kuraray

Noritake

KATANA™ Zirconia

MULTI-LAYERED ZIRCONIA DISC SERIES

TECHNICAL GUIDE

MULTI LAYERED

Kuraray Noritake Dental Inc.

kuraraynoritake.eu/katana-zirconia

KATANA™ Zirconia

HIGH AESTHETIC POTENTIAL FOR ZIRCONIA DENTAL RESTORATIONS*

SIMILAR TO NATURAL TOOTH ENAMEL AND HIGH MECHANICAL PROPERTY MULTI-LAYERED ZIRCONIA.

Ultra translucent Multi-Layered UTML and Super translucent Multi-Layered STML, ideal for efficient aesthetic anterior teeth restorations. High translucent and flexural strength Multi-Layered HTML PLUS, suitable for long-span bridges.
This technical guide will explain the important points to help you achieve successful restorations using “KATANA™ Zirconia”.

*Compared to our conventional products

(Image of gradiation)

4 LAYER STRUCTURE

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

( ) represents the thickness of each layer in the disc

RESTORATION PROCESS

1. Series Selection
2. Shade Selection
3. Disc Thickness Selection
4. Framework Design and Milling Process
5. Sintering and Adjusting
6. Finishing Methods

- 6.1 Glaze
- 6.2 Glazing and Staining
- 6.3 Build-ups

Completion

1 SERIES SELECTION

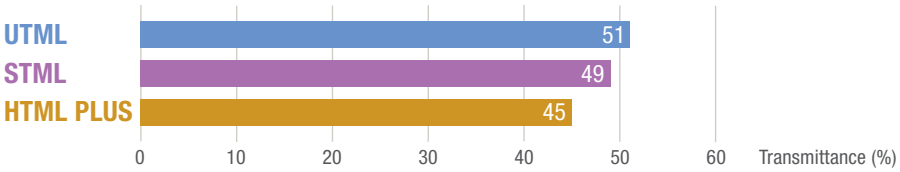
Each series has different translucency and mechanical properties. By choosing the right series, you can successfully restore a variety of cases: from aesthetic anterior restorations to long-span bridges in posterior regions up to full arch restorations.

UTML Ultra Translucent Multi-Layered. Ideal for anterior crowns and veneers, inlays/onlays and posterior single crowns. It offers highest translucency values in zirconia market and is comparable to glass ceramics from this point of view.

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 aesthetic enamel and dentin effects.

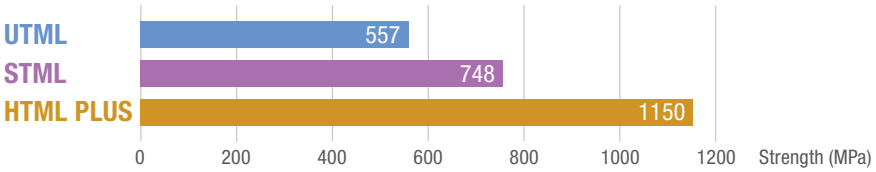
HTML PLUS High Translucent Multi-Layered. Suitable for anterior and/or posterior monolithic restorations that need high strengths and where the effect of the abutment color needs to be suppressed to a minimum. It can also be used for single crown restorations and for long-span bridges. Furthermore, it is an excellent framework material when used in combination with CerabienZR porcelain.

Translucency



Measurement condition: Evaluated by base material(white color).
All light transmittance, illuminant: D65, Thickness of sample: 1.0mm.
Data source: Kuraray Noritake Dental Inc. The numerical value varies according to a condition.

Flexural Strength

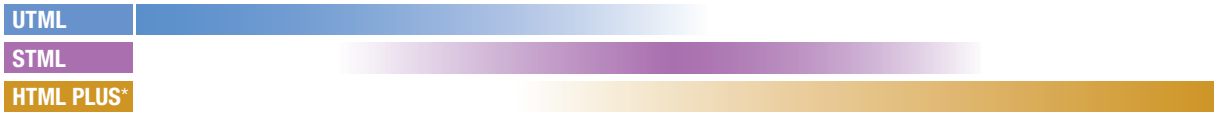


Measurement condition: Evaluated by base material(white color).
According to ISO 6872: 2015, Sample size: 3 x 4 x 40mm.
Data source: Kuraray Noritake Dental Inc. The numerical value varies according to a condition.

RECOMMENDATIONS FOR EACH SERIES

Recommended indications and applications

Veneer | Inlay/Onlay | Anterior Crown | Posterior Crown | 3 Unit Bridge | Long-span Bridge



* "KATANA™ Zirconia" HTML PLUS is recommended both for monolithic long-span restorations, e.g. in combination with "CERABIEN™ ZR" FC Paste Stain, and for frameworks overlayered with layered porcelain.

2 SHADE SELECTION

UTML SHADES

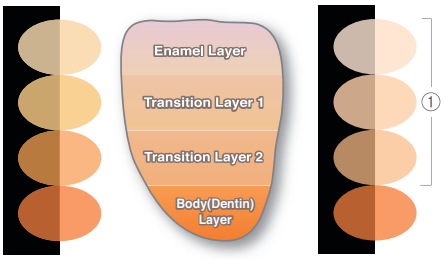
There are two different shade groups: “Standard Shades” and “Enamel Shades”. Enamel Shades have reduced chroma in the upper layer ① which allows you to enhance the translucent appearance of the incisal area, as desired, by utilizing external stain characterization.

Standard shade
(A1～D4)

Translucency
High translucency through all the disc layers.

Color
Color of Shade Guide*

*VITA Classical Shade Guide



Color and translucency of the layers after sintering
(image of gradation)

Enamel shade
(ENW, EA1, EA2, & EA3)

Translucency
High translucency through all the disc layers.

Color
Reduced chroma from incisal to transition layer (① part).

STML SHADES

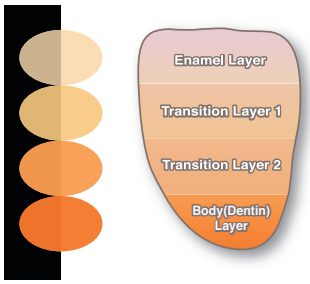
A well-balanced combination of chromatic and gradational translucency reproduces aesthetic enamel and dentin effects.

Standard shade
(NW, A1～A4, B1～B3, C1～C3, D2 & D3)

Translucency
Translucency is gradually decreased from the incisal to the cervical region to increase the masking level in the cervical region.

Color
Color of Shade Guide*

*NW: NORITAKE Shade Guide
A1～A4, B1～B3, C1～C3, D2 & D3: VITA Classical Shade Guide



Color and translucency of the layers after sintering
(image of gradation)

HTML PLUS SHADES

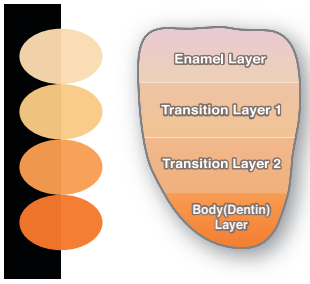
The masking ability of the HTML PLUS is well-balanced, due to its good level of translucency with gradation of the color.

Standard shade
(NW, A1～A4, B1～B3, C1～C3, D2 & D3)

Translucency
Translucency is gradually decreased from the incisal to the cervical region to increase the masking level in the cervical region.

Color
Color of shade guide*

*NW: NORITAKE Shade Guide
A1～A4, B1～B3, C1～C3, D2 & D3: VITA Classical Shade Guide



Color and translucency of the layers after sintering
(image of gradation)

2 SHADE SELECTION

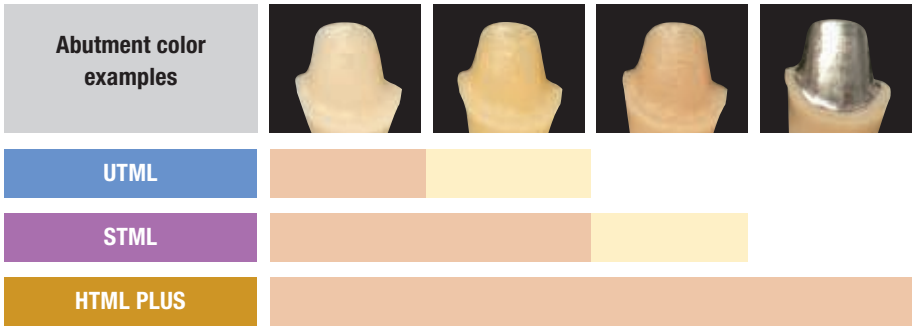
SHADE SELECTION

UTML	**Standard Shades**	A1 C1	A2 C2	A3 C3	A3,5 C4	A4 D2	B1 D3	B2 D4	B3	B4
	Enamel Shades	ENW*	EA1	EA2	EA3					
STML	**Standard Shades**	NW* C1	A1 C2	A2 C3	A3 D2	A3,5 D3	A4	B1	B2	B3
HTML PLUS	**Standard Shades**	NW* C1	A1 C2	A2 C3	A3 D2	A3,5 D3	A4	B1	B2	B3

*NW: NORITAKE Shade Guide Others : VITA Classical Shade Guide

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 brighter than the target color (with external staining).

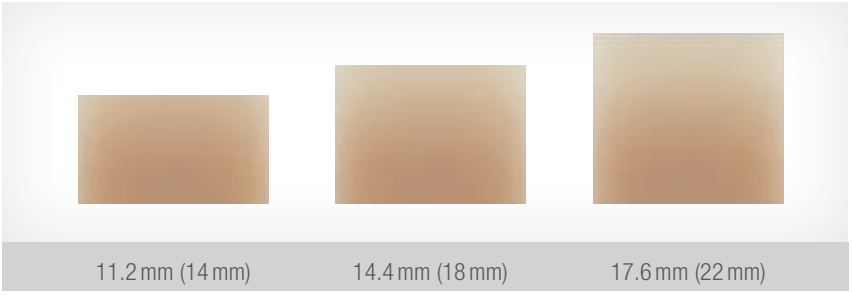
2. Zirconia with a high refractive index tends to look brighter on the posterior area. For posterior restorations using UTML or STML, choose darker than the target shade to achieve a natural look with surrounding teeth.

3. Even when the same shade color is used, the glazing and polishing finish will result in different color outcomes.
For all series which are set for glazing, select the target shade color. When polishing it tends to become darker and therefore a lighter shade than the target shade color should be selected.

3 DISC THICKNESS SELECTION

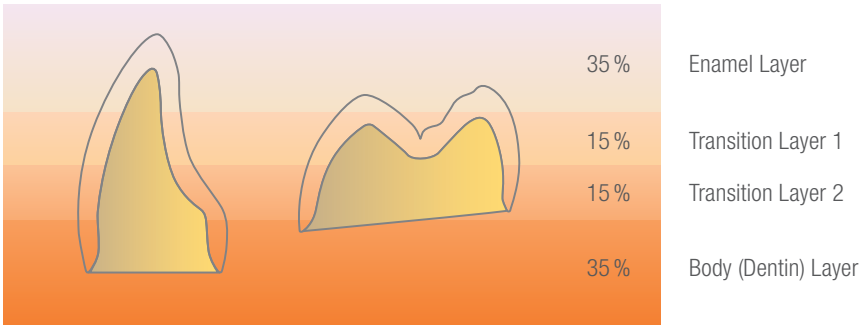
THICKNESS AFTER SINTERING (BEFORE SINTERING)

Multi-Layered UTML, STML and HTML PLUS discs are available in three thicknesses: 14, 18 and 22 mm. During sintering, the material shrinks by approximately 20%. Therefore, select the right disc thickness to achieve the appropriate gradation between the crown length the enamel to the body (dentin).



Actual size

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



(Image of gradation)

4 FRAMEWORK DESIGN AND MILLING PROCESS

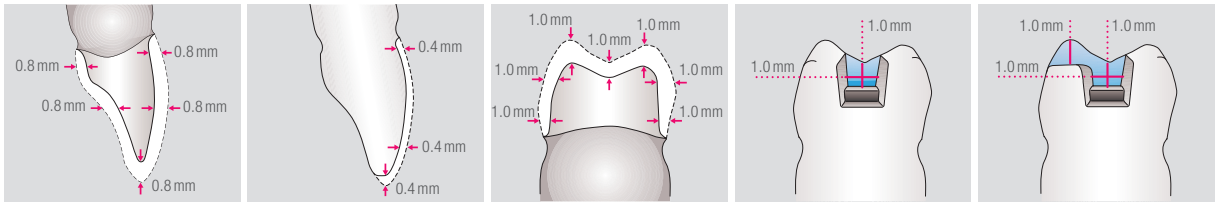
ANTERIOR CROWN, VENEER, POSTERIOR CROWN, INLAY, ONLAY

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

Minimum Wall Thickness of Zirconia

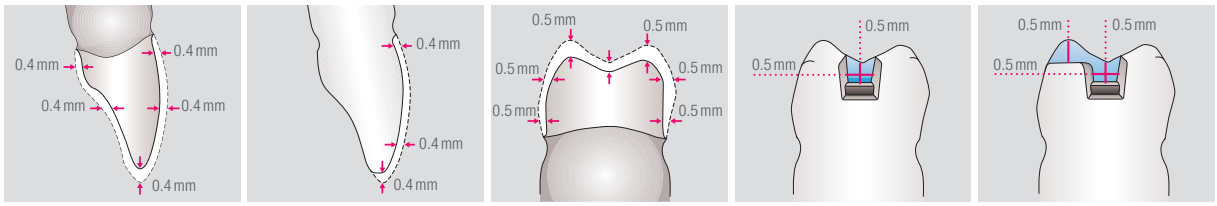
UTML **STML**



Anterior crown | Veneer* | Posterior crown | Inlay | Onlay

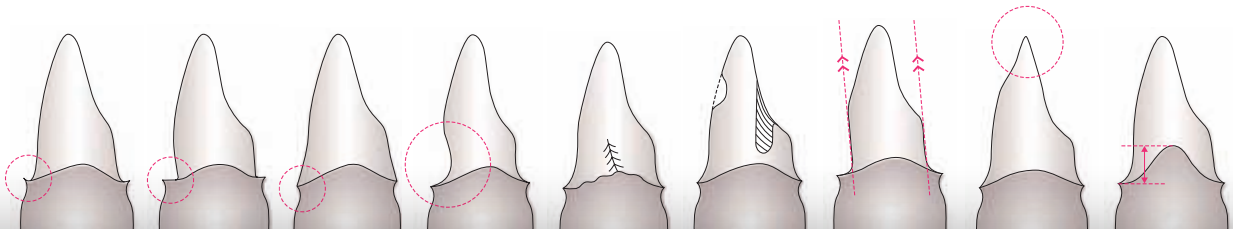
*Keep 0.8mm in case of porcelain build-up. You can reduce to 0.4mm when finishing with glaze and polish.

HTML PLUS



Anterior crown | Veneer | Posterior crown | Inlay | Onlay

Contraindications



„J“ Margin | Deep Shoulder | Knife Edge | Undercuts | Rough Margin | Groove | Parallel Axis | Sharp Incisal Top | Height Difference (Anterior)

BRIDGE / CONNECTOR CROSS SECTION

UTML, STML and HTML PLUS are products that offer consistent strength. You can design your restorations easily, safely and be confident that connectors will not lose their strength.

Follow the formula of applicable wall thickness.

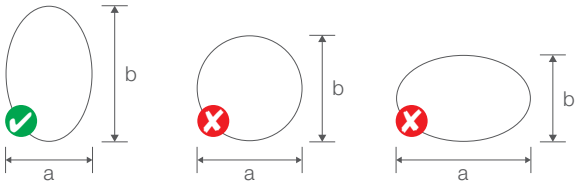
1. Do not make a sharp cut to adjust connector cross section by using a diamond disc as the disc creates sharp notches that may lead to cracks and imminent bridge failure.
2. UTML and STML are not suitable for a cantilevered pontic bridge.
3. HTML PLUS is limited to 2 pontics within a bridge. When 2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

Minimum Connector Cross Section

	UTML	STML	HTML PLUS
Anterior 2-3 units	12 mm^2 or more	12 mm^2 or more	7 mm^2 or more
Anterior 4 units or more	(not recommended)		9 mm^2 or more
Posterior 2-3 units	16 mm^2 or more (Premolar only)	16 mm^2 or more	9 mm^2 or more
Posterior 4 units or more	(not recommended)		9 mm^2 or more

THE IMPORTANCE OF CONNECTOR SHAPE AND SIZE

For long-lasting results of bridge restorations, the correct connector section design and dimensions are critical. The highest force applied to a connector acts vertically, from top to bottom. Therefore, the connector cross-section area of bridge restorations should be expanded vertically rather than horizontally, if possible.



Especially in anterior bridge cases, it is not always possible to achieve the required connector cross-section dimensions in the sagittal (lingual-vestibular) direction. In such cases, the connector cross-section area should always be extended in the vertical (incisal-cervical) direction. When designing the connector cross-section area, try to achieve the largest possible dimensions. For high level stability, it is more important to aim for the height of the connector cross-section rather than the width. A doubling of he width will only result in a doubling of the stability, while doubling the height will result in up to quadrupling the stability. Furthermore, depending on the distance between the abutment teeth, the mechanical load on the structure and the masticatory forces are also higher.

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 HTML PLUS, therefore need special attention such as 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:

	Temp.1	Rate of Temp. Increase °C/min. (°F/min.)	Temp.2	Rate of Temp. Increase °C/min. (°F/min.)	Temp.3	Rate of Temp. Increase °C/min. (°F/min.)	Temp.4	Hold Time	Rate of Temp. Increase °C/min. (°F/min.)	Temp.5
54-minute	Room Temp.	120°C/216°F	1450°C/2642°F	10°C/18°F	1600°C/2912°F	–	–	20 min.	-120°C/216°F	800°C/1472°F
90-minute	Room Temp.	50°C/90°F	1400°C/2552°F	4°C/7°F	1500°C/2732°F	10°C/18°F	1560°C/2840°F	16 min.	-50°C/90°F	800°C/1472°F
7-hour	Room Temp.	10°C/18°F	1550°C/2822°F	–	–	–	–	2-hour	-10°C/18°F	RT.

The above sintering recommendation is only a guideline; some adjustments may be required depending on each individual furnace.
If the furnace cannot be set according to the 54- or 90-minute sintering schedule, speed sintering cannot be used.

6 FINISHING METHODS

COMPATIBLE MATERIALS

CERABIEN™ ZR
FC Paste Stain, 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.

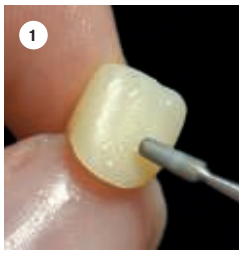
CRUCIAL TECHNICAL POINTS OF FINISHING

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 "KATANA™ Zirconia".

6.1 GLAZING

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

GLAZING METHOD

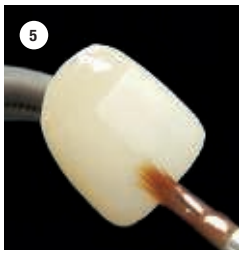


Create a surface texture over the entire crown under running water or wet condition

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

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

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



Apply glaze, bake, complete*

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

Glazing Baking Schedule: Select A, B, C or D method according to the material

No.	Product	Dry-out Time min.	Low Temperature °C/°F	Start Vacuum °C/°F	Heat Rate °C/min. (°F/min.)	Vacuum Level kPa	Release Vacuum °C/°F	Hold Time in the air min.	High Temperature °C/°F	Cooling Time min.
A	**CERABIEN™ ZR** FC Paste Stain Clear Glaze, Glaze	5	500/932	600/1112	45/81	96	750/1382	1	750/1382	4
B	**CZR PRESS** Glaze	5	600/1112	600/1112	65/117	96	850/1562	1	850/1562	4
C	**CERABIEN™ ZR** FL Glaze, VC Glaze	5	600/1112	600/1112	65/117	96	850/1562	1	850/1562	4
D	**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, C or D method according to the glaze material (or choice of glaze)

CERABIEN™ ZR FC Paste Stain, Clear Glaze, Glaze	+ CERABIEN™ ZR FC Paste Stain Grayish Blue, A+ ,etc.	Baking Schedule A
CZR PRESS Glaze	+ CERABIEN™ ZR External Stain Blue, Gray, A+, etc.	Baking Schedule B
CERABIEN™ ZR FL Glaze, VC Glaze	+ CERABIEN™ ZR External Stain Blue, Gray, A+, etc.	Baking Schedule C
CZR PRESS LF Glaze	+ CZR PRESS LF External Stain Blue, Gray, A+, etc.	Baking Schedule D

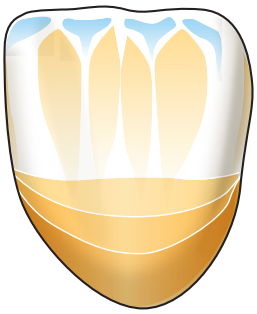
6.2 GLAZE AND STAIN METHOD

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

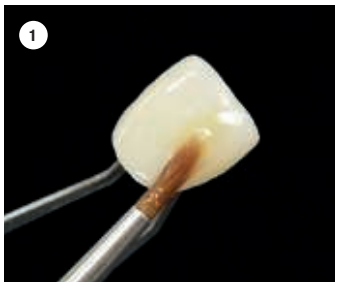


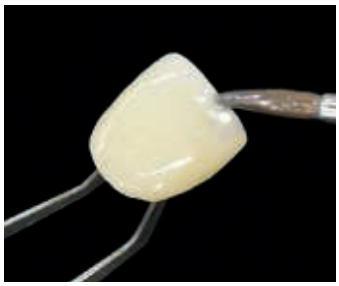
BLUE : GRAY = 1:1
- Apply stains to create shadows of mamelon characterizations

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 stain over glazed surface

Bake (under schedule E, F or G), completion

External Stain and FC Paste Stain* Baking Schedule: Select E, F or G according to the material

No.	Product	Dry-out Time min.	Low Temperature °C/°F	Start Vacuum °C/°F	Heat Rate °C/min. (°F/min.)	Vacuum Level kPa	Release Vacuum °C/°F	Hold Time in the air min.	High Temperature °C/°F	Cooling Time min.
E	**CERABIEN™ ZR** External Stain Grayish Blue, A+, etc.	5	500/932	600/1112	45/81	96	750/1382	1	750/1382	4
F	**CERABIEN™ ZR** External Stain Blue, Gray, A+, etc.	5	600/1112	–	50/90	–	–	–	850/1562	4
G	**CZR PRESS LF** LF External Stain Blue, Gray, A+, etc.	5	600/1112	–	45/81	–	–	1	840/1544	4

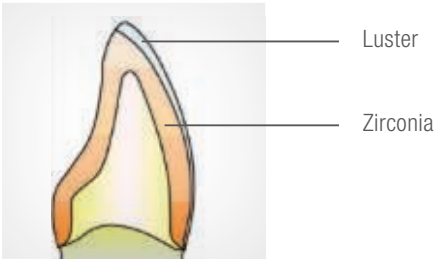
*In case of using FC Paste Stain Grayish Blue etc. on FC Paste Stain Glaze or Clear Glaze.

6.3 PORCELAIN BUILD-UP METHOD

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

TECHNICAL POINTS OF BUILD UP

1 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

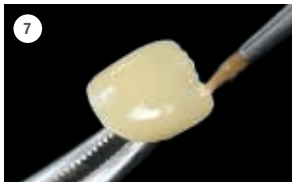
Determine build-up and zirconia thickness

Polish areas in contact with opposing tooth

Perform Alumina 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*1 (schedule H)



Apply internal stain, then bake (schedule I)

Porcelain build-up, then bake (schedule L)

Perform morphological correction and smooth surface

Apply glaze, external stain, then bake, complete*2

*1 In case there is not enough build-up space, internal stain can be used during wash baking (schedule H), and be sure to cover entire build-up surface with internal stain.
*2 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/min. (°F/min.)	Vacuum Level kPa	Release Vacuum °C/°F	Hold Time in the air min.	High Temperature °C/°F	Cooling Time min.
H	**Wash Baking** **Wash Baking during Internal Stain**	5	600/1112	600/1112	45/81	96	930/1706	1	930/1706	4
I	**Internal Stain***	5	600/1112	–	50/90	–	–	–	900/1652	4
J	**Translucent Luster etc.**	7	600/1112	600/1112	45/81	96	930/1706	1	930/1706	4
K	**External Stain** Glaze, Blue, Gray, A+, etc.	5	600/1112	–	45/81	–	–	–	930/1706	4
	FC Paste Stain Glaze, Grayish Blue, A+, etc.	5	600/1112	–	45/81	–	–	–	910/1670	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/min. (°F/min.)	Vacuum Level kPa	Release Vacuum °C/°F	Hold Time in the air min.	High Temperature °C/°F	Cooling Time min.
H	**Wash Baking** **Wash Baking during LF Internal Stain**	5	600/1112	600/1112	45/81	96	840/1544	1	840/1544	4
I	**LF Internal Stain*[1]**	5	600/1112	–	45/81	–	–	–	840/1544	4
J	**LF Translucent** **LF Luster etc.**	7	600/1112	600/1112	45/81	96	840/1544	1	840/1544	4
K	**LF External Stain** Glaze, Blue, Gray, A+, etc.	5	600/1112	–	45/81	–	–	0.5	840/1544	4
	CERABIEN™ ZR[*2] Glaze, Grayish Blue, A+, etc.	5	600/1112	–	45/81	96	–	–	840/1544	4

[*1] Can be eliminated if a wash coat baking was performed during the internal stain process.
[*2] The baking temperature varies with the type of product used as a substrate.

EU Importer
Kuraray Europe GmbH
Philipp-Reis-Strasse 4,
65795 Hattersheim am Main, Germany
Phone +49 (0)69 305 35 835
Fax +49 (0)69 305 98 35 835
www.kuraraynoritake.eu
centralmarketing@kuraray.com

- Before using this product, be sure to read the Instructions for Use supplied with the product.
- The specifications and appearance of the product are subject to change without notice.
- Printed color can be slightly different from actual color.

Kuraray Noritake Dental Inc.
1621 Sakazu, Kurashiki, Okayama 710-0801, Japan
Website www.kuraraynoritake.com

CE 1639

10/21 MKA00121