

1. PRODUCT DESCRIPTION:

Zirlux® Transitions blanks are made of pre-sintered yttria stabilized tetragonal zirconia polycrystalline ceramics (YTZP) for use as CAD/CAM milling blanks. 4Y-TZP is a commercially pure zirconia (ZrO₂) comprising about 4 mol % of Y₂O₃ to stabilize the tetragonal phase, the strongest and translucent form of zirconia. Zirlux® Transitions blanks are pre-shaded and can be milled using any compatible CAD/CAM machine. It is necessary to mill the blanks with an appropriate enlargement factor to account for the shrinkage that occurs during full sintering. The blanks are manufactured to have a well-controlled enlargement factor of approximately 1.21 (21%), which ensures that a good fit is achieved after full sintering. Each blank is labeled with its individual, precisely determined, enlargement factor. After full sintering, the material densifies into a high strength dental ceramic listed as Type 2 Class 5 according to ISO6872:2015

Indications

- Full Contour anterior and posterior crowns, bridges, inlays & onlays.
- Single tooth and bridge frameworks in the anterior and posterior, up to 14 units.

Contraindications

- Improper framework design

COMPOSITION (in wt%)

ZrO ₂	(+HfO ₂): > 90%
Y ₂ O ₃	> 7%
Al ₂ O ₃	< 1%

TECHNICAL DATA †

Coefficient of Thermal Expansion (25-500oC)	10.5 x 10 ⁻⁶ / °C
Flexural Strength:	1200 MPa
Vickers Hardness (HV10):	< 0.2%
Chemical Solubility:	< 1%

† As per ISO 6872:2015

2. ZIRCONIA FRAMEWORK DESIGN:

When designing a full contour zirconia restoration, it is important that minimum thickness requirements are met (see Table 1). 1.0 mm of occlusal and axial thickness is considered ideal for full contour zirconia restorations.

Anterior	Crowns	Bridges			
	Single-unit	3 unit	4 units with max 2 connected pontics	Cantilever with 1 pontic	Full Mouth up to 14 units
Axial:	0.5 mm	0.5 mm	0.7 mm	0.7 mm	0.7 mm
Incisal/Occlusal:	0.5 mm	0.5 mm	0.6 mm	0.8 mm	0.8 mm
Connector Dimensions:	n/a	7 mm ²	9 mm ²	12 mm ²	12 mm ²
Posterior					
Axial:	0.5 mm	0.5 mm	0.7 mm	0.7 mm	0.7 mm
Incisal/Occlusal:	0.5 mm	0.7 mm	0.8 mm	0.8 mm	0.8 mm
Connector Dimensions:	n/a	9 mm ²	12 mm ²	12 mm ²	12 mm ²

3. SHADE SELECTION:

Disc Shade	A1	A2	A3	A3.5	A4	B1	B2	B3	B4	C1	C2	C3	C4	D2	D3	D4	OM2
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4. MILLING:

Milling of the blanks is done with an enlargement of the zirconia factor of proximately 1.21 (or 21%) relative to the final desired dimensions. This compensates for the shrinkage that occurs during full sintering. Each Zirlux® Transitions disc box and blank is labeled with its unique Enlargement Factors (EF), as well as the Linear Shrinkage (LS, %) which is calculated from the EF. Please refer to the operating instructions of the corresponding CAD/CAM system for detailed milling instructions and the required inputs. It is strongly recommended to use a 0.6 mm diameter or finer tool for finishing occlusal surfaces to achieve accurate rendering of tooth anatomy and smoother contacts with opposing dentition.

5. FINISHING AND PREPARING FOR SINTERING:

It is recommended that all adjustments to zirconia restorations be completed prior to sintering. Only use suitable grinding instruments, low speed, and light pressure to avoid flaking, chipping and cracking of the restoration.

Steps:

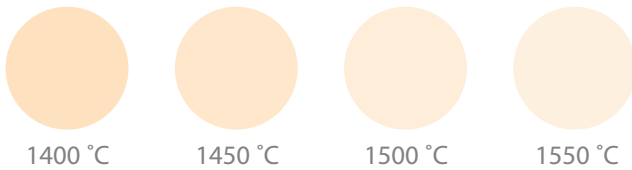
- Carefully separate the milled restoration from the starting blank using a fine diamond disk and smooth out the attachment area using a suitable grinding instrument.
- Make adjustments to the milled restoration as necessary.
- After finishing, clean the milled restoration using compressed air or water as necessary.
- If the restoration is moist or wet it should be dried prior to full sintering. Recommended drying time is at least 30 minutes (under heat lamp).

6. Oven Calibration & Sintering Principles:

- First, calibrate your oven. Use a ceramic temperature test ring, measure the ring for actual temperature and adjust your setting (ex. 1500° C).
- The standard sintering temperature we recommend for a 4:15 minute cycle is 1500° C.
- Zirlux® Transitions is a high-performance material with much smaller particle sizes compared to other materials. This provides many unique benefits such as; a higher strength/translucency ratio, higher strength integrity when finishing margins and a smoother/polished-like finish. To achieve optimal performance and an accurate shade match, you should perform an initial calibration with this material to your oven.
- If your restoration comes out light after sintering, then lower the temperature incrementally by 30 - 50 °C.



The Sintering Temperature Determines Chroma and Value



* With higher temperature, chroma will be decreased. Decreased chroma will make white L* value go up, making your crown look whitish.

* Different ovens have different temperature profiles, meaning that the actual temperature performance inside the heating chamber is different. Temperature adjustment may be needed if your restoration comes out lighter than the shade tab.

* Once you have found the right temperature for your oven for any shade (an A2 shade for example) the rest of the shades will be automatically coordinated due to the Zirlux® Transition shade system.

7. SINTERING:

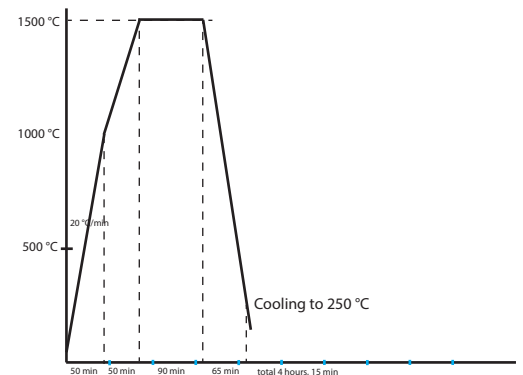
The sintering temperature for the zirconia is 1500°C ± 50°C. Higher temperature (up to 1550°C) is required for faster sintering cycles. Restorations can be sintered in any dental zirconia sintering furnace provided it can run the recommended sintering cycle below. Follow the sintering instructions of the corresponding furnace with regard to placement of frameworks and furnace accessories such as crucibles, sintering beads, sintering trays, etc. If using a crucible or dish, it is recommended to sinter Zirlux® Transitions restorations covered.

CAUTION: Do not sinter Zirlux® Transitions restorations along with any restorations stained with coloring liquids. Shade contamination may occur.

SINTERING CYCLE (Single crowns up to 30 per batch)*

Stage	Rate / min	Ramp Time	Hold Time
1 Ramp to 1000 °C	20 °C / min	50 min	0 min
2 Ramp to 1500 °C	10 °C / min**	50 min	90 min at 1500 °C
3 Cooling to 250 °C***	20 °C / min	65 min	n/a
Total time		4 hours, 15 min	

Optimal program for quick sintering of single crowns.

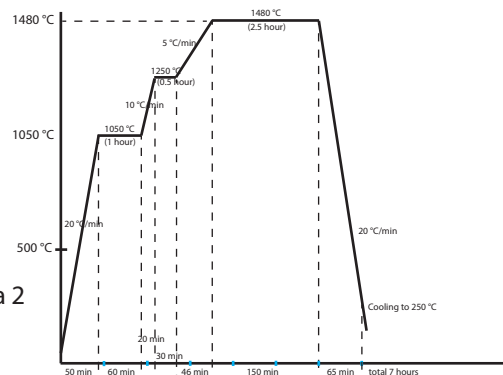


SINTERING CYCLE (Single Crowns exceeding 30 & 3 unit Bridges) *

	Stage	Rate / min	Ramp Time	Hold Time
1	Ramp to 1050 °C	20 °C / min	53 min	60 min
2	Ramp to 1250 °C	10 °C / min	20 min	30 min at 1250 °C
3	Ramp to 1480 °C	5 °C / min**	46 min	150 min at 1480 °C
4	Cooling to 250 °C***	20 °C / min	65 min	n/a
	Total time		7 hours	

Optimal program for single crowns exceeding quantities of 30 as well as 3 unit bridges with thick pontics (since large mass pontics require increased amounts of heat).

(2.5 hours of holding time will produce a pontic area with much better aesthetics than a 2 hour holding time since the white L* value is decreased)

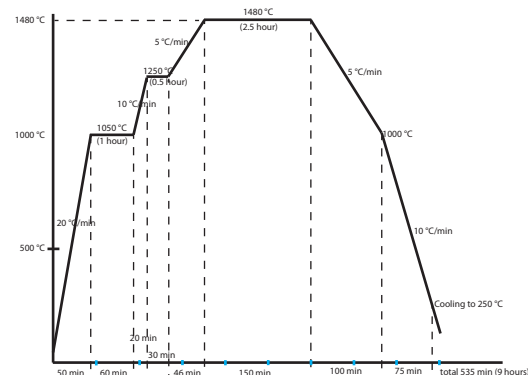

SINTERING CYCLE (Bridges over 3 units)*

	Stage	Rate / min	Ramp Time	Hold Time
1	Ramp to 1050 °C	20 °C / min	53 min	60 min
2	Ramp to 1250 °C	10 °C / min	20 min	30 min at 1250 °C
3	Ramp to 1480 °C	5 °C / min**	46 min	150 min at 1480 °C
4	Cooling to 1000 °C	5 °C / min	100 min	n/a
5	Cooling to 250 °C***	10 °C / min	75 min	n/a
	Total time		9 hours	

This is the universal program for single crowns and bridge cases.

The extended cooling time will ensure minimal distortion and stress-free cooling of the bridge restorations.

(2.5 hours of holding time will produce a pontic area with much better aesthetics than a 2 hour holding time since the white L* value is decreased)


SINTERING CYCLE (Bridges with Thick Pontic)*

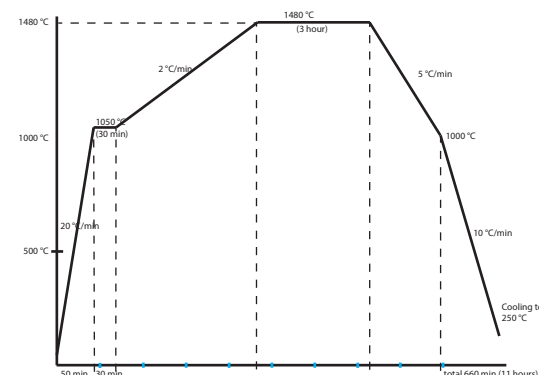
	Stage	Rate / min	Ramp Time	Hold Time
1	Ramp to 1050 °C	20 °C / min	50 min	30 min
2	Ramp to 1480 °C	2 °C / min**	215 min	180 min at 1480 °C
3	Cooling to 1000 °C	5 °C / min	100 min	n/a
4	Cooling to 250 °C***	10 °C / min	75 min	n/a
	Total time		11 hours	

Extended sintering time and cooling time (11 hours) ensures better pontic aesthetics, minimal distortion and stress-free bridges.

* For dry milled restorations. Include a drying step for wet milled restorations.

** Larger mass restorations require a slower heating rate.

*** Do not remove restorations from the furnace until below 500 °C



If using a sintering furnace with molybdenum disilicide (MOSI2) heating elements a Cleaning Cycle should be run if: (i) it is the first use of a new heating element(s), or (ii) sintered frameworks have come out discolored (yellowish). The recommended Cleaning Cycle is: heat at 20°C/min. to 1600 °C, hold for 2 hours followed by natural cool. The furnace should be run empty for this cycle. The effect of the Cleaning Cycle is to generate a protective silica (SiO2) coating on the heating elements, as is necessary to prevent discoloration of restorations.

8. POST-SINTERING PREPARATION:

If adjustments to the zirconia are necessary, it is recommended to use only grinding instruments indicated for zirconia. When grinding, use little or no pressure to reduce heat which can cause fractures in the framework. Ensure that the minimum thickness requirements and connector dimensions are maintained. See Tables 1 and 2. It is critical that the connector areas are not touched by a separating disc or grinding tool. This will compromise the strength of the zirconia framework.

Always use water during grinding to keep restorations cool. Before staining, the surface of the zirconia restoration must be sandblasted with alumina not coarser than 50 psi. After sandblasting, steam clean or ultrasonically clean the framework for 15 min. It is very important that the surface of the zirconia is free from dirt, milling dust/residue, and oily/greasy elements. When applying stains to the surface of zirconia, use only those intended for this purpose.

9. STAIN AND GLAZE OR LAYERING:

Applying vacuum during stain and glaze for Zirlux® Transitions is required. If the vacuum is not used then restorations will likely look opaque and the shade will be too light. It is important to have enough cooling time after glazing to avoid possible (micro) cracks in the zirconia restoration. Cooling too fast may result in cracks in the areas between thick pontics and thin wall.

PARAMETERS FOR GLAZE FIRING

	Preheating Temp [C / F]	Drying Time [min]	Temp Speed (Heat Rate) [C / F min]	Final Temp [C / F]	Holding Time [min]	Vacuum Start [C / F]	Vacuum End [C / F]
Glaze Firing	403 / 757	6:00	100 / 212	790 / 1454	1:30	450 / 842	789 / 1452

PARAMETERS FOR COOL DOWN

	Option 1 (Standard)	Option 2 (Extended time for big bridges)
800 °C	Oven starts to open slowly	Oven does not open
700 °C	54 seconds	1 min 19 seconds
600 °C	2 min 26 seconds (cumulative)	4 min 03 seconds (oven starts to open at 600 °C)
500 °C	4 min 47 seconds (cumulative)	6 min 51 seconds
400 °C	7 min 18 seconds (cumulative)	10 min 50 seconds
300 °C	8 min 22 seconds (cumulative)	11 min 20 seconds
Total glazing time	about 23 minutes (from start to finish)	about 29 minutes

10. POLISHING FULL CONTOUR RESTORATIONS:

It is very important that the occlusal surface of the full contour Zirlux® Transitions restoration has a smooth, glazed or polished surface. An abrasive surface can wear the patient's opposing dentition. If any anatomical adjustments are made on zirconia by the laboratory or dentist, the surface must be either re-glazed or polished using polishing cups and pastes developed to finish zirconia to maximum surfaces smoothness.

11. STORAGE:

Store in a cool, dry place.

12. WARNING AND SAFETY INSTRUCTIONS:

Do not inhale grinding dust. Do not get grinding dust into eyes. A dust mask and protective eyewear should be worn when processing zirconia.