Zenostar/Zenotec Zirconia Restorations

DESIGN AND PRODUCTION GUIDELINES

Valid from January 2013

CE 0483

ZENOTEC CAD/CAM

ZENOSTAR FULL CONTOUR
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1 Introduction

High quality restorations and long-term patient satisfaction can only be produced by combining a top-quality material with professional preparation and craftsmanship.

In order to guarantee the highest degree of reliability and satisfaction for the patient, the restoration should be designed and produced as set out in these guidelines. Failure to comply with any single part of these rules will have a detrimental effect on the quality of the restoration, for example on the final fit. Please bear in mind that different design and processing rules apply depending on the size and type of restoration.

2 Designing the restoration

Preparation

Before you start work, make sure that the tooth has been properly prepared for a ceramic restoration, in particular with a well-defined chamfer or rounded shoulder preparation. Unsuitable preparations can cause the restoration to fail.

Try to complete the design entirely on screen in order to avoid the need for subsequent correction, since this could result in damage to the material.

Framework wall thicknesses

Although restorations made with Zenotec Zr and Zenostar Zr materials can be designed to take up less space than those made with many other ceramics, the following minimum wall thicknesses must be observed:

- For anteriors: 0.4 mm
- For posteriors: 0.6 mm
- For all abutment teeth: 0.6 mm

The framework should be modeled as a full-contour restoration which supports the veneer at the cusps, so that an even veneer of 1 – 2 mm can be applied.

Connector design

- When designing the connectors, their cross section should be as large as possible.
- In terms of stability, the height of the connector is more important than its width. Doubling the width merely doubles the strength, whereas doubling the height multiplies the strength by a factor of eight. It is best therefore to aim for an oval cross section (Fig. 3).
- The greater the distance is between the abutment teeth and the greater the masticatory forces are, the greater is the physical load placed on the restoration. For this reason, no framework should be designed to have more than two pontics between any two abutment teeth.
As shown in Figs. 4 – 9, large-span bridges (with more than five units) can be designed provided that there are never more than two pontics between any two abutment teeth.
Overview of recommended connector cross-sections

<table>
<thead>
<tr>
<th>Framework size and type</th>
<th>Minimum cross-section of connector upper/lower (mm²)</th>
<th>Minimum wall thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single coping</td>
<td>–</td>
<td>0,4 – 0,6</td>
</tr>
<tr>
<td>Anterior single coping with splint</td>
<td>5/4</td>
<td>0,6</td>
</tr>
<tr>
<td>Posterior single coping with splint</td>
<td>9/9</td>
<td>0,6</td>
</tr>
<tr>
<td>Telescopic crown</td>
<td>–</td>
<td>0,5</td>
</tr>
<tr>
<td>Three-unit anterior bridge</td>
<td>5/4</td>
<td>0,6</td>
</tr>
<tr>
<td>Four-unit anterior bridge</td>
<td>7/6</td>
<td>0,6</td>
</tr>
<tr>
<td>Three-unit premolar anterior bridge</td>
<td>7/9</td>
<td>0,6</td>
</tr>
<tr>
<td>Four-unit premolar anterior bridge</td>
<td>9/12</td>
<td>0,6</td>
</tr>
<tr>
<td>Three-unit posterior bridge</td>
<td>9/12</td>
<td>0,6</td>
</tr>
<tr>
<td>Four-unit posterior bridge from 3 to 6 (two premolars)</td>
<td>12/14</td>
<td>0,6</td>
</tr>
<tr>
<td>Four-unit posterior bridge from 4 to 7 (one premolar, one molar)</td>
<td>14/16</td>
<td>0,6</td>
</tr>
<tr>
<td>Four-unit posterior bridge from 5 to 8 (two molars)</td>
<td>16/18</td>
<td>0,6</td>
</tr>
</tbody>
</table>

*Fig. 10 Connector cross-sections and wall thicknesses. The contact surface between the connector and a coping or pontic should be as round as possible.*

*As a rule, avoid designing connectors with flat edges or acute angles (Fig. 11).*

*Fig. 11* [Diagram of a well-designed connector](image1.png) *Fig. 12* [Diagram of an undesigned connector](image2.png)
Bars are the support elements which connect the framework to the blank. They provide a stable connection between the framework and the blank during milling. In large-span structures with more than seven units, the bars are also used to stabilize the work during sintering.

Drops are the vertical pins on which the framework stands during sintering. Drops support the framework and thereby prevent it from becoming deformed.

General rules for attaching bars and drops

- Bars and drops should have a diameter of 2 mm (Fig. 13).
- Bars should always be horizontal (Fig. 14) and with the exception of single copings should always be perpendicular to the direction of the bridge.
- The number and position of the drops must be chosen so as to ensure that the work stands firmly on the drops during sintering. In the posterior region, the drops should be offset from each other (Fig. 15).
- Drops should be kept as short as possible (approx. 1mm). This can be achieved by adjusting the vertical position of the work in the blank (see page 8) or by using the function “Drop edge max: 0.5 mm over tooth” in the CAM software.

For sintering large-span bridges with an oral arch, ensure that the drops are situated at the level of the oral arch, i.e. that they extend right up to the edge of the blank.

Also when sintering large-span bridges, be sure to select the option “Drops to top of blank” in the CAM software if the palatinal/lingual part of the blank is also to be sintered (Fig. 16).

Rules for single copings

- Attach three bars (Fig. 17).
- Do not attach drops.

Rules for bridges (Fig. 19)

Attaching bars

- Attach two bars (oral and vestibular) to end units.
- Attach one bar to all other units, alternating between oral and vestibular.
- Additional bars can be attached to larger items.

Attaching drops

- No drops need be attached to three-unit anterior bridges.

Bridges with less than three units must have drops:

- Posterior bridges must always have drops.
- End units must always have one drop.
- Pontics and molar copings must always have one drop.
- Premolars and anterior copings can be left out.
4 Positioning the work in the blank

In order to exploit the capacity of the blank to the full, place the items to be milled as close together as possible on the disc. Position large-span bridges with the arch as parallel as possible to the edge of the blank (Fig. 20).

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

- If the blank edge control function is deactivated, ensure that the work does not extend beyond the edge of the blank (Fig. 21).
- If the work extends beyond the edge of the blank, it will be highlighted in red.

Ensure that the bars of one piece of work do not intrude upon the milling area of another item unless the two are connected, since the work will otherwise be damaged. The ‘Job to Job’ connection function in Zenotec CAM fully exploits the capacity of the blank (Fig 23).

Rules for bridges of eight units and more

In the case of large-span bridges, make sure that the space between the end units and the oral arch are not encroached upon by other items (Figs. 25 and 26).
5 Positioning the work vertically in the blank

The distance from the restoration to the surface of the blank must not return a negative value; otherwise, the work would be too big for the blank. If drops have been attached to the work, then the vertical distance to the surface of the blank should be set to approx. 1 mm. In some cases, the vertical distance needs to be increased.

In the Zenotec T1 and in the Zenotec mini, the length of the tools that receive the positioning data for 25 mm blanks no longer needs to be adjusted manually. A Zenotec instruction manual is available from the Download Center of the Wieland web site (www.wieland-dental.de). This explains how to position the work in a 25 mm Zenotec or Zenostar milling blank.

For the Zenotec 2100, 4030, 4030 M1, 3020, 4820, 4820 M1 and easy milling machines, please observe the following:

Before starting the milling process, ensure that the burs are correctly adjusted for length. For 25 mm Zenotec and Zenostar blanks, the fixing rings must be pushed 5 mm towards the end of shank. Use the positioning aid to help you.

In this connection please also observe the operating instructions for your CAM software.
6 Separating the work from the blank

Smallish objects (one to seven units) such as single crowns and bridges without a palatinal/lingual blank section can be separated completely from the blank before sintering. This can be done using a turbine handpiece without water cooling. We recommend the use of a (silicone-bonded) diamond disc.

- First cut each bar half way through, preferably from the plain underside, in order to mark suitable separating points. When doing this, keep an eye on the crown margin and take care not to damage it.
- Then cut the bars through at the separating points, first at the crowns and then at the pontics. Use the turbine handpiece to trim away the remnants of the bars.

Rules for bridges with more than eight units

Large-span bridges should not be separated completely from the blank; they should be sintered whilst still connected to the blank on the oral side. With large-span bridges the number of bars left in place depends on the curvature of the bridge (arch).

- Bars should only be left in place on units of the same type. Bars should be left either on copings only or on pontics only.
- As far as possible, the bars should be left on the end units. If the end units are not of the same type, then the bar on the next unit of the same type should be left on.
- Two bars can be left on 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 first two rules, the bars at the end units are left on.
- If the bridge is asymmetrical, e.g. if it extends from 33 to 46, then three bars should be left in place. In accordance with the first two rules, two bars are left on at the end units. The third bar is left on at a unit elsewhere in the arch (see next page).

Fig. 31
### Typical situations

The teeth shaded green show where the bars should be left on during sintering.

<table>
<thead>
<tr>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 units, symmetrical</td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>2 bars at the ends, oral side</td>
<td></td>
</tr>
<tr>
<td>11 units, roughly symmetrical</td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>2 bars at the ends, oral side</td>
<td></td>
</tr>
<tr>
<td>10 units, asymmetrical</td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>2 bars at the ends, oral side</td>
<td></td>
</tr>
<tr>
<td>1 bar in the arch, oral side</td>
<td></td>
</tr>
<tr>
<td>Distance from bridge to surface of blank 2 mm</td>
<td></td>
</tr>
<tr>
<td>9 units, asymmetrical, cantilever pontic</td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
<tr>
<td>1 bar at the end, oral side</td>
<td></td>
</tr>
<tr>
<td>1 bar, oral side, at the coping next to the cantilever pontic</td>
<td></td>
</tr>
<tr>
<td>1 bar in the arch, oral side</td>
<td></td>
</tr>
<tr>
<td>Distance from bridge to surface of blank 2 mm</td>
<td></td>
</tr>
<tr>
<td>8 units, asymmetrical</td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
<tr>
<td>2 bars at the end, oral side</td>
<td></td>
</tr>
<tr>
<td>1 bar in the arch, oral side</td>
<td></td>
</tr>
<tr>
<td>One quadrant</td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
<tr>
<td>2 bars at the ends, oral side</td>
<td></td>
</tr>
</tbody>
</table>

**General guidelines for sintering**

- Before sintering, please ensure that the firing tray is clean and that it is not bent, but flat. If it no longer flat, it must be replaced.
- Turn over the firing tray after each sintering operation (i.e. turn it upside down).
- Monolithic crowns and bridges stained with Zenotec/Zenostar Color Zr stains must be dried before sintering.

*Please follow the instructions for use applicable to Zenostar / Zenotec Color Zr.*
- The fast sintering program can only be used for single crowns/copings.
Preparing a 13-unit bridge for sintering:

1. Bridge immediately after milling.
2. The vestibular bars are first cut through using a turbine handpiece.
3. Bridge with vestibular bars cut through.
4. Next the labial arch is removed with a cutting disc.
5. Bridge without labial arch.
6. Now the rear section of the blank is removed with a cutting disc.
7. Bridge without the rear section of the blank.
8. The remaining traces of the vestibular bars are removed with a turbine handpiece.
9. Finally, the bars on the oral side which are not needed during sintering are cut through with a turbine handpiece.
10. The bridge ready for sintering.
11. Sintering using a standard sintering program – large-span bridge on firing tray.
12. Always use a cover when sintering.

Sintering single copings, small and large-span bridges

- Sintering with standard sintering program – large-span bridge on firing tray. Always use a cover when sintering.
- Fast sintering of large-span bridges is not possible.
- Sintering with standard sintering program – single copings. Always use a cover when sintering.
- Fast sintering of single copings.
- Sintering with standard sintering program – short-span bridges. Always use a cover when sintering.
- Fast sintering of bridges is not possible.
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