G-CERAM® ZF Zirconia-Ceramic

instructions for use

G-CERAM ZF Zirconia-Ceramic powder is a natural feldspathic porcelain powder, which is used to make zirconium oxide (ZrO_2) and both lithium disilicate (LS_2) sub-structured porcelain crowns and bridges, porcelain veneer.

Thanks to its modelling ease of use, G-CERAM ZF Zirconia-Ceramic powder is a reliable ceramic powder for veneering, especially recommended for laboratories whose priority is rapidity and accuracy. Easy to use for the ceramist with a little experience but becomes extremely fine for the experienced technicians that recognizes its physical properties and aesthetic performances.

G-CERAM ZF Zirconia-Ceramic powder offers an immediate and accurate support in shade matching after each layering process with Base Dentine, Dentine and Incisal. In addition, high colour stability is ensured, even in the presence of varied thickness.

Further properties and performance characterize G-CERAM ZF, as follows: minimum shrinkage, natural characterization for superior true-to-life aesthetic appearance in all light condition thanks to the higher degree of translucency and colour depth.

Offering a wide colour range, G-CERAM ZF Zirconia-Ceramic powder will meet all specific shade requirements.

INDICATION

Zirconia-ceramic full veneers
Zirconia-ceramic partial veneers

CONTRAINDICATION

If patients are known to be allergic to any of the ingredients of G-CERAM ZF, the material should not be used. Patients with severely reduced residual dentition.
Veneering of metal frameworks
Any other use not listed in the indications

G-CERAM ZF Zirconia-Ceramic powder is a fine grain feldspathic porcelain.

Controlled production stages and optimum distrubition of particle sizes provide the development basis to obtain a stabile product and low shrinkage. Low shrinkage as well as simple and quick processing for the build-up of superior, esthetic restorations.

The major compositions of G-CERAM ZF Zirconia-Ceramic are: potassium feldspar (orthoclase) $KAlSi_3$ ($K_2O \cdot Al_2O_3 \cdot 6SiO_2$) and sodium feldspar (albite) $NaAlSi_3O_8$ ($Na_2O \cdot Al_2O_3 \cdot 6SiO_2$).

The main reason of using potassium feldspar ($KAlSi_3O_8$) to manufacture porcelain powder, because chemical solubility is very limited.

Leucite an increase in strength is considered to be because the interface between the glassy matrix and leucite particles occurred in continuous phases, with an effect due to fusion occurring during the transition from leucite particles to the glass phase. The leucite crystals cause increased strength of porcelain and reduce crack diffusion.

Another main component is quartz. Quartz (silisium dioxide SiO_2) increases the proportion of the glass phase and the translucensy.

For colorization of porcelain powder are use metal oxides. Metal oxides and pigments are added during the fritting proses to adjust opacity and translucency. G-CERAM ZF porcelain shade stability meets (CIE) L*a*b* standards.

It has been proven by assessment that the G-CERAM ZF Zirconia-Ceramic powder is biocompatible product. Tests are made according to the standard "ISO 10993-1 Biocompatibility Medical Device."

G-CERAM ZF does not contain any hazardous and toxic elements such as radioactive element, lead uranium, antimony and cadmium.

Formation of leucite and glass phase during production period is very important for the coefficient of thermal expansion. Potassium feldspar provides this capability in a frit firing and cooling proses.

Figure 1, contains a ternary-phase equilibrium diagram of the K_2O-Al_2O_3-$6SiO_2$ system, from which leucite may crystallize. The tetragonal leucite in veneering porcelains controlled their coefficient of thermal expansion.

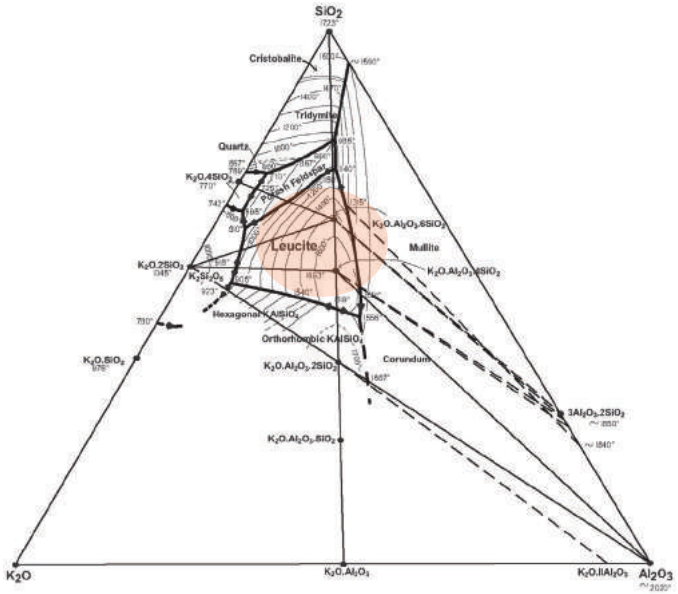


Figure 1

Physical and Chemical Properties			Value
Coefficient of Thermal Expansion (CTE)(25-500°C)	DENTINE	($10^{-6}.K^{-1}$)	9,0-9,5
Temperature of Glass Transition (TG)	DENTINE	°C	570
Softening Point (TS)	DENTINE	°C	660
Chemical Solubility	DENTINE	µg/cm²	<50
3-point Flexural Strength	DENTINE	Mpa	>90
Particule Size Distrubition	DENTINE	µm	approx. 23
Bonding Strength	DENTINE	Mpa	>50

Physical and Chemical Properties	Value
Chemical Solubility	< 100 µg/cm²
3-point Flexural Strength	>50 Mpa
Bonding Strength	>25 Mpa

Required physical and chemical properties EN ISO 6872 standard.

Shoulder	Base Dentine	Dentine	Incisal
Bleach	A0	A0	I6
Light	A1	A1	I1
Medium	A2	A2	I2
Medium	A3	A3	I3
Medium Dark	A3.5	A3.5	I4
Dark	A4	A4	I5
Bleach	B0	B0	I6
Light	B1	B1	I1
Medium Light	B2	B2	I2
Medium Dark	B3	B3	I4
Medium Dark	B4	B4	I4
Light	C1	C1	I1
Medium	C2	C2	I3
Dark	C3	C3	I4
Dark	C4	C4	I5
Light	D2	D2	I1
Medium Light	D3	D3	I2
Medium	D4	D4	I3

FIRING CHART

G-CERAM®	1st and 2st Shoulder	Wash Firing (Base Dentine)	1st Dentine	2st Dentine	Glaze Low &Stains	Add On
Dry Time	4 min	4 min	6 min	4 min	4 min	4 min
Start Temp	550°C	550°C	550°C	550°C	550°C	550°C
Heat Rate°C/min	55°C	55°C	55°C	55°C	55°C	55°C
Vacuum Start	600°C	600°C	600°C	600°C	None	600°C
Vacuum Stop	955°C	940°C	895°C	890°C	None	840°C
High Temp	960°C	940°C	900°C	895°C	895°C	840°C
Hold Time	1 min	1 min	20 sec	20 sec	1 min	1 min
Cool Time	1 min	1 min	3 min / 650°C	3 min / 650°C	3 min / 650°C	3 min / 600°C
Texture	Eggshell	Grainy Shiny	Grainy Shiny	Grainy Shiny	Glossy	Glossy

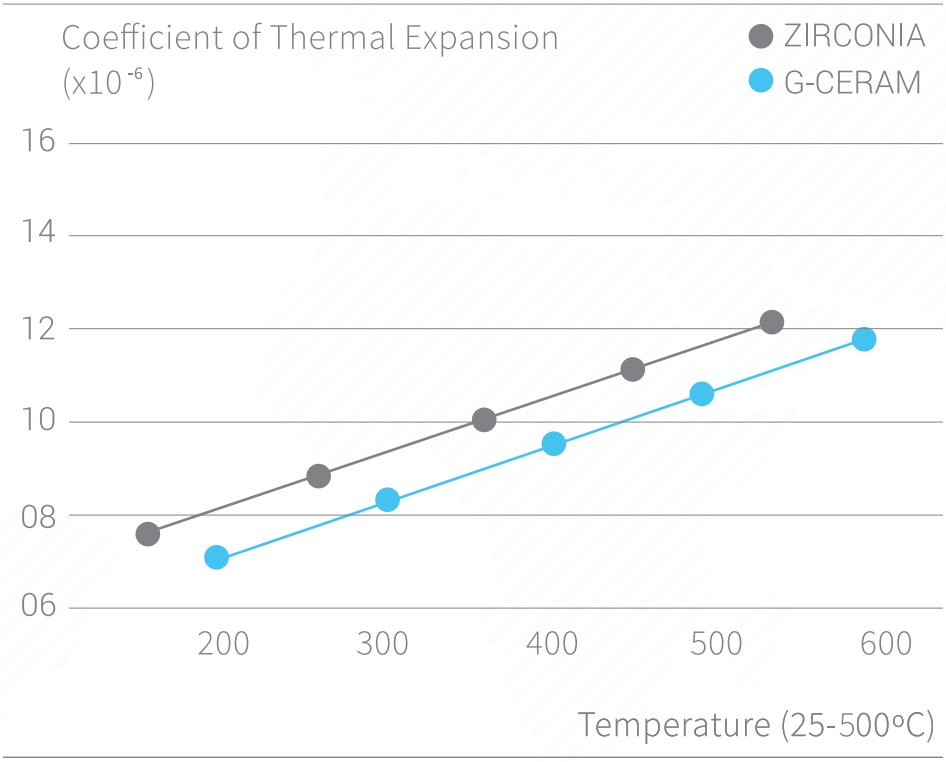
Zirconia framework is a lower thermal conduction characteristic material. Due to this physical characteristic, thermal stress will be generated in between framework and porcelain in cooling process. This situation will be higher in big bridges and full restorations. This residual thermal stress in the veneering porcelain can be resisted by slow cooling to reduce the transformation temperature of the veneering porcelain during the firing cycle (approx. 650°C).

Please note:

- The values listed here are intended for orientation only and should be regarded only as guidelines. Your firing results may differ.
- All firing results depend on the performance of the furnace used, which in turn depends on the brand, model, age of the furnace and calibration.
- Therefore, the guideline values will have to be adapted individually for each firing. We recommend running a test firing cycle to evaluate the performance of the furnace used.

In general, most of the lithium disilicate (LS_2) and zirconium oxide (Z_rO_2) used for ceramic fused to restorations are compatible with G-CERAM ZF Zirconia-Ceramic porcelains. We suggest that you utilize the framework material recommended for the product with a CTE in the range of 10.5-11.0 x $10^{-6}.K^{-1}$, measured in the range of 25-500°C.

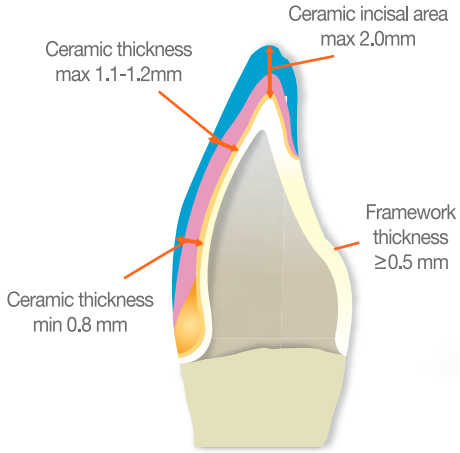
CTE Assessments



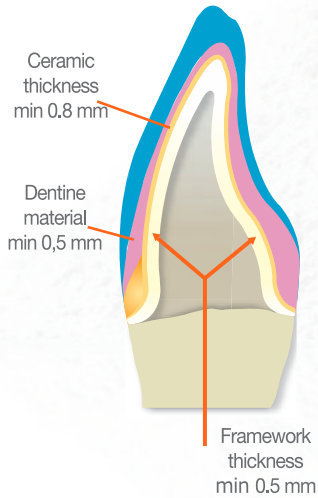
During model preparation, keep in mind that porcelain fused to zirconia restorations require a minimum thickness of 1,2 to 1,5 mm of which 0,5 to 0,8 mm is the zirconia frame portion. Remember that the use of shoulder porcelain requires a proper shoulder preparation.

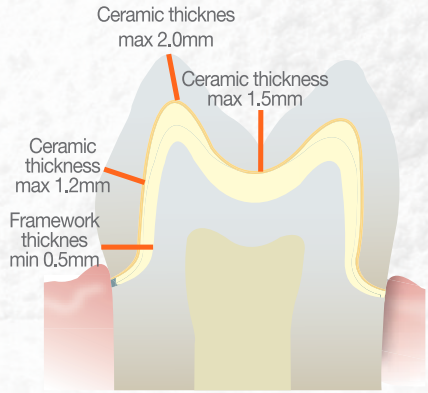
The modelling of the zirconia framework can be performed with the desired technique. The space reserved for the ceramic covering should not be less than 0,8 mm. The ceramic layer should not exceed 2,0 mm in thickness on the incisal borders to avoid the risk of fractures.

Avoid creating sharp corners, indentations, angles or curved edges on the metal surface that is to be covered. Every sharp corner is a potential point of origin for fractures, while every indentation could cause defects in the ceramic fusing process or fractures due to the contraction that occurs during firing.



Framework and ceramic layer thicknesses for aesthetic restorations





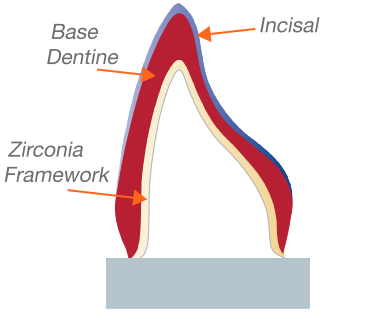

Zirconia Block
CAD Designing
Milling
Cleaning Firing
Coloring with Coloring Liquid
Sintering
Milling
YES
NO
Regeneration Firing
Wash Dentine
Veneering

Wash Dentine:

Before layering the Base Dentine and Incisal materials, sealing the model is a very important step. In this way, the ceramic material is prevented from drying out or sticking to the model. Use the Ceramic Separating Liquid to seal and lubricate the gypsum die and the adjoining areas of the model.

To overcome adequate bonding of framework and G-CERAM ZF porcelain,we suggested carrying out a Base Dentine washbake. The Base Dentine powder is mixed with Modelling Liquid to obtain a thin watery mixture and applied very thinly to the dry and clean substructure while ensuring uniform coverage.

Fire the Wash Dentine according to the recommended G-CERAM ZF Zirconia-Ceramic firing chart.



Recommended Standard Layering

Base Dentine:

Base Dentine has been mixed with Modelling Liquid. Base Dentine will be applied the whole surface starting from the cervical area. Base Dentine is applied in the required complete tooth shape.

To obtain adequate space for the incisal, and modifiers removal of corresponding amount of the dentine material according to the layering pattern is required.

Dentine Modifier

The Dentine Modifier material is used for modification of shade within a mamelon structure created in the incisal area. Dentine Modifier will increase the intensity of shade within specific areas. The Dentine Modifier materials can be used unmixed state or mixed with Base Dentine. The mamelon shape is, once again, only outlined.

Incisal:

To achieve a uniform level of moisture, the material should be carefully wetted with a brush in the interproximal areas from the palatal side before the incisal material is applied.

Apply small portions of G-CERAM ZF Incisal to complete the crown mould beginning from the middle third of the tooth. Incisal porcelain must be overdimensioned to compansate for firing shirinkage.

The incisal porcelains are highly translucent as compared to dentine porcelains. During the layering process, remember that the chromatic effect of the incisal porcelain is that of reducing the color saturation of the dentine while increasing luminosity. Apply the incisal porcelains in thin layers.

Condensing the ceramic surface (after restoration) using a large, dry brush, makes it more homogeneous, which prevents the ceramic from pulling away from the margin.

Before firing, the individual units of bridges must be separated in the interdental areas down to the substructure.

Remove the bridge from the model, then contacts points must be completed using dentine and incisal porcelains. Put the restoration on a firing tray for the firing process. Fire the 1th Dentine according to the recommended G-CERAM ZF Zirconia-Ceramic firing chart.

2nd DENTINE:

After the first dentin firing, the restoration is placed on the model and contact areas are controlled and adjusted.

The interproximal areas must be separated by using diamond disc. The correction and shaping must be done by using diamond burs.

After correction, it is recommended to clean the restoration with steam or under running water by using tooth brush.

After that, any deficient areas are supplemented with the base dentine and incisal.

The interdental areas and proximal contact points must be given special attention. First, the interdental areas are filled with Base Dentine. Once the interdental areas have been slightly condensed. The basal surface of the pontic is filled with Base Dentine.

Finalize corrections of shape is carried out starting from the cervical part using base dentine and incisal for recommended areas.

Fire the 2nd Dentine according to the recommended G-CERAM ZF Zirconia-Ceramic firing chart.

Prepare the restoration for glaze. Following the example of the natural tooth, the surface structure is contoured. Shape with diamond burs to create anatomy as desired.

Use a diamond disc to create angles as desired.

Marked anatomy

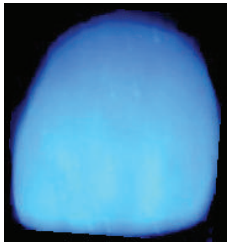
It is recommended to clean the restoration with steam or under running water by using tooth brush. After clean make it dry.

Mix the G-CERAM ZF Low Glaze powder with G-CERAM Glaze liquid to get a creamy mixture.

Apply a very ayer with a brush. During this procedure, stains can be layered alone or mixed with the glaze. Slowly, place the restoration into the oven and fire without engaging vacuum according to the G-CERAM ZF Zirconia-Ceramic firing chart.

Fluorescence:

Ceramics are colored with special fluorescent materialduring the production process. Thanks with this action, natural fluorescence effect emanate from deep inside of the crown. The natural fluorescence effect can be clearly observed in black light, diffuse light and daylight. G-CERAM Porcelain has an excellent fluorescence effect.



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To overcome adequate bonding of framework and G-CERAM ZF, porcelain we suggested carrying out a Base Dentine washbake. The Base Dentine powder is mixed with Modelling Liquid to obtain a thin watery mixture and applied very thinly to the dry and clean substructure while ensuring uniform coverage.

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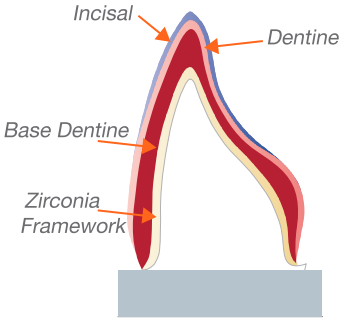

Recommended Standard Layering

Base Dentine:

Base Dentine has been mixed with Modelling Liquid.

Base Dentine will be applied the whole surface starting from the cervical area. Build up with the Base Dentine reduced tooth size.

Dentine:

Dentine has been mixed with Modelling Liquid. Dentine is applied in the required complete tooth shape. To obtain adequate space for the incisal, removal of corresponding amount of the dentine material according to the required layering pattern.

Dentine Modifier:

The Dentine Modifier material is used for modification of shade within a mamelon structure created in the incisal area. Dentine Modifier will increase the intensity of shade within specific areas. The Dentine Modifier materials can be used unmixed state or mixed with Dentine.

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Remove the bridge from the model, then contacts points must be completed using dentine and incisal porcelains. Put the restoration on a firing tray for the firing process. Fire the 1th Dentine according to the recommended G-CERAM ZF Zirconia-Ceramic firing chart.

2nd DENTINE:

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The interproximal areas must be separated by using diamond disc. The correction and shaping must be done by using diamond burs.

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Fire the 2nd Dentine according to the recommended G-CERAM ZF Zirconia-Ceramic firing chart.

Prepare the restoration for glazing. Following the example of the natural tooth, the surface structure is contoured. Shape with diamond burs to create anatomy as desired.

Use a diamond disc to create angles as desired.

Marked anatomy

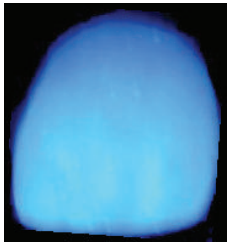
It is recommended to clean the restoration with steam or under running water by using brush. After clean make it dry.

Mix the G-CERAM ZF Low Glaze powder with G-CERAM Glaze liquid to get a creamy mixture.

Apply a very fine layer with a brush. During this procedure, stains can be layered alone or mixed with the glaze. Slowly, place the restoration into the oven and fire without engaging vacuum according to the G-CERAM ZF Zirconia-Ceramic firing chart.

Fluorescence:

Ceramics are colored with special fluorescent materialduring the production process. Thanks with this action, natural fluorescence effect emanate from deep inside of the crown. The natural fluorescence effect can be clearly observed in black light, diffuse light and daylight. G-CERAM Porcelain has an excellent fluorescence effect.



Comprensive Shade-matching

- **Base Dentine –** 18 shades
- **Dentine –** 18 shades
- **Incisal** - 10 shades
- **Shoulder –** 6 shades
- **Dentine Modifier –** 9 shades
- **Incisal Modifier –** 9 shades
- **Gum Porcelain –** 3 shades
- **Stain –** 11 shades
- **Glaze –** Low Glaze
- **Add-on correction –** 3 shades

G-CERAM Shade Guide A1-D4 (including A0 and B0) matches with Vita ® Classical Shade A1-D4.

Vita ® is a registered trademark of VITA Zahnfabrik H. Rauter GmbH & Co. KG, - Bad Säckingen, Germany

G-Ceram ZF Base - Dentine	A0 - D4	▸ Increase the opacity effect of dentine. ▸ Mainshade material to build up the ceramic restoration

A0	A1	A2	A3	A3,5	A4	B0	B1	B2	B3	B4	C1	C2	C3	C4	D2	D3	D4

G-Ceram ZF Dentine	A0 - D4	▸ Used to increase the chroma effect of dentine layer ▸ Mainshade material to build up the ceramic estoration according to natural teeth

A0	A1	A2	A3	A3,5	A4	B0	B1	B2	B3	B4	C1	C2	C3	C4	D2	D3	D4

G-Ceram ZF Incisal		▸ Last layer of build up the ceramic restoration according to natural teeth

I1	I2	I3	I4	I5	I6	Opal incisal clear	Opal incisal light	Opal incisal medium	Transparent

G-Ceram ZF Shoulder			▸ Used for optimizing the marginal areas of zirconia copings.
		Bleach	
		Light	
		Medium-Light	
		Medium	
		Medium-Dark	
		Dark	

G-Ceram ZF Dentine Modifier		White	▸ Used for preparing mamelons and creating special characterization ▸ Used for coloring the inside to obtain effects of depth ▸ Used for optimizing intensive dentine shade
		Yellow	
		Ocher	
		Brown	
		Gray	
		Pink	
		Orange	
		Blue	
		Violet	

G-Ceram ZF Gum Shade		Light	▸ Gum materials for esthetic appearance
		Medium	
		Dark	

G-Ceram ZF Incisal Modifier		White	▸ For different characterization and individualization ▸ Provide different colors of translucency effects
		Yellow	
		Ocher	
		Brown	
		Gray	
		Pink	
		Orange	
		Blue	
		Violet	

G-Ceram Liquids		Modelling	▸Used to mix all dentine, incisal and additional materials
		Glaze & Stain	▸ Used to mix all glaze & stain powders

G-Ceram ZF Low Glaze			▸ For polish surface of restoration

G-Ceram ZF Stain		White	▸ Used to provide the same characteristic image as natural teeth ▸ Used for restoration make up alone or mixed with one another
		Yellow	
		Ocher	
		Brown	
		Gray	
		Pink	
		Orange	
		Blue	
		Violet	
		Green	
		Black	

G-Ceram ZF Add On		Light	▸ Used for corrections and adjustment of shape after glaze firing
		Medium	
		Dark	

	Problems	Possible Causes	Solutions
01	**Horizontal cracks on the porcelain**	1) CTE of the Zirconium substructure is not compatible 2) Excessive vibration during application of Dentine and Incisal 3) Sharp edges on framework	1) Use substructures with CTE range with in $10.5x10^{-6}$-$11.0x10^{-6}$ 2) Avoid vibration during porcelain buildup 3) Eliminate sharp edges when finishing framework
02	**Porcelain is not bonding well to the zirconia framework**	1) Excessive or insufficient cintering 2) Contaminated framework surface	1) Follow the instructions of zirconia manufacturer 2) Check for contaminated framework surface
03	**Cracks during firing in the thick areas of porcelain**	1) Dry time is too short	1) Increase dry time
04	**Splits during firing in the Dentine and Incisal areas**	1) Dry time is too short	1) Increase dry time
05	**Porcelain appears milky without translucency**	1) Vacuum starts in low temperature 2) Liquid does not match properly	1) Vacuum must start at 600°C 2) Change liquid by using other branded liquids

	Problems	Possible Causes	Solutions
06	**Over glasses surface and /or greyish appearance**	1) Firing temperature is too high	1) Decrease high-temperature
07	**Hard porcelain**	1) Firing temperature is too high 2) Hold time is too high 3) Excessive vibration during application of Dentine	1) Decrease high-temperature 2) Decrease hold time 3) Avoid vibration during porcelain buildup
08	**High shrinkage**	1) Liquid density is too high	1) Reduce density of the liquid by adding distilled water
09	**Surface appears milky without translucency after Glaze firing**	1) Glaze layer is too thick 2) Grinding particles are not completely removed 3) Heat rate is too high	1) Apply thicker layer of Glaze 2) Wash with steam cleaner or running water with brush 3) Adjust heat rate to 55°C/min
10	**Cracks after Glaze firing**	1) Glaze high temperature is higher than Dentine high temperature	1) Double-check the firing parameters for Glaze and Dentine in accordance to the firing chart Note: in case of less shinning, increase hold time

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Manufacturer: Atlas-Enta (a member of Gulsa Group)

Made in Turkey

CE 2292