



Instructions For Use  
Will-Ceram® Z™ Zirconia ‘K’ Blocks  
*Patented*

**1. Product Description:**

Will-Ceram® Z™ Zirconia K Blocks are patented and made of binderized yttria stabilized tetragonal zirconia polycrystalline ceramics (YTZP) for use as CAD/CAM milling blanks. They are in a “green” state and can be dry milled using any compatible CAD/CAM machine that utilizes tool path and milling parameters appropriate for green machining of zirconia. It is necessary to mill the blocks with an appropriate enlargement factor to account for the shrinkage that occurs during sintering. The blocks are manufactured to have a well-controlled enlargement factor of approximately 1.26 (26%), which ensures that good fit is achieved after sintering. Each block is labeled with its individual, precisely determined, enlargement factor. After full sintering, the material densifies into a high strength dental ceramic of Type 2 Class 6 according to ISO 6872:2008.

**Composition<sup>-1-</sup> (in wt.%)**

ZrO <sub>2</sub> (HfO <sub>2</sub> )	Y <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	HfO <sub>2</sub>
>94 %	5.15% ± 0.20	0.25% ± 0.10	Typically < 3.0%

<sup>-1-</sup> composition after sintering

**Technical Data**

Coefficient of Thermal Expansion	(25-500 °C) <sup>-2-</sup> 10.6 X 10 <sup>-6</sup> / °C
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<sup>-2-</sup> as measured according to ISO 6872:2008

**2. Framework Preparation Guidelines:**

Proper framework design is critical for the success of zirconia restorations. The zirconia substructure is the load-carrying component of the restoration, and therefore should be designed in a manner to assure that it is of adequate strength. To achieve this, frameworks should be designed following the anatomy of the tooth, per the general guidelines below for framework thickness and connector dimensions. Failure to follow these guidelines may result in restorations that crack or break.

	Crowns		Bridges		
	Standard	splinted	3-unit	4-6 unit with max 2 connected pontics	Cantilever with 1 pontic
<b>Anterior</b>					
Framework Thickness					
Circular:	≥ 0.5 mm	≥ 0.5 mm	≥ 0.5 mm	≥ 0.7 mm	≥ 0.7 mm
Incisal/occlusal:	≥ 0.7 mm	≥ 0.7 mm	≥ 0.7 mm	≥ 1.0 mm	≥ 1.0 mm
Connector Dimensions	na	≥ 7 mm <sup>2</sup>	≥ 7 mm <sup>2</sup>	≥ 9 mm <sup>2</sup>	≥ 12 mm <sup>2</sup>
<b>Posterior</b>					
Framework Thickness					
Circular:	≥ 0.5 mm	≥ 0.5 mm	≥ 0.5 mm	≥ 0.7 mm	≥ 0.7 mm
Incisal/occlusal:	≥ 0.7 mm	≥ 0.7 mm	≥ 0.7 mm	≥ 1.0 mm	≥ 1.0 mm
Connector Dimensions:	na	≥ 9 mm <sup>2</sup>	≥ 9 mm <sup>2</sup>	≥ 12 mm <sup>2</sup>	≥ 12 mm <sup>2</sup>

**3. Milling:**

Milling of the blocks is done with an enlargement of the framework by a factor of approximately 1.26 (or 26%) relative to the final desired dimensions. This compensates for the shrinkage that occurs during full sintering. Each Will-Ceram® Z™ Zirconia K Block is labeled with its individual and unique Enlargement Factor (EF). Please refer to the operating instructions of the corresponding CAD/CAM system for detailed milling instructions and the required inputs.

**4. Finishing and preparing for sintering:**

It is recommended that all adjustments to frameworks be completed prior to sintering. Note that at this stage the frameworks are fragile and thus should be handled gently to avoid breakage. Only use suitable cutting and grinding instruments, low speed, and little pressure, to avoid flaking, chipping and cracking of the framework. Following are the steps:

- Carefully separate the milled framework from the starting block using a sharp blade, fine diamond disk, or diamond burr, as necessary.
- Carefully smooth out the attachment area and make adjustments to the framework using a diamond burr, as necessary.
- After finishing, clean the framework using compressed air only. Do not clean using water or any other fluid.

## 5. Sintering:

The sintering temperature for the frameworks is 1500°C. They can be sintered in any dental zirconia sintering furnace, provided it can reach this temperature. The recommended sintering cycle is given below. It is recommended to follow the sintering instructions of the corresponding furnace with regard to furnace furniture and placement of frameworks. Note the temperature of the furnace must be below 80°C prior to loading the furnace with the next batch of frameworks.

### Sintering Cycle

Ramp 1:	2 °C/min to 500 °C
Hold 1:	500 °C x 1 hour
Ramp 2:	5–10 °C/min to 1500 °C
Hold 2:	1500 °C x 2 hours
Cooling:	Natural cool
Opening:	Wait until below 400 °C

If using a sintering furnace with molybdenum disilicide (MoSi<sub>2</sub>) 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 10°C/min. to 1550°C, hold for 4 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 (SiO<sub>2</sub>) coating on the heating elements, as is necessary to prevent discoloration of frameworks.

## 6. Preparing for veneering:

If adjustments to the framework 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. Before veneering, the surface of the framework must be sandblasted with alumina not coarser than 50 µm and at pressures not exceeding 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. The fusion temperature of the stain must be higher than the fusion temperature of the porcelain subsequently layered onto it.

## 7. Veneering:

*Will-Ceram*<sup>®</sup> Z<sup>TM</sup> Zirconia K Blocks are compatible with any overlay porcelain with a CTE of (8.8–10.5)×10<sup>-6</sup>/°C approved for veneering of YTZP zirconia frameworks. This includes Cerabien CZR and CZR Press. The *Will-Ceram*<sup>®</sup> Z<sup>TM</sup> Porcelain System is especially compatible for veneering frameworks made from *Will-Ceram*<sup>®</sup> Z<sup>TM</sup> Zirconia K Blocks.

**8. Storage:** Store in a cool, dry place.

## 9. Warning and Safety Instructions:

Do not inhale processing dust. Do not get processing dust into eyes. Avoid direct skin contact with zirconia in a green state or milling residue. Use gloves if necessary. Wear a dust mask and protective eyewear and use a dust collection system or bench suction when processing zirconia frameworks.

### Shade Coordination Chart

Will-Ceram <sup>®</sup> Shade	Noritake Porcelain	Will-Ceram <sup>®</sup> Z Porcelain
K10	All Shades Bleach Shades	SB A00 B00
K11	B1	A1 B1
K12	A1 B2	B2 C1 D2 D4
K13	A2 A3	A2 A3 D3
K14	A3.5 A4	
K15	C1 D2	C2 C3 C4
K16	B3 B4	A3.5 A4
K17	C2 C3 D4	
K18	C4 D3	
K19		B3 B4



CEpartner4U, 3951DB, 13. NL  
Tel: +31(0)6-516.536.26



500 Memorial Drive • Somerset, NJ 08873 • USA  
Tel: 732-563-0084

