SINTERING INSTRUCTION

republic**Zr**® - cosmetic dentistry ceramics

The sintering curves have been tailored to our materials. Therefore, they are our recommendation for optimal sintering results. Since the actual temperature (energy) in each furnace may vary and can deviate from the programmed parameters, it is advisable to determine and adjust the individual furnace parameters through a test firing with PTC rings.We are happy to provide further guidance on this matter. info@dentrepublic.de

Zirconia constructions should be sintered in a furnace that is used exclusively for these products.
If other ceramic materials or glazing ceramics are fired in the same furnace, this may affect the sintering behavior or cause discoloration.

Final Temperatures

republic**Zr**® **classic**
3Y-TZP
WHITE | MONOCHROME
All positions in the dental arch – Frameworks for ceramic veneering,

republic**Zr**® Y-ML **unlimited**
3Y-TZP & 4Y-PSZ
Multi Yttria (Y_2O_3) Blanks with color and translucency gradient
All positions in the dental arch - Molar translucent ceramics

republic**Zr**® Y-ML **pioneer**
4Y-PSZ & 5Y-PSZ
Multi Yttria(Y_2O_3) Blanks with color and translucency gradient
All positions in the dental arch – Anterior translucent ceramics

1.500°C	*(1.480)* -1.500°C	1.530°C
		

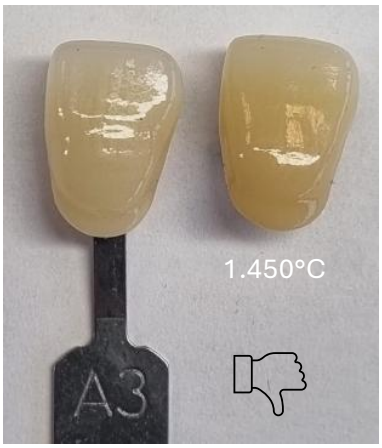
Influence of Temperature (Energy) on Material Properties

Adequate energy supply during the sintering process is essential for achieving the excellent mechanical properties (stability) of the material. Additionally, both color and translucency are significantly influenced by the applied energy. The key influencing factors are:

- **Time:** Particularly for massive constructions (e.g., large-span bridges with connected pontics, milled gingival parts, etc.), slow heating rates, holding points, and sufficient holding time at the final temperature are crucial for uniform heating.
- **Temperature:** The final temperature is especially relevant. Depending on the zirconia chemistry (Y_2O_3 content, color-giving oxides), both color and translucency will change. As a general rule:
  3Y-TZP:
  Higher temperature → Higher translucency, less chromatic appearance
  Lower temperature → Lower translucency, darker and more intense colors
  >4Y-PSZ (Multi-Yttria):
  Higher temperature → Less chromatic (paler), reduced translucency in the incisal area
  Lower temperature → Overly intense chromatic effect (e.g., dominant yellow), reduced translucency
- **Furnace Loading:** Thermal energy is distributed among all objects inside the furnace chamber. When the furnace is fully loaded, it is advisable to use slower heating rates (standard programs) to achieve optimal aesthetic results.

e.g.: republic**Zr**®Y-ML **pioneer**

If the final temperature is too high, the result will be less chromatic (pale). Translucency in the incisal area decreases. →



At too low a temperature, the color becomes over-chromatized (yellow-brown dominance). In monolithic constructions, this effect is significantly amplified after glazing. ←↓ picture on the left and below

(All images taken under different conditions. They are for illustration purposes only to demonstrate the effect.)

Control of Milled Constructions

- ✓ No material chipping, cracks, or other damages.
- ✓ No zirconia dust residues. Zirconia dust sinters onto the surface and its removal after sintering is time-consuming and not material-friendly. Remove using compressed air or a brush.
- ✓ No discolorations or foreign particles on the surface. Avoid contamination with metal dust, especially when working with materials like CoCr in the same workspace as ZrO2. Metallic residues on the surfaces oxidize during sintering, creating localized or partial discolorations.
- ✓ No shiny spots on the surface.
- ✓ The constructions must be dry. If wet processing was done, a drying cycle in a ceramic furnace should be performed to remove cooling and/or lubrication liquids from the porous structure. If dyed with liquid (even partially), ensure sufficient drying time (follow liquid manufacturer instructions). Forced air ovens ("dehydrators") have proven helpful for drying infiltration liquids.

If any of the listed defects are found and cannot be corrected as described, the construction should not be used for the fabrication of dental restorations.

Please also refer to the operating manual of the respective sintering furnace.

Before using fast sintering programs, ensure that your sintering furnace is designed for the heating rates and final temperatures.

For your own safety (burn risk!), please note that zirconia retains heat for a long time and remains hot accordingly. Additionally, constructions should never be cooled suddenly (e.g., placing them on a cold surface without a firing tray immediately after removal). This can lead to "thermal shock," which may cause cracks and fractures.

Sintering programs:

republic**Zr® Standard (Universal)**

Ramp		Parameter	Y-ML unlimited & pioneer	classic
heating rate 1	↗	8 °C/Min. to 1.150 °C	Final temperature	
holding time 1	↔	30 Min. to 1.150°C		
heating rate 2	↗	2 °C/Min. to 1.300 °C		
heating rate 3	↗	4°C/Min. to final temperature →	***1.500°C***	1.530°C
holding time 2	↔	120 Min. at final temperature		
cooling rate 1	↘	8°C/Min. to 800°C		
cooling rate 2	↘	Natural Cooling to 200°C (Opening temperature, Alternative: 5°C/min.		

republic**Zr® 4h (Fast) for max. 3-unit bridges with max. 1 pontic**

Ramp		Parameter	Y-ML unlimited	classic
heating rate 1	↗	40 °C/Min. to 1.150 °C	Final temperature	
holding time 1	↔	10 Min. to 1.150°C		
heating rate 2	↗	10 °C/Min. to final temperature →	1.510°C	1.550°C
holding time 2	↔	120 Min. at final temperature		
cooling rate 1	↘	40°C/Min. to 800°C		
cooling rate 2	↘	Natural Cooling to 200°C (Opening temperature), Alternative: 10°C/min.		

republic**Zr® 2h (Fast) for max. 3-unit bridges with max. 1 pontic / Y-ML unlimited only crowns**

Ramp		Parameter	Y-ML unlimited	classic
heating rate 1	↗	50 °C/Min. to 1.150 °C	Final temperature	
heating rate 2	↗	8 °C/Min. to final temperature →	1.550°C	
holding time 1	↔	30 Min. at final temperature		
cooling rate 1	↘	50°C/Min. to 800°C		
cooling rate 2	↘	Natural Cooling to 200°C (Opening temperature), Alternative: 5°C/min.		

- The use of fast sintering programs may lead to differing color and translucency results compared to the standard program.
- Do not place milled workpieces in the furnace above a maximum residual temperature of 70°C (thermal shock).
- The best results with republicZr® Y-ML pioneer are achieved at 1,500°C.

„Sintering makes the smile last."

We wish you great results and always beautiful sintering outcomes. If anything is not right, please do not hesitate to contact us. We love zirconia and are happy to advise you to optimize processes and results.

Warranty/Disclaimer
Application recommendations, whether given orally, in writing, or as part of practical instructions, are considered guidelines. Our products are subject to continuous development and are tested according to the latest scientific knowledge and legal requirements. We reserve the right to make changes to handling and composition based on this. The current version of the instructions can be found at www.dentrepublic.de/downloads. This version supersedes all previous versions.