



ZENOSTAR CAD/CAM MANUAL

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ZENOSTAR® 
UNIVERSAL ZIRCONIA SYSTEM

www.zenostar.com

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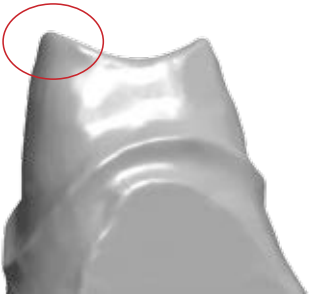


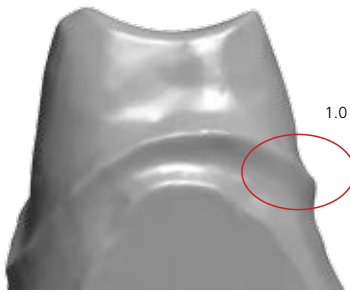
Introduction

Apart from a top-quality material, professional preparation and processing are pivotal in attaining high-quality restorations and long-term patient satisfaction. In order to ensure high reliability in the manufacture of the restorations, they should be designed and processed as set out in these guidelines.

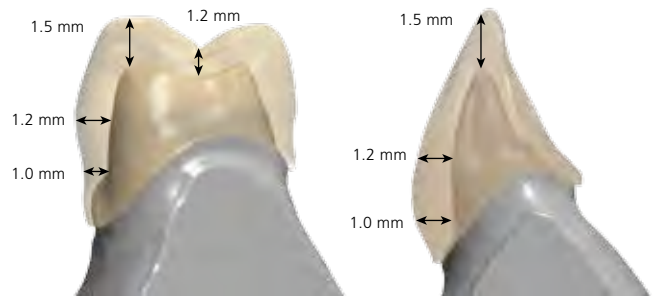
1 Notes on preparation

Before commencing the design process, make sure that the preparation is suitable for the placement of a ceramic restoration. The following guidelines should be observed:

Some limiting cases are exemplarily listed.

<ul style="list-style-type: none">■ No angles or sharp edges	
<ul style="list-style-type: none">■ Cusp-supporting preparation	
<ul style="list-style-type: none">■ Shoulder preparation with rounded inner edges and/or chamfer preparation	
<ul style="list-style-type: none">■ A minimum of 1.0 mm should be removed along the preparation margin	 <p>1.0 mm</p>

- When removing tooth structure, the space required for the restoration in question, as defined in the preparation guidelines, should be observed.



- Diameter of edges: > 1.0 mm



- Preparation angle: 6° – 8° when using a conventional cementation protocol, > 6° when using an adhesive cementation protocol



- Never position more than two connected pontics between any two abutment teeth.



2 Design parameters

2.1 Minimum wall thicknesses

Although restorations with Zenostar T and Zenostar MO can be designed to take up less space than those made with other ceramics, the minimum wall thicknesses and connector cross-sections indicated below must be observed for monolithic restorations and frameworks.

Overview of minimum wall thicknesses

Zenostar MO/T

Anterior region	Minimum wall thickness in mm	Design type
Crowns	0.4	Supporting the tooth shape and/or gingiva (incisal, occlusal, and/or basal)
Splinted crowns	0.6	
3-unit bridges	0.6	
4-unit and multi-unit bridges with 2 pontics*	0.6	
Cantilever bridges with a single pontic	0.7	

Posterior region	Minimum wall thickness in mm	Design type
Crowns	0.6	Supporting the tooth shape and/or gingiva (incisal, occlusal, and/or basal)
Splinted crowns	0.6	
3-unit bridges	0.6	
4-unit and multi-unit bridges with 2 pontics*	0.7	
Cantilever bridges with a single pontic	0.7	

*In Canada, bridge indications are limited to no more than 6 units with no more than 2 adjacent pontics.

Minimum wall thicknesses of Zenostar MO for the IPS e.max CAD-on technique

The IPS e.max CAD-on technique enables dental laboratories to use lithium disilicate glass-ceramics (LS₂) for the fabrication of zirconium-supported, high-strength bridge restorations.

For the CAD-on technique, the following components are required: a zirconium oxide framework made of Zenostar MO and a lithium disilicate veneering structure made of IPS e.max CAD.



Anterior and posterior region	Minimum wall thickness in mm
Crowns	0.5
Splinted crowns	0.5
3-unit bridges	0.5
4-unit and multi-unit bridges with 2 pontics*	0.5

*In Canada, bridge indications are limited to no more than 6 units with no more than 2 adjacent pontics.

The following point should be taken into account:

When using this technique, a framework that reflects the reduced anatomical tooth shape and supports the veneer at the cusp should be created, so that a veneer with an even thickness can be applied.

2.2 Connector cross-sections

Zenostar MO/T

Anterior region	Connector cross-section in mm ²
Crowns	-
Splinted crowns	7
3-unit bridges	7
4-unit and multi-unit bridges with 2 pontics*	9
Cantilever bridges with a single pontic	12

Posterior region	Connector cross-section in mm ²
Crowns	-
Splinted crowns	9
3-unit bridges	9
4-unit and multi-unit bridges with 2 pontics*	12
Cantilever bridges with a single pontic	12

Connector cross-sections of Zenostar MO for the IPS e.max CAD-on technique

Anterior and posterior region	Connector cross-section
Crowns	-
Splinted crowns	7
3-gliedrige Brücken	9
4-unit and multi-unit bridges with 2 pontics*	12

*In Canada, bridge indications are limited to no more than 6 units with no more than 2 adjacent pontics.

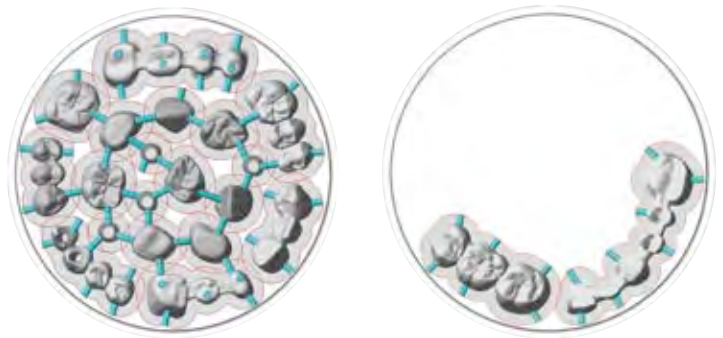
2.3 Connector design

When designing the connectors, not only a sufficiently large cross-section should be ensured, but also an appropriate height-to-width proportion: height \geq width.



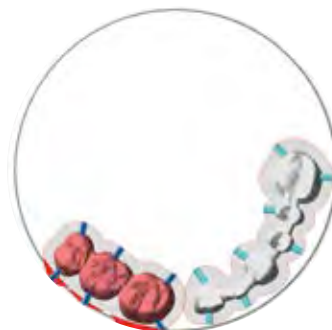
3 Positioning of the object in the disc

In order to exploit the full capacity of the disc, place the items to be milled as close together as possible on the disc. Ensure that the bars of one object do not intrude upon the milling area of another object unless the two have joint bars (job-to-job connection). Position large objects with the dental arch as parallel as possible to the edge of the disc.



The distance to the edge of the disc is monitored by the disc edge control function of Zenotec CAM. This means that it is not possible for the object to extend beyond the edge of the disc.

If the disc edge control function is deactivated, it is important to ensure that the object does not extend beyond the edge of the disc. Extension beyond the edge will be highlighted in red.



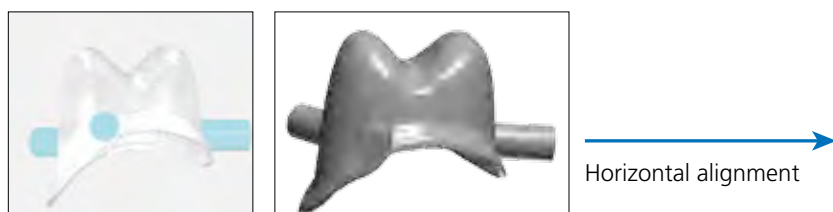
4 Defining bars and sinter support structures in the Zenotec CAM software

Bars are support elements which connect the framework to the disc. They provide a stable connection between the framework and the disc during milling. Sinter support structures are used to stabilize the object during sintering.

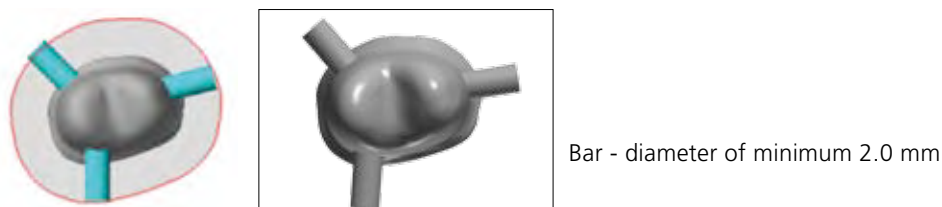


4.1 General rules for attaching bars

- The number and position of the bars is chosen based on the size of the restoration, the type of restoration and the sintering furnace used.
- Bars should always be horizontal.



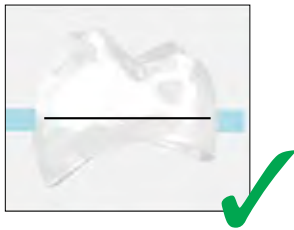
- When milling multi-unit restorations, the bars should be attached on the oral and the vestibular side of the restoration.
- Bars should have a diameter of at least 2.0 mm.



- Bars should always be positioned at least 1.0 mm above the preparation margin.



- When milling full-contour restorations or frameworks that reflect the reduced anatomical shape of the tooth, the bars should be positioned in the area of the anatomical equator. This ensures that no undercuts are created and that the restoration is optimally accessible from the top and bottom.



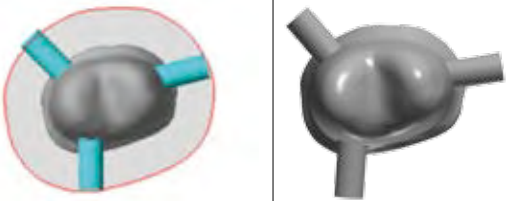
Bars in the area of the anatomical equator



- Bars should not be attached in interdental areas.

4.2 Rules for single-tooth restorations

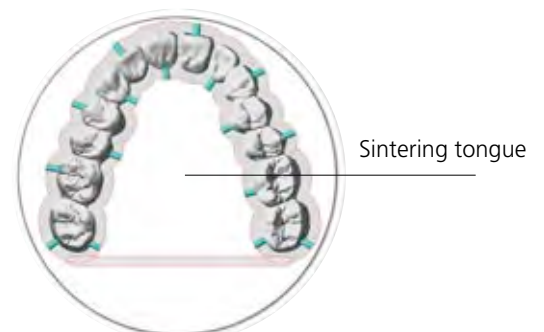
- Attach 3 bars to each single-tooth restoration.



4.3 Rules for multi-unit restorations

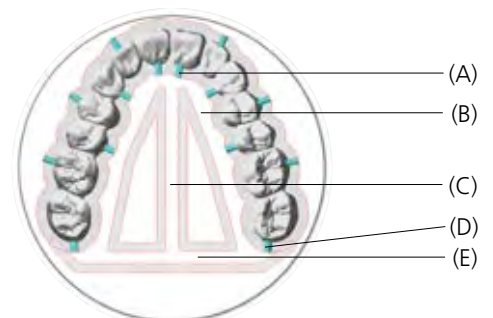
4.3.1 Bridges with sintering tongue (see section 5.2 for description)

- Attach two bars (oral and vestibular) to the end units. The bar connecting the end unit with the sintering tongue should be slightly thicker (2.5 - 3 mm). This prevents the restoration from suddenly breaking from the disc during the separation process.
- Attach one bar to all other units, alternating between oral and vestibular.



4.3.2 Bridges with sintering frame (see section 5.3 for description)

- Attach one bar to each pontic and connect it to the sintering frame (B).
- Attach one bar (A) to the sintering frame in such a way that it extends the frame's centre strut (C) and connect the bar to the restoration. Do not attach bars in interdental areas.
- End units should be provided with a bar perpendicular (D) to the sintering base (E).



5 Sinter support structures

Sinter support structures stabilize the restorations during sintering and prevent distortions. The shape and design of the sinter support structure is dependent on the sintering furnace used and the size of the restoration.

5.1 Sintering drops

Sintering drops are auxiliary occlusal pins on which the restoration rests horizontally during sintering. Drops are exclusively used when sintering objects in one of the **Wieland Zenotec sintering furnaces**. Drops support the horizontally placed restoration during sintering and thereby prevent it from becoming deformed. The number and position of the drops must be chosen so as to ensure that the object stands firmly on the drops during sintering on the aluminium oxide plate. In the posterior region, the drops should be offset from each other.

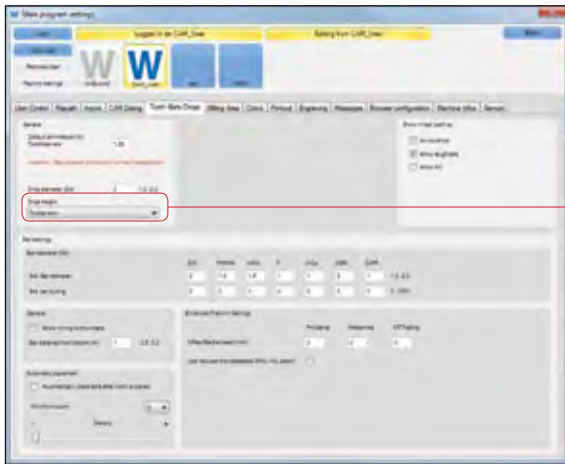


Drops should be kept as short as possible. This can be achieved by adjusting the vertical position of the object in the disc or by using the function "Drop edge max: 0.5 mm over tooth" in the CAM software. The Zenotec CAM software automatically calculates the drop height in relation to one plane.

The position of the restoration in the disc should be selected in such a way as to avoid any big differences in length of the drops.



The function "Drop edge max: 0.5 mm over tooth" can be selected in the Zenotec CAM software under "Settings" → "Tooth/Bars/Drops".



In the fabrication of bridges with more than 8 units, a sintering tongue needs to be attached additionally (see section 5.2). Make sure to select the function "Drops to top of disc" in the Zenotec CAM software when placing drops.



Use of sintering drops in Wieland Zenotec sintering furnaces

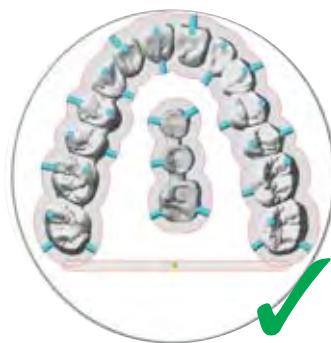
Types of restorations	2 units	3 units	More than 4 units	More than 8 units
Anterior tooth – Anterior tooth	✗	✗	✓	n. a.
Anterior tooth – Premolar	✗	✓	✓	Sintering tongue
Anterior tooth – Molar	n. a.	n. a.	✓	
Premolar – Premolar	✓	n. a.	✓	
Premolar – Molar	✓	✓	✓	
Molar – Splinted molar	✓	✓	✓	

n. a : not applicable

5.2 Sintering tongues

In contrast to sintering frames, sintering tongues consist of a solid block of material. They are employed when sintering restorations with more than 8 units in one of the Wieland Zenotec sintering furnaces.

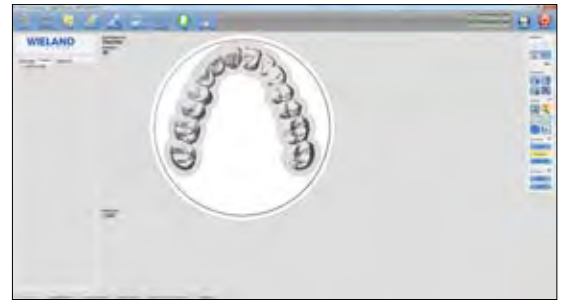
Care should be taken not to position any restorations within the sintering tongue that might interrupt the oral connection of the end units.



5.2.1 Attaching a sintering tongue in der Zenotec CAM software

Step 1

Position the restoration in the disc



Step 2

Attach bars



Step 3

Attach drops



Step 4

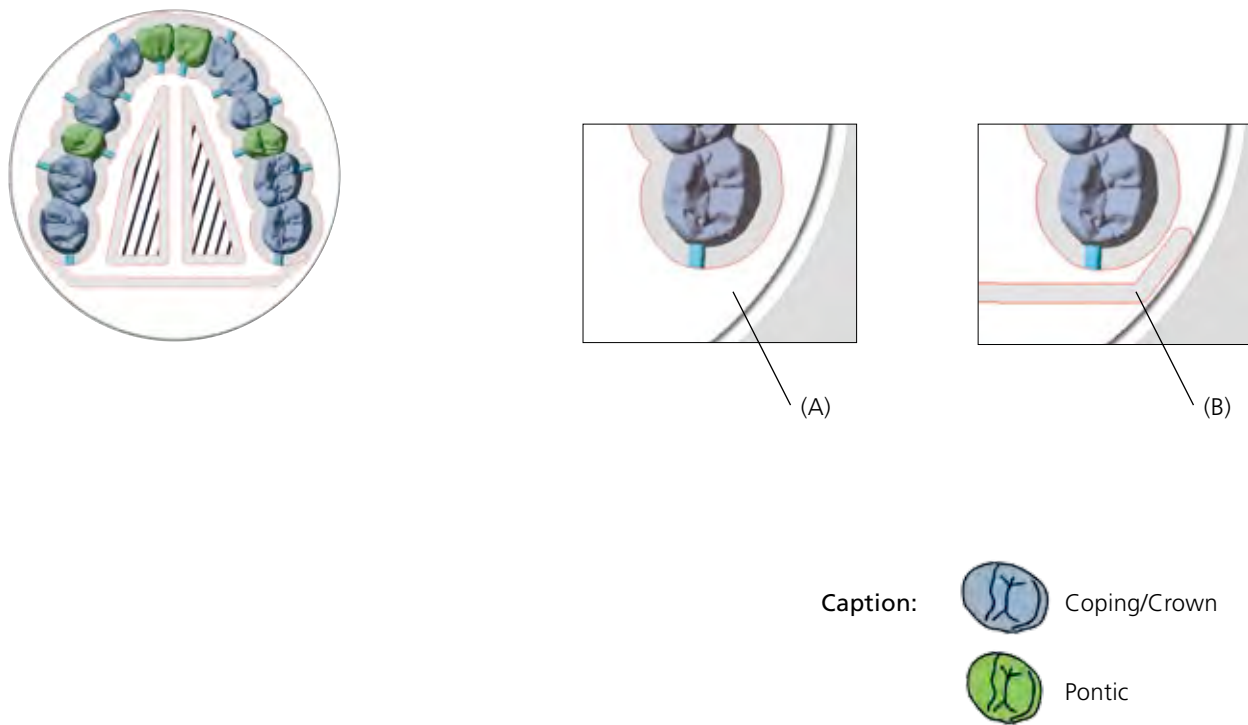
Create sintering tongue

Select "Cutting" icon. Left-click to set connection points and save them with ESC



5.3 Sintering frames

A sintering frame is a framework structure with a centre strut, which is positioned within the dental arch. Sintering frames are to be used for restorations with more than 5 units and a strong curvature that are sintered in the Programat S1 sintering furnace from Ivoclar Vivadent. For bridges with up to 5 units, a sintering frame is required if the restoration cannot be adequately stabilized on the pontics because of the strong curvature. Also see note in the Zenostar Instructions for Use.



If there is sufficient space between the end units of the restoration and the disc edge (A), we recommend applying the cut between the restoration and the disc edge (B).

5.3.1 Attaching a sintering frame in the Zenotec CAM software

Step 1

Position the restoration in disc



Step 2

Attach bars



Step 3

Attach sintering base

Select "Cutting" icon. Left-click to set connection points and save them with ESC

The bars attached to the end units must be supported by the sintering base



Step 4

Sintering frame: Position inside frames on the left side

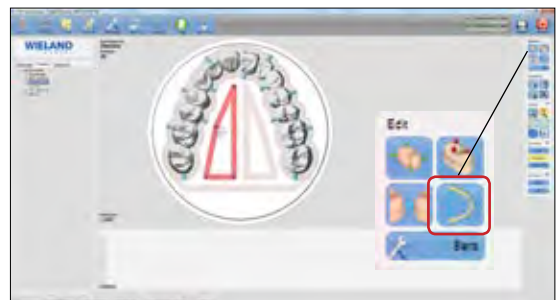
Select "Cutting" icon. Left-click to set connection points and save them with ESC



Step 5

Sintering frame: Position inside frames on the left side



Select "Cutting" icon. Left-click to set connection points and save them with ESC



6 Overview of the different sinter support structures used depending on the sintering furnace


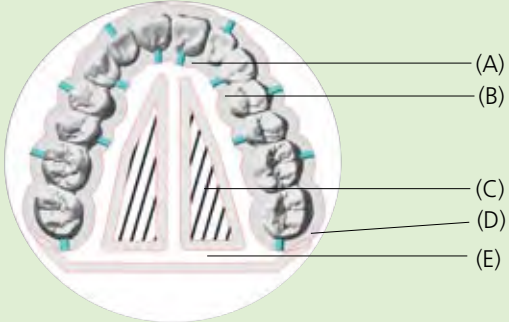
The type of sinter support structure is dependent on the type of sintering furnace.

Recommended sintering furnaces

Wieland Zenotec sintering furnaces	Ivoclar Vivadent sintering furnace
<p>Zenotec Fire P1 Zenotec Fire M2/M2+ Zenotec Fire cube</p> 	<p>Programat S1</p> 

Positioning of bars and sinter support structures depending on the indication

Bridges with 2 to 7 units	Bridges with 2 to 5 units
<p>Bars</p>	<p>Bars</p>
<p>Attach 2 bars (oral and vestibular) to the end units.</p>	<p>Attach 2 bars (oral and vestibular) to the end units.</p>
<p>Attach one bar to all other units, alternating between oral and vestibular.</p>	<p>Attach one bar to all other units, alternating between oral and vestibular.</p>
<p>Sinter support structures</p>	<p>Sinter support structures</p>
<p>Sintering drops required</p>	<p>No sintering frame and no sintering drops required. Also see "Guidelines for the processing of ZrO₂ materials in the Programat S1".</p>

Bridges with more than 8 units	Bridges with more than 6 units
Bars	Bars
Attach two bars (oral and vestibular) to end units.	Attach one bar (A) in such a way that it extends the centre strut (C) of the sintering frame (B) and connect it to the restoration. Do not attach bars in interdental areas.
Attach one bar to all other units, alternating between oral and vestibular.	Connect all pontics, to which a bar has been attached, to the sintering frame.
	Provide end units with a bar (D) perpendicular to the base (E) of the sintering frame.
Sinter support structures	Sinter support structures
Restorations with more than 8 units need to be provided with sintering drops and a sintering tongue.	Sintering frame
	

7 Separating unsintered restorations from the disc and finishing

Only fine tungsten carbide burs and grinding instruments with small diameters should be used.

7.1 Objects without a sinter support structure

Objects without a sinter support structure are separated completely from the disc before sintering.

- First cut each bar half-way through.
- Then cut the bars at the crowns completely through.
- Subsequently, cut the bars at the pontics.
- When doing this, keep an eye on the crown margin and take care not to damage it.
- Use a suitable instrument to trim away the remnants of the bar.



7.2 Objects with a sinter support structure

Objects with a sinter support structure are not separated from the sintering frame or the sintering tongue before sintering. In the case of restorations with a sintering tongue, the number of bars left in place depends on the symmetry of the restoration.

- Bars should be left either on copings/crowns only or on pontics only. Combinations of bars on copings/crowns and pontics should be avoided.

Coping - Coping	
Pontic - Pontic	
Pontic - Coping	
Coping - Coping	

Caption:  Coping/Crown
 Pontic

- Bars should be left on end units. If the end units are not of the same type (copings/crowns or pontics), then the bar on the next unit of the same type should be left on.
- Two bars can be left in place if the bridge is roughly symmetrical, i.e. if it has the same number of units in each quadrant or if the bridge occupies only one quadrant. In accordance with the other rules mentioned, the bars at the end units are left on.
- If the bridge is asymmetrical, then three bars should be left on. In accordance with the other rules mentioned, two bars are left on at the end units. The third bar is left on at a unit elsewhere in the arch (see section 7.4).

7.3 Separating objects from the sinter support structure



1. Separate vestibular bars.



2. Restoration with separated vestibular bars.



3. Remove the labial arch with a separating disc.



4. Restoration with sintering tongue.



5. Trim away remnants of bars.






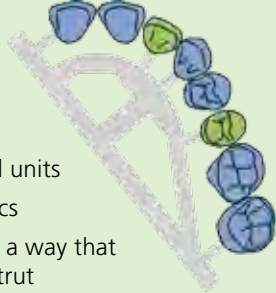
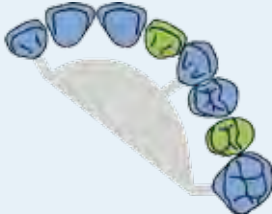
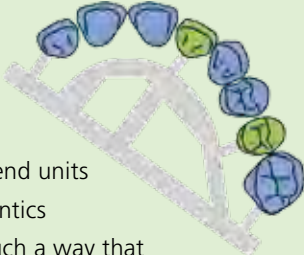



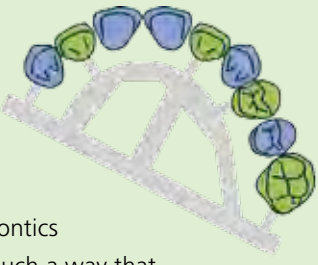

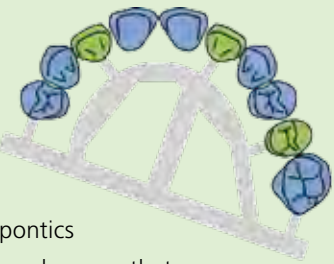

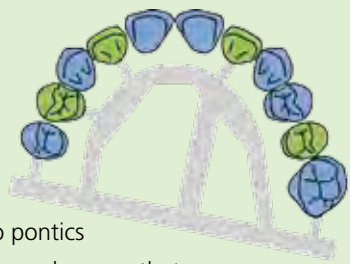

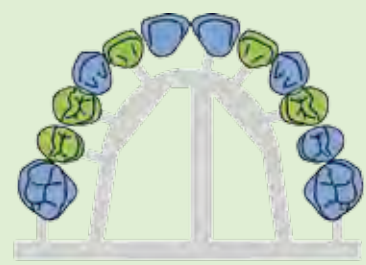
6. Separate bars attached to the sintering tongue which are not required.



7. Restoration ready for sintering.

7.4 Examples of restorations with sinter support structure

	Wieland Zenotec sintering furnaces	Ivoclar Vivadent sintering furnace
		
6-unit bridge	No sintering tongue required	 <p>2 bars attached to end units Bars attached to pontics 1 bar attached in such a way that it extends the centre strut</p>
7-unit bridge	No sintering tongue required	 <p>2 bars attached to end units Bars attached to pontics 1 bar attached in such a way that it extends the centre strut</p>
8-unit bridge, nearly a quadrant	 <p>2 bars attached to end units</p>	 <p>2 bars attached to end units Bars attached to pontics 1 bar attached in such a way that it extends the centre strut</p>
8-unit bridge, asymmetrical	 <p>2 bars attached to end units 1 bar attached in the dental arch</p>	 <p>2 bars attached to end units Bars attached to pontics 1 bar attached in such a way that it extends the centre strut</p>

<p>9-unit bridge, asymmetrical, with cantilevered pontic</p>	 <p>1 bar attached to end unit 1 bar attached to the coping adjacent to the cantilevered pontic 1 bar in the dental arch</p>	 <p>2 bars attached to end units Bars attached to pontics 1 bar attached in such a way that it extends the centre strut</p>
<p>10-unit bridge, asymmetrical</p>	 <p>2 bars attached to end units 1 bar in the dental arch</p>	 <p>2 bars attached to end units Bars attached to pontics 1 bar attached in such a way that it extends the centre strut</p>
<p>11-unit bridge, nearly symmetrical</p>	 <p>2 bars attached to end units</p>	 <p>2 bars attached to end units Bars attached to pontics 1 bar attached in such a way that it extends the centre strut</p>
<p>12-unit bridge, symmetrical</p>	 <p>2 bars attached to end units</p>	 <p>2 bars attached to end units Bars attached to pontics 1 bar attached in such a way that it extends the centre strut</p>

Caption:  Coping/Crown
 Pontic

8 Before sintering

One of the most important processes in the fabrication of zirconium oxide restorations is the sintering process. In this process, high temperatures are used to transform the porous white body into a densely sintered restoration. This production step imparts the restoration with its final physical properties such as high strength and light transmission. The following procedure should be observed:

- All restorations must be clean and free of milling dust before they are sintered. Use a soft brush or oil-free compressed air for cleaning.
- Restorations infiltrated with staining liquids should be completely dry. A drying temperature of 140°C (284°F) must not be exceeded.

Also see notes in the Zenostar Instructions for Use!

9 Sintering

The Zenotec sintering furnaces and the Ivoclar Vivadent sintering furnace Programat S1 are supplied with various standard and quick sintering programs. The program to be selected is dependent on the size of the restoration and the sintering furnace.

For detailed information on the furnaces please refer to the Operating Instructions of the respective system.

- The use of sintering beads is generally not recommended for the sintering of objects in the Programat S1 from Ivoclar Vivadent and the furnaces of the Zenotec system.
- For sintering restorations with standard programs in Wieland sintering furnaces, the use of a high-purity aluminium oxide sintering rest (A) and cover (C) is recommended. For quick sintering programs use a special sintering rest (B) without a cover.



- Place the restorations on the sinter table in the Programat S1 sintering furnace from Ivoclar Vivadent. Conduct the sintering procedure without a cover. Also see note in the Zenostar Instructions for Use and the note on processing ZrO₂ materials in Programat S1.
- Always keep the sintering auxiliaries clean and free of dust so that contamination of the sintered restorations is avoided.
- The restorations must not touch each other during sintering.
- The sintering tray in the Wieland Zenotec furnaces must be turned over after each sintering operation.
- Observe the program selection.

For sintering times please refer to the Zenostar Instructions for Use!

10 Processing after sintering

Following sintering, the restorations may be refined with suitable instruments. Cooling the restoration with water is essential when using diamond grinding instruments. Alternatively, a turbine handpiece in combination with suitable finishing instruments may be used. Please observe the manufacturer's directions regarding grinding instruments.

Further processing of the densely sintered, cooled Zenostar restorations:

- The adjustment of sintered Zenostar restorations should be kept to a minimum.
- The restorations should only be finished mechanically if it is absolutely necessary.
- Seat the Zenostar restoration on the model, check the fit and make slight adjustments, if needed.
- Check marginal areas and slightly finish, if required.
- Finishing of the restoration should be performed with little pressure.
- When finishing frameworks, aim to round sharp edges and angles.
- Do not separate interdental areas with separating discs.
- After finishing, check the minimum wall thickness.
- Only use grinding instruments that are in an impeccable state.
- Check the restoration for defects and cracks before and after further processing.
- Milling dust sintered to the restoration must be removed before veneering.

Before veneering, clean frameworks with running water or the steam jet, and dry.

11 Veneering

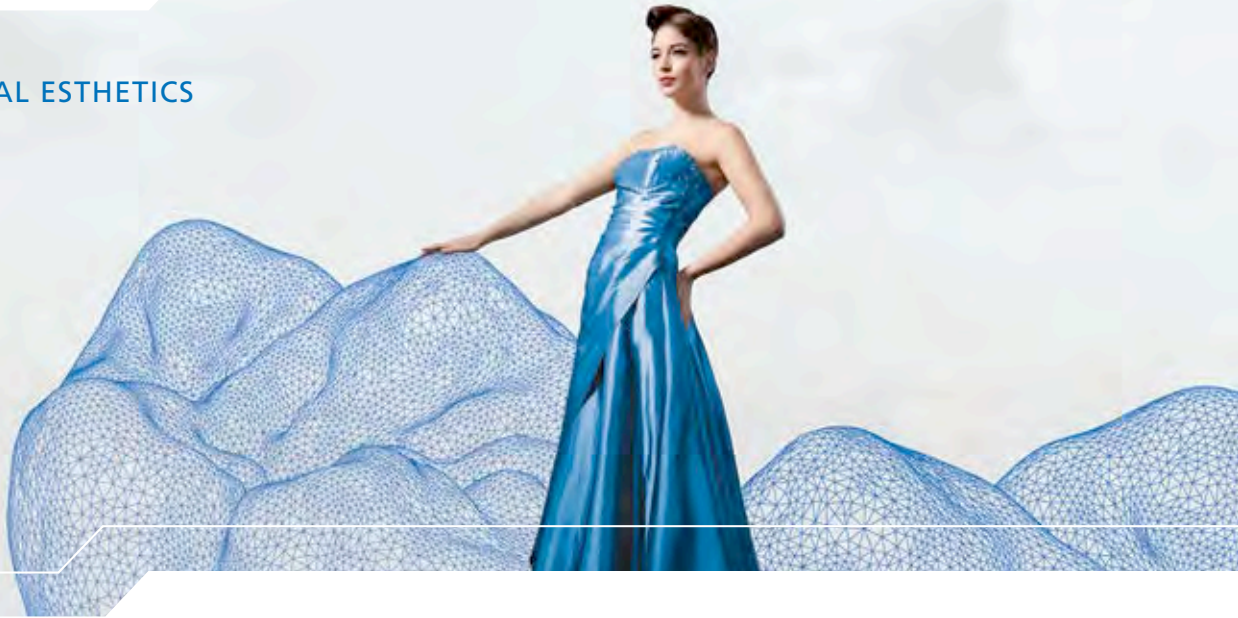
The use of ceramic materials from Wieland Dental (Zenoflex Dimension) and Ivoclar Vivadent (IPS e.max Ceram) is recommended for the veneering of Zenostar restorations.

12 Cementation of the restoration

The restoration can be conventionally cemented using phosphate cement or glass ionomer cement. Ivoclar Vivadent recommends using Multilink®Automix for adhesive luting, SpeedCEM® for self-adhesive luting and Vivaglass®CEM PL for conventional cementation. For more detailed information, please refer to the comprehensive Zenostar Instructions for Use or the Cementation Navigation System from Ivoclar Vivadent.

www.cementation-navigation-system.com

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