

## Tips & Tricks



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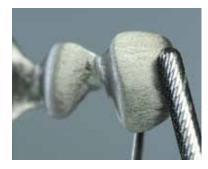
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#### **General materials science**

IPS Style<sup>®</sup> is an innovative ceramic system designed for the fabrication of metal-ceramic restorations – from anterior crowns to multiple-unit bridges.

IPS Style is a feldspar-free veneering material that emulates the high qualities of feldspar ceramics and even outperforms the latter as it is fired at a lower temperature and thereby offers an extended range of applications and increased reliability. In addition, IPS Style sets new standards in terms of esthetics.

The metal-ceramic material is suitable for veneering dental alloys with a coefficient of thermal expansion in the range of  $13.8-15.2 \times 10^{-6}$ /K (25–500 °C). It can therefore be used for a versatile range of indications.

#### **Crystals science**

The low-fusing metal-ceramic IPS Style is the first dental ceramic that contains oxyapatite crystals in its formulation, combined with leucite and fluorapatite. These three crystalline phases fulfil a range of different functions in the glass-ceramic and enable the fabrication of restorations that offer a high firing stability, optimized shrinkage behaviour and natural-looking esthetics.

Close-up of the crystals contained in IPS Style®:

Crystalline leucite

Controlled expansion and strength

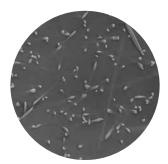
(approx. 8,200-fold magnification)



Leucite (KAISi<sub>2</sub>O<sub>6</sub>) provides the material with controlled expansion characteristics and high strength. The coefficient of thermal expansion of the glass-ceramic can be adjusted by varying the proportion of leucite.

The distribution and size of the leucite crystals inhibit crack propagation. These features explain why leucite is a proven component employed in most metal-ceramic materials, e.g. IPS InLine®, for conventional alloys. Fine needle-like fuorapatite

Lifelike basic brightness, vitality and vibrancy (approx. 10,000-fold magnification)



Fluorapatite  $(Ca_5(PO_4)_3F)$  imparts vitality and heightened brightness to restorations due to the scattering and diffuse reflection of light.

This increase in brightness prevents the ceramic from looking grey. This is not affected by the number of firing cycles needed to complete the restoration. Fluorapatite has been used previously to achieve a similar effect in the IPS d.SIGN® metal ceramic. Needle-shaped oxyapatite

Selective control of translucency and opacity (approx. 10,000-fold magnification)



Translucency is controlled mainly by adjusting the amount of oxyapatite in the ceramic. All the shaded components of the IPS Style<sup>®</sup> range contain oxyapatite crystals  $(NaY_9(SiO_4)_6O_2)$ .

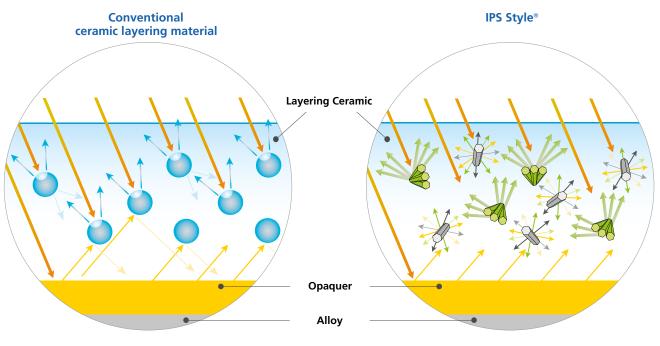
They have a high capacity to reflect light, which helps to create an effect of depth.

### The effect of oxyapatite

While opacity levels are conventionally adjusted by pigments, the opacity of IPS Style is controlled by oxyapatite crystals. All the shaded components of the IPS Style range contain oxyapatite crystals: The lower the amount of oxyapatite crystals, the more translucent is the material.

For instance, IPS Style Ceram Transpa Neutral contains hardly any oxyapatite crystals. In contrast, the content of oxyapatite is especially high in the opaquer, which is required to provide excellent masking capabilities. This results in a beneficial shade effect.

Oxyapatite crystals reflect incident light very strongly and even their low content contributes to a deep-seated shade effect. Some light interacts with the fluorapatite crystals and in so doing reaches the opaquer. The oxyapatite and fluorapatite crystals contained in the opaque layer reflect the light again and scatter it diffusely. In this way, the shade of the opaquer travels to the outer layers of the restoration and becomes an integral component of the shade and light management of the entire ceramic restoration. The result: a deep-seated shade effect and high vibrancy.



Schematic diagram:

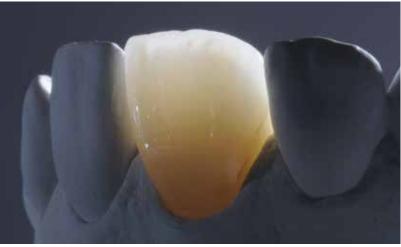
Conventional opacity produced by a high content of opaque pigments: Incident light is reflected from the surface and partially absorbed by the layering material. The material has a dull look. The shade of the opaquer does not have a depth effect. Opacity produced by the needle-shaped crystals: Incident light is scattered and reflected diffusely. The high reflection capacity of the crystals determines the esthetics of the restoration and integrates the shade of the opaquer into the play of light and shade of the restoration.

### **Biocompatibility**

A material is compatible with living tissue (biocompatible) if it does not produce an interaction, or only a negligible interaction, with the body. Like any dental material, the new IPS Style ceramic must be biocompatible. This also applies to the alloys and luting composites used in combination with IPS Style.

Biocompatibility is tested and assessed on the basis of standards that prescribe defined test methods. IPS Style has passed all the required toxicity tests.

The metal-ceramic is therefore considered to be biocompatible.



Picture: Oliver Morhofer, MDT, Germany

## Shade



The Law Devices Print Contra 11 All Contractions 

## Shade

### A-D shade system / 3D MASTER

IPS Style is supplied in the A–D shades. A shade combination chart is available from our sales reps to facilitate the conversion to the 3D MASTER shade system. The table below provides an overview of the most popular 3D MASTER shades:

Desired shade 3D MASTER shade system	Required materials IPS Style®				
	IPS Style®Ceram Powder Opaquer	Mixing ra	atio for the dentin layer	IPS Style®Ceram Incisal	
2M2	0 A1	<sup>1</sup> ⁄ <sub>4</sub> D A1	<sup>3</sup> ⁄ <sub>4</sub> D A2	11	
2M3	0 A1	<sup>1</sup> ⁄ <sub>4</sub> D A2	<sup>3</sup> ⁄ <sub>4</sub> D B3	12	
3M2	0 D3	<sup>1</sup> / <sub>2</sub> D A3	½ D D3	13	
3M3	O B4	D B4		13	

Note: The combinations and mixing ratios indicated in the table above are intended to be used as a reference only. Users may have to adjust them to meet individual requirements.

### In perfect harmony: IPS e.max<sup>®</sup> and IPS Style<sup>®</sup>

The IPS Style metal-ceramic and the IPS e.max all-ceramic materials harmoniously blend in with each other when used side by side in the same patient. Complex clinical cases can be solved using a variety of materials to provide the most ideal treatment. There are four features that make this possible:

- 1 Coordinated shade system: for a harmonious overall appearance
- 2 Intuitive handling: the layering materials deliver stability during application and excellent firing properties
- 3 Identical soft tissue design: coordinated shades and shade designations (Gingiva Solution)



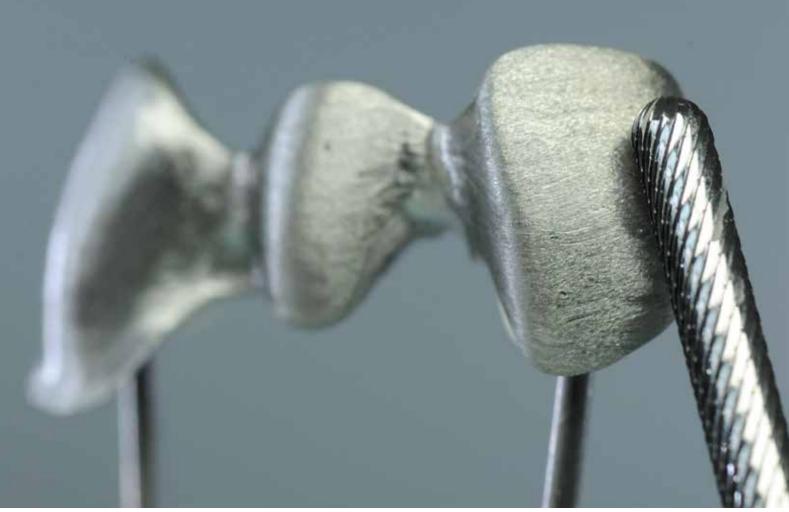
Tooth 11: IPS Style<sup>®</sup>; Tooth 21: IPS e.max<sup>®</sup> Picture: Oliver Morhofer, MDT, Germany

4 Identical range of stains and glazes: IPS lvocolor

Please see the Gingiva Solution Brochure and the Gingiva Solution Manual for further information on soft tissue design ("pink esthetics").

### Shade stability

Restorations keep their shade and brightness even when fired several times due to the special composition of the crystalline phases contained in IPS Style. The colour differences ( $\Delta E$ ) measured are not perceptible by the average observer. Greying does not occur.



Picture: Dieter Grübel, MDT, Liechtenstein (ICDE Ivoclar Vivadent)

### **Fabrication procedure**

IPS Style is suitable for the veneering of all types of metal frameworks in the indicated CTE range, irrespective of the system used to produce them: precious or base metal alloy, digitally milled or conventionally cast – the choice lies with the user.



The manual "Framework design for metal-ceramic restorations" provides detailed instructions of how to design frameworks correctly – from both an esthetic and functional perspective.

### Alloy selection

Modern metal-ceramic materials need to keep apace with the fast changing alloy market. They should be equally suitable for high-gold casting alloys as well as for base metal alloys. The latter are becoming increasingly popular for use in CAD/CAMbased subtractive and additive manufacturing processes. As a result, this segment is growing rapidly. The low-fusing IPS Style metal-ceramic has been designed to respond to these changes.

Ivoclar Vivadent offers a broad spectrum of alloys that are compatible with IPS Style. A certificate has been especially compiled to provide users with an overview of the company's alloys that are compatible with IPS Style. Please see overleaf or look it up at www.ivoclarvivadent.com/style.



You can also find this information in the Instructions for Use of IPS Style.



Tip:

Frameworks milled from the Colado CAD CoCr4 cobalt chromium alloy can be easily veneered with IPS Style.

### Note:

Due to its wide CTE range of  $13.8-15.2 \times 10^{-6}$ /K ( $25-500^{\circ}$ C), IPS Style is also suitable for use in conjunction with popular dental alloys from other manufacturers. If alloys from third parties are used, please observe the instructions for use of the relevant manufacturer.

### Alloy table

Alloy	CTE 25-500°C	Oxidation						
		Temperature [°C]	Holding time [min]	Vacuum				
High-gold								
Brite Gold	14.8	925	5	no vac				
Brite Gold XH	14.4	980	5	vac				
Golden Ceramic	14.6	925	5	no vac				
Aquarius Hard	14.5	925	5	no vac				
Aquarius	14.6	925	5	no vac				
d.SIGN 98	14.3	925	5	no vac				
W BioPorta G	14.5	930	5	no vac				
Y	14.6	1,010	5	no vac				
Aquarius XH	14.1	925	5	no vac				
Y-2	15.0	1,010	5	no vac				
W Porta Reflex	14.3	930	5	no vac				
W Porta	14.0	930	5	no vac				
W Porta Geo Ti	14.1	930	5	no vac				
Y-Lite	13.9	1,010	5	no vac				
Sagittarius	14.0	950	1	no vac				
Y-1	14. 8	1,010	5	no vac				
d.SIGN 96	14.3	950	5	vac				
Reduced gold								
W Porta Impuls	14.0	930	5	no vac				
d.SIGN 91	14.2	950	1	no vac				
W Porta SMK 82	13.9	930	5	no vac				
W	14.2	950	1	no vac				
W-5	14.0	950	5	no vac				
Lodestar	14.1	950	1	no vac				
W-3	13.9	950	1	no vac				
Leo	13.9	950	1	no vac				
W-2	14.2	950	1	no vac				
W Euro 45	14.1	930	5	no vac				
Palladium-based al	loys							
W Simidur S2	14.2	930	5	no vac				
Spartan Plus	14.3	1,010	5	vac				
Spartan	14.2	1,010	5	vac				
Capricorn	14.1	950	1	no vac				
d.SIGN 84	13.8	950	1	no vac				
Protocol	13.8	950	1	no vac				
Callisto 75 Pd	13.9	900	1	no vac				
W Duo Pal 6	14.1	930	5	no vac				
Aries	14.7	950	1	no vac				
d.SIGN 67	13.9	950	1	no vac				
d.SIGN 59	14.5	1,010	10	no vac				
W Simidur S12	14.8	930	5	no vac				
W Simidur Reflex LC	14.8	930	5	no vac				
d.SIGN 53	14.8	1,010	10	no vac				
W-1	15.2	1,010	5	vac				
Capricorn 15	14.3	950	1	no vac				
Callisto CPG	14.2	900	1	no vac				
	1	550						

Alloy	CTE 25-500°C	Oxidation					
		Temperature [°C]	Holding time [min]	Vacuum			
Implant alloys							
👿 Porta Implant	14.2	930	5	no vac			
Callisto Implant 78	13.9	950	5	vac			
Callisto Implant 33	14.0	925	1	no vac			
W Euro 33 Implant	14.3	930	5	no vac			
IS-64	14.8	1,010	5	no vac			
Callisto Implant 60	14.5	950	1	no vac			
Base metal alloys							
Colado NC	14.0	980	1	vac			
4all	13.9	950	1	no vac			
d.SIGN 30	14.5	925	5	vac			
Colado CC	14.2	950	1	vac			
For CAD/CAM							
Base metal alloys							
Colado CAD CoCr4	14.4	980	1	vac			

#### W Original WIELAND Dental Alloy



Provided the required framework design with metal scallops and the ceramic layer thicknesses of up to max. 1.5 mm can be achieved, these alloys can be used with standard cooling in the Programat<sup>®</sup> furnaces.

If the requirements cannot be met, long-term cooling may be favourable on base metal alloys as well as on alloys with a high CTE.

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

### Preparing CAD/CAM alloys for veneering

Certain procedures are simplified if frameworks are produced using a digital method. It is nonetheless essential to prepare milled or laser sintered frameworks carefully for the veneering process with IPS Style:

1. After milling, separate the restoration from the disc, using instruments that are suitable for CoCr alloys, such as cross-cut tungsten carbide burs or suitable separating disks.



Important:

Leftover disc material must not be used as casting alloy.

- 2. Once removed from the disc, thoroughly clean the restoration with hot steam and then degrease with ethyl alcohol.
- 3. Rework the surface until all sharp line angles and edges are rounded (e.g. use clean tungsten carbide burs that are compatible with CoCr alloys or ceramic-bonded grinders). If required, adjust the shape of the framework. Make sure not to exceed the maximum speed recommended by the manufacturer for the instruments.



#### Important:

Make sure to grind all of the surface that will subsequently be veneered with IPS Style. Caution: Work in one direction only to prevent overlapping and the formation of bubbles in the IPS Style ceramic during the veneering process.

4. Subsequently, blast the veneering surfaces with disposable blasting medium (aluminium oxide, optimum grit size: 110 µm, 2–4 bar) and then rinse off the blasting medium under running water. Next, clean thoroughly with hot steam. This provides an enlarged, clean metal surface and a sound bond to the opaquer.



#### Important:

Make sure the workpiece does not become contaminated after this process (e.g. do not touch it with your fingers). Wear a dust mask when finishing the metal framework to protect yourself from inhaling grinding dust. Protect your eyes with goggles.



Picture: Dieter Grübel, MDT, Liechtenstein (ICDE Ivoclar Vivadent)

5. Oxidizing: Colado CAD CoCr4 does not necessarily require an oxide firing, but it is recommended because it allows the quality of the framework conditioning to be visually checked.



Picture: Dieter Grübel, MDT, Liechtenstein (ICDE Ivoclar Vivadent)

 Please observe the following oxidation parameters: Temperature 980°C, with vacuum, holding time 1 min.
Wait until the furnace is completely open before you remove the framework.

Next, remove the oxide layer using disposable blasting medium (aluminium oxide, optimum grit size: 110  $\mu$ m, 2–4 bar). If you use a different alloy, observe the relevant instructions of the alloy manufacturer.

- Thoroughly clean the surface of the framework again under running water and with hot steam. After cleaning, do not touch the metal framework with your fingers and keep it generally clean.

6. You may now proceed to veneer the framework in the usual manner.



#### Tip:

Polishing non-veneered metal areas of the framework:

After the final glaze firing, carefully remove oxide residues from the inner aspect of the crown using disposable blasting medium (aluminium oxide, 110  $\mu$ m, 2 bar). Make sure that the glazed ceramic is not overexposed to the blasting medium. Tip: Cover the ceramic with wax before blasting. Finish and polish the metal portions of the framework with rubber finishers/polishers. Avoid local overheating during polishing.



#### **Silver alloys**

IPS Style is also suitable for use in conjunction with alloys that have an elevated silver content. If these alloys are used, the ceramic surface of the restoration is ground prior to the application of each additional ceramic layer and thoroughly cleaned with the steam jet. Silver ions in the heating muffle are removed by running the cleaning program of the Programat ceramic furnace.

#### **Electroplated crowns**

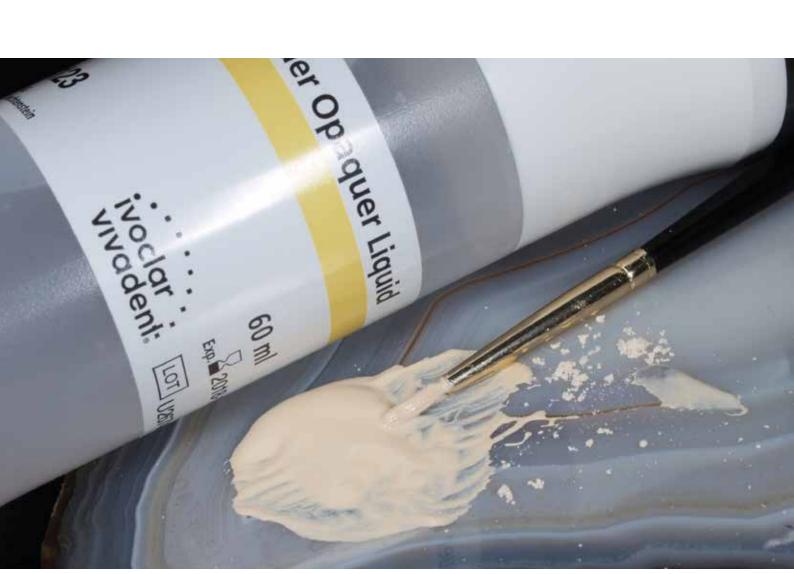
IPS Style can also be used to veneer frameworks fabricated in the electroplating (Galvano) technique.

#### Note:

The instructions of the manufacturer of the respective electroplating system must be observed.



## Opaquer and bonding



Picture: Velimir Žujić, MDT, Croatia

## Opaquer and bonding

#### Applying the opaquer

Applying two opaque layers provides the foundation for achieving optimal results with IPS Style. The first thin (wash) layer enhances the bond between the metal framework and the ceramic layers subsequently applied onto it. Possible accumulations of gas may escape from the alloy during the firing procedure. The second coating is applied in a covering layer.

IPS Style Ceram Powder Opaquer can be conventionally applied with a brush or ball-shaped ceramic instrument or by means of the spray-on technique. If the spray-on technique is used, the opaquer powder and liquid should be mixed to have a slightly lower viscosity.

Whichever technique is used, the result will be the same: excellent masking power, silky mat surface and an identical shade reproduction.

Dried opaque powder residue can be re-moistened with distilled water.

### Adhesive bonding / Bonder

Application of the IPS Style Ceram Powder Opaquer results in an effective metal-ceramic bond. No advantage is gained by applying a bonder prior to the opaquer. It is therefore not recommended to use a bonder in conjunction with IPS Style.



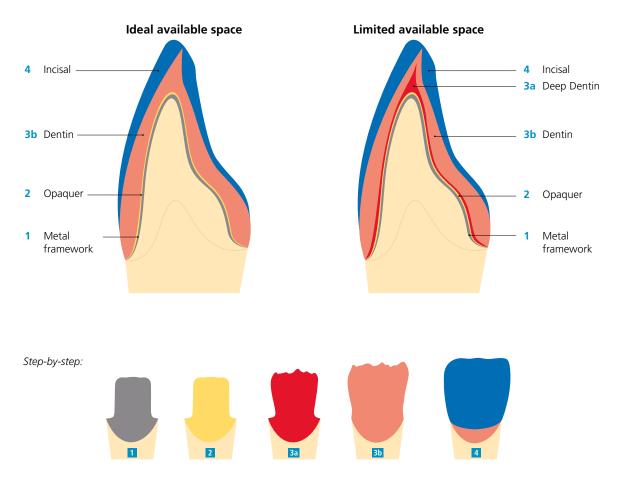
Picture: Velimir Žujić, MDT, Croatia



Picture: Milos Miladinov, MDT, Romania

### Standard layering technique

Layering example:



### Initial steps when using base metal CAD/CAM alloys

Thoroughly clean the surface with a clean brush under running water before each application of ceramic/after each ceramic firing. In the process, the water-soluble oxides are removed and the conditions for bubble-free and optimal results are established.

Subsequently, clean the restoration once more thoroughly with the steam jet.

### **Build-up liquids**

Various build-up liquids are available for mixing the IPS Style layering materials. Which ever you choose depends on your preferred working technique.



 IPS Build-Up Liquid allround: Long working time, moist working consistency and high stability



IPS Build-Up Liquid soft:
Drier working consistency and medium stability

#### In comparison:



 Distilled water:
Adding distilled water reduces the working time and stability. The firing results are not affected by the use of distilled water.



#### Note:

Make sure the ceramic materials are sufficiently moist when you apply them to avoid the formation of bubbles. Use distilled water to rewet layering materials. By using distilled water, organic compounds do not accumulate. Possible grey discolourations in the restoration are prevented.



Picture: Oliver Morhofer, MDT, Germany

### Soft tissue design

Gingival structures can be reconstructed using specially designed ceramic materials. The extensive range of IPS Style Ceram Gingiva and Intensive Gingiva shades enables the lifelike reconstruction of "pink esthetics".



Picture: DT Brain Walters, Dr David Dunn, Australia

The gingiva materials are part of the Gingiva Solution range of shades and products.

"Gingiva Solution" comprises suitable materials for the true-to-nature design of artificial gingiva in all-ceramic, metal-ceramic and composite restorations. Standardized shades and shade designations facilitate the application of the indvidual materials.



Please see the Gingiva Solution Brochure and the Gingiva Solution Manual for further information on soft tissue design ("pink esthetics").

#### Add-on materials

IPS Style includes a variety of add-on materials designed for adjusting contact points, pontic rests, shoulder areas, etc.

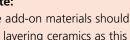
#### Shade range:

- IPS Style Ceram Add-On Margin
- IPS Style Ceram Add-On Dentin
- IPS Style Ceram Add-On Incisal
- IPS Style Ceram Add-On Bleach
- IPS Style Ceram Add-On 690 °C

(together with the Glaze firing, firing temperature 750 °C) (together with the Glaze firing, firing temperature 750 °C) (together with the Glaze firing, firing temperature 750 °C) (together with the Glaze firing, firing temperature 750 °C) (after the Glaze firing, firing temperature 690 °C)







The add-on materials should not be mixed with the layering ceramics as this may impair the firing stability.



#### **Stains**

IPS Ivocolor is suitable for the individualized staining and characterization of IPS Style restorations. The universal assortment of stains and glazes is coordinated with all\* press, layering and CAD ceramic materials from Ivoclar Vivadent.

Effective wetting properties of the ceramic surfaces are essential to allow the IPS Ivocolor Shades, Essence and Glaze materials to be applied in a homogeneous coating. The wetting properties can be improved by rubbing the surface with moist ceramic powder or pumice.

\* with the exception of uncrystallized IPS e.max CAD and CAD-on restorations



### Glazing

After the restoration has been finalized and characterized, it should always be subjected to a glaze firing. The gloss is determined by the amount of glazing material being applied:

To achieve a high gloss, apply the glaze material in a liberal and full layer. To achieve a silky mat shiny finish with pronounced surface texture, apply a thinner coating.





Picture: Oliver Morhofer, MDT, Germany

### Ceramic shrinkage / Edge strength

IPS Style is a mixed glass-ceramic with a defined grain size distribution. The ceramic particles are tightly packed together even when they are only layered and not yet fired. The shrinkage behaviour is therefore optimized.

In addition, the opaquer and layering materials feature a similar architecture. This means that the ceramic can effectively wet the surface of the opaquer once the firing temperature has been reached.

The result achieved after the first firing cycle is already very close to the final shape due to an optimized sintering process. The materials stay there where they have been applied. Uncontrolled delamination of ceramic material at interdental or occlusal areas is avoided. As a result, fewer firing processes are required and this helps save time.

IPS Style features an optimized shrinkage behaviour, which is also reflected in its high edge stability.

If the ceramic part is large, overall shrinkage is distributed to two firing cycles by conducting an intermediate firing cycle with Deep Dentin or Dentin material. If IPS Style Ceram Impulse materials are applied, the intermediate firing cycle helps secure the Impulse materials in position.



Conventional metal-ceramic



IPS Style®

Shrinkage behaviour of the ceramic and wetting of the opaquer – a comparison: IPS Style® produced a visibly better firing result than the conventional metal-ceramic after one firing cycle under standardized test conditions\*.

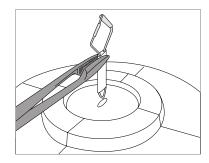
\* Source: R&D Ivoclar Vivadent, Schaan, 2015

### **Furnace calibration**

The heating element and the heating muffle of the furnace may be subject to change, depending on the length of service life and nature of use.



Programat furnaces should be subjected to an automatic temperature calibration process at least every six months.



The automatic temperature test set ATK2 is designed for checking and calibrating the exact firing temperature.

### **Firing parameters**

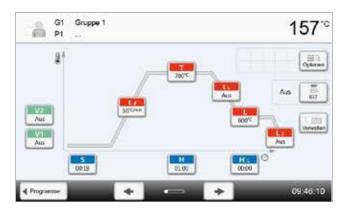
The firing parameters of the Programat furnaces are optimally coordinated with IPS Style by providing specially designed programs. Ceramic furnaces of other manufacturers may feature different modes of operation compared to the Programat furnaces (e.g. predrying time, heating rate). The firing parameters may have to be adjusted accordingly for these furnaces.



### Long-term cooling

If IPS Style is applied in layers of a thickness of more than 1.5 mm, long-term cooling may be favourable in conjunction with all main, corrective and glaze firing cycles.

This applies to base metal alloys and alloys with a high CTE. If long-term cooling is used, the closed furnace head cools down to a temperature of 650 °C. Applying long-term cooling is particularly important if it is recommended in the instructions for use of the relevant alloy manufacturer.





### 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 GmbH

Tech Gate Vienna Donau-City-Straße 1 1220 Vienna Austria Tel. +43 1 263 191 10 Fax: +43 1 263 191 111 www.ivoclarvivadent.at

#### Ivoclar Vivadent Ltda.

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

#### Ivoclar Vivadent Inc.

1-6600 Dixie Road Mississauga, Ontario LST 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 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 73479 Ellwangen, Jagst Germany Tel. +49 7961 889 0 Fax +49 7961 6326 www.ivoclarvivadent.de

#### Ivoclar Vivadent Marketing (India)

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

Ivoclar Vivadent Marketing Ltd. The Icon Horizon Broadway BSD Block M5 No. 1 Kecamatan Cisauk Kelurahan Sampora 15345 Tangerang Selatan – Banten Indonesia

Tel. +62 21 3003 2932 Fax +62 21 3003 2934 www.ivoclarvivadent.com

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.ivoclarviyadent.ip

#### Ivoclar Vivadent Ltd.

4F TAMIYA Bldg. 215 Baumoe-ro Seocho-gu Seoul, 06740 Republic of Korea Tel. +82 2 536 0714 Fax +82 2 6499 0744 www.ivoclarvivadent.co.kr Ivoclar Vivadent S.A. de C.V. Calzada de Tlalpan 564, Col Moderna, Del Benito Juárez 03810 México, D.F. México Tel. +52 (55) 50 62 10 00 Fax +52 (55) 50 62 10 29 www.ivoclarvivadent.com.mx

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 Pawła II 78 00-175 Warszawa Poland Tel. +48 22 635 5496 Fax +48 22 635 5469 www.ivoclarvivadent.pl

#### Ivoclar Vivadent LLC Prospekt Andropova 18 korp. 6/ office 10-06 115432 Moscow Russia

Tel. +7 499 418 0300 Fax +7 499 418 0310 www.ivoclarvivadent.ru

#### Ivoclar Vivadent Marketing Ltd.

Qlaya Main St. Siricon Building No.14, 2<sup>rd</sup> Floor Office No. 204 P.O. Box 300146 Riyadh 11372 Saudi Arabia Tel. +966 11 293 8345 Fax +966 11 293 8344 www.ivoclarvivadent.com

#### Ivoclar Vivadent S.L.U.

Carretera de Fuencarral n°24 Portal 1 – Planta Baja 28108-Alcobendas (Madrid) Spain Tel. +34 91 375 78 20 Fax +34 91 375 78 38 www.ivoclarvivadent.es

#### **Ivoclar Vivadent AB** Dalvägen 14 169 56 Solna Sweden

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

Compass Building Feldspar Close Warrens Business Park Enderby Leicester LE19 4SD United Kingdom Tel. +44 116 284 7880 Fax +44 116 284 7881 www.ivoclarvivadent.co.uk

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



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