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IPS InLine® One
One-layer metal-ceramic

IPS InLine®
Conventional metal-ceramic

IPS InLine® PoM
Press-on-Metal ceramic

IPS InLine®

Instructions for Use



ivoclar vivadent: technical

CE 0123

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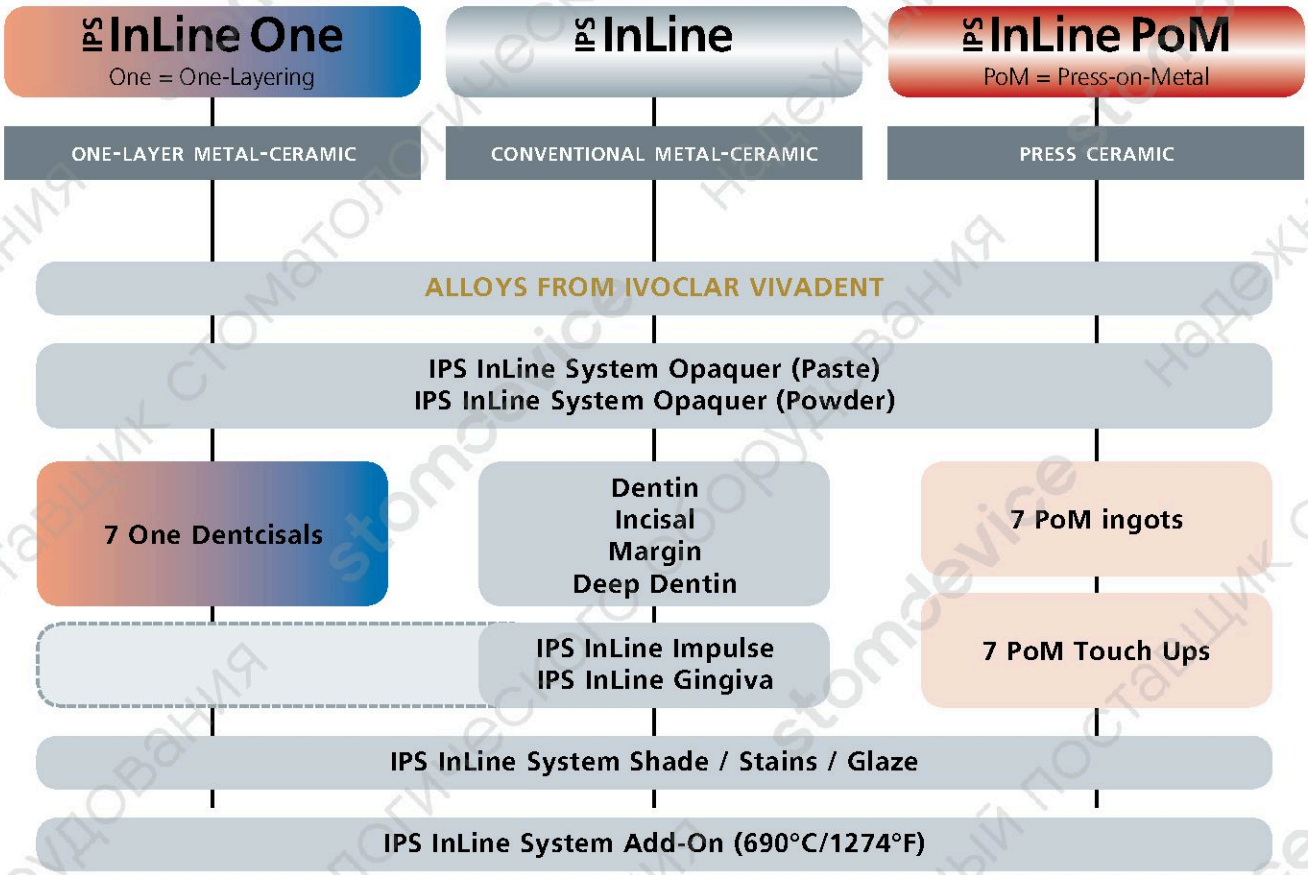
IPS InLine® PoM
Press-on-Metal ceramic

Optimize your working procedures and simultaneously increase the productivity and economic efficiency in your laboratory.
With the **IPS InLine** metal-ceramic system, you will have the flexibility required for today's everyday laboratory work – from simple layering to highly esthetic veneers.
The **IPS InLine** metal-ceramic system permits the fabrication of restorations shaded according to A-D, Chromascop and Bleach shade guides.
After the application of the opaquer, you can choose the product and the corresponding processing procedure according to your personal preferences and the clinical situation:

- **IPS InLine One**: Uncomplicated one-layer ceramic for quick and efficient layering
- **IPS InLine**: Conventional metal-ceramic for traditional, individualized layering
- **IPS InLine PoM**: Press-on-Metal ceramic for accurately fitting, fully anatomical press-on procedures

The IPS InLine System gives you the choice without increasing the number of components. Join in a new way to process metal-ceramic.

IPS InLine



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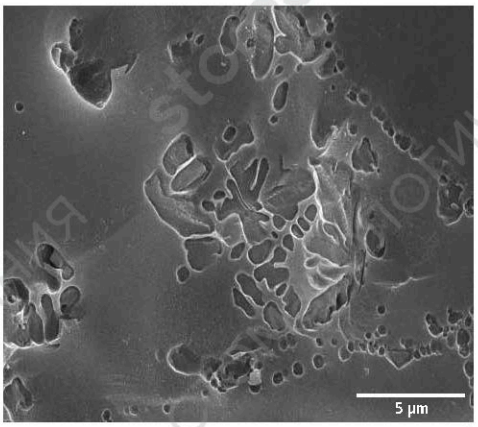
Product Information

IPS InLine® One – one-layer metal-ceramic
IPS InLine® – conventional metal-ceramic

Material

IPS InLine and IPS InLine One are veneering ceramic materials containing leucite. They are suitable for the fabrication of metal-ceramic restorations at firing temperatures higher than 900 °C (1652 °F). With both products, alloys in the CTE range of 13.8–15.0 x $10^{-6}/K^{-1}$ (25–500°C) can be veneered, irrespective of the metal composition. These ceramics are based on leucite-forming glasses, some of which are produced of feldspar raw materials of a natural origin. 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 results in a homogeneous structure for the veneering material, which is not only extremely gentle to antagonist but also provides the high strength and convincing optical properties of the IPS InLine veneering ceramic materials.





IPS InLine Deep Dentin, IPS InLine Dentin, IPS InLine Transpa Incisal, IPS InLine Gingiva, IPS InLine One Dentcisal:

CTE (25–500°C) [10^{-6} /K][1]	12.9 ± 0.5
Flexural strength (biaxial) [MPa][1] [2]	≥ 50
Chem. solubility [µg/cm²][1]	≤ 100
Firing temperature [°C]	900–930

[1] according to ISO 6872:2008
[2] typical mean value for the flexural strength is 80 MPa

Classification: Dental ceramics Type 1 / Class 1

Indications
- One-layer veneering ceramic for the most popular dental alloys in the CTE range of 13.8–15.0 x 10^{-6}/K (25–500°C) (IPS InLine One)
- Conventional multi-layer veneering ceramic for the most popular dental alloys in the CTE range of 13.8–15.0 x 10^{-6}/K (25–500°C) (IPS InLine)
- Veneers on refractory die material (only IPS InLine)

Contraindications
- If patients are known to be allergic to any of the ingredients, the material should not be used.
- Bruxism
- Veneering of titanium and zirconium oxide frameworks
- Any other use not listed in the indications

Important processing restrictions
- Exceeding or falling short of the stipulated veneering layer thicknesses
- Failure to observe the layer thickness ratio between the framework and layering ceramic
- Mixing with and processing in conjunction with other dental ceramics
- Veneering of dental alloys not within the stipulated CTE range
- Failure to observe the necessary minimum connector and framework thicknesses

Side effects
If patients are known to be allergic to any of the components in the materials, IPS InLine One and IPS InLine restorations should not be used.

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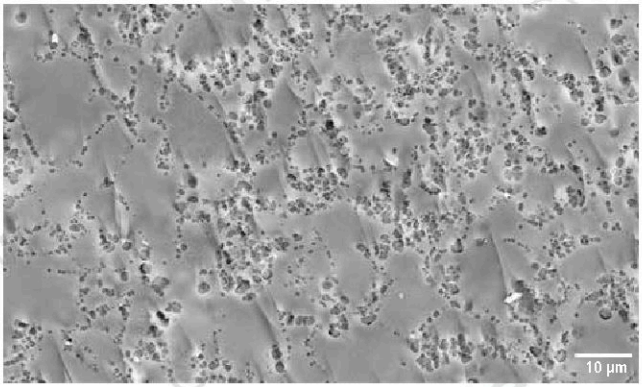
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IPS InLine® PoM – Press-on-Metal ceramic

Material

The IPS InLine PoM ingots are made of a glass-ceramic material containing leucite and based on synthetic glass raw materials, which contain small quantities of an opalescent glass-ceramic in addition to the translucent components. This provides the ingots pressed to full contour with their highly esthetic appearance. The ingots are shaded with pigments, the temperature resistance of which permits the high shade match of the pressed restorations. Both in their pressed and unpressed condition, the ingots demonstrate an iso-tropic structure, which is responsible for its homogeneous distribution of the leucite crystals and the high strength. Another important feature of IPS InLine PoM is its excellent firing stability, which enables the application of Touch-Up materials, Shade, Stains and Glaze without jeopardizing the accuracy of fit of the restoration. The Touch-Up materials are leucite glass-ceramics shaded according to the ingot shade concept. Their thermal expansion and firing temperature are adjusted to suit the application in the cervical area of the ingot after pressing and before the characterization firing cycles.





IPS InLine PoM ingots:

CTE (25–500°C) [10^{-6} /K][1]	13.2 ± 0.5
Flexural strength (biaxial) [MPa][1] [2]	≥ 50
Chem. solubility [µg/cm²][1]	≤ 100
Press temperature [°C]	940–950

[1] according to ISO 6872:2008

[2] typical mean value for the flexural strength is 130 MPa

Classification: Dental ceramics Type II / Class 1

Indications

- Fully anatomical pressing on masked (opaquerized) crown and bridge metal frameworks
- Pressing on dental alloys with a CTE range of 13.8–14.5 x 10^{-6}/K (25–500°C) with a silver content of <10%

Contraindications

- Pressing on dental alloys with a CTE outside the stipulated range and not featuring the defined composition
- Alloys with a silver (Ag) content higher than 10%.
- If patients are known to be allergic to any of the ingredients, the material should not be used.
- Pressing on titanium and zirconium oxide frameworks
- Very deep sub-gingival preparations
- Patients with substantially reduced residual dentition
- Bruxism
- Any other use not listed in the indications

Important processing restrictions

- Exceeding or falling short of the stipulated layer thicknesses for press ceramics
- Failure to observe the layer thickness ratio between the framework and layering ceramics
- Failure to observe the necessary minimum connector and framework thicknesses
- Layering with IPS InLine One / IPS InLine layering materials (e.g. Dentcisal, Dentin, Incisal, Deep Dentin, Margin, Impulse and Gingiva materials, etc.)
- Mixing with and processing in conjunction with other dental ceramics
- Pressing over dental alloys not within the stipulated CTE range

Side effects

If patients are known to be allergic to any of the components in the materials, IPS InLine PoM restorations should not be used.

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Composition

IPS InLine One	IPS InLine	IPS InLine PoM
– **IPS InLine One Ceramic Materials** Leucite ceramic based on alcalialumo silicate glasses and feldspar	– **IPS InLine Ceramic Materials** Leucite ceramic based on alcalialumo silicate glasses and feldspar – **IPS InLine Margin Build-Up Liquid** Water and cellulose derivative	– **IPS InLine PoM Ingots** Leucite ceramic based on alcalialumo silicate glasses – **IPS InLine PoM Touch-Up Materials** Leucite ceramic based on alcalialumo silicate glasses – **IPS e.max AlOx Plungers** Al_2O_3 – **IPS e.max AlOx Plunger Separator** Boron nitride – **IPS PressVEST Powder** SiO_2 (quartz powder), MgO and $NH_4H_2PO_4$ – **IPS PressVEST Liquid** Colloidal silicic acid in water – **IPS PressVEST Speed Powder** SiO_2 (quartz powder), MgO and $NH_4H_2PO_4$ – **IPS PressVEST Speed Liquid** Colloidal silicic acid in water

– **IPS InLine System Shade / Stains / Glaze**
Ceramic materials and glycols

– **IPS InLine System Build-Up Liquids L and P**
Water, glycols and additives

– **IPS InLine System Powder Opaquer Liquid**
Water, glycols, acetic acid, additives

– **IPS InLine System Opaquer Liquid**
Butylene glycol, glycerine, thickening agent

– **IPS InLine System Glaze and Stains Liquid**
Butandiol

– **IPS Model Sealer**
Ethyl acetate, nitro-cellulose, softener

– **IPS Ceramic Separating Liquid**
Paraffin oil

– **IPS Margin Sealer**
Wax dissolved in hexane

Warning

– Hexane is highly flammable and detrimental to health. Avoid contact of the material with skin and eyes. Do not inhale vapours. Keep away from sources of ignition.
– Avoid inhaling grinding dust when working on ceramic restorations. Use suction equipment or protective masks.

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Coordinated Ivoclar Vivadent alloys

IPS InLine One, IPS InLine ...
are suitable for alloys with a CTE of approximately 13.8 to 15.0 x 10^{-6}/K at 25–500 °C. If the required framework design with metal scallops (as described on page 25) and the ceramic layer thickness of max. 1.5 mm are observed, these alloys may be processed using **standard cooling** in the Programat® furnaces.

IPS InLine PoM ...
is suitable for pressing on alloys with a CTE of 13.8 to 14.5 x 10^{-6}/K at 25–500 °C and with a maximum silver content of 10 %.



Alloy	IPS InLine One IPS InLine	IPS InLine PoM IPS Investment Ring 100/200 g	IPS InLine PoM IPS Investment Ring 300 g	Colour	CTE 25–500°C
High gold					
Brite Gold	✓*	–	–	rich yellow	14.8
Brite Gold XH	✓*	–	–	rich yellow	14.4
Golden Ceramic	✓*	–	–	rich yellow	14.6
Callisto 86	✓	✓	✓	rich yellow	14.4
Aquarius Hard	✓*	✓ 2)	✓ 2)	rich yellow	14.5
Aquarius	✓*	–	–	rich yellow	14.6
d.SIGN 98	✓*	✓ 1)	–	rich yellow	14.3
Callisto 84	✓	✓	✓	rich yellow	14.3
Y	✓	–	–	yellow	14.6
Aquarius XH	✓	✓	✓	yellow	14.1
Y-2	✓*	–	–	yellow	15.0
Y-Lite	✓	✓	✓	yellow	13.9
Sagittarius	✓	✓	✓	white	14.0
Y-1	✓*	–	–	yellow	14.8
d.SIGN 96	✓	✓	–	yellow	14.3
Reduced gold					
d.SIGN 91	✓	✓	✓	white	14.2
W	✓	–	–	white	14.2
W-5	✓	–	–	white	14.0
Lodestar	✓	✓	✓	white	14.1
W-3	✓	✓	✓	white	13.9
Leo	✓	✓	✓	white	13.9
W-2	✓	✓	✓	white	14.2
Evolution Lite	✓	–	–	white	14.2
Palladium content					
Spartan Plus	✓	✓	–	white	14.3
Spartan	✓	✓	–	white	14.2
Capricorn	✓	✓	✓	white	14.1
d.SIGN 84	✓	✓ 2)	✓ 2)	white	13.8
Protocol	✓	✓ 2)	✓ 2)	white	13.8
Callisto 75 Pd	✓	✓	✓	white	13.9
Aries	✓	–	–	white	14.7
d.SIGN 67	✓	–	–	white	13.9
d.SIGN 59	✓*	–	–	white	14.5
d.SIGN 53	✓**	–	–	white	14.8
W-1	✓*	–	–	white	15.2
Capricorn 15	✓	–	–	white	14.3
Callisto CPG	✓	✓	✓	white	14.2
Implant alloys					
Callisto Implant 78	✓	✓	✓	white	13.9
Callisto Implant 33	✓	✓	✓	white	14.0
IS-64	✓**	–	–	white	14.8
Callisto Implant 60	✓**	–	–	white	14.5
Free of precious metals					
Colado NC	✓	✓	✓	white	14.0
4all	✓	✓ 2)	✓ 2)	white	13.8
d.SIGN 30	✓**	✓ 2)	✓ 2)	white	14.5
Colado CC	✓**	✓ 2	✓ 2)	white	14.2

* Cooling to 800 °C / 1472 °F
** Cooling to 700 °C / 1292 °F
1) Single restorations
2) see "Important" next page

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

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Important

IPS InLine One, IPS InLine

- If these minimum requirements cannot be observed, cooling to *800 °C, or **700 °C (depending on the alloy type), is required in conjunction with all main firings and glaze firings.
- With ceramic layer thicknesses of over 1.5 mm up to max. 2.5 mm, as well as with voluminous restorations (e.g. implant-retained reconstructions) in combination with high gold and base metal alloys, cooling to *800 °C or ** 700 °C must be conducted. This also applies to soldered restoratios.

Important

IPS InLine PoM

- With alloys in the lower CTE range of 13.8 x 10^{-6}/K at 25–500 °C and the upper range of 14.5 x 10^{-6}/K at 25–500 °C, no ceramic shoulders should be used. With such framework geometries (shoulder) or non-metal-supported areas, the cooling and tension conditions are critical. For ceramic shoulders, alloys in the CTE range of approximately 14.0 to 14.3 x 10^{-6}/K at 25–500 °C are recommended.
- For single restorations – particularly with ceramic shoulders – only the 200g or 300g investment rings should be used, since the expansion values as well as the cooling and tension conditions are ideally coordinated.

Important

IPS InLine System Powder Opaquer

- Alloys (CTE of approx. 13.8 to 15.0 x 10^{-6}/K at 25–500 °C) with a solidus point of ≥ 1080 °C are suitable for opaquerizing with the powder opaquer at a firing temperature of 960 °C.

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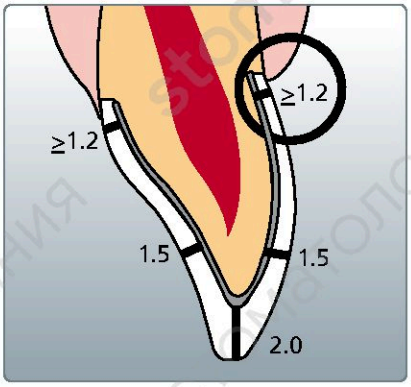
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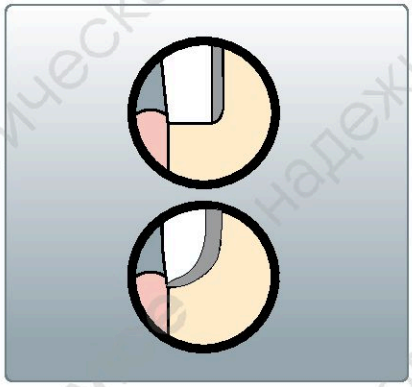
Preparation guidelines and minimum layer thicknesses

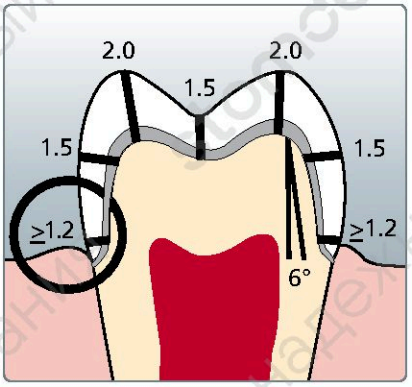
The preparation must provide sufficient space to achieve stable and esthetic metal-ceramic restorations. The usual preparation guidelines for metal-ceramics apply for the IPS InLine System. As usual for metal-supported restorations, dentists may use conventional cementation.

A chamfer preparation is suitable for tapered metal margins. For metal-supported inlays, partial crowns and inlay-retained bridges that are seated using conventional cementation, a chamfer preparation is indicated to minimize the cement gap. The margin is designed in metal. For esthetically pleasing single crowns and bridge abutment crowns, a ceramic shoulder should be provided. For that purpose, a shoulder preparation is required. With adhesive cementation, the margin can be designed in the ceramic. However, the margin should not be bevelled in such cases, since thin, non-metal-supported margins demonstrate a fracture risk.

IPS InLine One One-layer metal-ceramic	**IPS InLine** Conventional metal-ceramic	**IPS InLine PoM** Press-on-Metal ceramic
Minimum dimensions for metal frameworks – Crowns min. 0.3 mm – Abutment crowns min. 0.5 mm Minimum ceramic layer thickness – IPS InLine One min. 0.8 mm	Minimum dimensions for metal frameworks – Crowns min. 0.3 mm – Abutment crowns min. 0.5 mm Minimum ceramic layer thickness – IPS InLine min. 0.8 mm	Minimum dimensions for metal frameworks – Crowns min. 0.3 mm – Abutment crowns min. 0.5 mm Minimum ceramic layer thickness – IPS InLine PoM min. 0.8 mm

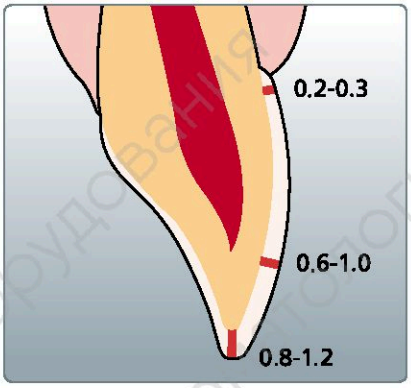


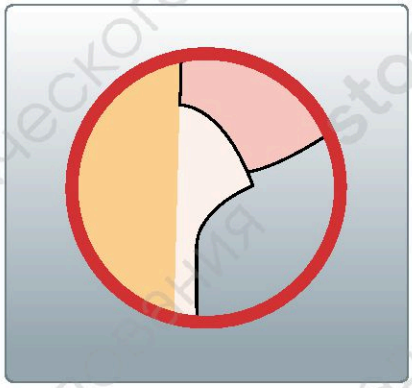


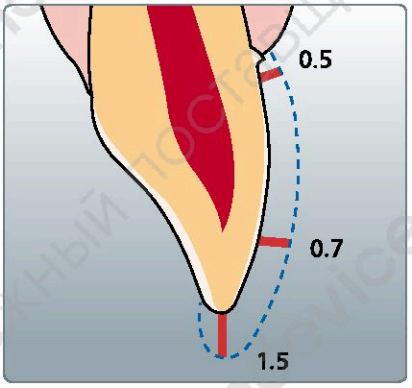


- With conventional cementation, a minimum height of 3 mm of the prepared tooth and a convergence angle of approx. 6° must be observed.
- The following minimum connector dimensions should be observed for bridge restorations: The connector dimensions depend on the selected alloy and the pontic width (see Framework Design Guidelines, page 9).

Veneers on refractory die material







Dimensions in mm

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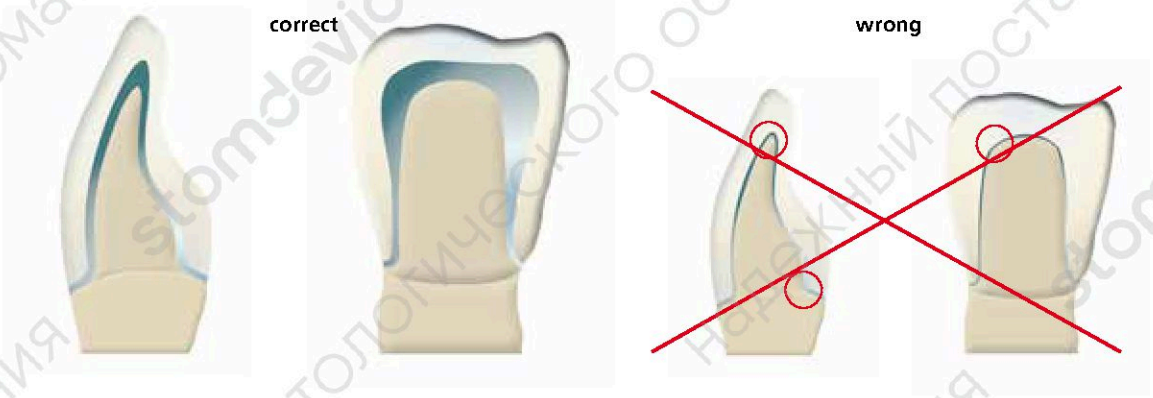
Framework design criteria

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

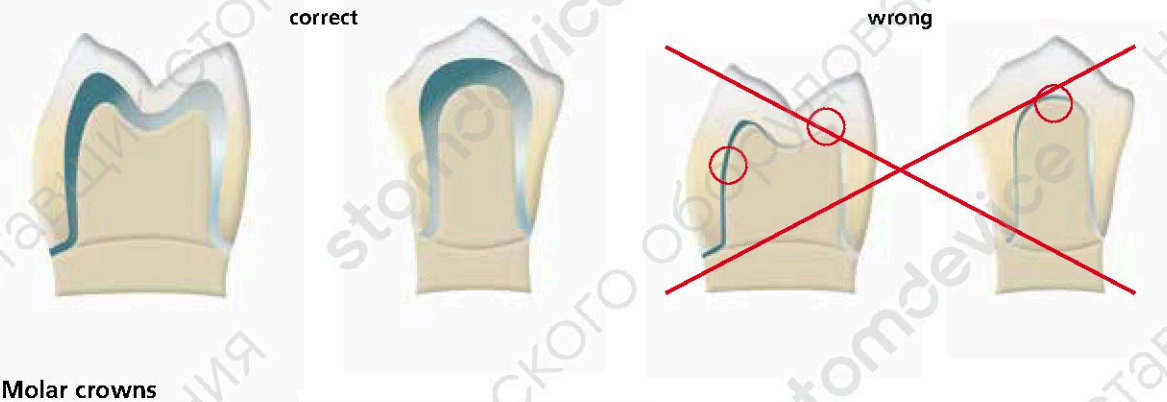
1. Functional support of the veneering ceramic

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. Such angles and edges should already be rounded off in the wax-up, not as late as in the metal. 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). Please refer to the Instructions for Use of the corresponding alloy for further information.

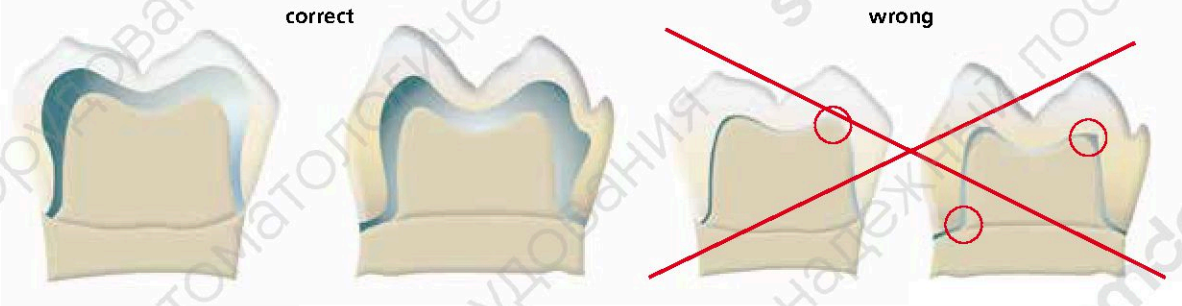
Anterior crowns



Premolar crowns



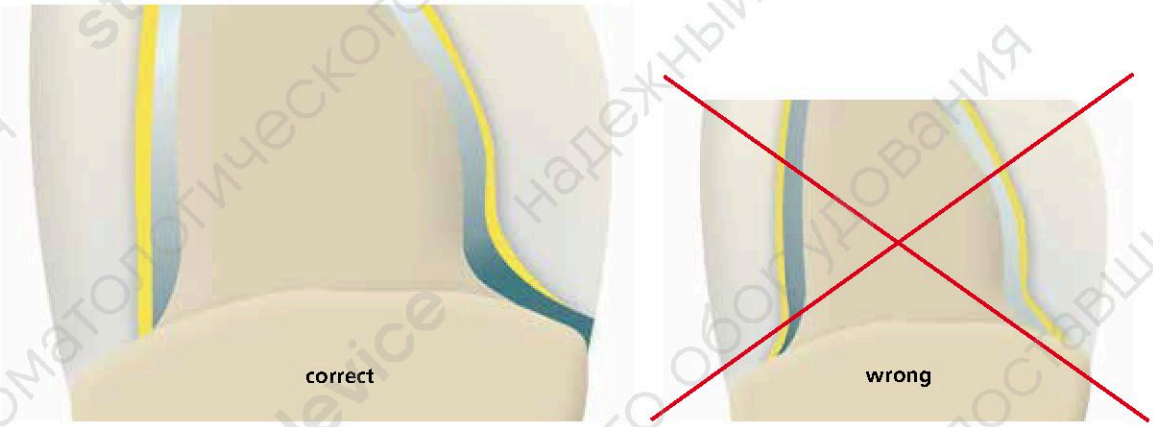
Molar crowns



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2. Framework design for fired ceramic shoulders

With fired ceramic shoulders, 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 to achieve functional support of the framework on the preparation. Excellent accuracy of fit on the preparation is essential to ensure that the shoulder material may not reach the inner aspects of the framework during subsequent application.



3. Framework stability

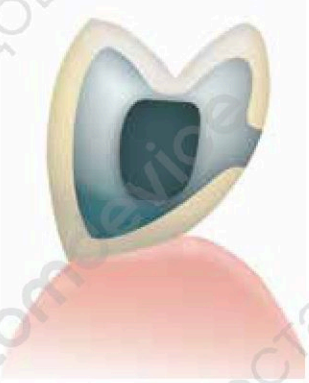
The dimensions and shape of the interdental connector surfaces significantly influence the stability of the restoration during processing as well as the clinical long-term success after incorporation. Therefore, the dimensions of the interdental connector surface must be designed in accordance with the alloy used (take the 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

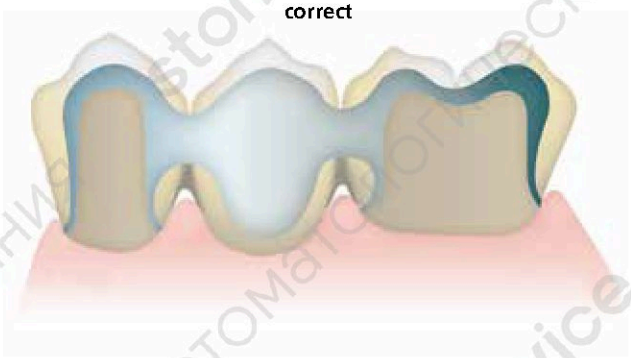
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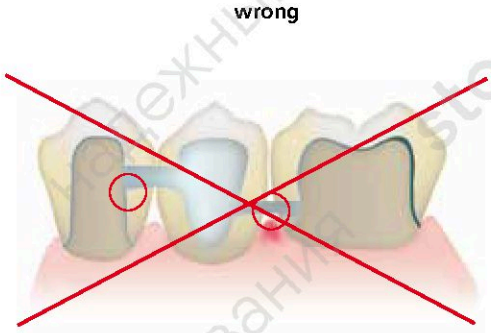
4. Framework design for bridges

Thermal stress during firing and masticatory forces after cementation affect metal frameworks. These forces must be transferred on 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 with the corresponding reduction of the ceramic provides the most predictable results.

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 scallop-type design with e.g. interproximal reinforcements counteracts this development. Additionally, this framework design (e.g. with cooling struts) ensures more even cooling of the restoration during the cooling phase. This is particularly important for high gold alloys.

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 given special attention in order to ensure proper periodontal hygiene with interdental brushes and dental floss.







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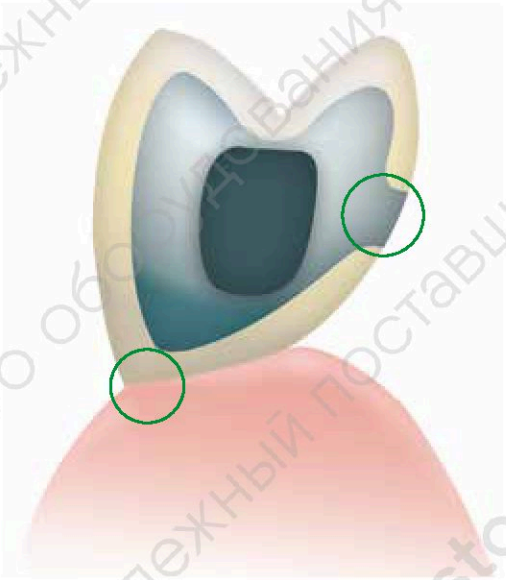
5. Design of bridge pontics

Bridge pontics are designed with esthetic and functional aspects as well as oral hygiene in mind. 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 scallop is recommended. Furthermore, to ensure even cooling of the bridge pontic that absorbs the most heat, additional cooling struts are advantageous.

Bridge pontic design – ovate pontic

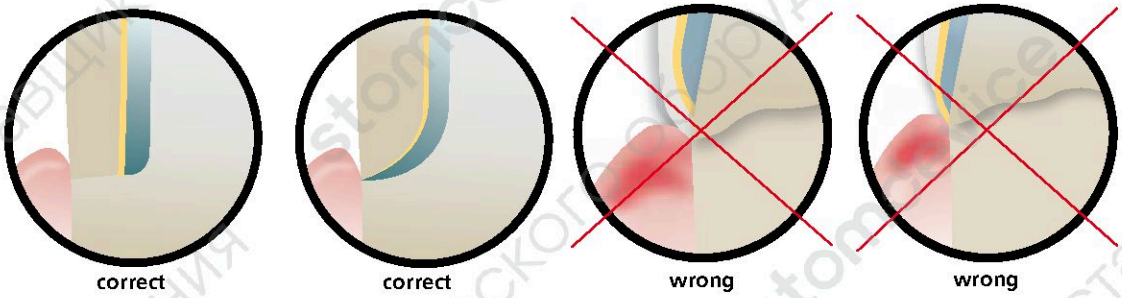


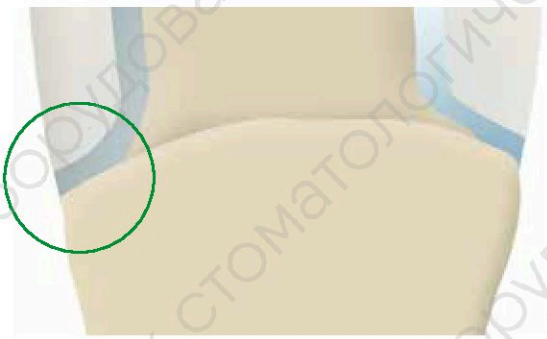
Bridge pontic design – saddle-type pontic

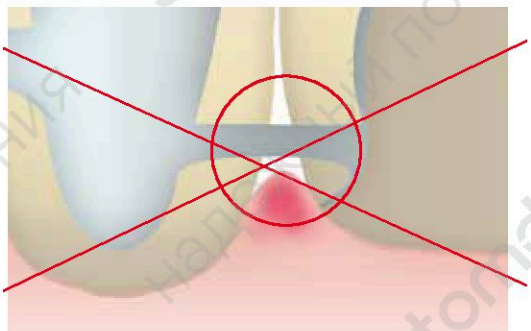


6. Interface between metal and ceramic

The interface 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 neither be located in the contact area nor on surfaces involved in masticatory functions. The interface in the interdental area should be designed in such a way that cleaning of these hard-to-reach areas is possible.





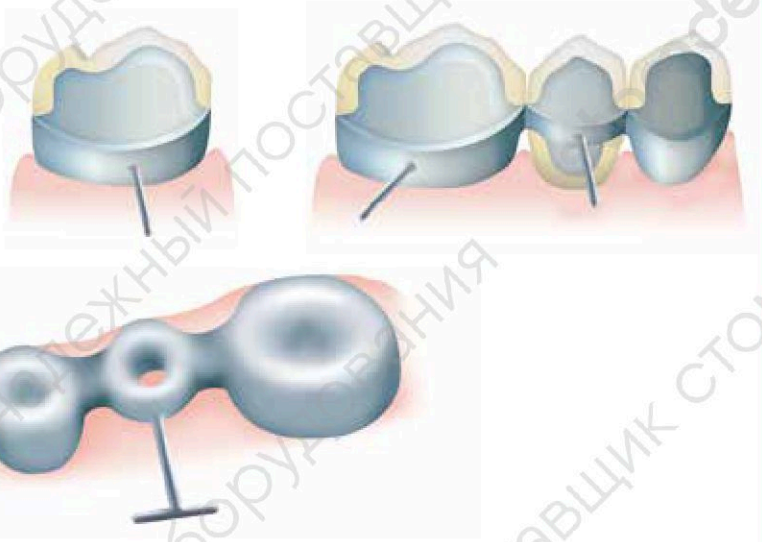


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Holding pins

In order not to damage the crown wall during processing, the crown and bridge frameworks are provided with holding pins. They are directly attached to the framework with the help of wax. 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 struts during casting and firing.



Important

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 Guidelines for Metal-Ceramic Restorations" for additional information on framework design. They can be ordered from your Ivoclar Vivadent contact address.



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Step-by-step

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 for single crowns should be at least 0.3 mm 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 of interdental hygiene and the alloy used.



Design the framework in a reduced supported shape.



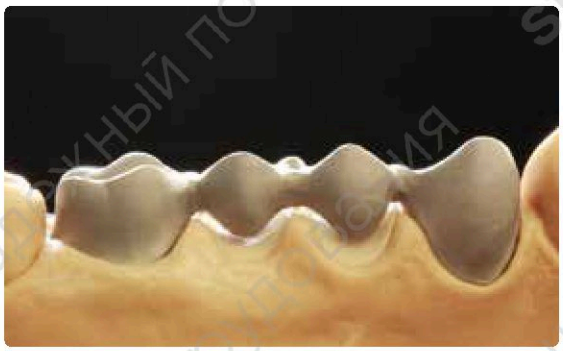
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Alloy processing / oxide firing

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



Metal framework before blasting



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



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.

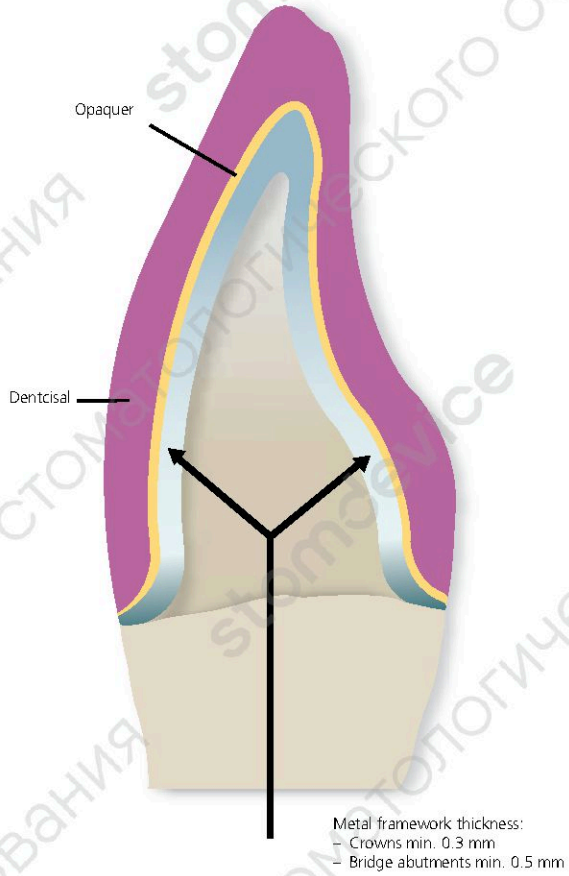


After oxide firing, the framework should exhibit an evenly oxidized surface.

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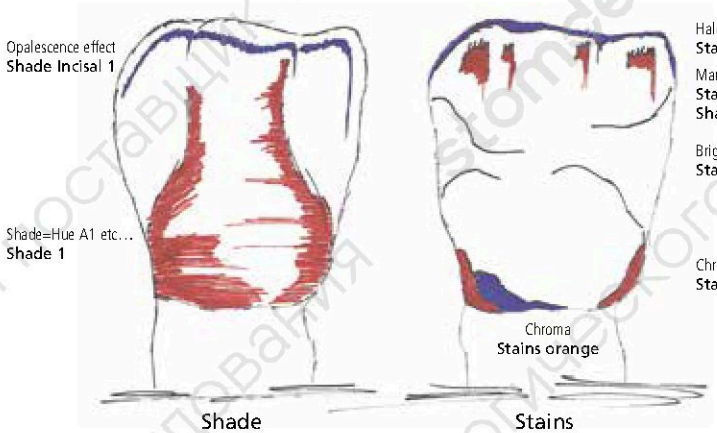
IPS InLine One layering diagram



	Ideal layer thickness	Limited layer thickness
Framework	0.3–0.5 mm	0.3–0.5 mm
Opaquer	0.1 mm	0.1 mm
Dentcisal cervical incisal	 0.8 mm 1.5 mm	 0.5 mm 0.8 mm

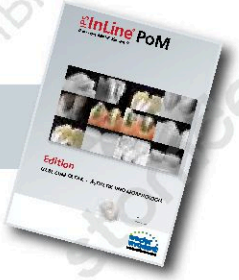
These figures are drawn from past experience and they may vary in certain situations.

Note:
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 InLine System Shade/Stains can be used to achieve true-to-nature shade effects.

You can find additional information on esthetic individualization in the edition "Love for Detail" by D. Grübel. It can be ordered from your Ivoclar Vivadent contact address.



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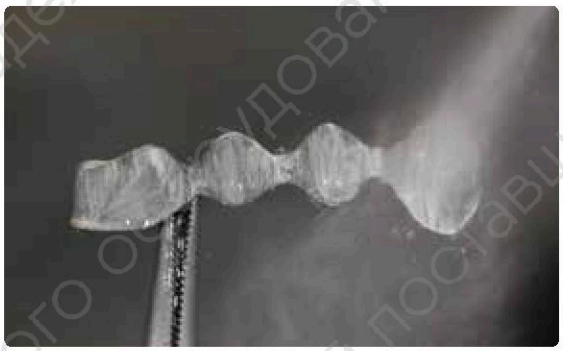
Opaquer Firing

Paste opaquer

1st Opaquer firing (wash firing) (paste opaquer)

Select the IPS InLine System Opaquer paste in the corresponding tooth shade. If required, homogenize the opaquer paste by stirring it before taking it from its jar. Extrude the desired amount from the syringe or jar and mix thoroughly on the mixing pad. Thin it, if required. Apply the first opaquer layer thinly and agitate it into the alloy surface. After firing and cooling, clean the opaquerized metal framework with the steam jet and dry with oil-free air.





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

2nd Opaquer firing (paste opaquer)

Apply the second opaquer layer in such a way that the metal framework is entirely covered with opaquer. After firing, the IPS InLine System Opaquer should show a covering, silky-mat shiny surface. After the opaquer firing, the conditioned surfaces of the alloy framework should be entirely covered with opaquer.





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

Firing parameters IPS InLine System Opaquer (paste opaquer), 1st and 2nd Opaquer firing

T °C/°F	B °C /°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
930/1706	403/ 757	6	100/180	2	450/842	929/1704

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Powder opaquer

1st Opaquer firing (wash firing) (powder opaquer)

Select the IPS InLine System Powder Opaquer in the corresponding tooth shade. Remove the amount of powder opaquer required for the wash from the jar and mix it thoroughly with the Powder Opaquer Liquid on the mixing pad until it has reached the desired consistency. Apply the first opaquer layer thinly on the metal framework and agitate it into the alloy surface. After firing and cooling, clean the opaquerized metal framework with the steam jet and dry with oil-free air.






Important
Mix IPS InLine System Powder Opaquer only with the Powder Opaquer Liquid.

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2nd Opaquer firing (powder opaquer)

Remove the amount of powder opaquer required for the covering layer from the jar and mix it together with the remaining, dried up "wash opaquer" on the mixing pad. Then, mix the powder opaquer with the Powder Opaquer Liquid until it has reached the desired consistency.

Apply the second opaquer layer evenly and in such a way that the metal framework is entirely covered with opaquer. After firing according to the stipulated firing parameters, 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 should be entirely covered with opaquer.





Tip:
A glass or ceramic instrument is optimally suitable to apply the IPS InLine Powder Opaquer for the opaquer firing. Naturally, a brush can also be used to apply IPS InLine Powder Opaquer.

The IPS InLine System Powder Opaquer and Powder Opaquer Liquid are ideally suitable for the application with conventional spray-on techniques. Mix the powder opaquer to a thin consistency, depending on the spray-on system used. Observe the instructions of the manufacturer of the spray-on systems.



Important
- **Use distilled water to rewet the mixed or the already applied powder opaquer.**
- **The firing tray with the opaquerized metal framework should only be placed in the firing chamber and removed from it once the furnace head is completely open and the beeper has sounded.**

Firing parameters IPS InLine System Opaquer (powder opaquer), 1st and 2nd Opaquer firing

T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
960/1760	403/757	4	100/180	2	450/842	959/1758

Important
IPS InLine System Powder Opaquer
– Alloys (CTE of approx. 13.8 to 15.0 x 10^{-6}/K at 25-500 °C) with a solidus point of ≥ 1080 °C are suitable for opaquerizing with the powder opaquer at a firing temperature of 960 °C.

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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 stone die and the adjacent areas using IPS Model Sealer. Additionally, separate the area of the pontics with IPS Ceramic Separating Liquid.

Tip:
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 materials. Before firing, separate the entire interdental area down to the opaquer.

Tip:
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

Important
- **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 and removed from it once the furnace head is completely open and the beeper has sounded.**

Firing parameters 1st Denticisal firing

T °C/°F	B °C/°F	S min	t↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
910/1670	403/757	4	60/108	1	450/842	909/1668

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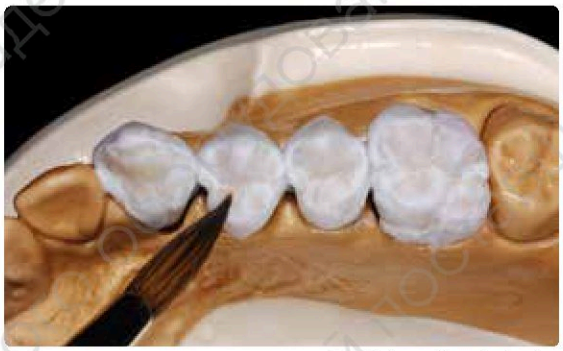
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2nd Dentcisal firing

Finish and thoroughly clean the restoration. Clean under running water or with the steam jet. Blasting the restoration with Al_2O_3 (type 50) 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 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

Important

- **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 and removed from it once the furnace head is completely open and the beeper has sounded.**

Firing parameters 2nd Denticisal firing

T °C/°F	B °C /°F	S min	t↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
900/1652	403/757	4	60/108	1	450/842	899/1650

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Individual finishing

Finishing and preparing for the Stains and Glaze firing

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

- Finish the restoration using diamond grinders and give it a true-to-nature shape and surface structure, 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 pre-polished using silicone disks.
- If gold and/or silver dust was used to visualize 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.

Stains and Characterization firing

Before the Stains and Characterization firing, the restoration must be free of dirt and grease. Any contamination after cleaning must be prevented. The following steps must be observed:

- For better wetting of the stains, IPS InLine/IPS InLine PoM Glaze and Stains liquid may be slightly rubbed into the surface.
- If a more intensive shade effect is desired, it is achieved by several staining procedures and repeated firing. The application of too many stains results in an unnatural shade effect.
- The cusps and fissures can be individualized using Stains.
- The basic chromatic shade is supported with the corresponding Shade material (see table).

Shade combination table for IPS InLine One / IPS InLine / IPS InLine PoM

Shade	1	2	3	4	5	6	7	SI1	SI2
A-D	A1, B1, B2	A2, A3, A3.5	B3, B4, D4	A4	C1, D2, D3	C2, C3, C4	–	A1, A2, A3, B1, B2, B3, B4	A3.5, A4, C1, C2, C3, C4, D2, D3, D4
Chromascop	110, 120, 130 BL1, BL2, BL3, BL4	140, 210, 220, 230, 240	310, 320, 330	340, 540	–	410, 420, 430, 440, 510	520, 530	110–140, 210, 220, 310, 320, BL1–BL4	230, 240, 330, 340, 410–440, 510–540

Firing parameters for the IPS InLine System Shade/Stains firing

T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
850/1562	403/757	6	60/108	1	450/842	849/1560

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Shade adjustment with IPS InLine System Shade and Stains

These stains may be fired in a separate Stains firing. Minor shade adjustments and individual characterizations may also be fired in the Glaze firing.
Dispense the desired quantity of IPS InLine System Shade and dilute and mix with IPS InLine System Glaze and Stains Liquid to the desired consistency. Pooling should be avoided and the material must not be applied too thickly. If a more intensive shade effect is desired, it is achieved by several staining procedures and repeated firing. The application of too many stains results in an unnatural shade effect.

Firing parameters for the IPS InLine System Shade/Stains firing (Stains and Characterization firing)

T °C/°F	B °C/°F	S min	t↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
850/1562	403/757	6	60/108	1	450/842	849/1560

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

Glaze firing

After the Stains and Characterization firing with IPS InLine System Shade/Stains, the Glaze firing is conducted.

- If required, homogenize the Glaze paste by stirring it before taking it from its jar. Extrude the desired amount of IPS InLine System Glaze paste from the syringe or jar and mix thoroughly on the mixing pad. If a different consistency is desired, adjust the consistency by diluting the material with IPS InLine System Glaze and Stains Liquid. Next, apply the Glaze material in the usual manner using a brush. Make sure not to apply the Glaze material either in too thick or too thin layers.
- Minor shade adjustments may be carried out together with the Glaze firing.

Firing parameters for the Glaze firing

T °C/°F	B °C/°F	S min	t↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
850/1562	403/757	6	60/108	2	450/842	849/1560

When working with a furnace from other manufacturers these parameters have to be adjusted accordingly! Finally, the shade of the completed restoration is checked.

If less gloss is desired, the holding time can be reduced to 1 minute.

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

Add-On after Glaze firing

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.

Firing paramters for the Add-On 690°C/1274°F after Glaze firing

T °C/°F	B °C/°F	S min	t↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
690/1274	403/757	4	60/108	1	450/842	689/1272

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Individually designed and characterized bridge made of IPS InLine One

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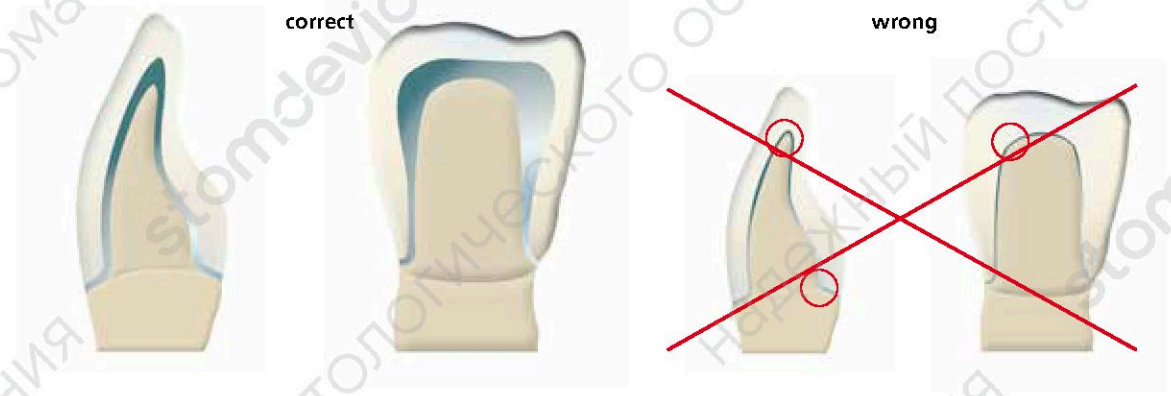
Framework design criteria

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

1. 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 by 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.

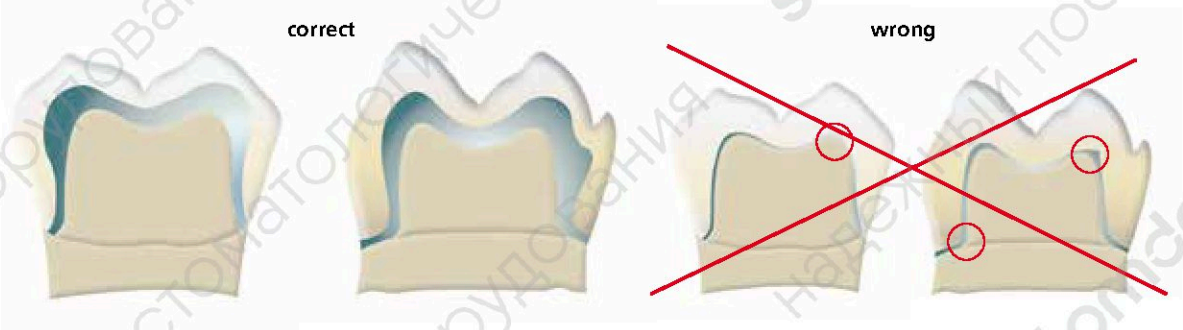
Anterior crowns



Premolar crowns



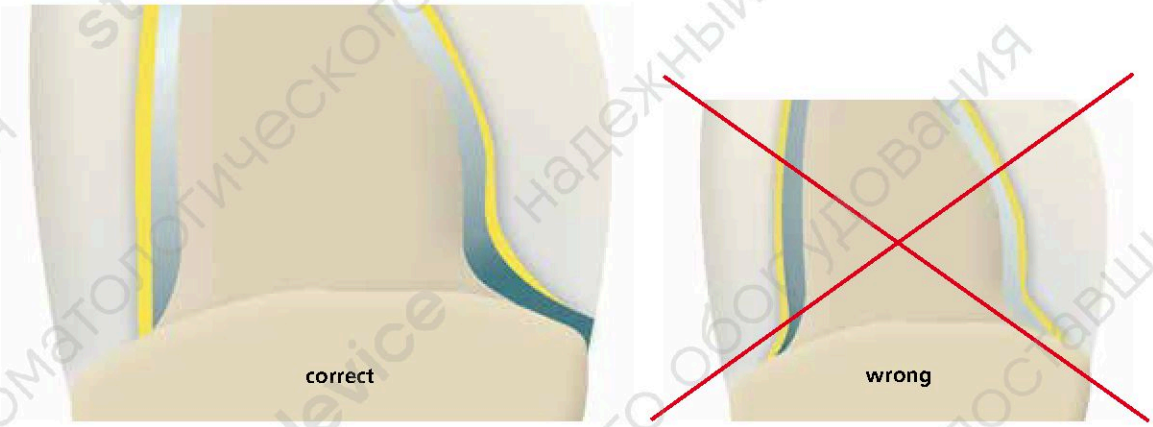
Molar crowns



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2. Framework design for fired ceramic shoulders

With fired ceramic shoulders, 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 to achieve functional support of the framework on the preparation. Excellent accuracy of fit on the preparation is essential to ensure that the shoulder material may not reach the inner aspects of the framework during subsequent application.



3. Framework stability

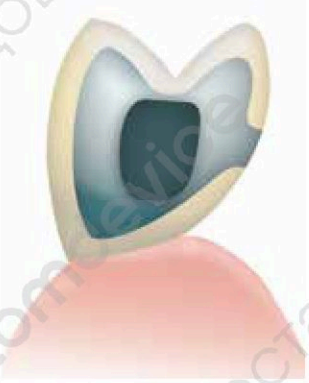
The dimensions and shape of the interdental connector surfaces significantly influence the stability of the restoration during processing, as well as the clinical long-term success after incorporation. Therefore, the dimensions of the interdental connector surface must be designed in accordance with the alloy used (take the 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

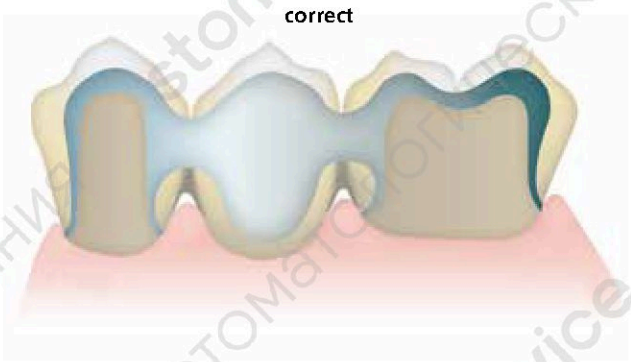
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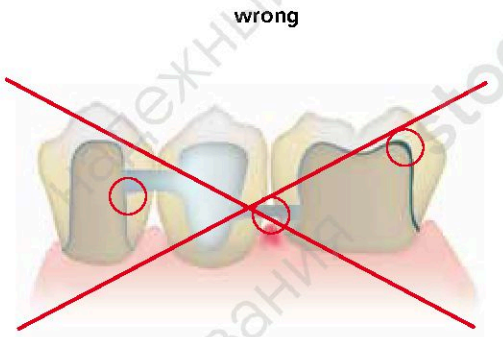
4. Framework design for bridges

Thermal stress during firing and masticatory forces after cementation affect metal frameworks. 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 with the corresponding reduction of the ceramic provides the most predictable results.

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 scallop-type design with e.g. interproximal reinforcements counteracts this development. Additionally, this framework design (e.g. with cooling struts) 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 given special attention when designing the bridge in order to ensure proper periodontal hygiene with interdental brushes and dental floss.





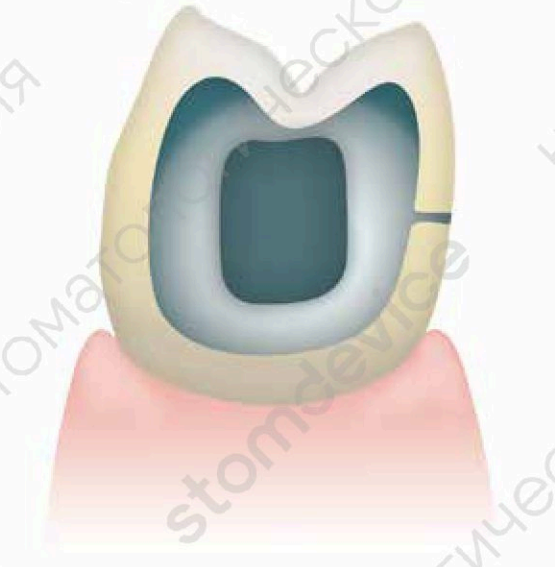


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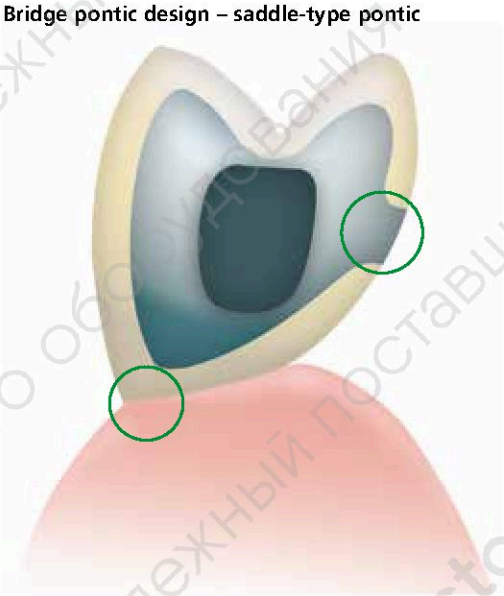
5. Design of bridge pontics

Bridge pontics are designed with esthetic and functional aspects as well as oral hygiene in mind. 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 scallop is recommended. Furthermore, to ensure even cooling of the bridge pontic that absorbs the most heat, additional cooling struts are advantageous.

Bridge pontic design – ovate pontic

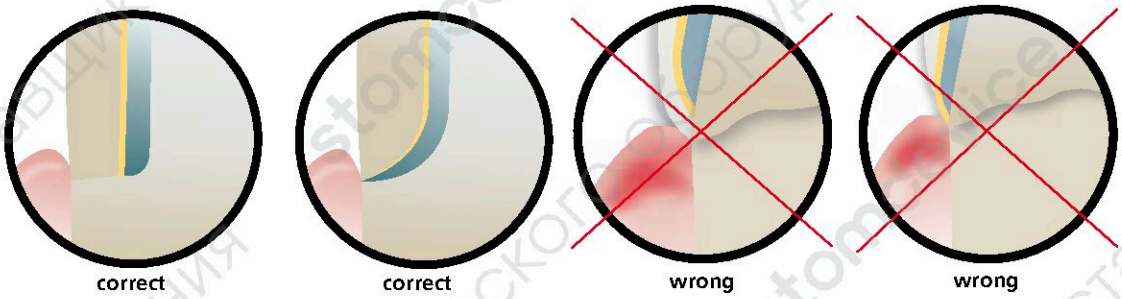


Bridge pontic design – saddle-type pontic

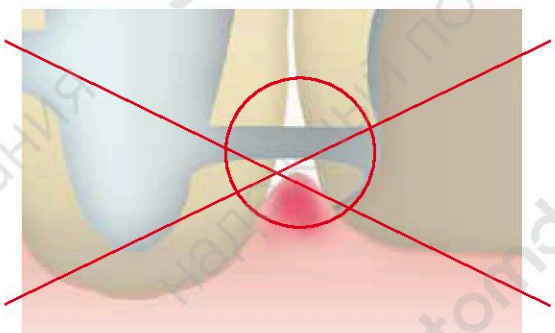


6. Interface between metal and ceramic

The interface 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 interface in the interdental area should be designed in such a way that cleaning of these hard-to-reach areas is possible.





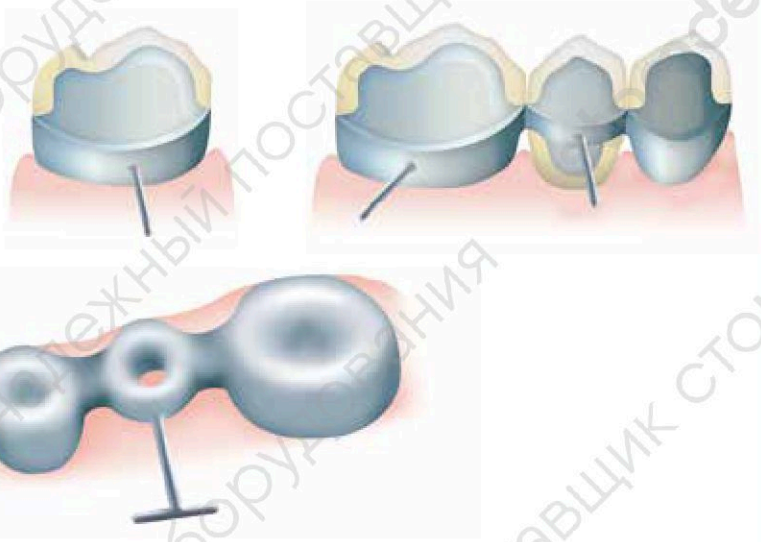


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Holding pins

In order not to damage the crown wall during processing, the crown and bridge frameworks are provided with holding pins. They are directly attached to the framework with the help of wax. 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 struts during casting and firing.



Important

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 Guidelines for Metal-Ceramic Restorations" for additional information on framework design. They can be ordered from your Ivoclar Vivadent contact address.



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Step-by-step procedure

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 for single crowns should be at least 0.3 mm 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 of interdental hygiene and the alloy used.





Design the framework in a reduced supported shape.

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Alloy processing / oxide firing

The cast metal framework is finished using tungsten carbide burs or ceramic-bonded grinding instruments. To make room for the ceramic shoulder (labial or circular), the marginal area of the framework is reduced up to the inner edge of the chamfer or shoulder preparation.



Surface finishing before blasting.



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



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.

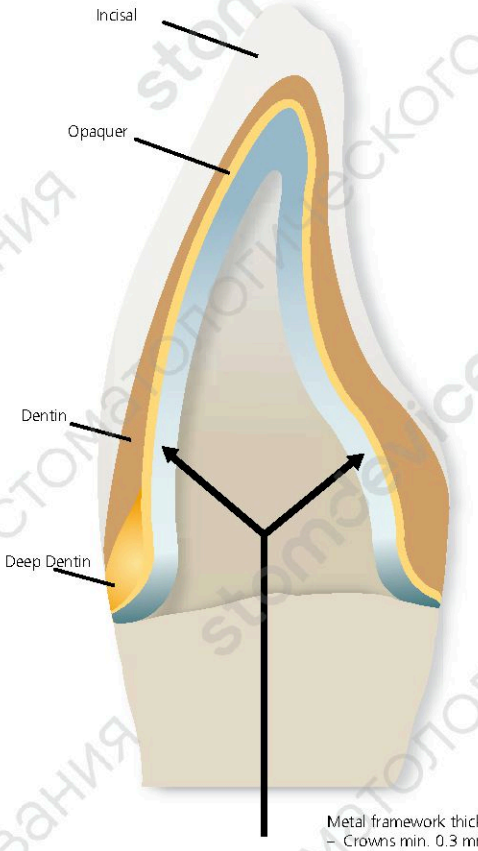


After oxide firing, the framework should exhibit an evenly oxidized surface.

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IPS InLine layering diagram



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

	Ideal layer thickness	Limited 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 mm	0.5 mm
incisal	0.7 mm	0.3 mm
Incisal		
cervical	0.2 mm	0.1 mm
incisal	0.5 mm	0.4 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 (Chromascop, 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.

With Chromascop shades, the Incisal materials are only layered up to the beginning of the cervical third.



e.g. A–D shades



e.g. Chromascop shades

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Opaquer Firing

Paste opaquer

1st Opaquer firing (wash firing) (paste opaquer)

Select the IPS InLine System Opaquer paste in the corresponding tooth shade. If required, homogenize the opaquer paste by stirring it before taking it from its jar. Extrude the desired amount from the syringe or jar and mix thoroughly on the mixing pad. Thin it, if required. Apply the first opaquer layer thinly and agitate it into the alloy surface. After firing and cooling, clean the opaquerized metal framework with the steam jet and dry with oil-free air.





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

2nd Opaquer firing (paste opaquer)

Apply the second opaquer layer in such a way that the metal framework is entirely covered with opaquer. After firing, the IPS InLine System Opaquer should show a covering, silky-mat shiny surface. After the opaquer firing, the conditioned surfaces of the alloy framework should be entirely covered with opaquer.





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

Firing parameters IPS InLine System Opaquer (paste opaquer), 1st and 2nd Opaquer firing

T °C/°F	B °C /°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
930/1706	403/ 757	6	100/180	2	450/842	929/1704

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IPS InLine System Opaquer F

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

- **Either**: Apply the 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 the second layer is applied and fire at 930 °C/1706 °F.



Powder opaquer

1st Opaquer firing (wash firing) (powder opaquer)

Select the IPS InLine System Powder Opaquer in the corresponding tooth shade. Remove the amount of powder opaquer required for the wash from the jar and mix it thoroughly with the Powder Opaquer Liquid on the mixing pad until it has reached the desired consistency. Apply the first opaquer layer thinly on the metal framework and agitate it into the alloy surface. After firing and cooling, clean the opaquerized metal framework with the steam jet and dry with oil-free air.









Important

Mix IPS InLine System Powder Opaquer only with the Powder Opaquer Liquid.

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2nd Opaquer firing (powder opaquer)

Remove the amount of powder opaquer required for the covering layer from the jar and mix it together with the remaining, dried up "wash opaquer" on the mixing pad. Then, mix the powder opaquer with the Powder Opaquer Liquid until it has reached the desired consistency.

Apply the second opaquer layer evenly and in such a way that the metal framework is entirely covered with opaquer. After firing according to the stipulated firing parameters, 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 should be entirely covered with opaquer.





Tip:
A glass or ceramic instrument is optimally suitable to apply the IPS InLine Powder Opaquer for the opaquer firing. Naturally, a brush can also be used to apply IPS InLine Powder Opaquer.

The IPS InLine System Powder Opaquer and Powder Opaquer Liquid are ideally suitable for the application with conventional spray-on techniques. Mix the powder opaquer to a thin consistency, depending on the spray-on system used. Observe the instructions of the manufacturer of the spray-on systems.



Important
- **Use distilled water to rewet the mixed or the already applied powder opaquer.**
- **The firing tray with the opaquerized metal framework should only be placed in the firing chamber and removed from it once the furnace head is completely open and the beeper has sounded.**

Firing parameters IPS InLine System Opaquer (powder opaquer), 1st and 2nd Opaquer firing

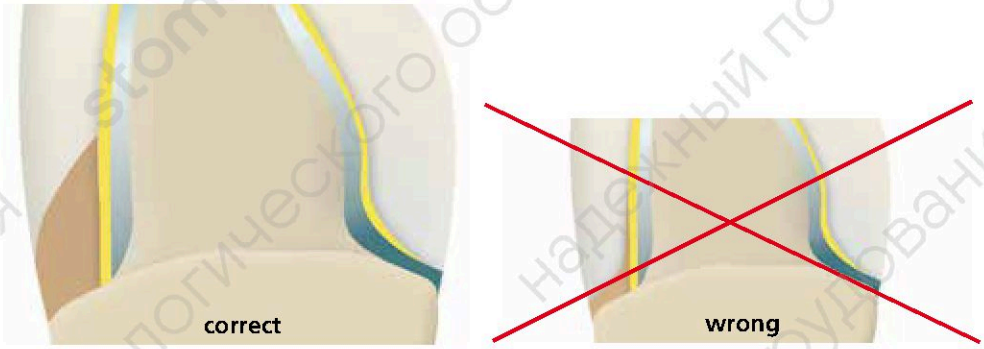
T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
960/1760	403/757	4	100/180	2	450/842	959/1758

Important
IPS InLine System Powder Opaquer
– Alloys (CTE of approx. 13.8 to 15.0 x 10^{-6}/K at 25-500 °C) with a solidus point of ≥ 1080 °C are suitable for opaquerizing with the powder opaquer at a firing temperature of 960 °C.

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1st and 2nd Margin firing

A ceramic shoulder can be fabricated on the metal framework after the opaquer firing, if the necessary space has been provided during finishing. Before creating the ceramic shoulder, seal the stone 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 shoulder material from the die.



Tip:
When designing a ceramic shoulder (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.

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After firing, the shoulder may have to be slightly adjusted by grinding in order to remove any interfering areas. Subsequently, the accuracy of fit (sinter shrinkage) has to be optimized by means of a 2nd Margin firing. Use the same Margin materials as for the 1st Margin firing for that purpose.
First, however, isolate the die again using IPS Ceramic Separating Liquid. Subsequently, supplement the missing areas by carefully inserting the shoulder material into the gap created during the 1st Margin firing so that the ceramic shoulder is provided with optimum accuracy of fit. Complete the shoulder, dry, and carefully remove the framework with the completed and dried shoulder material from the die and place it on the firing tray.

Firing parameters for IPS InLine Margin (1st and 2nd firing)

T °C/°F	B °C /°F	S min	t↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
930/1706	403/757	4	60/108	1	450/842	929/1704

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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 respectively. Isolate the stone die and the adjacent areas using IPS Model Sealer. Additionally, separate the area of the pontics with IPS Ceramic Separating Liquid.

Tip:
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 adaption 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 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.

Tip:
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

Firing parameters for the 1st Dentin and Incisal firing

T °C	B °C	S min	t ↗ °C/min	H min	V_1 °C	V_2 °C
910/1670	403/757	4	60/108	1	450/842	909/1668

Important
- **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 and removed from it once the furnace head is completely open and the beeper has sounded.**

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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 (type 50) 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 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 Dentin and Incisal materials



Final design of the occlusal surface

Firing parameters for the 2nd Dentin and Incisal firing

T °C	B °C	S min	t ↗ °C/min	H min	V_1 °C	V_2 °C
900/1652	403/757	4	60/108	1	450/842	899/1650

Important

- **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 and removed from it once the furnace head is completely open and the beeper has sounded.**

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Margin Add-On firing

Margin Add-On is an add-on material for the ceramic shoulder area, which is applied after the main or add-on firing cycles with Dentin and Incisal materials. Thus, it is possible to adjust the accuracy of the marginal shoulder. Subsequently, the restoration is completed with the new Shade/Stains and Glaze materials.

Firing parameters for the Margin Add-On firing

T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
900/1652	403/757	4	60/108	1	450/842	899/ 1650

Add-On firing

Before the completion of a restoration, small adjustments, such as contact points, pontic rests, or accuracy of fit of the shoulder, may be necessary.

In order to employ a lower firing temperature, IPS InLine Dentin/Incisal materials can be mixed with IPSInLine Add-On in a 1:1 ratio and subsequently applied.

Firing parameters for the Margin Add-On firing

T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
860/1580	403/757	4	60/108	1	450/842	859/1578

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Individual finishing

Finishing and preparing for the Stains and Glaze firing

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

- Finish the restoration using diamond grinders and give it a true-to-nature shape and surface structure, 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 disks.
- If gold and/or silver dust was used to visualize 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.

Stains and Characterization firing

Before the Stains and Characterization firing, the restoration must be free of dirt and grease. Any contamination after cleaning must be prevented. The following steps must be observed:

- For better wetting of the stains, IPS InLine System Glaze and Stains liquid may be slightly agitated on the surface.
- If a more intensive shade effect is desired, it is achieved by several staining procedures and repeated firing. The application of too many stains results in an unnatural shade effect.
- The cusps and fissures can be individualized using Stains.
- The basic chromatic shade is supported with the corresponding Shade material (see table).

Shade combination table for IPS InLine One / IPS InLine / IPS InLine PoM

Shade	1	2	3	4	5	6	7	SI1	SI2
A-D	A1, B1, B2	A2, A3, A3.5	B3, B4, D4	A4	C1, D2, D3	C2, C3, C4	–	A1, A2, A3, B1, B2, B3, B4	A3.5, A4, C1, C2, C3, C4, D2, D3, D4
Chromascop	110, 120, 130 BL1, BL2, BL3, BL4	140, 210, 220, 230, 240	310, 320, 330	340, 540	–	410, 420, 430, 440, 510	520, 530	110–140, 210, 220, 310, 320, BL1–BL4	230, 240, 330, 340, 410–440, 510–540

Firing parameters for the IPS InLine System Shade/Stains firing

T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C /°F	V_2 °C/°F
850/1562	403/757	6	60/108	1	450/842	849/1560

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Shade adjustment with IPS InLine System Shade and Stains

These stains may be fired in a separate Stains firing. Minor shade adjustments and individual characterizations may also be fired in the Glaze firing.

Dispense the desired quantity of IPS InLine System Shade and dilute and mix with IPS InLine System Glaze and Stains Liquid to the desired consistency. Pooling should be avoided and the material must not be applied too thickly. If a more intensive shade effect is desired, it is achieved by several staining procedures and repeated firing. The application of too many stains results in an unnatural shade effect.

Firing parameters for the IPS InLine System Shade/Stains firing (Stains and Characterization firing)

T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C /°F
850/1562	403/757	6	60/108	1	450/842	849/1560

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

Glaze firing

After the Stains and Characterization firing with IPS InLine System Shade/Stains, the Glaze firing is conducted.

- Remove IPS InLine System Glaze paste from the syringe and mix thoroughly. If a different consistency is desired, adjust the consistency by diluting the material with IPS InLine System Glaze and Stains Liquid. Next, apply the Glaze material in the usual manner using a brush. Make sure not to apply the Glaze material either in too thick or too thin layers.
- Minor shade adjustments may be carried out together with the Glaze firing.

Firing parameters for the Glaze firing

T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
850/1562	403/757	6	60/108	2	450/842	849/1560

When working with a furnace from another manufacturer, these parameters have to be adjusted accordingly! Finally, the shade of the completed restoration is checked.

If less gloss is desired, the holding time can be reduced to 1 minute.

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

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Add-On after Glaze Firing

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.

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

T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
690/1274	403/757	6	60/108	1	450/842	689/1272



Individually designed and characterized bridge made of IPS InLine

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IPS InLine® PoM – Accurate Press-On Technique

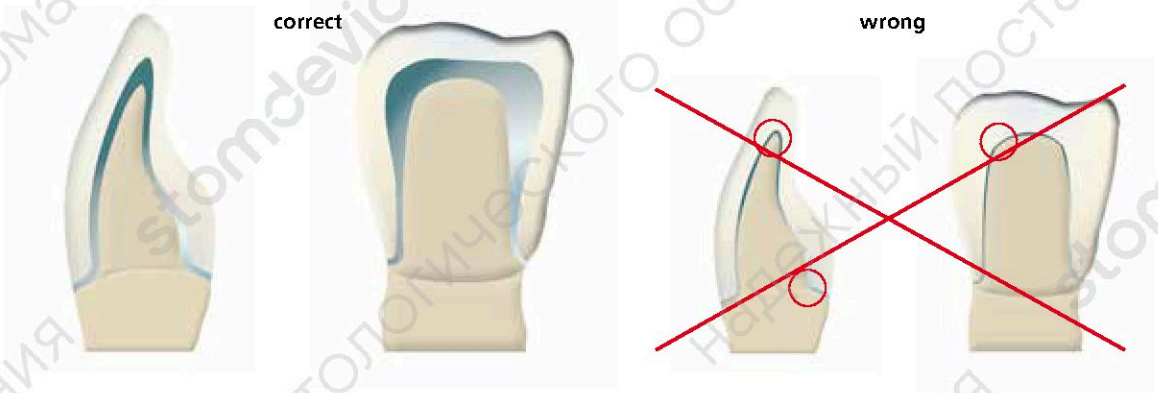
Framework design criteria

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

1. 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 by 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.

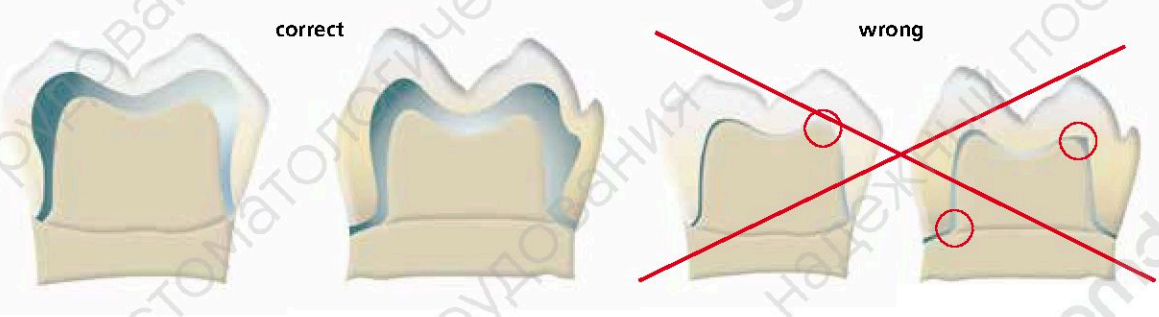
Anterior crowns



Premolar crowns



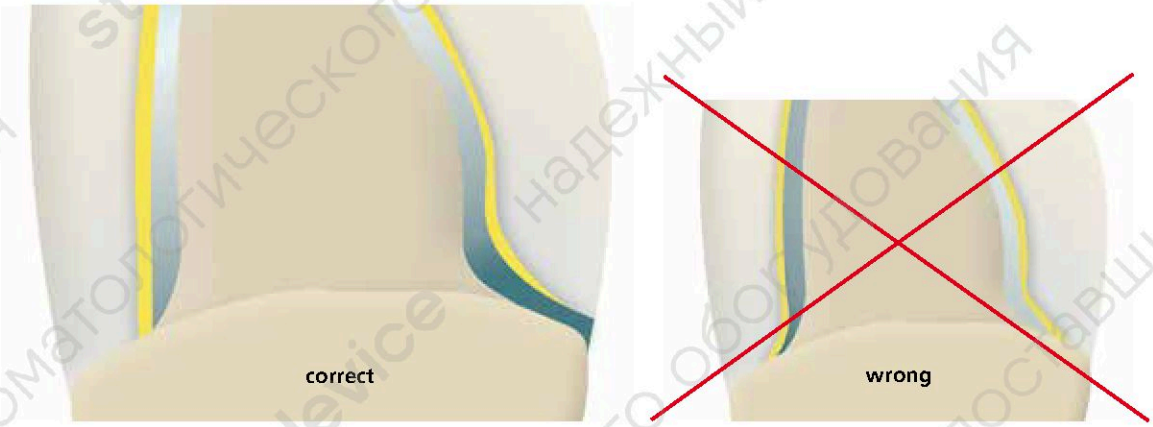
Molar crowns



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2. Framework design for pressed-on ceramic shoulders

With pressed-on ceramic shoulders, 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 to achieve functional support of the framework on the preparation. Excellent accuracy of fit on the preparation is essential to ensure that the shoulder material may not reach the inner aspects of the framework during subsequent application.



3. Framework stability

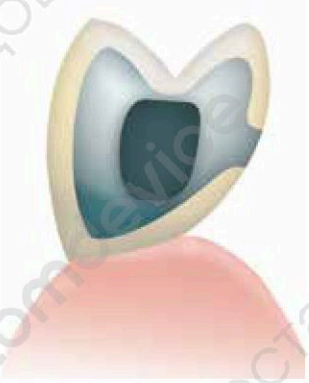
The dimensions and shape of the interdental connector surfaces significantly influence the stability of the restoration during processing as well as the clinical long-term success after incorporation. Therefore, the dimensions of the interdental connector surface must be designed in accordance with the alloy used (take the 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

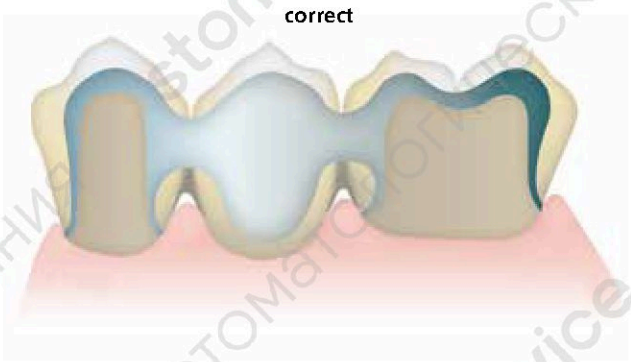
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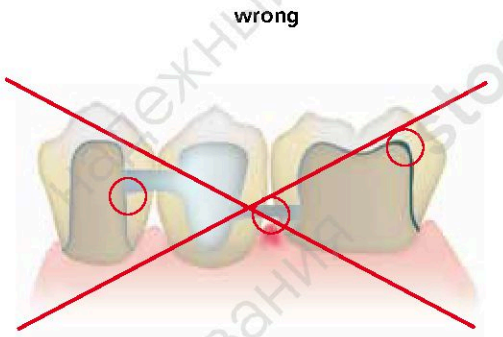
4. Framework design for bridges

Thermal stress during firing and masticatory forces after cementation affect metal frameworks. These forces must be transferred 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 with the corresponding reduction of the ceramic provides the most predictable results.

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 scallop-type design with e.g. interproximal reinforcements counteracts this development. Additionally, this framework design (e.g. with cooling struts) 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 given special attention when designing the framework in order to ensure proper periodontal hygiene with interdental brushes and dental floss.





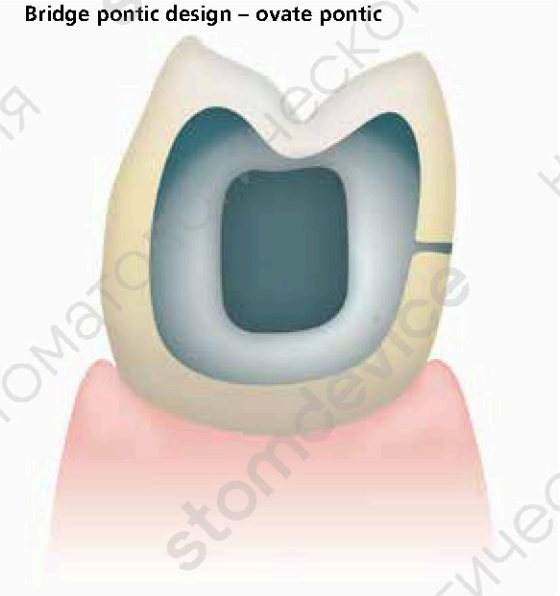


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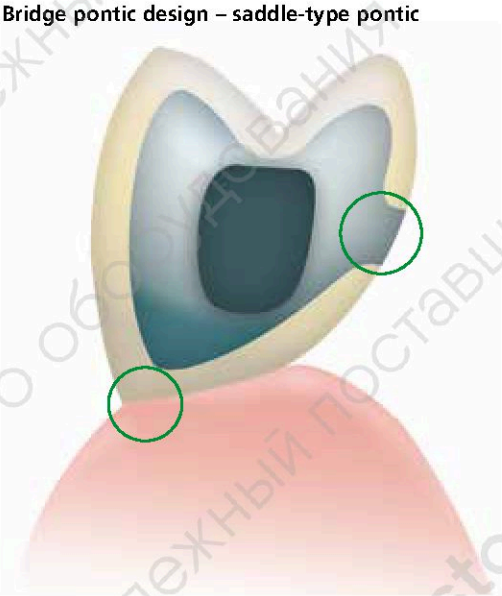
5. Design of bridge pontics

Bridge pontics are designed with esthetic and functional aspects as well as oral hygiene in mind. 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 scallop is recommended. Furthermore, to ensure even cooling of the bridge pontic that absorbs the most heat, additional cooling struts are advantageous.

Bridge pontic design – ovate pontic

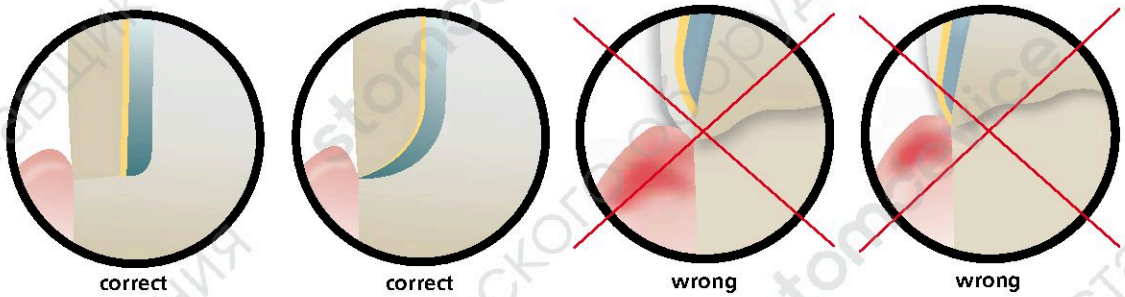


Bridge pontic design – saddle-type pontic

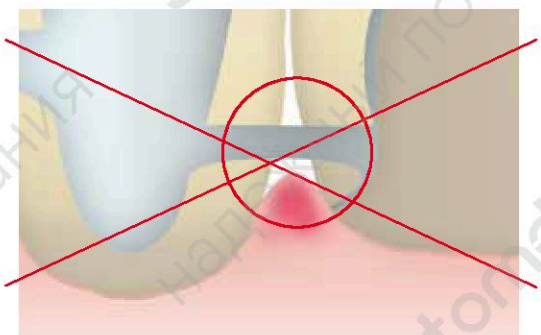


6. Interface between metal and ceramic

The interface 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 neither be located in the contact area nor on surfaces involved in masticatory functions. The interface in the interdental area should be designed in such a way that cleaning of these hard-to-reach areas is possible.







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Retention pins

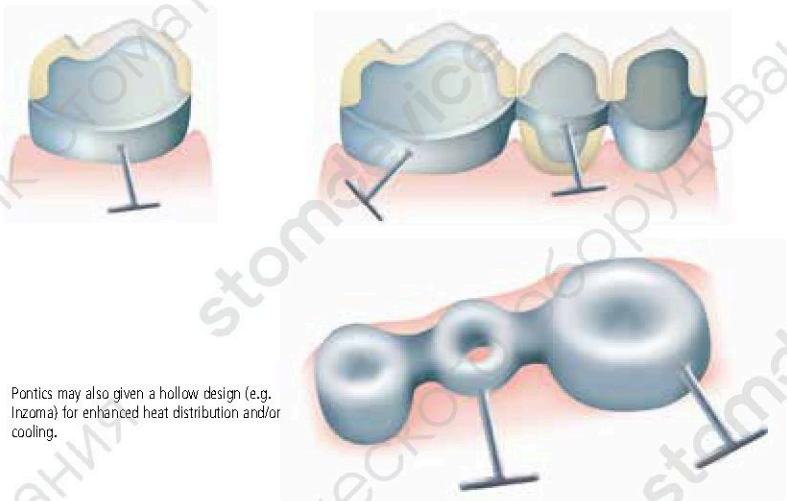
It is important for the press-on-metal technique that retention pins are attached to the crown and bridge frameworks. These retention pins have to be attached in the area of the pontics or the scallops. They are directly attached to the framework with the help of wax. Dimensions of Ø 1.0–1.5 mm for the retention pins have proven to be useful.

Advantages of cast-on retention pins:
1. Act as cooling struts during casting and firing
2. Retention for improved fixation in the investment material during the press-on procedure with IPS InLine PoM
3. Handling aid for further processing

The retention pins have to be shaped in such a way that the bridge framework cannot distort and/or move in the investment material. At least 2 retention pins (diverging) have to be provided for bridge frameworks, one of which has to be positioned in the area of the pontic.



If straight wax wires are used, 2 diverging wires have to be applied for bridges. A profile has to be positioned in the area of the pontic.



Pontics may also given a hollow design (e.g. Inzoma) for enhanced heat distribution and/or cooling.

Important

The retention 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 Guidelines for Metal-Ceramic Restorations" for additional information on framework design. They can be ordered from your Ivoclar Vivadent contact address.



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Step-by-step procedure

Starting situation



Maxillary and mandibular model articulated in the "Stratos 200"



Starting situation for the metal-supported IPS InLine PoM restoration

Framework design

Design the framework with a reduced anatomical shape taking the planned press-on procedure into account. The wall thickness for single crowns should be at least 0.3 mm 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 of interdental hygiene and the alloy used.





Design the framework in a reduced supported shape.

- **Due to the optical properties, the ceramic should feature a thickness of at least 0.8 mm in connection with the press-on-metal technique.**
- **Especially if frameworks are to be pressed over, it is recommended to attach retention grooves in the palatal / lingual area.**

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Alloy processing / oxide firing

The cast metal framework is finished using tungsten carbide burs or ceramic-bonded grinding instruments. To make room for the ceramic shoulder (labial or circular), the marginal area of the framework is reduced up to the inner edge of the chamfer or shoulder preparation.



Surface finishing before blasting



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



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.

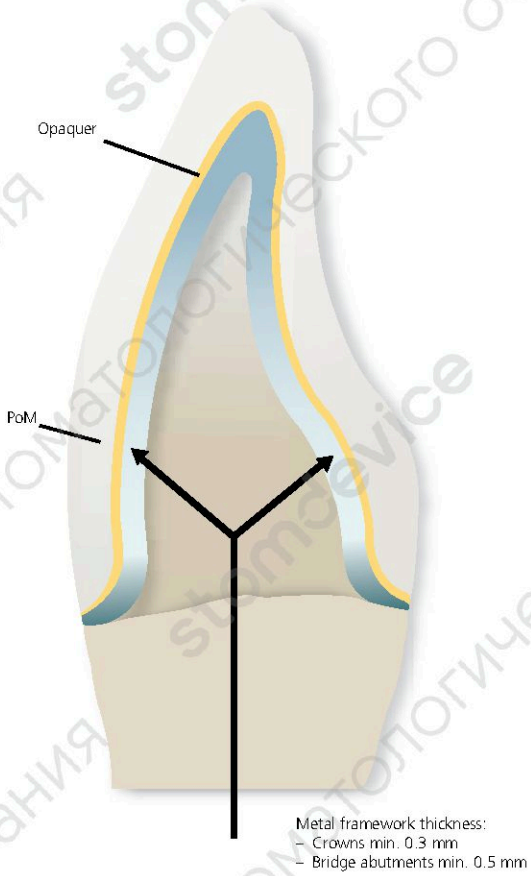


After oxide firing, the framework should exhibit an evenly oxidized surface.

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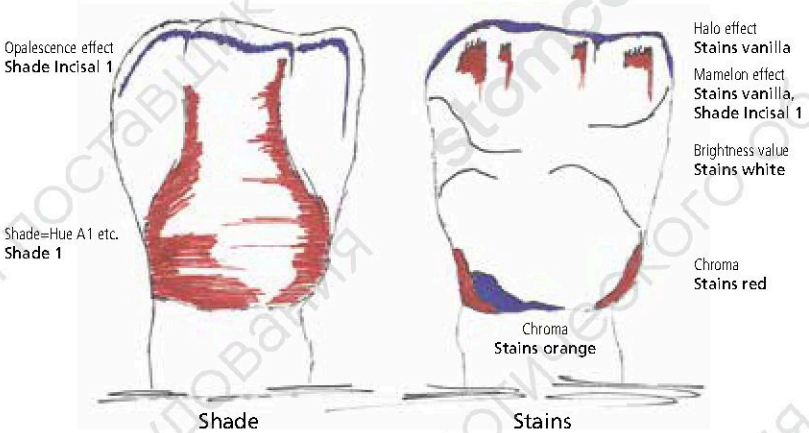
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IPS InLine PoM layering diagram



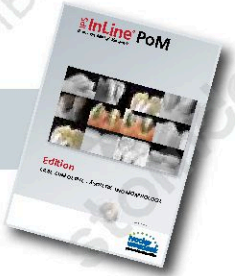
	Ideal layer thickness	Limited layer thickness
Framework	0.3–0.5 mm	0.3–0.5 mm
Opaquer	0.1 mm	0.1 mm
PoM	0.8–1.5 mm	0.8

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



Depending on the desired individualization, IPS InLine System Shade/Stains can be used to achieve true-to-nature shade effects.

You can find additional information on esthetic individualization in the edition "Love for Detail" by D. Grübel. It can be ordered from your Ivoclar Vivadent contact address.



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Opaquer Firing

Paste opaquer

1st Opaquer firing (wash firing) (paste opaquer)

Select the IPS InLine System Opaquer paste in the corresponding tooth shade. If required, homogenize the opaquer paste by stirring it before taking it from its jar. Extrude the desired amount from the syringe or jar and mix thoroughly on the mixing pad. Thin it, if required. Apply the first opaquer layer thinly and agitate it into the alloy surface. After firing and cooling, clean the opaquerized metal framework with the steam jet and dry with oil-free air.





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

2nd Opaquer firing (paste opaquer)

Apply the second opaquer layer in such a way that the metal framework is entirely covered with opaquer. After firing, the IPS InLine System Opaquer should show a covering, silky-mat shiny surface. After the opaquer firing, the conditioned surfaces of the alloy framework should be entirely covered with opaquer.





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

Firing parameters IPS InLine System Opaquer (paste opaquer), 1st and 2nd Opaquer firing

T °C/°F	B °C /°F	S min	t °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
930/1706	403/ 757	6	100/180	2	450/842	929/1704

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IPS InLine System Opaquer F

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

- **Either**: Apply the 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 the second layer is applied and fire at 930 °C/1706 °F.



Powder opaquer

1st Opaquer firing (wash firing) (powder opaquer)

Select the IPS InLine System Powder Opaquer in the corresponding tooth shade. Remove the amount of powder opaquer required for the wash from the jar and mix it thoroughly with the Powder Opaquer Liquid on the mixing pad until it has reached the desired consistency. Apply the first opaquer layer thinly on the metal framework and agitate it into the alloy surface. After firing and cooling, clean the opaquerized metal framework with the steam jet and dry with oil-free air.









Important

Mix IPS InLine System Powder Opaquer only with the Powder Opaquer Liquid.

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2nd Opaquer firing (powder opaquer)

Remove the amount of powder opaquer required for the covering layer from the jar and mix it together with the remaining, dried up "wash opaquer" on the mixing pad. Then, mix the powder opaquer with the Powder Opaquer Liquid until it has reached the desired consistency.

Apply the second opaquer layer evenly and in such a way that the metal framework is entirely covered with opaquer. After firing according to the stipulated firing parameters, 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 should be entirely covered with opaquer.





Tip:
A glass or ceramic instrument is optimally suitable to apply the IPS InLine Powder Opaquer for the opaquer firing. Naturally, a brush can also be used to apply IPS InLine Powder Opaquer.

The IPS InLine System Powder Opaquer and Powder Opaquer Liquid are ideally suitable for the application with conventional spray-on techniques. Mix the powder opaquer to a thin consistency, depending on the spray-on system used. Observe the instructions of the manufacturer of the spray-on systems.



Important
- **Use distilled water to rewet the mixed or the already applied powder opaquer.**
- **The firing tray with the opaquerized metal framework should only be placed in the firing chamber and removed from it once the furnace head is completely open and the beeper has sounded.**

Firing parameters IPS InLine System Opaquer (powder opaquer), 1st and 2nd Opaquer firing

T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
960/1760	403/757	4	100/180	2	450/842	959/1758

Important
IPS InLine System Powder Opaquer
– Alloys (CTE of approx. 13.8 to 15.0 x 10^{-6}/K at 25-500 °C) with a solidus point of ≥ 1080 °C are suitable for opaquerizing with the powder opaquer at a firing temperature of 960 °C.

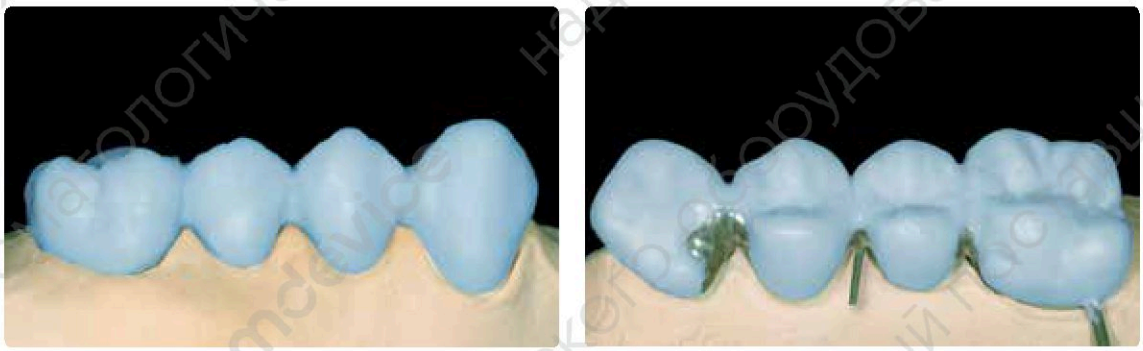
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Wax-up

After the fabrication of the model with detachable segments and the preparation of the dies, the restoration is contoured. Use only organic waxes for contouring, since they fire without leaving residue.

- Weigh the metal framework coated with opaquer and record the weight. The weight is used to determine the wax weight after contouring. .
- Subsequently, secure the framework on the model in the proper position and wax the margins first.
- Fabricate a fully anatomical wax-up as usual. Observe a layer thickness of at least 0.8 mm. Make sure not to exceed a thickness of 1.5 mm in order to ensure optimum shade reproduction.
- Observe a wax thickness of at least 0.8 mm to avoid incomplete press results.



Fully anatomical wax-up on the metal framework. Observe the minimum layer thicknesses at all times.

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Sprueing

The diameter for the sprues is 3 mm. For multi-unit bridges, each bridge unit must be provided with a sprue. Always attach the sprues in the direction of flow of the ceramic and at the thickest part of the wax-up so that smooth flowing of the viscous ceramic during pressing is enabled. Depending on the number of objects to be invested, either the 100 g, 200 g, or 300 g IPS Investment Ring System is selected. Bridges must only be pressed in the 200 g or 300 g Investment Ring System. The following sprueing guidelines have to be observed:

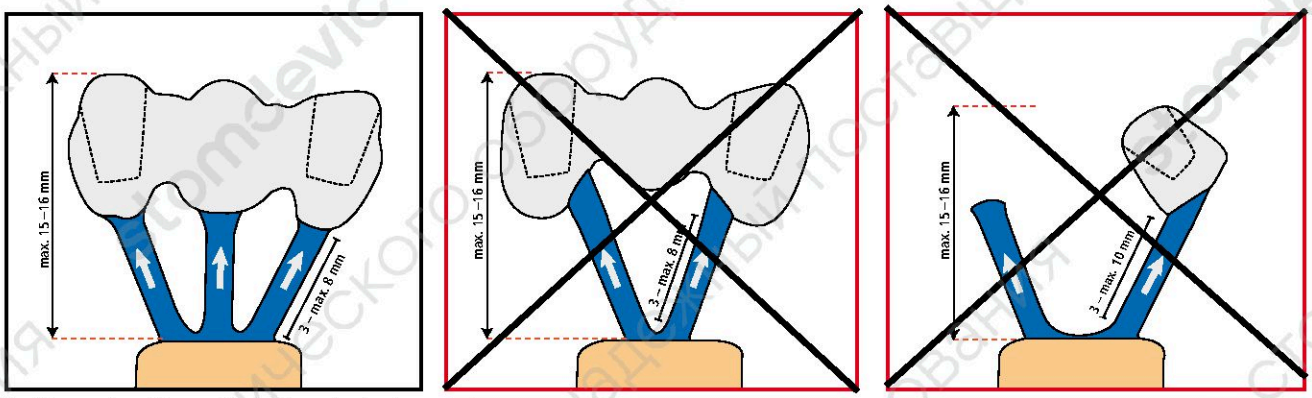
	Single Crowns, Bridges
Ring Base	100 g, 200 g, 300 g
Wax wire Ø	3 mm
Length of the wax wire	min. 3 mm, max. 10 mm
Length of the wax wire including waxed-up object	max. 15–16 mm
Sprue attachment point at the waxed-up object	thickest part of the wax-up; every bridge unit
Sprue angle to the waxed-up object	in the direction of flow of the ceramic; observe the cusp angulation
Sprue angle to the ring base	45–60°
Design of the attachment points	rounded, no angles or edges
Distance between the objects	min. 3 mm
Distance to the silicone ring	Crowns: min. 10 mm; Bridges: 58 mm
Important	Larger bridges may also be placed in the centre of the investment ring.



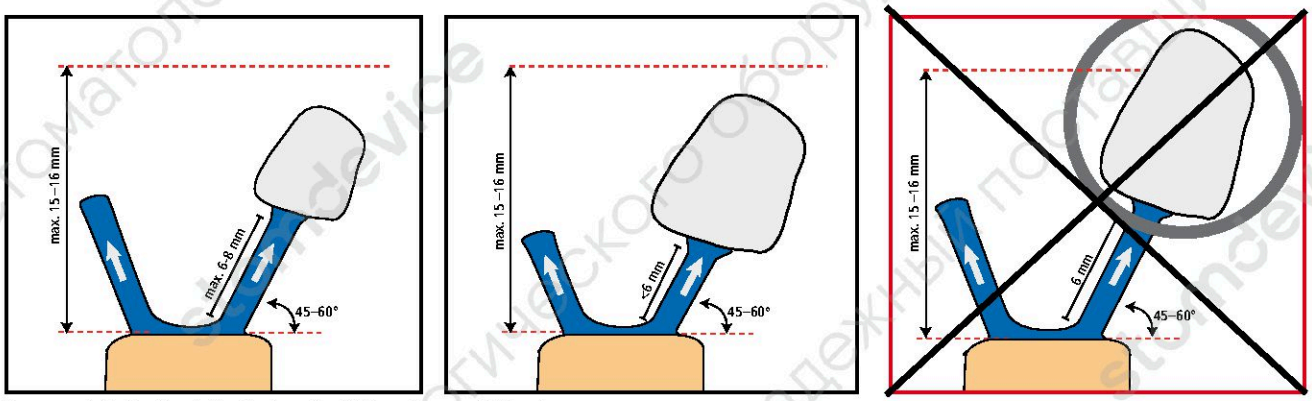
On the IPS Investment Ring Base, always attach sprues in the direction of flow of the ceramic and to the thickest part of the restoration.

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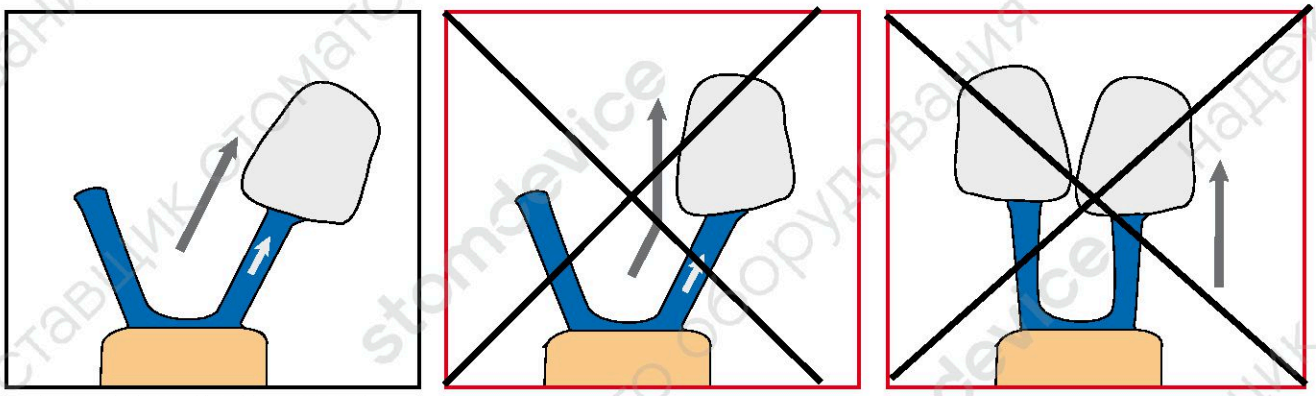
Correct sprueing



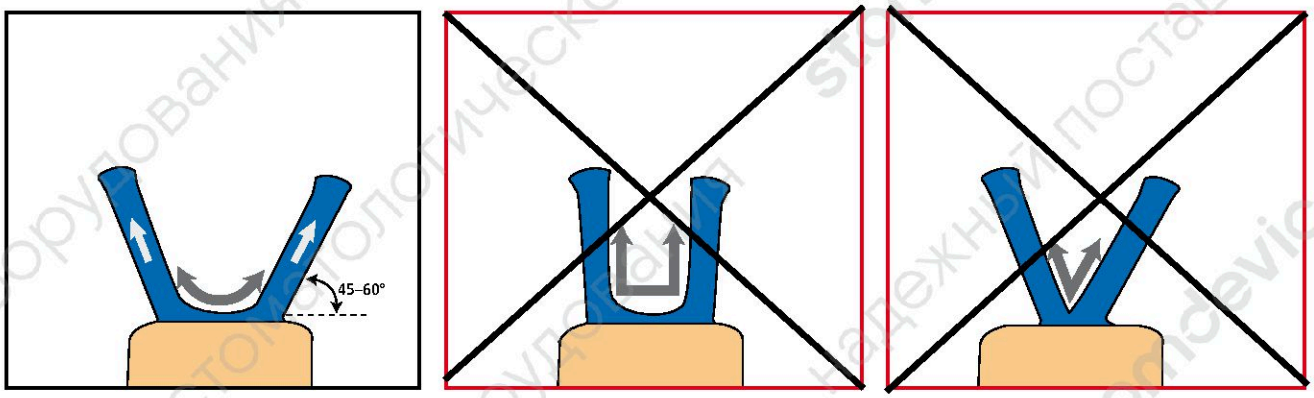
Direct the sprues towards the wax pattern (imagine continuation of wax pattern).



The sprue and object together should not be longer than 15-16 mm. Observe a 45-60° angle.

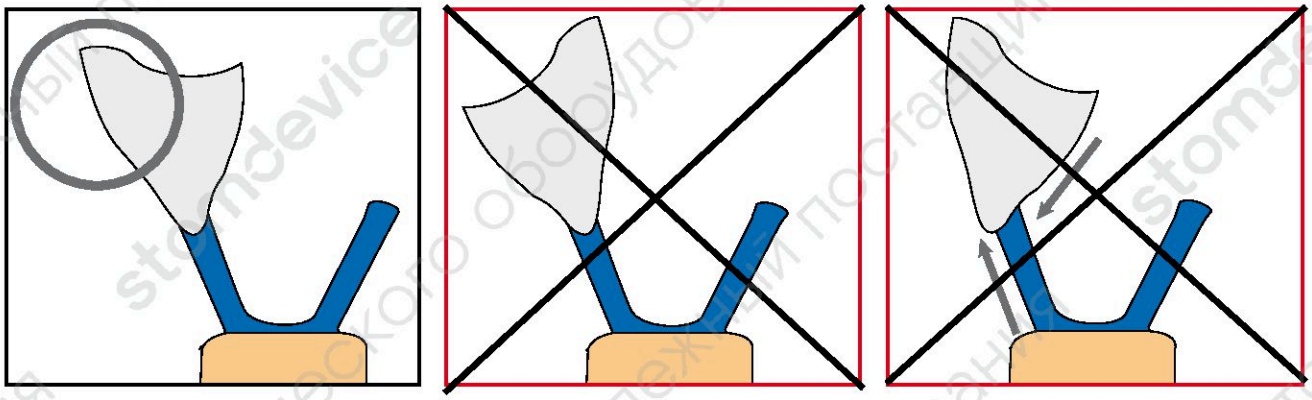


Provide sprues in the direction of flow of the ceramic material.

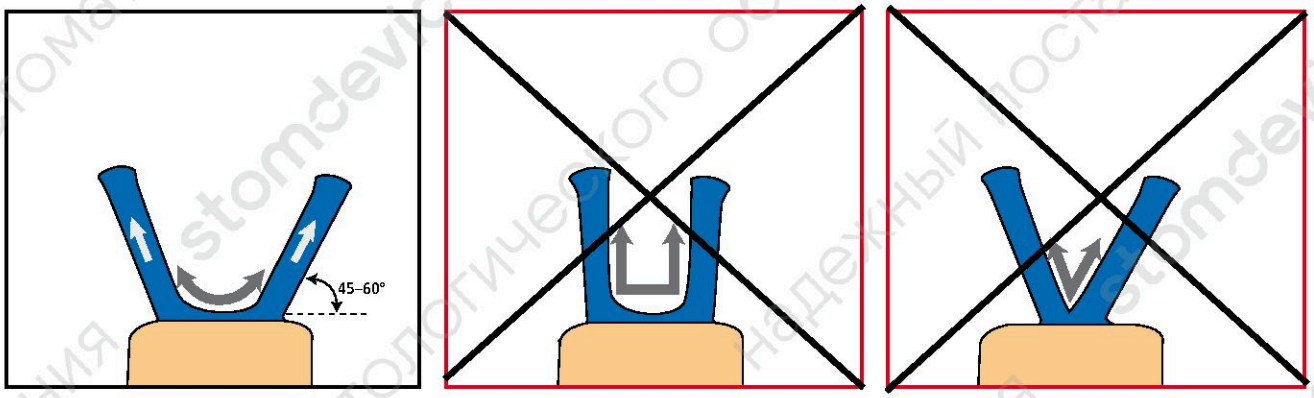


The attachment points of the sprues must be rounded. Observe a 45–60° angle.

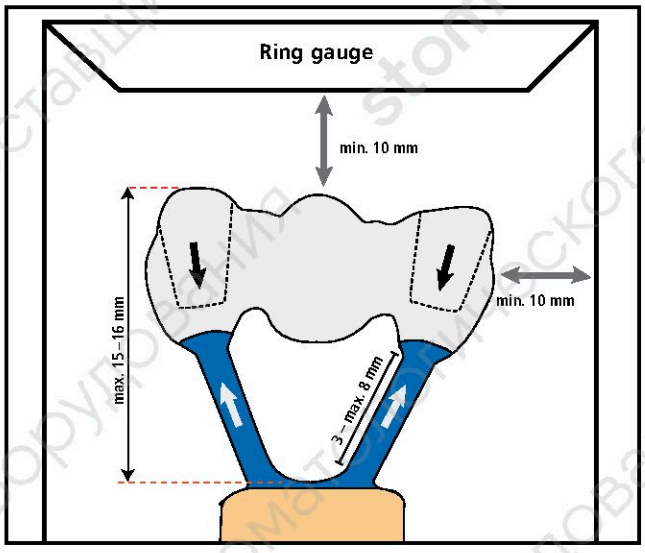
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If the crown is viewed from the proximal, the longer side of the object (usually the buccal surface) points outwards. Additionally, the flow of the ceramic material must be observed.



The attachment points of the sprues must be rounded. Observe a 45–60° angle.



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Investing

Investing is carried out using either IPS PressVEST (e.g. overnight) or IPS PressVEST Speed. For that purpose, the IPS Silicone Ring with the matching investment ring gauge is used. Determine the precise wax weight as follows:

- Weigh the ring base (seal the opening of the ring base with wax).
- Position the objects to be pressed on the ring base and attach them with wax. Weigh again.
- The wax weight is calculated by deducting the weight of the ring base and the weight of the framework (including opaquer) from the total weight.

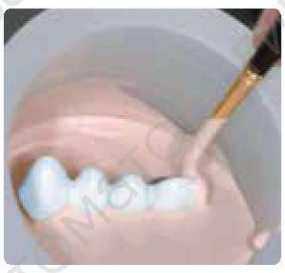
	100 g		200 g			300 g				
Number of ingots	1 x XS	1 x S	2 x XS	1 x S + 1 x XS	1 x S + 1 x S	3 x XS	3 x S	6 x XS	3 x XS + 3 x S	6 x S
Individual objects	1	2–3	3–4	4–5	5–6	4–5	5–6	6–7	8–9	9–12
Bridge pontics			3	3–4	4–6	3–4	4–6	6–7	8–9	9–12
Wax weight	0.4 g	0.6 g	1.0 g	1.5 g	2.0 g	1.4 g	2.1 g	3.0 g	4.1 g	5.1 g

Please refer to the Instructions for Use of the corresponding investment material for the detailed processing parameters. The following procedure is recommended:

- Do **not** use a debubblizer on the wax objects. Remove separator thoroughly with oil-free compressed air.
- Mix the investment material. The investment material contains quartz powder. Therefore, avoid the inhalation of dust.
- Use a suitable instrument for the fine investment of the cavity. Make sure that the delicate wax margins are not damaged.
- Carefully place the IPS Silicone Ring on the ring base without damaging the wax objects. The silicone ring must sit flush on the investment ring base.
- Subsequently, carefully fill the investment ring with investment material up to the marking and position the ring gauge with a hinged movement.
- Allow the investment ring to set without manipulating it.
- Do not use IPS PressVEST for investment over the weekend to prevent crystallization.

Investment material mixing ratio

Investment material	100 g investment ring	200 g investment ring	300 g investment ring
IPS PressVEST	13 ml liquid 9 ml dist. water	26 ml liquid 18 ml dist. water	39 ml liquid 27 ml dist. water
IPS PressVEST Speed	16 ml liquid 11 ml dist. water	32 ml liquid 22 ml dist. water	48 ml liquid 33 ml dist. water




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Preheating

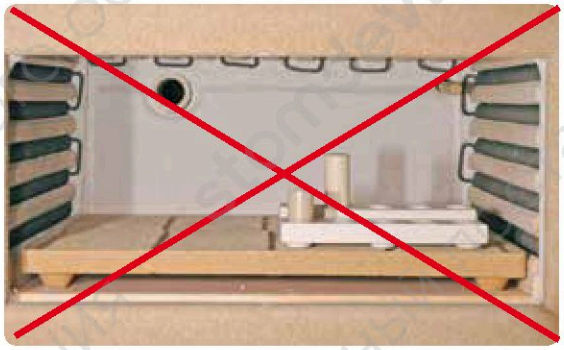
After the stipulated setting time of the respective investment material (IPS PressVEST or IPS PressVEST Speed), the investment ring is prepared for preheating as follows:

- Remove the ring gauge and ring base with a turning movement.
- Carefully push the investment ring out of the IPS Silicone Ring.
- Remove rough spots on the bottom surface of the investment ring with a plaster knife. Check the 90° angle. Investment material residue must not enter the sprues. Blow into the sprues if necessary.
- If several investment rings are preheated together, mark them with the respective ingot shade.
- When placing several investment rings in the preheating furnace using the Speed method, make sure that the furnace temperature does not drop too much.

	IPS PressVEST	IPS PressVEST Speed
Setting time	min. 60 min	min. 30 min, max. 45 min
Preheating furnace temperature	Start room temperature heat up to 850 °C/1562 °F / 5 °C/9°F min	Direct 850 °C/1562 °F
Position of the investment ring in the furnace	towards the rear wall, tipped with the opening facing down	towards the rear wall, tipped with the opening facing down
IPS InLine PoM ingots	**no preheating**	
IPS Alox plunger/IPS One-Way plunger 300g	**no preheating**	
Holding time at final temperature 850°C/1562°F	at least 90 min	at least 90 min
Important		If several Speed investments are to be conducted, they should be invested consecutively and placed into the preheating furnace at an interval of approximately 20 minutes. Make sure that the furnace temperature does not drop too much when placing the investment rings into the preheating furnace. The stipulated holding time counts from the point when the preheating temperature has been reached again.



Position the heating muffle towards the rear wall, tipped with the opening facing down



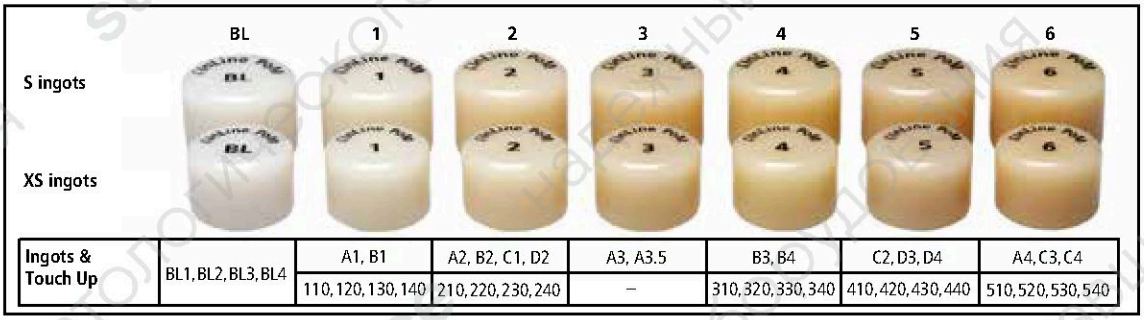
Do **not** preheat the IPS InLine PoM ingot and the IPS One-Way plunger.

In order to ensure smooth working procedures in the laboratory on a daily basis, impeccable functioning of the infrastructure, particularly the preheating furnaces, is essential. This includes their maintenance, cleaning with a vacuum cleaner in a cool state as well as regular checks of the temperature controls and heating elements, etc. by the manufacturer.

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Selection of ingots

Select the proper ingot. Only seven shades are sufficient to reproduce all the Chromascop, A-D and Bleach shades. Therefore, it is possible to press fully anatomical restorations for different patient cases in one press cycle. The final tooth shade is achieved by individual characterization using the IPS InLine System Shade/Stains and Glaze materials.
Given the two ingot sizes, the objects may be optimally fabricated with the corresponding number of IPS InLine PoM ingots depending on the wax weight.



Ingots & Touch Up	BL1, BL2, BL3, BL4	A1, B1	A2, B2, C1, D2	A3, A3.5	B3, B4	C2, D3, D4	A4, C3, C4
		110, 120, 130, 140	210, 220, 230, 240	–	310, 320, 330, 340	410, 420, 430, 440	510, 520, 530, 540

Pressing with the 100g, 200g, 300g IPS Investment Ring System



IPS Alox Plunger for the IPS Investment Ring System 100g, 200g



Provide a **cold** IPS Alox Plunger and **cold** IPS InLine PoM ingots in the desired shade.



Insert the **cold** IPS InLine PoM ingot with the imprint facing upwards into the **hot** investment ring.



Then, place the powder-coated IPS Alox Plunger into the **hot** investment ring.



Place the **hot** and completed investment ring in the centre of the **hot** press furnace using the IPS Investment Ring Tongs.



Press START to start the selected program.



Once the press program is completed, place the hot investment ring on the cooling grid using the Investment Ring Tongs and allow it to cool to room temperature.

Press parameters for IPS InLinePoM ingots in the IPS Investment Ring System 100 g and 200 g

Investment Ring 100 g and 200 g	B °C/°F	T °C/°F	H min 100 g	H min 200 g	t ↗ °C/°F/min	V_1 °C/°F	V_2 °C/°F	N / E
EP 500 / V 2.9	700/1292	950/1742	10	20	60/108	500/932	950/1742	0 Program 11-20
EP 600 / EP 600 Combi	700/1292	940/1724	10	20	60/108	500/932	940/1724	**250 µm/ min.***
Programat EP 3000 / Programat EP 5000	700/1292	940/1724	10	20	60/108	500/932	940/1724	**250 µm/ min.***

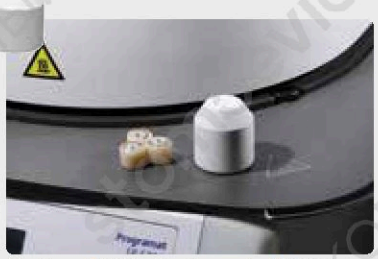
***Important:** If you enter the program manually, observe the abort criterion.

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IPS One-Way Plunger 300 g for IPS Investment Ring System 300 g





Provide a **cold** IPS One-Way Plunger and **cold** IPS InLine PoM ingots in the desired shade.



Insert the **cold** IPS InLine PoM ingots with the imprint facing upwards into the **hot** investment ring.



Place the **cold** IPS One-Way Plunger 300 g in the **hot** investment ring.



Place the **hot** and completed investment ring in the centre of the **hot** press furnace using the IPS Investment Ring Tongs



Press START to start the selected program.



Once the press program is completed, place the hot investment ring on the cooling grid using the Investment Ring Tongs and allow it to cool to room temperature.

Press parameters for IPS InLine PoM ingots in the IPS Investment Ring System 300 g

Investment Ring 300 g	B °C/°F	T °C/°F	H min 300 g	t ↗ °C/°F/min	V_1 °C/°F	V_2 °C/°F	N / E
EP 500 / V 2.9	700/1292	960/1760	40	60/108	500/932	960/1760	Program 31–51
EP 600 / EP 600 Combi	700/1292	950/1742	40	60/108	500/932	950/1742	**50 µm/min.***
Programat EP 3000 / Programat EP 5000	700/1292	950/1742	40	60/108	500/932	950/1742	**50 µm/min.***

***Important:** If you enter the program manually, observe the abort criterion.

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Divesting

Once the investment ring has cooled to room temperature (approx. 60 min), divest as follows:

- Mark the length of the Alox plunger on the cooled investment ring.
- Separate the investment ring using a separating disk. This predetermined breaking point enables reliable separation of the investment material and the ceramic material.
- Always use polishing beads to divest the pressed objects (rough and fine divestment). Do not use Al_2O_3 .
- Rough divestment is carried out with polishing beads at 4 bar (60 psi) pressure.
- Fine divestment is carried out with polishing beads at 1–1.5 bar (15–22 psi) pressure.
- Observe the blasting direction and distance to prevent damage to the object margins during divestment. Cover the marginal areas thoroughly with the glove.



Mark the length of the Alox plunger.



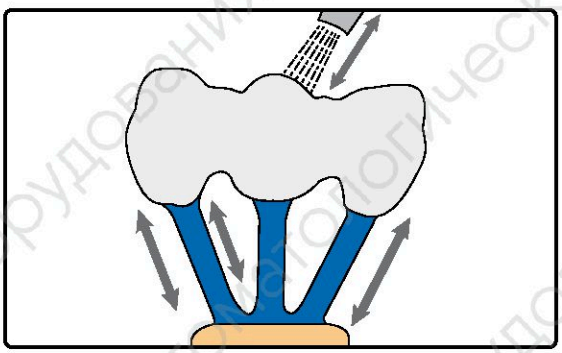


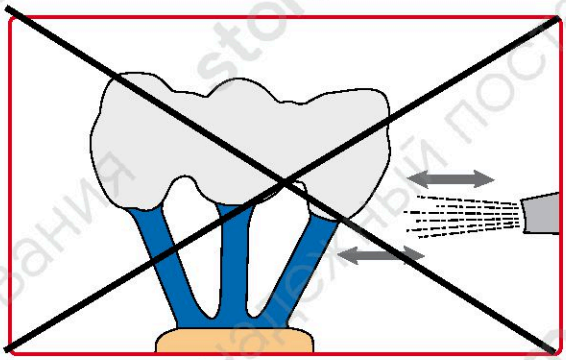
Separate the investment ring using a separating disk.





The Alox plunger is already very clean if it is removed with tongs from the investment material. Check the cleanness and blast with Al_2O_3 if required.





Sandblasting the objects

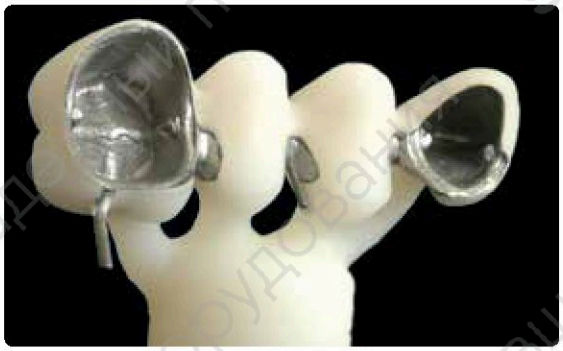
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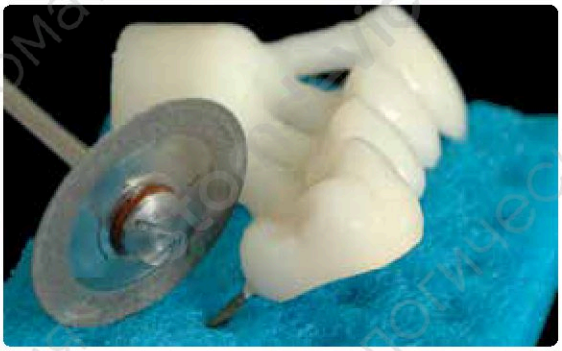
Separating / finishing

After separation of the sprues and smoothing of the attachment points, the pressed object is fitted to the master model. For that purpose, the usual rotary instruments (as those used for IPS Empress) are used (without pressure and overheating). After that, carefully sandblast the restoration. Finally, clean the restoration under running water or with steam. Dry thoroughly with oil-free air.





Bridge with sprues





Special attention is required for separating the palatal metal retention pin. Make sure to separate and polish the retention pin carefully after glazing without creating too much heat.

Adjustments with IPS InLine PoM Touch-Up

For minor shape adjustments, such as incompletely pressed margins or occlusal surfaces, the 7 Touch-Up materials are available in the respective ingot shade. The Touch-Up materials must only be used for metal-supported IPS InLine PoM restorations.

Processing

- The restoration must be free of dirt and grease prior to adjustment. For that purpose, clean the restoration thoroughly with a steam jet.
- Apply the IPS InLine PoM Touch-Up material mixed with IPS InLine System Build-Up Liquid on the missing, cleaned areas using a brush and slightly blot with an absorbent cloth.
- Place the restoration on the firing tray and fire it.
- Next, finish the restoration or apply second Touch-Up adjustments and fire with the same parameters.



Adjustment with IPS InLine PoM Touch Up

Firing parameters for IPS InLine PoM Touch-Up

T °C/°F	B °C/°F	S min	t↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
840/1544	403/757	4	60/108	1	450/842	839/1542

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Individual finishing

Finishing and preparing for the Stains and Glaze firing

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

- Finish the restoration using diamond grinders and give it a true-to-nature shape and surface structure, 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 disks.
- If gold and/or silver dust was used to visualize 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.

Stains and Characterization firing

Before the Stains and Characterization firing, the restoration must be free of dirt and grease. Any contamination after cleaning must be prevented. The following steps must be observed:

- For better wetting of the stains, IPS InLine System Glaze and Stains liquid may be slightly agitated on the surface.
- If a more intensive shade effect is desired, it is achieved by several staining procedures and repeated firing. The application of too many stains results in an unnatural shade effect.
- The cusps and fissures can be individualized using Stains.
- The basic chromatic shade is supported with the corresponding Shade material (see table).

Shade combination table for IPS InLine One / IPS InLine / IPS InLine PoM

Shade	1	2	3	4	5	6	7	SI1	SI2
A-D	A1, B1, B2	A2, A3, A3.5	B3, B4, D4	A4	C1, D2, D3	C2, C3, C4	–	A1, A2, A3, B1, B2, B3, B4	A3.5, A4, C1, C2, C3, C4, D2, D3, D4
Chromascop	110, 120, 130 BL1, BL2, BL3, BL4	140, 210, 220, 230, 240	310, 320, 330	340, 540	–	410, 420, 430, 440, 510	520, 530	110–140, 210, 220, 310, 320, BL1–BL4	230, 240, 330, 340, 410–440, 510–540

Firing parameters for the IPS InLine System Shade/Stains firing

T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
800/1472	403/757	6	60/108	1	450/842	799/1470

Note:
All the firing cycles for stains and characterization as well as the Glaze firing in conjunction with IPS InLine PoM restorations are carried out at 800 °C / 1472 °F.

Important
All InLine System products such as Opaquer, Shade, Stains, Glaze, Add-On 690 °C and Liquids are compatible with IPS InLine PoM.

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Shade adjustment with IPS InLine System Shade and Stains

These stains may be fired in a separate Stains firing. Minor shade adjustments and individual characterizations may also be fired in the Glaze firing.

Dispense the desired quantity of IPS InLine System Shade and dilute and mix with IPS InLine System Glaze and Stains Liquid to the desired consistency. Pooling should be avoided and the material must not be applied too thickly. If a more intensive shade effect is desired, it is achieved by several staining procedures and repeated firing. The application of too many stains results in an unnatural shade effect.

Firing parameters for the IPS InLine System Shade/Stains firing (Stains and Characterization firing)

T °C/°F	B °C /°F	S min	t ↗ °C//°Fmin	H min	V_1 °C/°F	V_2 °C/°F
800/1472	403/757	6	60/108	1	450/842	799/1470

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

Glaze firing

After the Stains and Characterization firing with IPS InLine System Shade/Stains, the Glaze firing is conducted.

- Remove IPS InLine System Glaze paste from the syringe and mix thoroughly. If a different consistency is desired, adjust the consistency by diluting the material with IPS InLine System Glaze and Stains Liquid. Next, apply the Glaze material in the usual manner using a brush. Make sure not to apply the Glaze material either in too thick or too thin layers.
- Minor shade adjustments may be carried out together with the Glaze firing.

Firing parameters for the Glaze firing

T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C /°F
800/1472	403/757	6	60/108	2	450/842	799/1470

When working with a furnace from another manufacturer, these parameters have to be adjusted accordingly! Finally, the shade of the completed restoration is checked.

If less gloss is desired, the holding time can be reduced to 1 minute.

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

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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.

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

T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
690/1274	403/757	4	60/108	1	450/842	689/1272

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



Individually designed and characterized bridge made of IPS InLine PoM

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IPS InLine® – Veneers

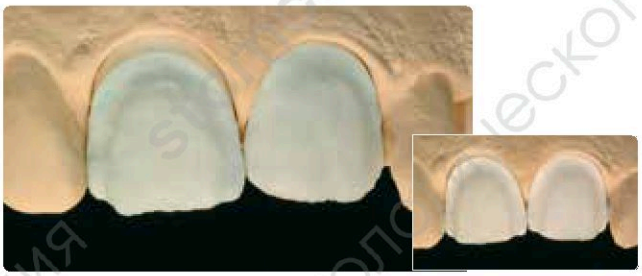
The following chapter shows the step-by-step layering of veneers on refractory dies.
Important: After each working step, the master model has to be immersed in water for about 5–10 minutes, depending on the size.

Tip:
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, Cosmotech VEST from GC or G-CERA™ VEST from GC (observe the instructions of the manufacturer).
Important: Correct processing and properly degassed dies are an important prerequisite for accurately fitting veneers.

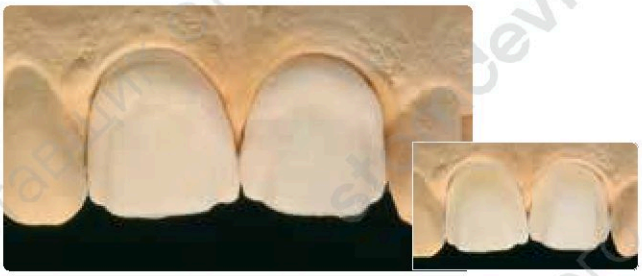


Wash firing

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

Firing parameters for IPS InLine Add-On / IPS InLine System Glaze

T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
830/ 1526	403/ 757	4	60/108	1	450/ 842	829/ 1524



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

T °C	B °C	S min	t ↗ °C/min	H min	V_1 °C	V_2 °C
940/ 1724	403/ 757	8	60/108	1	450/ 842	939/ 1722



Dentin/Impulse firing

Internal layering is modelled to the natural characteristics and consists of a dentin build-up and various effects. Individual layering with the Impulse materials enables mamelons, opalescence and translucent effects to be achieved.

Firing parameters for the Dentin / Impulse firing

T °C	B °C	S min	t ↗ °C/min	H min	V_1 °C	V_2 °C
940/ 1724	403/ 757	8	60/108	1	450/ 842	939/ 1722

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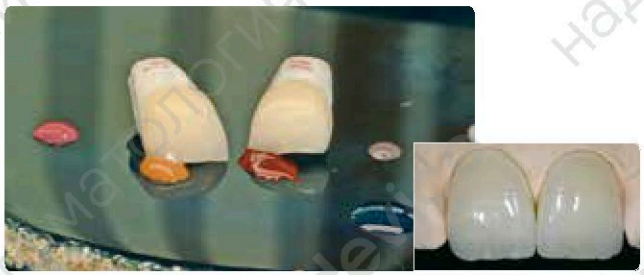


Incisal firing

Subsequently, build up the outer enamel layer and fire.

Firing parameters for the Incisal firing

T °C/°F	B °C/°F	S min	t ↗ °C /°F/min	H min	V_1 °C/°F	V_2 °C/°F
930/ 1706	403/ 757	8	60/108	1	450/ 842	929/ 1704



Glaze firing

Apply the IPS InLine System Glaze paste on the surface and fire.

Firing parameters for the Glaze firing

T °C/°F	B °C/°F	S min	t ↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
860/ 1580	403/ 757	8	60/108	1	450/ 842	859/ 1578



Divesting the veneers

Remove large amounts of die material using a grinding disk. Fine divestment is carried out with polishing beads at 1 bar (30 psi) pressure.



Conditioning the veneers 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 with running water and dry.
Important: IPS InLine veneers must be placed with the adhesive technique.

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IPS InLine® One / IPS InLine® / IPS InLine® PoM
General Information

Cementation

As usual, your dentist may use a conventional cementation protocol for metal-supported IPS InLine restorations or use adhesive cementation for metal-supported restorations with a ceramic shoulder as well as IPS InLine veneers.
Glass ionomer cements, such as Vivaglass CEM, or self-adhesive composite cements are suitable for conventional cementation. For an adhesive cementation protocol, we recommend the Multilink Automix universal composite.

	Esthetic luting composites		Universal luting composite	Self-adhesive composite cement
Material	**Variolink® Veneer**	**Variolink® II**	**Multilink® Automix**	**SpeedCEM**
Polymerization	**light-curing**	**light-/dual-curing**	**dual-curing**	**self-curing**
Method	**Adhesive:** Syntac or ExciTE Total-Etch	**Adhesive:** Syntac or ExciTE DSC Total-Etch	**Adhesive:** Multilink Primer A/B self-etching	**Self-adhesive**
IPS InLine One One-layer metal-ceramic	–	–	✓	✓
IPS InLine Conventional metal-ceramic	–	–	✓	✓
IPS InLine PoM Press-on-Metal ceramic	–	–	✓	✓
IPS InLine Veneers	✓	✓	–	–

Please observe the corresponding Instructions for Use.

✓ Recommended product combination
– Not recommended

Conditioning of the restoration

Metal-ceramic restorations

- Sandblast the inner aspects of the crown (parameters according to the instructions of the manufacturer of the restorative material) until an even mat surface has been achieved.
- If necessary, clean the restoration in an ultrasonic unit for about 1 minute.
- Thoroughly rinse with water spray and dry with oil-free air.
- **Important:** In order to create a strong bond, do not clean the metal surfaces with phosphoric acid.
- 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.

IPS InLine Veneers

- Etch the inner aspect of the veneer with IPS Ceramic Etching Gel for 120 seconds.
- Thoroughly rinse 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.

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IPS InLine One – One-layer metal-ceramic

Firing Parameters



IPS InLine One *One-layer metal-ceramic*	T °C/°F	B °C/°F	S min	t↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
1st + 2nd Opaquer firing, powder opaquer	960/1760	403/757	4	100/180	2	450/842	959/1758
1st + 2nd Opaquer firing, paste opaquer	930/ 1706	403/757	6	100/180	2	450/842	929/1704
1st Dentcisal firing	910/1670	403/757	4	60/108	1	450/842	909/1668
2nd Dentcisal firing	900/1652	403/757	4	60/108	1	450/842	899/1650
Shade/Stains firing	850/1562	403/757	6	60/108	1	450/842	849/1560
Glaze firing	850/1562	403/757	6	60/108	2	450/842	849/1560
Add-On after Glaze firing (690 °C/1274°F)	690/1274	403/757	4	60/108	1	450/842	689/1272

T = Firing temperature °C/°F
B = Stand-by temperature °C/°F
S = Closing time in minutes
t↗ = Heating rate °C/°F/min
H = Holding time
V_1 = Vacuum on temperature °C/°F
V_2 = Vacuum off temperature °C/°F

These firing parameters are guidance values. They are valid for the Programat furnaces from Ivoclar Vivadent.
Deviations (approx. +/- 10 °C/18 °F) may occur:

- Depending on the furnace generation.
- If ceramic furnaces from other manufacturers are used.
- In case of regional differences in the power supply or if several electrical devices are operatated on the same circuit.

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IPS InLine® – Conventional metal-ceramic

Firing Parameters



IPS InLine *Conventional metal-ceramic*	T °C/°F	B °C/°F	S min	t↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
1st + 2nd Opaquer firing, powder opaquer	960/1760	403/757	4	100/180	2	450/842	959/1758
1st + 2nd Opaquer firing / Gingiva, paste opaquer	930/1706	403/757	6	100/180	2	450/842	929/1704
1st + 2nd Margin firing	930/1706	403/757	4	60/108	1	450/842	929/1704
1st Dentin and Incisal firing / Gingiva	910/1670	403/757	4	60/108	1	450/842	909/1668
2nd Dentin and Incisal firing / Gingiva	900/1652	403/757	4	60/108	1	450/842	899/1650
Margin Add-On firing	900/1652	403/757	4	60/108	1	450/842	899/1650
Corrective firing after Dentin and Incisal firing, Add-On	860/1580	403/757	4	60/108	1	450/842	859/1578
Shade / Stains firing	850/1562	403/757	6	60/108	1	450/842	849/1560
Glaze firing	850/1562	403/757	6	60/108	2	450/842	849/1560
Add-On after Glaze firing (690 °C/1274)	690/1274	403/757	4	60/108	1	450/842	689/1274

T = Firing temperature °C/°F
B = Stand-by temperature °C/°F
S = Closing time in minutes
t↗ = Heating rate °C/°F/min
H = Holding time
V_1 = Vacuum on temperature °C/°F
V_2 = Vacuum off temperature °C/°F

These firing parameters are guidance values. They are valid for the Programat furnaces from Ivoclar Vivadent.
Deviations (approx. +/- 10 °C/18 °F) may occur:

- Depending on the furnace generation.
- If ceramic furnaces from other manufacturers are used.
- In case of regional differences in the power supply or if several electrical devices are operatated on the same circuit.

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IPS InLine® PoM – Press-on-Metal ceramic

Investment material mixing ratio

Investment material	100 g investment ring	200 g investment ring	300 g investment ring
IPS PressVEST	13 ml liquid 9 ml dist. water	26 ml liquid 18 ml dist. water	39 ml liquid 27 ml dist. water
IPS PressVEST Speed	16 ml liquid 11 ml dist. water	32 ml liquid 22 ml dist. water	48 ml liquid 33 ml dist. water

Press parameters



Press parameters for IPS InLine PoM ingots in the IPS Investment Ring System 100 g and 200 g

Investment Ring 100 g and 200 g	B °C/°F	T °C/°F	H min 100 g	H min 200 g	t ↗ °C/°F/min	V_1 °C/°F	V_2 °C/°F	N / E
EP 500 / V 2.9	700/1292	950/1742	10	20	60/108	500/932	950/1742	0 Program 11-20
EP 600 / EP 600 Combi	700/1292	940/1724	10	20	60/108	500/932	940/1724	**250 µm/ min.***
Programat EP 3000 / Programat EP 5000	700/1292	940/1724	10	20	60/108	500/932	940/1724	**250 µm/ min.***

***Important:** If you enter the program manually, observe the abort criterion.

Press parameters for IPS InLinePoM ingots in the IPS Investment Ring System 300 g

Investment Ring 300 g	B °C/°F	T °C/°F	H min 300 g	t ↗ °C/°F/min	V_1 °C/°F	V_2 °C/°F	N / E
EP 500 / V 2.9	700/1292	960/1760	40	60/108	500/932	960/1760	Programm 31–51
EP 600 / EP 600 Combi	700/1292	950/1742	40	60/108	500/932	950/1742	**50 µm/min.***
Programat EP 3000 / Programat EP 5000	700/1292	950/1742	40	60/108	500/932	950/1742	**50 µm/min.***

***Important:** If you enter the program manually, observe the abort criterion.

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Firing parameters



IPS InLine PoM *Press-on-Metal Keramik*	T °C/°F	B °C/°F	S min	t↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
1st + 2nd Opaquer firing, powder opaquer	960/1760	403/757	4	100/180	2	450/842	959/1758
1st + 2nd Opaquer firing, paste opaquer	930/1706	403/757	6	100/180	2	450/842	929/1704
Touch-Up firing	840/1544	403/757	4	60/108	1	450/842	839/1542
Shade/Stains firing	800/1472	403/757	6	60/108	1	450/842	839/1542
Glasur-Brand	800/1472	403/757	6	60/108	2	450/842	839/1542
Add-On after Glaze firing (690 °C/1274 °F)	690/1274	403/757	4	60/108	1	450/842	689/1272

T = Firing temperature °C/°F
B = Stand-by temperature °C/°F
S = Closing time in minutes
t↗ = Heating rate °C/°F/min
H = Holding time
V_1 = Vacuum on temperature °C/°F
V_2 = Vacuum off temperature °C/°F

These firing parameters are guidance values. They are valid for the Programat furnaces from Ivoclar Vivadent.

Deviations (approx. +/- 10 °C/18 °F) may occur:

- Depending on the furnace generation.
- If ceramic furnaces from other manufacturers are used.
- In case of regional differences in the power supply or if several electrical devices are operatated on the same circuit.

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IPS InLine® – Veneer

Firing parameters



IPS InLine *Veneers*	T °C/°F	B °C/°F	S min	t↗ °C/°F/min	H min	V_1 °C/°F	V_2 °C/°F
Wash Firing	830/1526	403/757	4	60/108	1	450/842	829/1524
Cervical firing	940/1724	403/757	8	60/108	1	450/842	939/1722
Dentin / Impulse firing	940/1724	403/757	8	60/108	1	450/842	939/1722
Incisal firing	930/1706	403/757	8	60/108	1	450/842	929/1704
Glaze firing	860/1580	403/757	8	60/108	1	450/842	859/1578

T = Firing temperature °C/°F
B = Stand-by temperature °C/°F
S = Closing time in minutes
t↗ = Heating rate °C/°F/min
H = Holding time
V_1 = Vacuum on temperature °C/°F
V_2 = Vacuum off temperature °C/°F

These firing parameters are guidance values. They are valid for the Programat furnaces from Ivoclar Vivadent.
Deviations (approx. +/- 10 °C/18 °F) may occur:

- Depending on the furnace generation.
- If ceramic furnaces from other manufacturers are used.
- In case of regional differences in the power supply or if several electrical devices are operatated on the same circuit.

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IPS InLine®

Combination Tables

A–D shades



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IPS InLine®

Chromascop shades



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Independent of any shade system

Impulse Kit

Occlusal Dentin



Mamelon



Opal Effect



Transparent



Cervical Incisal



Gingiva Kit

Gingiva Opaquer

Gingiva



Intensive Gingiva



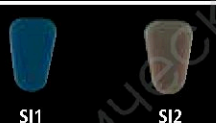
Shade / Stains Kit

Shade



AD shades	A1, B1, B2	A2, A3, A3.5	B3, B4, D4	A4	C1, D2, D3	C2,C3,C4	–
Chromascop	110, 120, 130 BL1, BL2, BL3, BL4	140, 210, 220, 230, 240	310, 320, 340	340, 540	–	410, 420, 430, 440, 510	520, 530

Shade Incisal



Stains



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Bleach Kit BL



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IPS InLine® PoM

Opaquer AD	BL1, BL2, BL3, BL4	A1, B1	A2, B2, C1, D2	A3, A3.5	B3, B4	C2, D3, D4	A4, C3, C4
Opaquer Chromascop		110, 120, 130, 140	210, 220, 230, 240		310, 320, 330, 340	410, 420, 430, 440	510, 520, 530, 540
Ingots							
Touch-Up							

IPS InLine® One

Opaquer AD	BL1, BL2, BL3, BL4	A1, B1	A2, B2, C1, D2	A3, A3.5	B3, B4	C2, D3, D4	A4, C3, C4
Opaquer Chromascop		110, 120, 130, 140	210, 220, 230, 240		310, 320, 330, 340	410, 420, 430, 440	510, 520, 530, 540
Dentcisal							

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Finished metal, shape and shade





The dental lab work was carried out by Dieter Grübel, ICDE/Schaan.

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Ivoclar Vivadent worldwide

Ivoclar Vivadent AG
Bendererstrasse 2
9494 Schaan
Liechtenstein
Tel. +423 235 35 35
Fax +423 235 33 60
www.ivoclarvivadent.com

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

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

Ivoclar Vivadent Inc.
1-6600 Dixie Road
Mississauga, Ontario
L5T 2Y2
Canada
Tel. +1 905 670 8499
Fax +1 905 670 3102
www.ivoclarvivadent.us

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

Ivoclar Vivadent Marketing Ltd.
Calle 134 No. 7-B-83, Of. 520
Bogotá
Colombia
Tel. +57 1 627 3399
Fax +57 1 633 1663
www.ivoclarvivadent.co

Ivoclar Vivadent SAS
B.P. 118
F-74410 Saint-Jorioz
France
Tel. +33 4 50 88 64 00
Fax +33 4 50 68 91 52
www.ivoclarvivadent.fr

Ivoclar Vivadent GmbH
Dr. Adolf-Schneider-Str. 2
D-73479 Ellwangen, Jagst
Germany
Tel. +49 7961 889 0
Fax +49 7961 6326
www.ivoclarvivadent.de

Wieland Dental + Technik GmbH & Co. KG
Schwenninger Strasse 13
D-75179 Pforzheim
Germany
Tel. +49 7231 3705 0
Fax +49 7231 3579 59
www.wieland-dental.com

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

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

Ivoclar Vivadent K.K.
1-28-24-4F Hongo
Bunkyo-ku
Tokyo 113-0033
Japan
Tel. +81 3 6903 3535
Fax +81 3 5844 3657
www.ivoclarvivadent.jp

Ivoclar Vivadent Ltd.
12F W-Tower, 1303-37
Seocho-dong, Seocho-gu,
Seoul 137-855
Republic of Korea
Tel. +82 2 536 0714
Fax +82 2 596 0155
www.ivoclarvivadent.co.kr

Ivoclar Vivadent S.A. de C.V.
Av. Insurgentes Sur No. 863,
Piso 14, Col. Napoles
03810 México, D.F.
México
Tel. +52 55 5062 1000
Fax +52 55 5062 1029
www.ivoclarvivadent.com.mx

Ivoclar Vivadent BV
De Fruittuinen 32
2132 NZ Hoofddorp
Netherlands
Tel. +31 23 529 3791
Fax +31 23 555 4504
www.ivoclarvivadent.com

Ivoclar Vivadent Ltd.
12 Omega St, Rosedale
PO Box 303011 North Harbour
Auckland 0751
New Zealand
Tel. +64 9 914 9999
Fax +64 9 914 9990
www.ivoclarvivadent.co.nz

Ivoclar Vivadent Polska Sp. z o.o.
Al. Jana Pawla II 78
00-175 Warszawa
Poland
Tel. +48 22 635 5496
Fax +48 22 635 5469
www.ivoclarvivadent.pl

Ivoclar Vivadent Marketing Ltd.
Prospekt Andropova 18 korp. 6/
office 10-06
115432 Moscow
Russia
Tel. +7 499 418 0300
Fax +7 499 418 0310
www.ivoclarvivadent.ru

Ivoclar Vivadent Marketing Ltd.
Qlaya Main St.
Siricon Building No.14, 2nd Floor
Office No. 204
P.O. Box 300146
Riyadh 11372
Saudi Arabia
Tel. +966 11 293 8345
Fax +966 11 293 8344
www.ivoclarvivadent.com

Ivoclar Vivadent S.L.U.
C/ Ribera del Loira nº 46, 5ª planta
28042 Madrid
Spain
Tel. + 34 913 757 820
Fax + 34 913 757 838
www.ivoclarvivadent.es

Ivoclar Vivadent AB
Dalvägen 14
S-169 56 Solna
Sweden
Tel. +46 8 514 939 30
Fax +46 8 514 939 40
www.ivoclarvivadent.se

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

Ivoclar Vivadent Limited
Ground Floor Compass Building
Feldspar Close
Warrens Business Park
Enderby
Leicester LE19 4SE
United Kingdom
Tel. +44 116 284 7880
Fax +44 116 284 7881
www.ivoclarvivadent.co.uk

Ivoclar Vivadent, Inc.
175 Pineview Drive
Amherst, N.Y. 14228
USA
Tel. +1 800 533 6825
Fax +1 716 691 2285
www.ivoclarvivadent.us

Manufacturer:
Ivoclar Vivadent AG, 9494 Schaan/Liechtenstein
www.ivoclarvivadent.com

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