing once the furnace head is completely open and the beeper has sounded.

Firing parameters for the 1st and 2nd Opaquer firing see page 35.

IPS InLine® One – One-layer technique

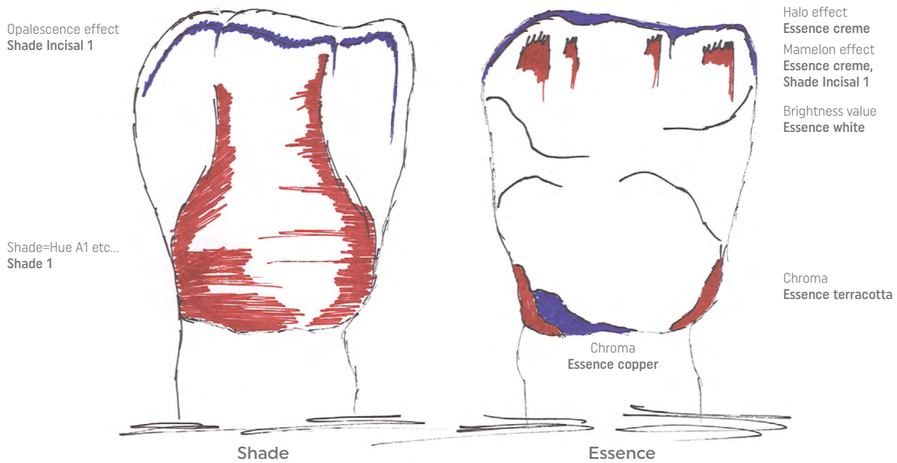
Layering diagram



Metal framework thickness:
– Crowns min. 0.3 mm
– Bridge abutments min. 0.5 mm

	Ideal layer thickness	Low layer thickness
Framework	**0.3–0.5 mm**	**0.3–0.5 mm**
Opaquer	**0.1 mm**	**0.1 mm**
Dentcisal		
Cervical	**0.8 mm**	**0.5 mm**
Incisal	**1.5 mm**	**0.8 mm**

To enhance the chroma in thin layers, IPS InLine Deep Dentin in the corresponding opaquer shade may be thinly applied on the opaquer.



Depending on the desired individualization, IPS Ivocolor Essences/Shades can be used to achieve true-to-nature shade effects.

1st Dentcisal firing

Isolate the model before layering the Dentcisal material. In this way, the ceramic material is prevented from drying out or sticking to the model. Isolate the plaster die and the adjacent areas using IPS Model Sealer. Additionally, isolate the area of the pontics with IPS Ceramic Separating Liquid.

To achieve an optimum bond between the ceramic material and the opaquer surface, apply a small amount of IPS InLine One Dentcisal material to the cervical and interdental areas (for bridges) and slightly roughen it.

Make sure that the restoration is slightly overcontoured so that the actual tooth shape is achieved after firing. After lifting the bridge off the model, supplement the contact points with Dentcisal material. Before firing, separate the entire interdental area down to the opaquer.

Densify the ceramic surface (after contouring) with a large, dry brush toward the cervical margin before firing.

The ceramic material is applied according to the individual situation.

For an optimum firing result, the interdental areas must be separated down to the opaquer.

Restoration after the 1st Dentcisal firing

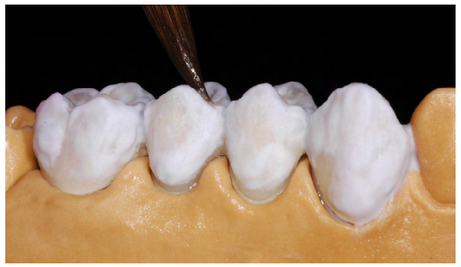
– Use distilled water to rewet the mixed or even already applied layering material.
– The firing tray with the restoration should only be placed in the firing chamber / removed from the firing chamber after firing once the furnace head is completely open and the beeper has sounded.

Firing parameters for the 1st Dentcisal firing see page 35.

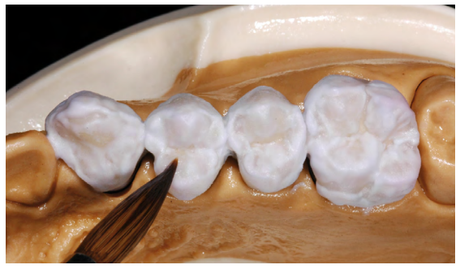
2nd Dentcisal firing

Finish and thoroughly clean the restoration. Clean under running water or with the steam jet. Blasting the restoration with Al_2O_3 (50 µm) at 1 bar (15 psi) pressure is only necessary if there is superficial contamination after cleaning. Thoroughly dry the restoration and complete the missing areas. Pay special attention to interdental spaces, as well as to contact points.

Place the completely layered restoration on the firing tray and ensure adequate support. The firing tray with the restoration should only be placed in the firing chamber once the furnace head is completely open and the beeper has sounded. Use the firing parameters stipulated below to fire the restoration.



Supplementing the restoration with Dentcisal material



Final design of the occlusal surface

– Use distilled water to rewet the mixed or even already applied layering material.
– The firing tray with the restoration should only be placed in the firing chamber / removed from the firing chamber after firing once the furnace head is completely open and the beeper has sounded.

Firing parameters for the 2nd Dentcisal firing see page 35.

Individual finishing

Preparing for Stain and Glaze firing

Before the Stain and Glaze firing, the restoration has to be prepared as follows:

- Finish the restoration using diamonds and give it a true-to-nature shape and surface texture, such as growth lines and convex/concave areas.
- Areas which should exhibit a higher gloss after glaze firing (e.g. pontic rests) can be smoothed out and prepolished using silicone discs.
- If gold and/or silver dust was used to design the surface texture, the restoration has to be thoroughly cleaned with steam. Make sure to remove all gold or silver dust in order to avoid any discolouration after firing.

The true-to-nature shape and surface texture are designed.

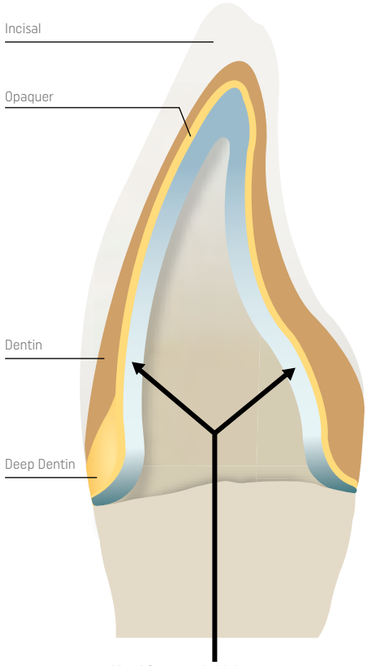
Make sure that the surface of the IPS InLine ceramic is not too glossy before applying the glazing paste. If the ceramic surface is too glossy, the glazing paste may flow off and penetrate the indentations in the ceramic surface (e.g. interdental areas). Slight blasting of the ceramic surface with e.g. 50 µm aluminium oxide supports wetting of the ceramic surface with glazing paste and thus has a positive effect.

The procedure for the Stain firing and Characterization firing as well as the Glaze firing are described in the chapter "Finishing" (see page 30).

Individually designed and characterized bridge made of IPS InLine One

IPS InLine® – Standardized individual layering technique

Layering diagram



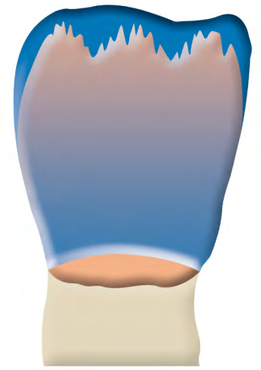
Metal framework thickness:
– Crowns min. 0.3 mm
– Bridge abutments min. 0.5 mm

	Ideal layer thickness	Low layer thickness
Framework	0.3–0.5 mm	0.3–0.5 mm
Opaquer	0.1 mm	0.1 mm
Deep Dentin		
Cervical	–	0.3 mm
Incisal	–	0.1 mm
Dentin		
Cervical	1.0 mm	0.5 mm
Incisal	0.7 mm	0.3 mm
Incisal		
Cervical	0.2 mm	0.3 mm
Incisal	0.5 mm	0.1 mm

These figures are drawn from past experience and they may vary in certain situations.

Depending on the clinical situation or the selected shade system (A-D and Bleach), various components may be used to achieve targeted shade effects.

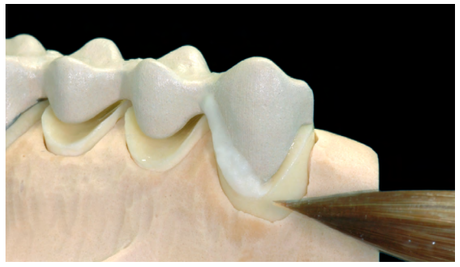
The Incisal materials in A–D shades are applied up to the centre of the cervical third.



1st and 2nd Margin firing

A ceramic margin can be fabricated on the metal framework after the Oopaquer firing, if the necessary space has been provided during finishing. Before creating the ceramic margin, seal the plaster die with IPS Margin Sealer and then, after drying, with IPS Ceramic Separating Liquid.

After that, the IPS Margin material in the respective shade is generously applied in drop-shaped increments in the cervical area (i.e. the outer surface of the ceramic is given a convex design) and dried. Then, carefully remove the framework with the dried Margin material from the die.



When designing a ceramic margin (particularly for bridges), the Margin material may be applied slightly higher up in the proximal areas. This will reduce the interdental shrinkage during the subsequent Dentin and Incisal firings.

After firing, the margin may have to be slightly adjusted by grinding in order to remove any interfering areas. Then, the accuracy of fit of the margin has to be optimized with a second Margin firing (sinter shrinkage). Use the same Margin materials as for the 1st Margin firing for that purpose.
First, however, seal the die again using IPS Ceramic Separating Liquid. Subsequently, supplement the missing areas by carefully inserting the Margin material into the gap created during the 1st Margin firing, so that the ceramic margin is provided with optimum accuracy of fit. Complete the margin, dry, and carefully remove the framework with the completed and dried Margin material from the die and place it on the firing tray.

Firing parameters for the 1st and 2nd Margin firing see page 35.

1st Dentin and Incisal firing

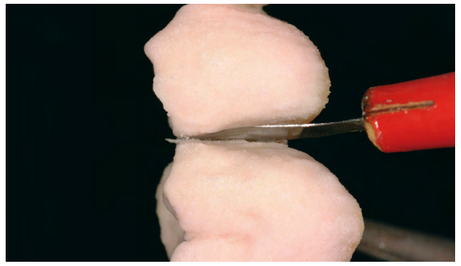
Isolate the model before layering the Dentin and Incisal materials. In this way, the ceramic material is prevented from drying out or sticking to the model. Isolate the plaster die and the adjacent areas using IPS Model Sealer. Additionally, isolate the area of the pontics with IPS Ceramic Separating Liquid.

To achieve an optimum bond between the ceramic material and the opaquer surface, apply a small amount of IPS InLine Deep Dentin or Dentin material to the cervical and interdental areas (for bridges) and slightly roughen it. In this way, the adaptation of the ceramic material on the opaquer surface is enhanced.

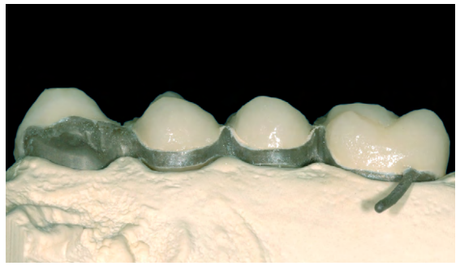
Make sure that the restoration is slightly overcontoured so that the actual tooth shape is achieved after firing. The bridge/crown is lifted off the model to supplement the contact points with Dentin and Incisal materials. Before firing, separate the entire interdental area down to the opaquer.

Densify the ceramic surface (after contouring) with a large, dry brush toward the cervical margin before firing.

The ceramic material is applied according to the layering diagram.



For an optimum firing result, the interdental areas must be separated down to the opaquer.



Restoration after the 1st Dentin / Incisal firing

- **Use distilled water to rewet the mixed or even already applied layering material.**
- **The firing tray with the restoration should only be placed in the firing chamber / removed from the firing chamber after firing once the furnace head is completely open and the beeper has sounded.**

Firing parameters for the 1st Dentin and Incisal firing see page 35.

2nd Dentin and Incisal firing

Finish and thoroughly clean the restoration. Clean under running water or with the steam jet. Blasting the restoration with Al_2O_3 (50 µm) at 1 bar (15 psi) pressure is only necessary if there is superficial contamination after cleaning. Thoroughly dry the restoration and complete the missing areas. Pay special attention to interdental spaces, as well as to contact points.
Place the completely layered restoration on the firing tray and ensure adequate support. Use the firing parameters stipulated below to fire the restoration.

Supplementing the restoration with Dentin and Incisal materials

Final design of the occlusal surface

– Use distilled water to rewet the mixed or even already applied layering material.
– The firing tray with the restoration should only be placed in the firing chamber / removed from the firing chamber after firing once the furnace head is completely open and the beeper has sounded.

Firing parameters for the 2nd Dentin and Incisal firing see page 35.

Corrective firings (Add-On)

Margin Add-On firing

Margin Add-On is an add-on material for the ceramic margin area, which is applied after the main or add-on firing cycles with Dentin and Incisal materials. Thus, it is possible to correct minor inaccuracies of the marginal shoulder. Subsequently, the restoration is completed as usual with the IPS Ivocolor Essences/Shades and Glazes using lower firing temperatures.

Firing parameters for the Margin Add-On firing see page 35.

Add-On firing

Before the completion of a restoration, small adjustments, such as contact points, pontic rests, shoulder adjustments, may be necessary. In order to employ a lower firing temperature, IPS InLine Dentin/Incisal materials can be mixed with IPS InLine Add-On in a 1:1 ratio and subsequently applied.

Firing parameters for the Add-On firing see page 35.

Individual finishing

Preparing for Stain and Glaze firing

Before the Stain and Glaze firing, prepare the restoration as follows:
– Finish the restoration using diamonds and give it a true-to-nature shape and surface texture, such as growth lines and convex/concave areas.
– Areas which should exhibit a higher gloss after Glaze firing (e.g. pontic rests) can be smoothed out and prepolished using silicone discs.
– If gold and/or silver dust was used to design the surface texture, the restoration has to be thoroughly cleaned with steam. Make sure to remove all gold or silver dust in order to avoid any discolouration after firing.

The true-to-nature shape and surface texture are designed.

Make sure that the surface of the IPS InLine ceramic is not too glossy before applying the glazing paste. If the ceramic surface is too glossy, the glazing paste may flow off and penetrate the indentations in the ceramic surface (e.g. interdental areas). Slight blasting of the ceramic surface with e.g. 50 µm aluminium oxide supports wetting of the ceramic surface with glazing paste and thus has a positive effect.

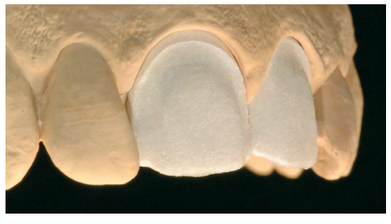
The procedure for the Stain firing and Characterization firing as well as the Glaze firing are described in the chapter "Finishing" (see page 30).

IPS InLine® veneers

The following chapter shows the step-by-step layering of veneers on refractory dies.

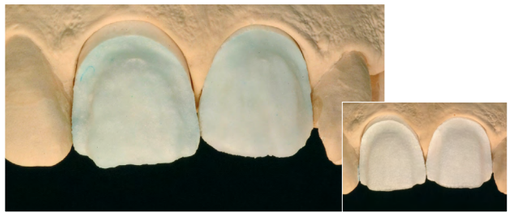
The refractory die model must be soaked in distilled water for approximately 5–10 minutes before each working step.

For the veneer fabrication, smaller working steps and several intermediate firing cycles are recommended.



Model fabrication

Fabricate a duplicate model using a commercially available refractory die material, e.g. BegoForm® from Bego (observe the instructions of the manufacturer).
Important: Correct processing and properly degassed dies are an important prerequisite for accurately fitting veneers.



Wash firing

After degassing the refractory dies, apply IPS InLine Add-On mixed with the IPS InLine Mixing Liquid allround in a thin layer and fire.

Firing parameters for the Wash firing see page 35.

Cervical firing

Build up the marginal areas using a mixture of IPS InLine Dentin and, for example, Occlusal Dentin brown.

Firing parameters for the Cervical firing see page 35.

Dentin/Impulse firing

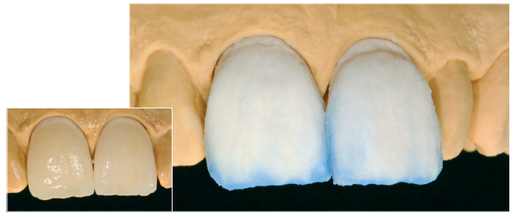
Internal layering is performed based on the natural model and consists of a dentin build-up and various effects.
Individual layering with the Impulse materials enables mamelons, opalescent and translucent effects to be achieved.

Firing parameters for the Dentin/Impulse firing see page 35.

Incisal firing

Subsequently, build up the outer enamel layer and fire.

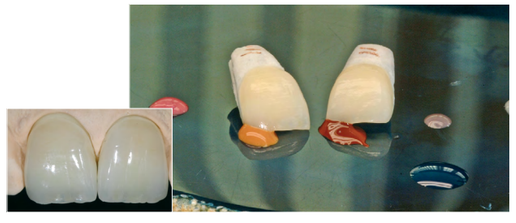
Firing parameters for the Incisal firing see page 35.



Glaze firing

Apply IPS Ivocolor Glaze to the surface and fire.

Firing parameters for the Glaze firing see page 35.



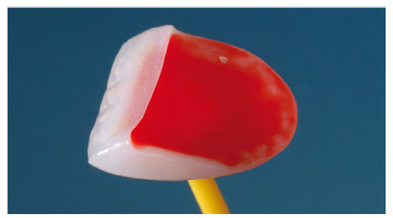
The procedure for the Stain firing and Characterization firing as well as the Glaze firing are described in the chapter "Finishing" (see page 30).

Divesting the veneers

Remove large amounts of die material using a grinding disc. Fine divestment is carried out with polishing beads at max. 1 bar (14.5 psi) pressure.

Conditioning the veneer for adhesive cementation

Etch the inner aspect of the veneer with IPS Ceramic Etching Gel for 120 seconds in preparation for adhesive cementation. Next, thoroughly rinse the object under running water and dry.
Important: IPS InLine veneers must be seated using the adhesive technique.



For information about the use of IPS Ceramic Etching Gel please refer to the Instructions for Use.

Completion

IPS Ivocolor®

IPS Ivocolor is a universal stains and glaze assortment for the individualized staining and characterization of ceramic materials. The range of products has been coordinated with the layering, press and CAD ceramics as well as the ziconium oxide materials from Ivoclar and can be used regardless of the CTE of the ceramic.

The composition of the pastes was optimized with regard to the application behaviour and the firing results. The gel-type structure of the pastes can be optimally adjusted to the desired consistency for the application by adjusting of the degree of dilution. It thus provides individual solutions with regard to the surface texture and the degree of gloss of the restoration.

From surface staining to the shading of layering materials – IPS Ivocolor enables you to achieve brilliant, esthetic restorations.

Mixing ratio: IPS Ivocolor Essence powders are intensively stained. Only small amounts must be added to the respective carrier material (max. 5%).

For detailed information about the use of PS Ivocolor Glazes, Shades and Essences, please refer to the IPS Ivocolor Instructions for Use.

Stain and Characterization firing

IPS Ivocolor Shade

IPS Ivocolor Shade pastes are used to tint the shades of ceramic materials. They are preferably used for surface staining.

Thoroughly clean the restoration with the steam cleaner and dry with oil-free compressed air.

Dispense the desired quantity of IPS Ivocolor Shade and dilute and mix it to the desired consistency with IPS Ivocolor Mixing Liquid allround or longlife.

Apply IPS Ivocolor Shade in the cervical or body area and check the shade adjustment achieved with the help of the shade guide.

If only minor shade adjustments are required, they may be applied during the glaze firing cycle. For larger shade adjustments, we recommend conducting a Stain firing cycle before Glaze firing.

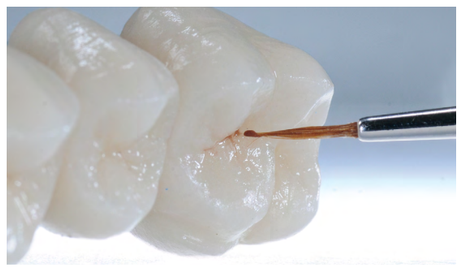
IPS Ivocolor Essence

IPS Ivocolor Essence powders are used for individual characterization. In this chapter, the superficial staining with IPS Ivocolor Essences is addressed. For more detailed information about the use of IPS Ivocolor Essence powders, please refer to the IPS Ivocolor Instructions for Use.

Thoroughly clean the restoration with the steam cleaner and dry with oil-free compressed air.

Dispense the desired quantity of IPS Ivocolor Essence and mix it to the desired consistency with IPS Ivocolor Mixing Liquid allround or longlife or Essence Fluid.

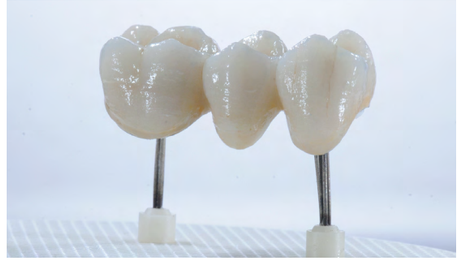
Subsequently, apply individual characterizations, such as discolourations or ...



... white spots to the ceramic surface.

These stains may be fired in a separate Stain firing cycle (firing parameters see page 35).

If only minor shade adjustments and individualized characterizations are applied, however, the materials may be fired together with the Glaze.



- **Pooling should be avoided and the material must not be applied too thickly.**
- **More intensive shades are achieved by several staining procedures, not by applying thicker layers.**
- **If the desired shade is not achieved, an additional Stain firing cycle is conducted using the same firing parameters.**
- **IPS Ivocolor Shade and IPS Ivocolor Essence may be mixed with each other. Only IPS Ivocolor Mixing Liquids allround/longlife must be used to adjust the consistency.**

Glaze firing using IPS Ivocolor

Firing of the glazing material

Thoroughly clean the restoration with the steam cleaner and dry with oil-free compressed air. Dispense IPS Ivocolor Glaze Powder/FLUO or Glaze Paste/FLUO onto a mixing pad and slightly dilute and mix it with IPS Ivocolor Mixing Liquid allround or longlife.

Next, apply the Glaze material using a brush.
If necessary apply small shade adjustments onto the applied glaze using IPS Ivocolor Shade and/or Essence and conduct the Glaze firing cycle.

- The degree of gloss of the glazed surface is controlled via the consistency of the glazing material and the applied quantity, not by means of the firing temperature. For a higher degree of gloss, the glazing material must be applied in a correspondingly thicker layer.
- Additional Glaze firing cycles can be conducted with the same firing parameters.
- The ceramic surface must not be too smooth in order to prevent the glazing paste from flowing off.
- IPS Ivocolor Essence Fluid is not suitable for diluting.

Firing parameters for the Glaze firing with IPS Ivocolor see page 35.

Corrective firings (Add-On)

Add-On after Glaze firing

After the completion of a restoration, small adjustments, such as contact points, pontic rests, shoulder adjustments, may be necessary.
Mix the IPS InLine System Add-On 690 °C/1274 °F material with the desired build-up liquid, apply on the missing areas, and fire.

Special attention is required for separating the "retention pins". Make sure to separate the retainers after glazing and polish carefully without creating too much heat.

Firing parameters for IPS InLine System Add-On 690 °C/1274 °F after Glaze firing see page 35.

General Information

Cementation

Your dentist can apply a conventional cementation protocol when placing metal-supported IPS InLine restorations. IPS InLine veneers must be placed using an adhesive cementation technique.
The following materials are recommended for cementation:

	Esthetic luting composite		Self-adhesive resin cement	Glass ionomer cement
Material	Variolink® Esthetic		Speedcem® Plus	ZirCAD® Cement
Curing	Light-curing	Dual-curing	Self-curing with light-curing option	Self-curing
Cementation protocol	**Adhesive:** Adhese® Universal or Syntac®	**Adhesive:** Adhese® Universal or Syntac®	**Self-adhesive**	**Conventional**
IPS InLine Metal-supported	–	✓	✓	✓
IPS InLine Veneers All-ceramics	✓	✓	–	–

Conditioning of the metal-ceramic restoration

Carefully blast the inner surfaces of the crown with Al_2O_3 until an even mat surface has been achieved.
- If necessary, clean the restoration in an ultrasonic unit for about 1 minute.
- Thoroughly rinse the restoration with water spray and dry with oil-free air.
- **Important:** In order to achieve a strong bond, do not clean the metal surfaces with phosphoric acid.
- Apply Monobond® Plus to the pre-treated surfaces with a brush or microbrush and allow to react for 60 seconds. Subsequently, disperse with a strong stream of air.

Conditioning of the veneer

Option 1 using Monobond Plus
- Thoroughly rinse the veneer with water spray and dry with water- and oil-free air.
- Etch the inner aspect of the veneer with IPS Ceramic Etching Gel for 120 seconds.
- Thoroughly rinse the veneer with water spray and dry with oil-free air.
- Apply Monobond Plus with a brush or a microbrush to the pre-treated surfaces, let it react for 60 s and then disperse with a strong stream of air.

Option 2 using Monobond Etch & Prime
- Thoroughly rinse the veneer with water spray and dry with water- and oil-free air.
- Apply Monobond Etch & Prime on the bonding surface using a microbrush and agitate it into the surface for 20 seconds. Allow to react for another 40 seconds.
- Then thoroughly rinse off Monobond Etch & Prime with water and dry the restoration with a strong stream of water- and oil-free air for approximately 10 seconds.

Please observe the corresponding Instructions for Use.

Firing parameters

IPS InLine	Firing temperature T [°C/°F]	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t↗ [°C/°F]	Holding time H [min]	Vacuum on V_1 [°C/°F]	Vacuum off V_2 [°C/°F]
1st and 2nd Powder Opaquer firing	960/1760	403/757	4:00	100/180	2:00	450/842	959/1758
1st and 2nd Paste Opaquer firing	930/1706	403/757	6:00	100/180	2:00	450/842	929/1704
1st and 2nd Margin firing	930/1706	403/757	4:00	60/108	1:00	450/842	929/1704
1st Dentin / Incisal / Dentcisal / Gingiva firing	910/1670	403/757	4:00	60/108	1:00	450/842	909/1668
2nd Dentin / Incisal / Dentcisal / Gingiva firing	900/1652	403/757	4:00	60/108	1:00	450/842	899/1650
Margin Add-On firing	900/1652	403/757	4:00	60/108	1:00	450/842	899/1650
Corrective firing after the Dentin / Incisal firing, Add-On	860/1580	403/757	4:00	60/108	1:00	450/842	859/1578
Stain firing*	830/1526	403/757	6:00	60/108	1:00	450/842	829/1524
Glaze firing	830/1526	403/757	6:00	60/108	1:00	450/842	829/1524
Add-On after Glaze firing	690/1274	403/757	4:00	60/108	1:00	450/842	689/1274

*The purpose of the Stain firing cycle is to fix IPS Ivocolor Shades/Essences in place. It is recommended for extensive characterizations (e.g. one-layer technique).

IPS InLine (veneer technique) Veneers fabricated on refractory dies	Firing temperature T [°C/°F]	Stand-by temperature B [°C/°F]	Closing time S [min]	Heating rate t↗ [°C/°F]	Holding time H [min]	Vacuum on V_1 [°C/°F]	Vacuum off V_2 [°C/°F]
Wash firing	830/1526	403/757	4:00	60/108	1:00	450/842	829/1524
Cervical firing	940/1724	403/757	8:00	60/108	1:00	450/842	939/1722
Dentin / Impulse firing	940/1724	403/757	8:00	60/108	1:00	450/842	939/1722
Incisal firing	930/1706	403/757	8:00	60/108	1:00	450/842	929/1704
Glaze firing using IPS Ivocolor	830/1526	403/757	8:00	60/108	1:00	450/842	829/1524

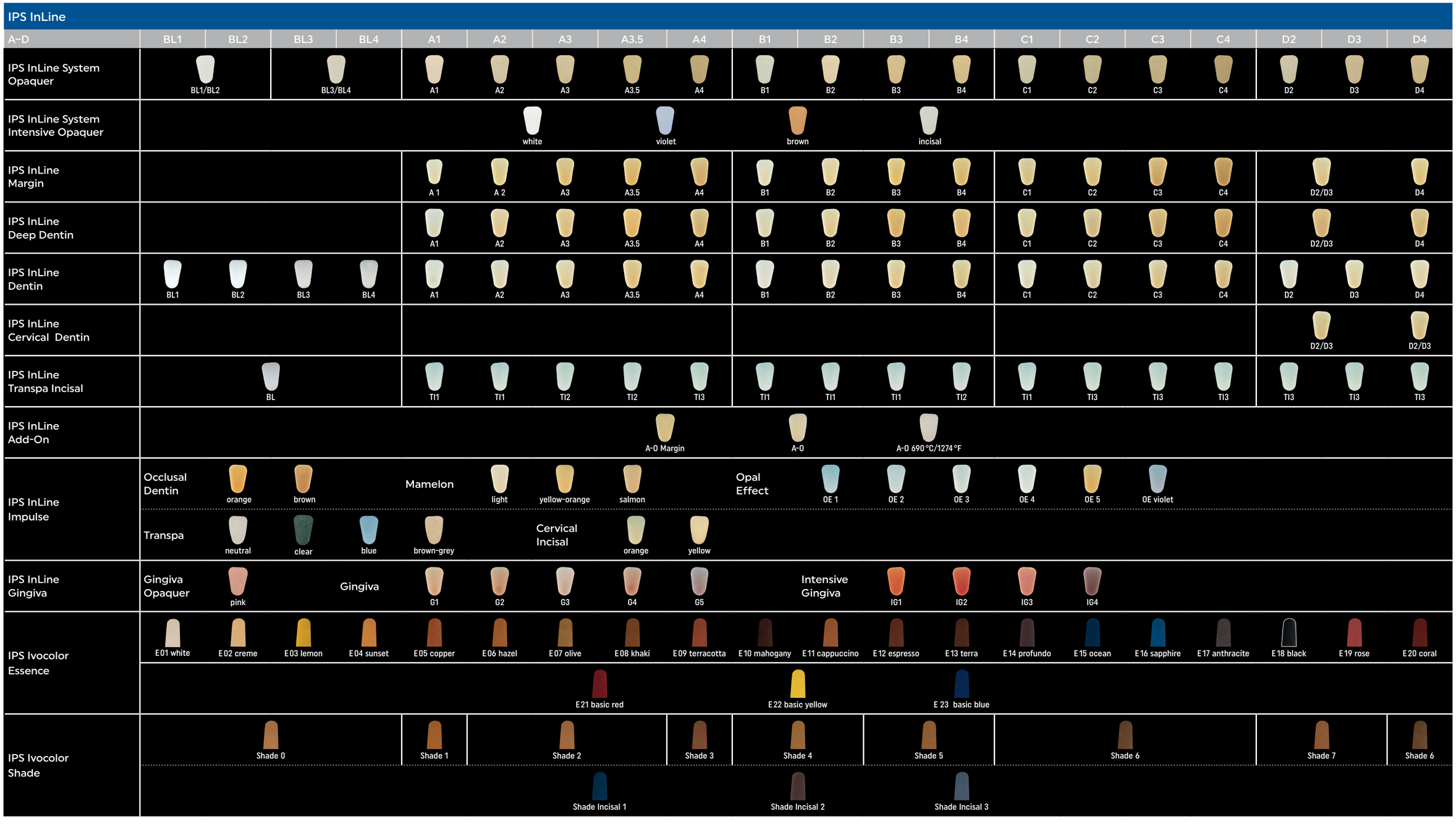
Please observe the regulatory Instructions for Use (www.ivoclar.com/eIFU).

- All the firing programs described do not involve active cooling. After the holding time, the furnace heater switches off and the furnace head cools down with a device-related cooling gradient due to the time-controlled opening of the furnace head. If long-term cooling is conducted, the closed furnace head cools down to 650 °C/1202 °F after the heater is switched off, at which point the time-controlled opening of the furnace head provides the device-related cooling gradient.
- If further Dentin / Incisal firings / One firings are required, they will be conducted with the 2nd Dentin / Incisal / Dentcisal / Gingiva firing cycles.
- With very large restorations, we recommend slightly extending the pre-drying time (closing time S).
- If ceramic layers of more than 1.5 mm thickness are applied, long-term cooling can be advantageous in conjunction with base metal alloys and alloys with a high CTE.

These firing parameters are guidance values. They are valid for the Programat furnaces from Ivoclar. When using ceramic furnaces of other manufacturers, it may be necessary to adjust the firing parameters. Deviations may occur:
- due to the furnace generation
- due to regional differences in the power supply or if several electrical devices are operated on the same circuit.

General information

Combination table



IPS InLine One							
IPS InLine System Opaquer	BL1, BL2, BL3, BL4	A1, B1	A2, B2, C1, D2	A3, A3.5	B3, B4	C2, D3, D4	A4, C3, C4
IPS InLine One Dentcisal	 BL	 1	 2	 3	 4	 5	 6

Manufacturer
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