

# TECHNICAL GUIDE

## KATANA™ ZIRCONIA

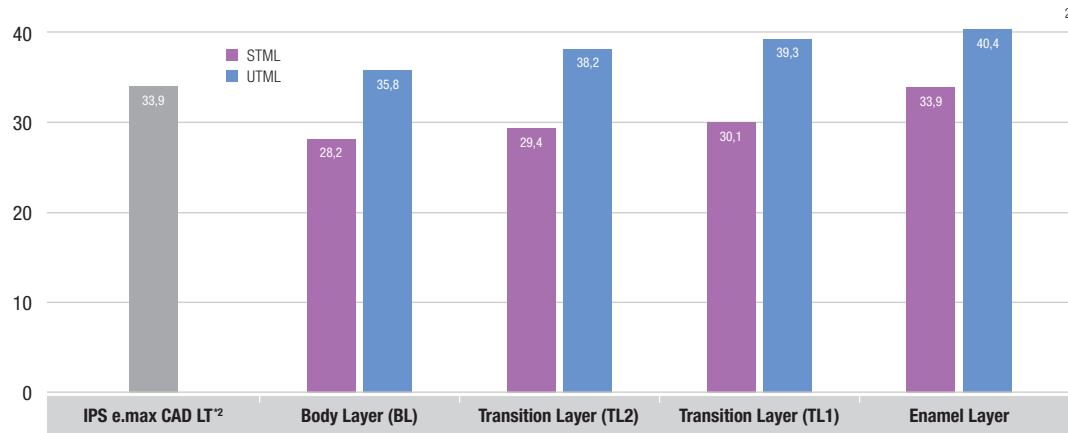
### MULTI-LAYER SERIE



## HIGH ESTHETIC WITH KATANA ZIRCONIA

New series which features translucency similar to natural tooth enamel is now available.

Introducing the new series of ultra translucent multi-layered UTML and superior translucent multi-layered STML, ideal for efficient esthetic anterior teeth restorations. Research and studies on the translucency of different ceramic materials have shown that the light transmission of KATANATM Zirconia STML in the enamel layer is comparable to IPS e.max CAD LT<sup>1</sup>. KATANATM Zirconia UTML showed a higher translucency level on all layers as that of lithium disilicate.\* These high translucent zirconia materials require different technical methods from the previously introduced ML and HT. This technical guide will explain the important points to help you achieve successful restoration using KATANATM Zirconia.



\* Source: F. Beuer, J. Schweiger, ConsEuro 2015 London, Kuraray Satellite Symposium, May 14th 2015

<sup>1</sup> IPS e.max CAD LT is a registered trademark of Ivoclar Vivadent GmbH.

<sup>2</sup> Method: After sintering, samples are made of each material, with a thickness of 1 mm + \_0.05mm. Light transmission within the range of 400 - 700 nm is measured. The permeability is given a value between 100% (transparent) and 0% (opaque). K. Ueda, J.F. Güth, K. Erdelt, M. Stimmelmayer, H. Kappert, F. Beuer: Light Transmittance by a Multi-coloured Zirconia Material. Dent Mater J 2015; 34(3): 310-314.; D. Awad, B. Stawarczyk, A. Liebermann, N. Ilie: Translucency of Esthetic Dental Restorative CAD/CAM Materials and Composite Resins with Respect to Thickness and Surface Roughness. J Prosthet Dent 2015; 113(6): 534-540.; J.F. Güth, T. Zuch, S. Zwinge, J. Engels, M. Stimmelmayer, D. Edelhoff: Optical Properties of Manually and CAD/CAM-fabricated Polymers. Dent Mater J 2013; 32(6): 865-871.





### Four-Layer Structure:

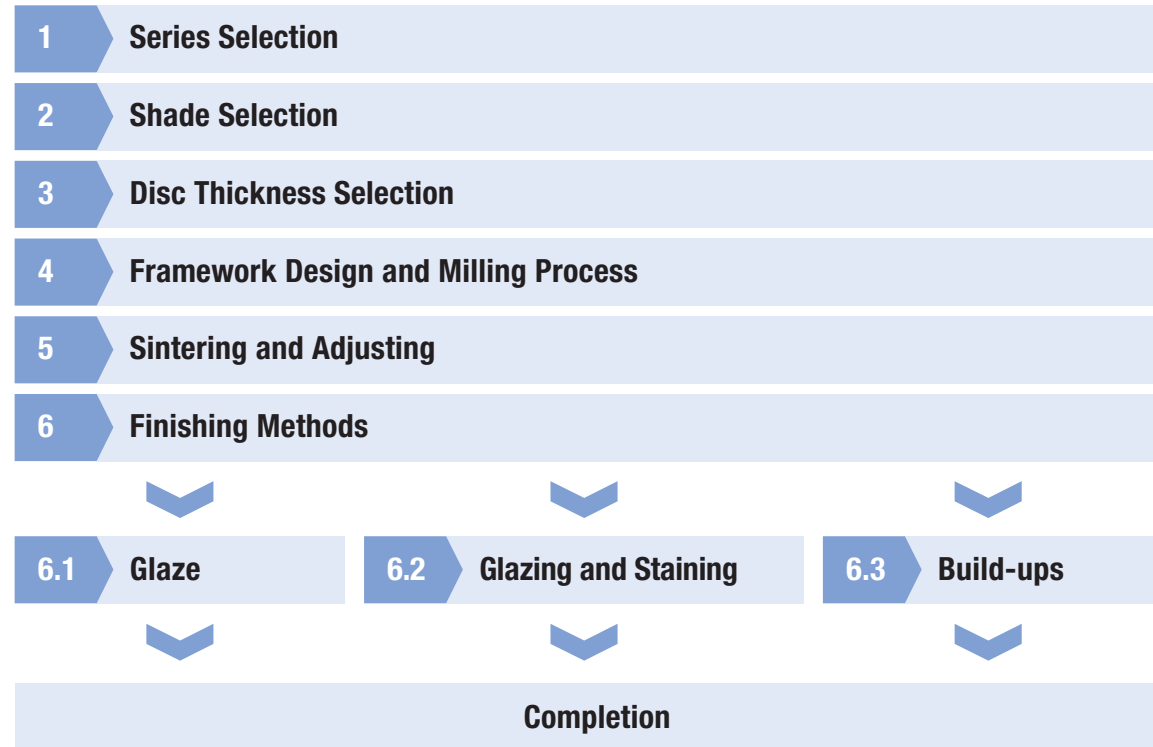
- Enamel Layer (35 %)
- Transition Layer 1 (15 %)
- Transition Layer 2 (15 %)
- Body (Dentin) Layer (35 %)

Percentages shown in the brackets reflect the thickness ratio of the disc.



(Image of gradation)

## RESTORATION PROCESS



# 1

## SERIES SELECTION

Each series has different translucency and mechanical properties. By choosing the right series, you can successfully restore a wide-range of cases, from the esthetic anterior to posterior bridgework.

**UTML** Ultra Translucent Multi-Layered. Ideal for anterior crowns and veneers, inlays/onlays and posterior single crowns.

**STML** Super Translucent Multi-Layered. Ideal for up to 3 units posterior bridges with a well-balanced combination of chromatic and gradational translucency, which reproduces esthetic enamel and dentin effects.

**ML & HT** High flexural strength zirconia is suitable for single unit frameworks and long-span bridges.

### RECOMMENDATIONS FOR EACH SERIES

Recommended Applications\*



Veneer

Inlay/Onlay

Anterior Crown

Posterior Crown

3 Unit Bridge

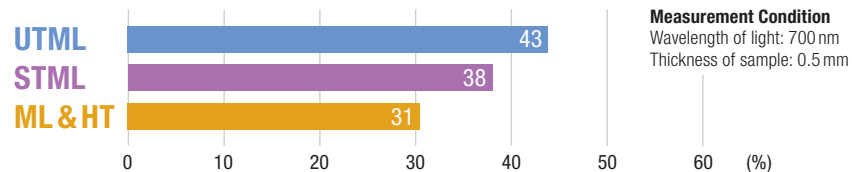
Long-span Bridge

**UTML**

**STML**

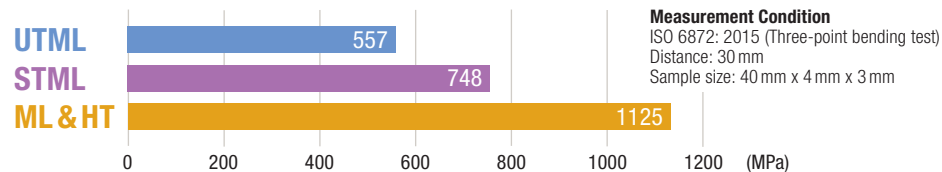
**ML & HT**

### Translucency (raw zirconia material) / Transmittance Rate (%)



Data Source: Kuraray Noritake Dental Inc. The numerical value varies according to the conditions.

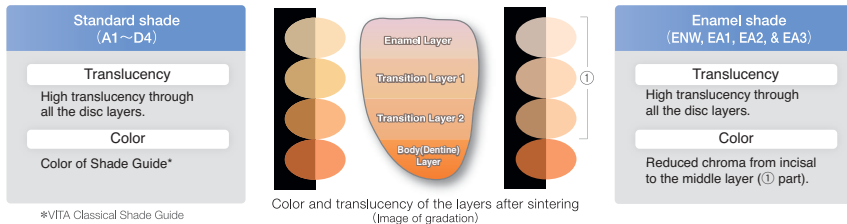
### Mechanical Properties (raw zirconia material) / Flexural Strength (MPa)



Data Source: Kuraray Noritake Dental Inc. The numerical value varies according to the conditions.

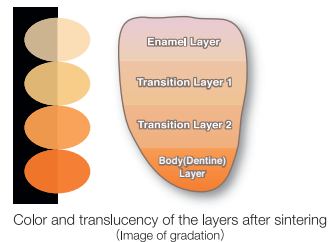
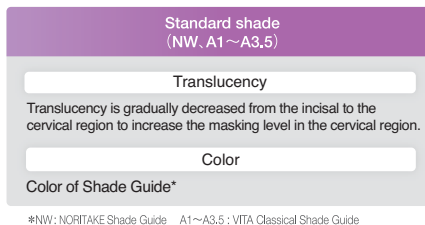
## UTML SHADES

There are two different shade groups: “Standard Shades” and “Enamel Shades”. Enamel Shades have reduced chroma in the upper layer (①) which allows you to enhance the translucent appearance of the incisal area, as desired, by utilizing external stain characterization.



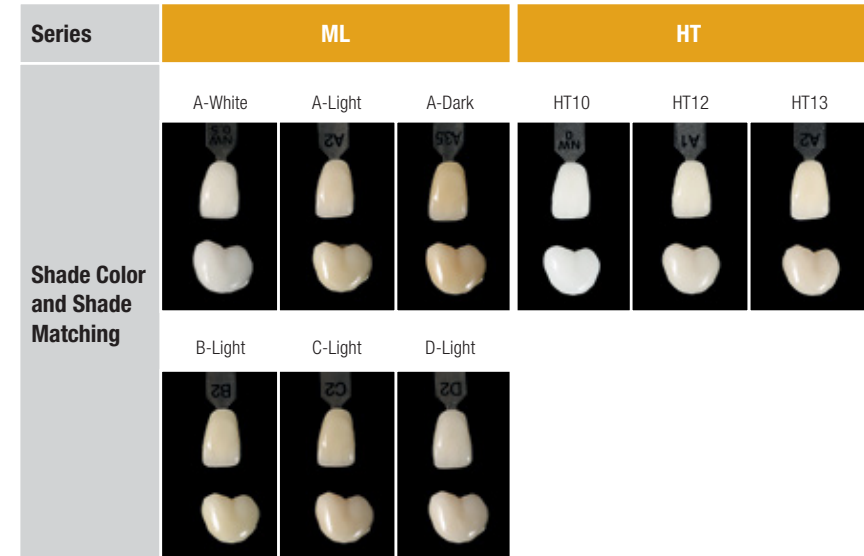
## STML SHADES

A well-balanced combination of chromatic and gradational translucency reproduces esthetic enamel and dentin effects.



## ML & HT SHADES

ML (Multi-Layered) is suitable for full contour crowns and bridges, and HT (High-Translucent) Monolithic Shaded is suitable for frameworks.



**MULTI  
LAYERED**

## SHADE SELECTION

UTML	Standard Shades	A1	A2	A3	A3,5	A4	B1	B2	B3	B4
		C1	C2	C3	C4	D2	D3	D4		
	Enamel Shades	EA1	EA2	EA3	ENW					
STML	Standard Shades	A1	A2	A3	A3,5	NW	A4	B1	B2	B3
		C1	C2	C3	D2	D3				
ML		A-Light	A-Dark	B-Light	C-Light	D-Light	A-White			
HT		HT10	HT12	HT13						

## RECOMMENDATIONS FOR SHADE SELECTION

1. Range of abutment color varies by translucency of the series.



Select the shade number that corresponds to the target color.

Select a shade number one level brighter than the target color (with external staining).

2. Zirconia with a high refractive index tends to look brighter on the posterior area. For posterior restorations using UTML or STML, choose one shade darker than the target shade to achieve a natural look with surrounding teeth.

3. Even when the same shade color is used, the glazing and polishing finish will result in different color outcomes.

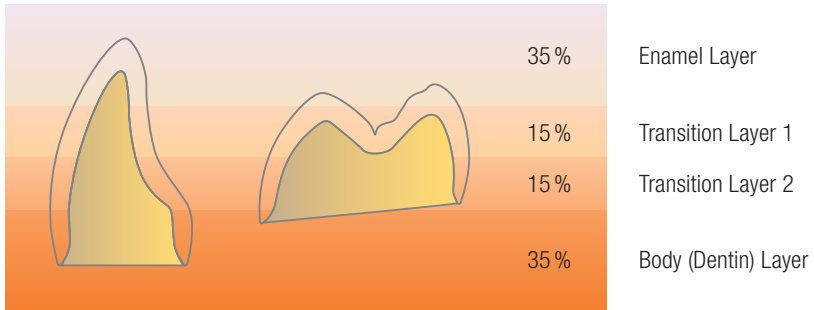
UTML STML } For glazing, select the target shade color, and for polishing, it tends to become one shade darker. Therefore, select one lighter shade than the target shade color.

ML & HT } For polishing, select the target shade color, and for glazing, it tends to become lighter. Therefore, adjust the color by external staining.

### 3

## DISC THICKNESS SELECTION

Multi-Layered UTML, STML and ML discs come in three thicknesses; 14, 18 and 22 mm. When sintering, the thickness will reduce to 80%. Therefore, select the right disc thickness to achieve the appropriate gradation between the crown length the enamel to the body (dentin).



(Image of gradation)



Actual size

Example: Fabricating an anterior crown with 11 mm length, use an 18 mm disc (14.4 mm after sintering) including the enamel layer to the body (dentin) layer. For the 7 mm posterior crown fabrication, a 14 mm disc (11.2 mm after sintering) is recommended between enamel and body (dentin) layers.

## ANTERIOR CROWN, VENEER, POSTERIOR CROWN, INLAY, ONLAY

It is crucial to keep a minimum wall thickness\* for a successful restoration, and keep in mind:

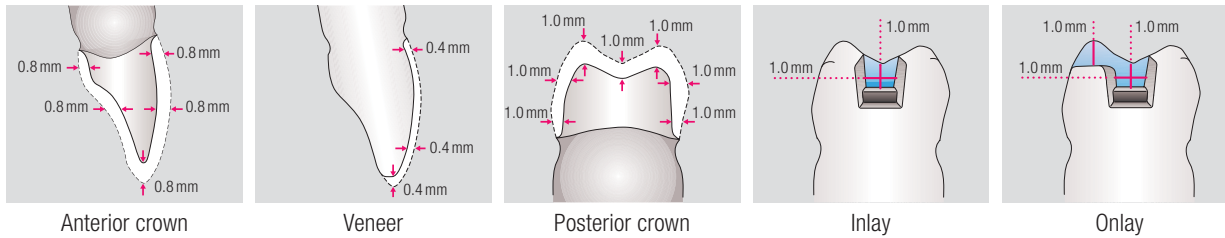
\* Not including the thickness of build-up porcelain

Attention: In case of having more than 3.0 mm thickness on prosthetics, an higher chrome than indicated shades could appear, especially on high chrome shades (A3.5, A4, B3, B4, C3, C4, D3, D4).

### MINIMUM WALL THICKNESS OF ZIRCONIA

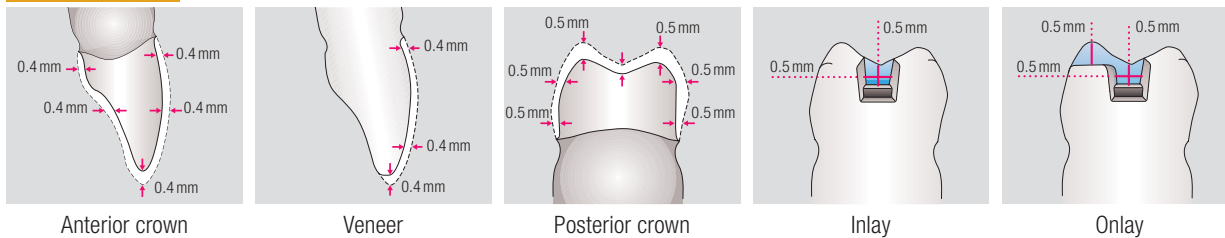
UTML

STML



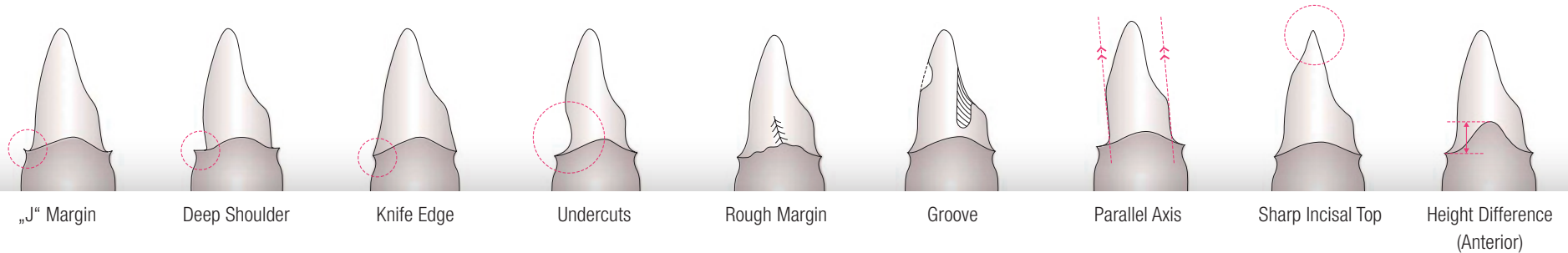
\* Keep 0.8mm in case of porcelain build-up. You can reduce to 0.4mm when finishing with glaze and polish.

ML & HT





## CONTRAINDICATIONS



## BRIDGE / CONNECTOR CROSS SECTION

Follow the formula of applicable wall thickness.

- 1) Do not make a sharp cut to adjust connector cross section by using a diamond disc as the disc creates sharp notches that may lead to cracks and imminent bridge failure.
- 2) UTML and STML are not suitable for a cantilevered pontic bridge.
- 3) ML and HT are limited to 2 pontics within a bridge. When 2 pontics connect, the cross section should be 12 mm<sup>2</sup> or more. The cantilevered pontic is limited to 1 and cross section should be 12 mm<sup>2</sup> or more.

## MINIMUM CONNECTOR CROSS SECTION

	UTML	STML	ML & HT
Anterior 2-3 units	12 mm <sup>2</sup> or more	12 mm <sup>2</sup> or more	7 mm <sup>2</sup> or more
Anterior 4 units or more	(not recommended)		9 mm <sup>2</sup> or more
Posterior 2-3 units	16 mm <sup>2</sup> or more (Premolar only)	16 mm <sup>2</sup> or more	9 mm <sup>2</sup> or more
Posterior 4 units or more	(not recommended)		9 mm <sup>2</sup> or more

## 5

### SINTERING AND ADJUSTING

Follow the sintering schedule. After sintering adjust inside of the framework and margin.

- 1) Be sure that material is fully cooled to avoid cracking.
- 2) UTML and STML flexural strength are not as strong as ML and HT, therefore need special attention like not using excess force or work under running water for inside and/or margin adjustment.
- 3) Use “Crack Finder” after adjustment to make sure no cracking occurred.

### SINTERING PROGRAM SETTING

	UTML	STML	ML & HT
High Temperature	1550 °C / 2822 °F		1500 °C / 2732 °F
Hold Time	2 hours		2 hours
Rate of Temperature Increase	10 °C / 18 °F minute		10 °C / 18 °F minute
Rate of Temperature Decrease	-10 °C / -18 °F minute		-10 °C / -18 °F minute

## 6

### FINISHING METHODS

#### COMPATIBLE MATERIALS

##### Cerabien™ ZR

FL Glaze, VC Glaze, External Stain,  
Internal Stain, Luster, etc.

##### CZR Press LF

LF External Stain, LF Internal Stain,  
LF Luster, etc.

Warning: Do not mix Cerabien™ ZR and CZR Press LF powder for build-up.  
Do not use CZR Press (H-ingot, L-ingot, Esthetic White Ingot) for UTML and STML.

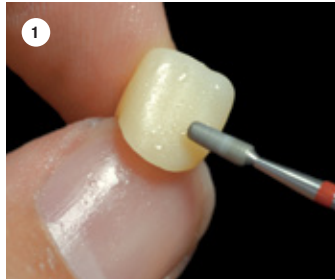
#### CRUCIAL TECHNICAL POINTS OF FINISHING

- 1) Polish contact area with opposing tooth and clean restoration by using an ultrasonic cleaner for maximum benefits.
- 2) After sintering and adjustment, clean restoration thoroughly.
- 3) When glazing, staining and sintering porcelain always use a stand-pin. Sintering schedules vary per product, therefore review technical instructions.
- 4) Do not fabricate until cool down to avoid potential cracking.
- 5) Select the shade number that corresponds to abutment color and according to KATANATM Zirconia.

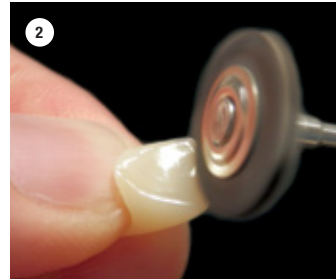
## 6.1 GLAZING

The multi-layered zirconia is designed to achieve esthetic results by using glaze method at final process.

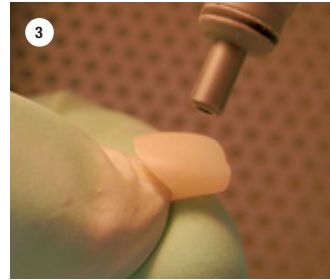
### GLAZING METHOD



1 Create a surface texture over the entire crown under running water or wet condition\*1



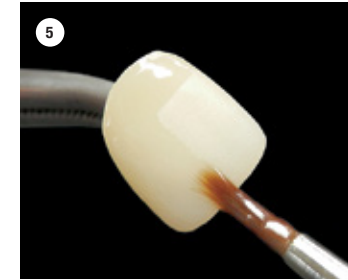
2 Polish areas in contact with opposing tooth. For polishing only finish complete entire crown with polishing



3 Alumina sandblast surface of the crown (50~70µm, 30psi, 0.2MPa)



4 Clean restoration using an ultrasonic cleaner in alcohol or acetone, or steam cleaner



5 Apply glaze, bake, complete\*2

\*1 Warning: Do not use rough surface points /e.g. Green Stone Points, Coarse Diamond Points) for your final correction. It could cause micro cracks and a rough surface which are leading to white spots.

\*2 Under A, B or C method, it is possible to mix glaze and external stain then bake.

### GLAZING METHOD: Select A, B or C method according to the material

No.	Product	Dry-out Time min.	Low Temperature °C/°F	Start Vacuum °C/°F	Heat Rate °C/°F min.	Vacuum Level kPa	Release Vacuum °C/°F	Hold Time in the air min.	High Temperature °C/°F	Cooling Time min.
A	CZR Press Glaze	5	600/1112	600/1112	65/117	96	850/1562	1	850/1562	4
B	Cerabien™ ZR FL Glaze, VC Glaze	5	600/1112	600/1112	65/117	96	850/1562	1	850/1562	4
C	CZR Press LF Glaze	5	600/1112	600/1112	45/81	96	800/1472	1	840/1544	4

### MIX GLAZE AND EXTERNAL STAIN METHOD

Select A, B or C method according to the glaze material (or choice of glaze)		
<b>CZR Press Glaze</b>	+ Cerabien™ ZR External Stain Blue, Gray, A+, etc.	Baking Schedule A
<b>Cerabien™ ZR FL Glaze, VC Glaze</b>	+ Cerabien™ ZR External Stain Blue, Gray, A+, etc.	Baking Schedule B
<b>CZR Press LF Glaze</b>	+ CZR Press LF External Stain Blue, Gray, A+, etc.	Baking Schedule C

## 6.2

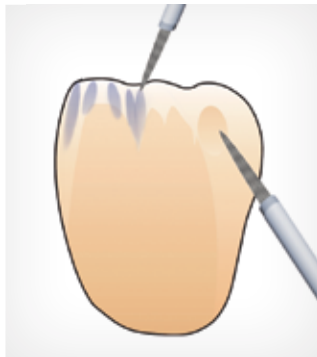
## GLAZE AND STAIN METHOD

After glazing, applied staining will enhance translucent appearance. The UTML enamel shades have reduced chroma in the upper layer which allows you to enhance the translucency appearance of the incisal area, as desired, by utilizing external stain characterization.

### TECHNICAL POINTS OF STAINING

- 1) In addition to the feature of horizontal gradation of the multi-layered disc, applying stain with a vertical direction will create three-dimensional appearance.
- 2) Apply Gray, Blue on the incisal edge area, and A+, B+, C+, D+, etc. on the mamelon area to enhance internal texture and translucency.

### EXAMPLE OF EXTERNAL STAIN



#### BLUE : GRAY = 1:1

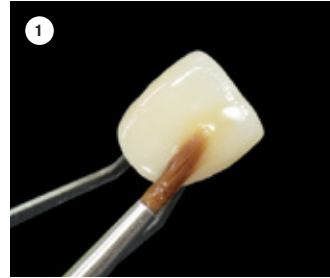
- Apply stains to create shadows of mamelon characterizations

#### A+, B+, C+, D+, etc.

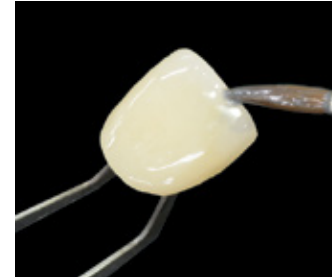
- Apply external stain horizontally for adjusting chroma
- Apply external stain vertically to show internal texture characterization

### GLAZING PROCESS

Process glazing on zirconia surface using page 11 “Glazing” method.



Apply external stain over glazed surface



Bake (under schedule D or E), completion

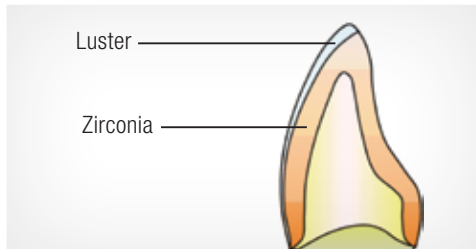
### EXTERNAL STAIN: Select D or E according to the material

No.	Product	Dry-out Time min.	Low Temperature °C/°F	Start Vacuum °C/°F	Heat Rate °C/°F min.	Vacuum Level kPa	Release Vacuum °C/°F	Hold Time in the air min.	High Temperature °C/°F	Cooling Time min.
D	<b>Cerabien™ ZR</b> External Stain Blue, Gray, A+, etc.	5	600/1112	–	50/90	–	–	–	850/1562	4
E	<b>CZR Press</b> LF External Stain Blue, Gray, A+, etc.	5	600/1112	–	45/81	–	–	1	840/1544	4

Higher esthetic appearance will be created by layering Luster porcelain over zirconia.

### TECHNICAL POINTS OF BUILD UP

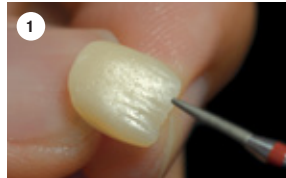
- 1) For UTML/STML, it is crucial to secure the minimum wall thickness as recommended on page 8 “**Framework Design and Milling Process**”, and apply only one layer on the incisal part.
- 2) Polishing finish on lingual side is recommended.



UTML/STML Build-up Image

### FABRICATION PROCESS

Select layering material: either Cerabien™ ZR or CZR Press LF.



Create mamelon structure under running water or wet condition\*1



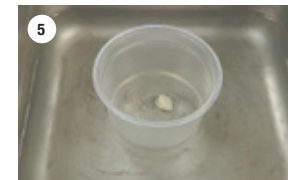
Determine build-up and zirconia thickness



Polish areas in contact with opposing tooth



Perform Almina sandblast on the surface of the unpolished area of the crown (50~70µm, 30psi)



Clean restoration using an ultrasonic cleaner in alcohol or acetone, or steam cleaner



Apply wash, then bake\*2 (schedule F)



Optional: Apply internal stain, then bake (schedule G)



Porcelain build-up, then bake (schedule H)



Perform morphological correction and smooth surface



Apply glaze, external stain, then bake, complete\*3

\*1 Warning: Do not use rough surface points (e.g. Green Stone Points, Coarse Diamond Points) for your final correction. It could cause micro cracks and a rough surface which are leading to white spots.

\*2 In case there is not enough build-up space, internal stain can be used during wash baking (schedule F), and be sure to cover entire build-up surface with internal stain.

\*3 The surface without porcelain build-up (for example lingual side) is recommended polishing finish.

For glazing, external stain and baking on the non build-up surface of Cerabien™ ZR material it is crucial to follow methods of page 11 “**Glazing**” step 5 and page 12 “**Glaze & Stain Method**” steps 1 and 2.

## 6.3

## PORCELAIN BUILD-UP METHOD

### CERABIEN™ ZR BAKING SCHEDULE

No.	Product	Dry-out Time min.	Low Temperature °C/°F	Start Vacuum °C/°F	Heat Rate °C/°F min.	Vacuum Level kPa	Release Vacuum °C/°F	Hold Time in the air min.	High Temperature °C/°F	Cooling Time min.
F	Wash Baking Wash Baking during Internal Stain	5	600/1112	600/1112	45/81	96	930/1706	1	930/1706	4
G	Internal Stain*	5	600/1112	–	50/90	–	–	–	900/1652	4
H	Translucent Luster etc.	7	600/1112	600/1112	45/81	96	930/1706	1	930/1706	4
I	External Stain Glaze, Blue, Gray, A+, etc.	5	600/1112	–	45/81	–	–	–	930/1706	4

\* Can be eliminated if a wash coat baking was performed during the internal stain process.

### CZR PRESS LF BAKING SCHEDULE

No.	Product	Dry-out Time min.	Low Temperature °C/°F	Start Vacuum °C/°F	Heat Rate °C/°F min.	Vacuum Level kPa	Release Vacuum °C/°F	Hold Time in the air min.	High Temperature °C/°F	Cooling Time min.
F	Wash Baking Wash Baking during LF Internal Stain	5	600/1112	600/1112	45/81	96	840/1544	1	840/1544	4
G	LF Internal Stain*	5	600/1112	–	45/81	–	–	–	840/1544	4
H	LF Translucent LF Luster etc.	7	600/1112	600/1112	45/81	96	840/1544	1	840/1544	4
I	LF External Stain Glaze, Blue, Gray, A+, etc.	5	600/1112	–	45/81	–	–	0.5	840/1544	4

\* Can be eliminated if a wash coat baking was performed during the LF internal stain process.

## APPLICATION WITH ANTERIOR PROSTHESES MADE OF HIGHLY TRANSLUCENT KATANA™ ZIRCONIA

INDICATION 1) Cementation of crowns, bridges, inlays and onlays. For more detailed information, refer to the Instructions for Use.



**After preparing the abutments**  
An anterior bridge made of crown and bridge resin has become dislodged. The abutments are vital teeth.



**Prosthesis**  
A PFZ bridge with a frame fabricated using KATANA™ Zirconia HT12.



**Application of Try-in Paste**  
Evaluate the shade of the cement before cementation.



**Try-in**  
After checking the cement's shade, rinse the prosthesis and tooth surface with water to remove Try-in Paste.



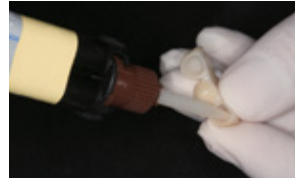
**Pretreatment of the prosthesis (A)** Sandblast the prosthesis (at 0.3 to 0.4 MPa), clean with an ultrasonic cleaner for 2 minutes, then dry.



**Pretreatment of the prosthesis (B)** Apply CERAMIC PRIMER PLUS and blow dry with air.



**Pretreatment of the abutments (C)** Apply Tooth Primer, allow it to react for 20 seconds, then blow dry with air.



**Application of PANAVIA™ V5**  
Use Universal (A2).



**Placement of the prosthesis**  
After placement, remove excess cement using a piece of gauze, a small brush, etc.



**Light-curing**  
Light-cure the entire surface of the prosthesis, including the margins.



**Final polymerization**  
Make sure the prosthesis is left in place, unmoved, for 3 minutes.

## ZIRCONIA BONDING WITH PANAVIA™ V5

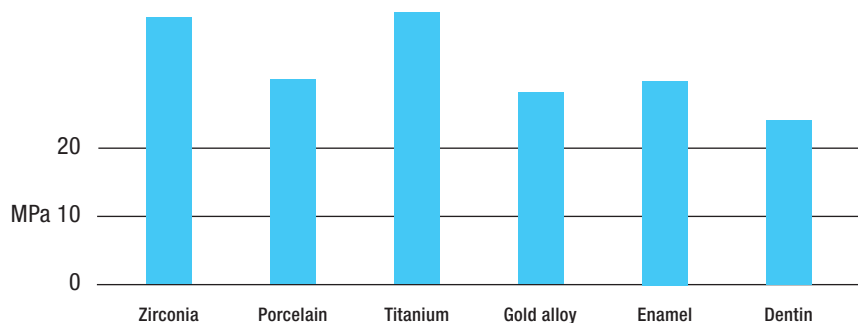
### SIMPLY CEMENT YOUR ZIRCONIA WITH PANAVIA™ V5

One cement. All cement indications. One prime procedure.

From now on you cement all your prosthetics with one predictable procedure. And just relax while cementing even precious veneers or bonding to zirconia. With our revolutionary PANAVIA™ V5 that's possible.

But PANAVIA™ V5 is not a cement only for your dentist. It's also the best way to cement your prosthetics in your lab, e.g. implant abutments and frameworks.

### PANAVIA™ V5 SHEAR BOND STRENGTH TO MULTIPLE MATERIALS<sup>1</sup>



<sup>1</sup> Pretreatments: Zirconia, Gold Alloy - sandblast; Porcelain - HF; Titanium, Enamel, Dentin - polished with # 1000 SIC Paper; Source: Kuraray Noritake Dental.



# PANAVIA™ V5



## THE ORIGINAL MDP MONOMER

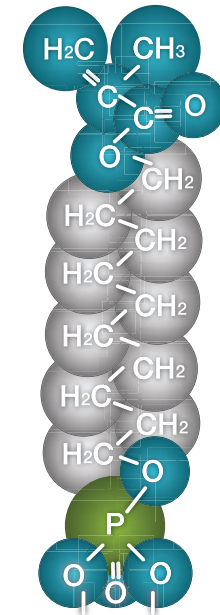
Since 1983, with the introduction of PANAVIA™ EX resin cement and the original MDP monomer, Kuraray has provided innovative and exceptional technologies that have improved the quality of adhesive dentistry and influenced the dental industry.

## THE ORIGINAL MDP MONOMER

Based on Research gathered over 15 years: "...regardless of the conditioning methods, MDP-monomer based cements presented the most favorable bond values compared to those of other resin cements."

Systematic Review of Adhesion Studies on Zirconia; M. Özcan, J Dent Res Vol# 90 A: 374, 2011  
www.iadr.org

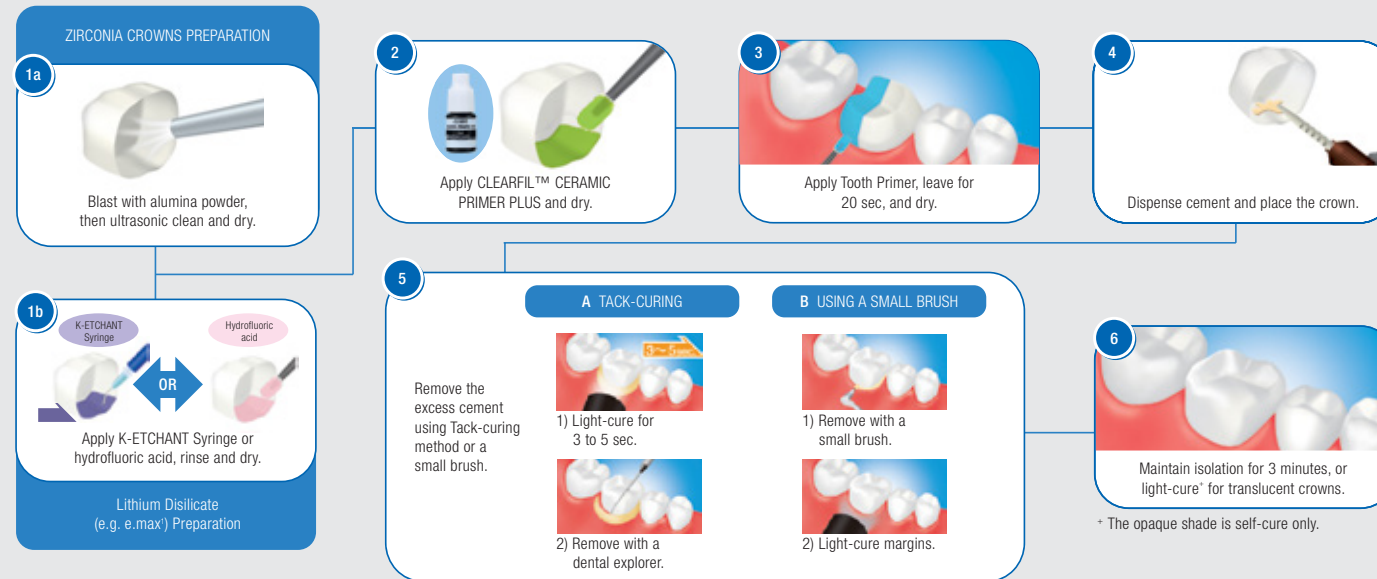
## MDP MOLECULAR STRUCTURE



M-O-M-O-M-O-M

Surface of base metal alloy (e.g. Zirconia, Alumina, Ni-Cr Alloy, Ti Alloy, SUS)

## BASIC PROCEDURE FOR ZIRCONIA & LITHIUM DISILICATE (E.MAX1) RESTORATIONS WITH PANAVIA™ V5



(Opaque shade is used for method B)

## REFILL PANA VIA™ V5

- 1 **PANA VIA™ V5 Tooth Primer** (4 ml), #3635-EU
- 2 **CLEARFIL CERAMIC PRIMER PLUS** (4 ml), #3637-EU
- 3 **PANA VIA™ V5 Paste** (4.6 ml / 8.1 g), 20 Mixing Tips  
**Universal (A2) # 3611-EU, Clear # 3612-EU,**  
**Brown (A4) # 3613-EU, White # 3614-EU,**  
**Opaque # 3615-EU**
- 4 **PANA VIA™ V5 Try-in Paste** (1.8 ml)  
**Universal (A2) # 3621-EU, Clear # 3622-EU,**  
**Brown (A4) # 3623-EU, White # 3624-EU,**  
**Opaque # 3625-EU**
- 5 **K-ETCHANT Syringe** (2 x 3ml), 2 x 20 Needle tips (E),  
#3252-EU

**Mixing tip** (20 Mixing tip), #3626-EU

**Endo tip (S)** (20 Endo tip (S)), #3629-EU





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