

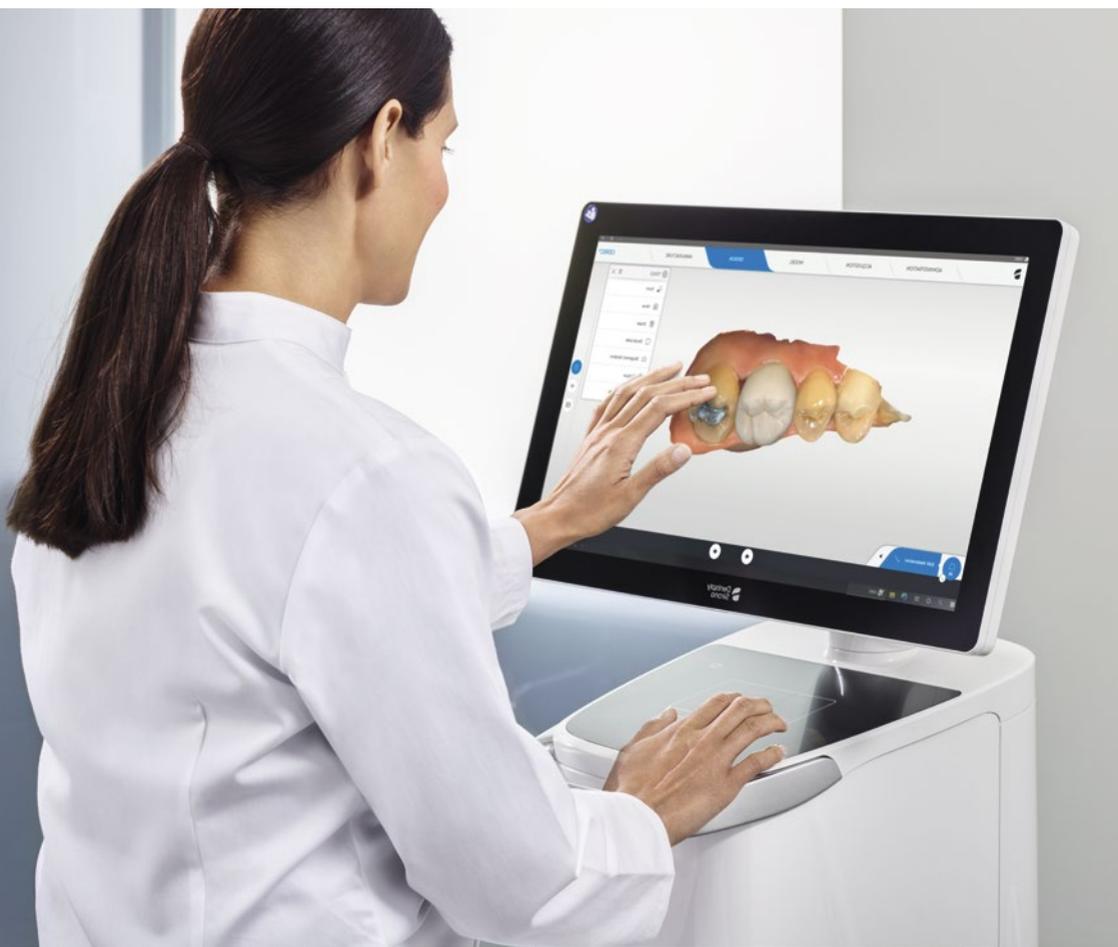
THE DENTAL  
SOLUTIONS  
COMPANY™



# Clinical guide

for chairside restorations with the CEREC® system

[dentsplysirona.com](http://dentsplysirona.com)



## Introduction

Knowledge is key. Having the right information available is the foundation for maximizing learning and proficiency.

The latest edition of the “Clinical Guide for Chairside Restorations with the CEREC system” provides detailed information and clinical recommendations to support newcomers to the CEREC system. This guide was developed by experts for experts, as we place great value on shared empirical insights.

Our goal for this guide is to facilitate the sharing of expertise so you can quickly reach your utmost potential. It can support you to optimize your daily work, expand your practice and serves as a reliable clinical reference.

A special word of thanks goes to our contributors, Dr. Andreas Ender and the University of Zurich, who kindly shared their protocols and clinical experience.



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## Scan

### Clinical procedure

Assessment and diagnosis are the first steps. The treatment plan is discussed with the patient. For this purpose, an initial scan of the intraoral situation is very helpful. As it can be added to an X-ray image, the intraoral situation can be presented to the patient graphically on a screen (inclusion of the antagonist, 3D representation).

Intraoral scans performed with CEREC® Primescan® facilitate patient communication and allow the clinician to monitor changes in the tooth and oral mucosa with the OraCheck® software.

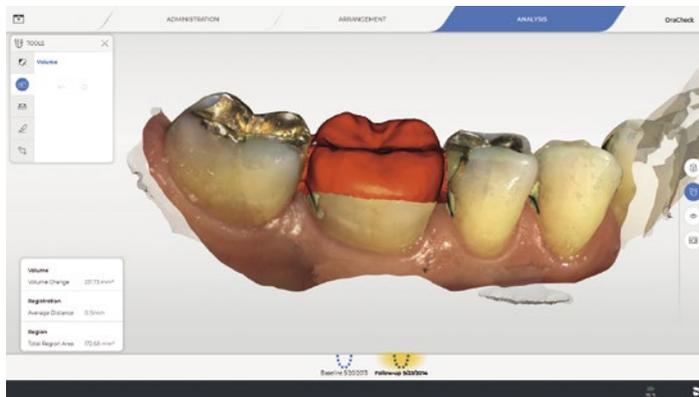


Intraoral scan for patient communication

### OraCheck – Digital intraoral monitoring

The OraCheck software enables a 3D comparison between two or more digital models. The software superimposes the images and displays differences in color scale.

This allows you to visualize, document and explain changes in the intraoral situation of your patients. It is the perfect partner for Primescan® or other powerful scanners.



## Digital impression

The foundation of a well-fitting restoration is the intraoral impression. This primarily refers to the preparation, however the opposing jaw and

### Preparation of the digital impression

It is important to retain the soft tissues, especially the cheek and tongue, when taking optical impressions. The OptraGate® (Ivoclar Vivadent) is effective for achieving this. It can be used as the standard protocol even during preparation, as the view of the working field is very much improved by its use. If the cheek is very thick, using a DryTips® (Mölnlycke Health Care) in the area of the first molars can create a better separation from the dental arch. The small size is usually preferable, as the large DryTips® often interfere with the closing of the maxilla and mandible for buccal registration. A mirror or saliva ejector can be used to hold the tongue.

**Tip:** in a sitting position, the tone of the tongue and mouth floor muscles is lower than when lying down. Therefore, it is recommended to take the impression of the mandible in a 6-7 o'clock sitting position. The impression of the bite can also be acquired optimally in this position.

> more about the CEREC system



bite are also important factors. All components of the CEREC system are optimally coordinated to achieve very well-fitting occlusal surfaces.

### Soft tissue management

The most important aspects of the impression of the preparation are the visibility of the preparation margins and a dry working field. The basic prerequisite for this is healthy periodontal conditions. Controlling bleeding from inflamed gingiva is difficult to impossible and calls into question the treatment itself, in which the definitive restoration is the final step.

Soft tissue management for the preparation impression can be achieved with the classic retraction cord with a hemostatic agent. The correct selection of the size is important here. The retraction cord should fill the existing sulcus as completely as possible to displace the gingiva laterally and apically. If the retraction cord is too small, it will “disappear” into the sulcus and the gingiva will rest against the preparing margin. A retraction cord that is too large will cover the preparation margin.

### As a general guideline:

Probing depth	Size
< 1 mm	000
1-2 mm	00
2-3 mm	0
3-4 mm	1
> 4mm	2+

Alternatively, retraction paste can also be used.

For further information on hemostasis, especially in conjunction with adhesive technique, for example, an article in the journal “Quintessenz Zahnmedizin, Issue 7/18, is recommended.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4163818/>



## Performing an optical impression

After properly preparing the field, the impression can be taken. The extent of the impression depends on the clinical situation. In the **Full crown with zirconium oxide** case, for example, a quadrant impression up to the equilateral canine tooth is sufficient. It is advantageous to adhere

### 1 Mandible full-arch scan technique: seated patient, dentist in 6-7 o'clock position, CEREC Primescan at 11 o'clock position

The scanner starts on the lingual side at the most distal tooth and is guided along the dental arch at a 60-80° angle to the canine tooth. At the canine, the scanner is swiveled to the occlusal and guided distally to the terminal tooth. Now the scanner is swiveled buccally at an angle of 60-80° to the occlusal plane and guided mesially again to the canine. The scan path is completed by swiveling to the incisal surface of the canine. During this first scan of the entire mandibular arch, the camera is guided in the sagittal plane.

It is important that the scan path is followed in this order. You can interrupt the path at any time, for example, to dry the next section and hold the tongue. Nevertheless, continue scanning at the point at which you stopped.

The anterior region is the most demanding part of the impression-taking process. There are few 3D structures and many smooth surfaces here. Therefore, an additional acquisition sequence is necessary for optimal accuracy. Start with the camera in the oral area of the 2nd premolar and move the camera at a 70-90° angle to the occlusal surface, but now

along the dental arch to the midline of the jaw. Now pan to the incisal surface of the anterior teeth, move the camera distally to the 2nd premolar and then pan the camera 70-90° buccally. Move the camera along the dental arch mesially again to the midline of the jaw. The camera orientation for this second anterior tooth scan is always with the camera tip pointing distally. Now perform this anterior tooth scan on the contralateral side, also from the 2nd premolar to the midline.

**Attention:** as you scan, continuously ensure the preparation is dry. The longer the scan time, the greater the risk of saliva running onto the tooth surface. Stop the scanning process at any time and dry the surface to obtain an optimal result. Optragate®, DryTips® (parotid patches) and saliva ejectors are recommended here.

The preparation and the adjacent proximal surfaces are then completely scanned. CEREC Primescan is positioned so that the scan direction is aligned with the missing surface and the scanner is held in this position for approximately 1 second. During this time, the scanner can optimally capture the surface in its entire acquisition depth of

to a specific scanning strategy. It enables efficient acquisition of all parts of the mandibular arch, reduces unnecessary duplicate scans and thus the amount of data and computing time, while at the same time ensuring optimal accuracy and reproducibility.

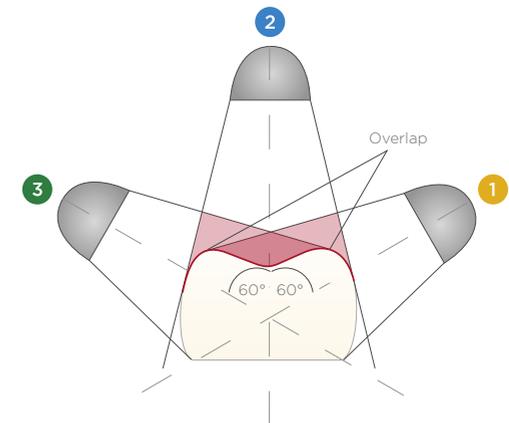
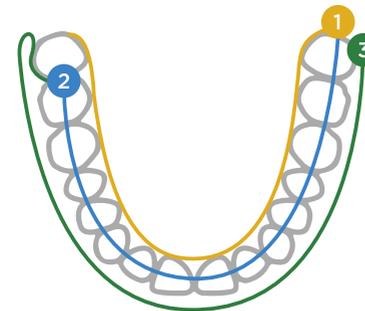
20 mm. Excessive panning and moving of the scanner is not necessary and is sometimes counterproductive, as more soft tissue tends to be acquired as artifacts. With this technique, the 3D model is now completed. In addition to the preparation, the adjacent proximal surfaces, the buccal area in the premolar region are also important. These are required for an optimal final bite.

### 2 Maxilla full-arch scan technique: supine patient, dentist in 12 o'clock position, CEREC Primescan at 7 o'clock position

The upper jaw is acquired using the same strategy as the mandible.

**Tip:** when panning towards the buccal surface, the patient should relax and close the mandible as much as possible as this provides more space for the scanner in the buccal corridor.

Move the CEREC Primescan slowly (1 second per tooth). This may feel unfamiliar at first but avoids having to rescan and therefore reduces the overall scanning time.



### 3 Buccal bite: seated patient, dentist in 6-7 o'clock position, CEREC Primescan in 11 o'clock position

**Attention:** for full-arch scans, ALWAYS carry out the buccal bite registration bilaterally. Only this way can an optimal designation of mandible and maxilla be guaranteed.

The patient closes in habitual intercuspatation. If necessary, the bite can be verified on the contralateral side with occlusal foil. In patients with a high salivary flow, the insertion of a cotton roll on the lingual side is helpful. The buccal surfaces and especially the interdental spaces should be dry.

CEREC Primescan is positioned at the first molar at a 90° angle to the occlusal plane. Now the scanner is guided with a slow zigzag movement (cranial-caudal) from the first molar mesially to the canine. Avoid guiding the scanner distally as it will bump into the ascending branch of the mandible or compress the cheek.

The model calculation starts automatically in the background. The more efficient the scan, the less unnecessary data the software has to process and the faster the model calculation is completed.

Both are painful for the patient and lead to evasive movements of the mandible and thus to incorrect tooth designation. Ensure the correct position of the mandible during the buccal impression by placing the thumb of your second hand on the chin. This way, you will notice if the patient begins to shift the mandible.

Always scan 3-4 teeth in the buccal impression (first molar to the canine), even if the software often confirms the allocation of the two jaws with a green check mark after scanning 1-2 teeth. The green check mark only indicates whether an assignment is technically feasible, not whether that designation is optimally possible.



#### Scanning strategies for partial and full jaw scan with CEREC Primescan

Scanning with CEREC Primescan is very simple. If you do not yet have a preferred scan sequence, you will find scanning strategies for a full jaw as well as a partial scan below which are easy to learn and work well.

##### Full jaw scan with CEREC Primescan

<https://youtu.be/XNh1DRRCxc>

##### Partial scan with CEREC Primescan

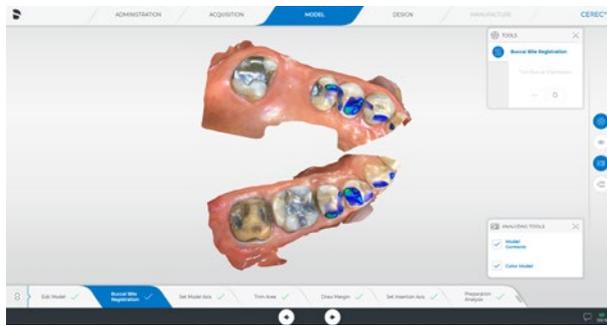
<https://youtu.be/A41Tq7Cy-B0>

# Design

## 1 Examining the occlusion

In the Model tab, reviewing the occlusal contacts is important. Here you can see the calculated virtual contacts. Inspect the position of virtual and real contacts. Ideally, they should be congruent. The intensity of the virtual contacts is secondary. It can vary from patient to patient and has various biological causes (mobility of the teeth, compression of the tooth row dependent on the force required in the final bite, previous contacts, etc.). Discrepancies between real and virtual occlusal contacts can either be due to faulty scans of the individual jaws (artifacts, incorrect

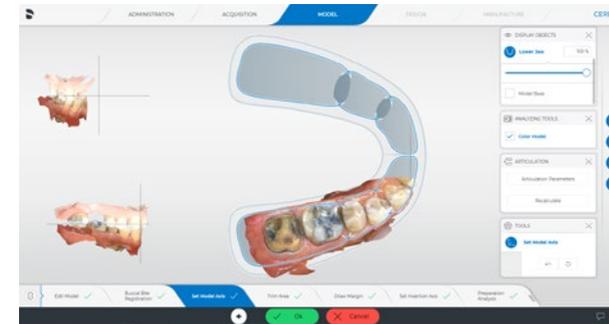
scanning technique) or errors during buccal impression (patient did not close completely, patient did not close in maximum intercuspitation, patient moved the mandible during buccal registration, buccal surfaces or interdental spaces were massively covered with saliva, buccal registration performed too quickly). For optimal crown design and minimization of correction work, these errors should be avoided. Depending on the source of the error, it may be necessary to eliminate artifacts or take a new jaw or buccal impression.



Activate “Model contacts” and match the position of the contacts with the intraoral situation

## 2 Examining the model axis

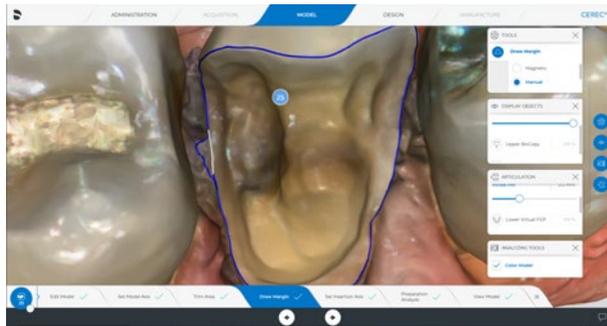
Review the position of the model in the virtual articulator. Correct alignment is important for an optimal restoration proposal, but also for calculating the movement paths of the virtual articulator.



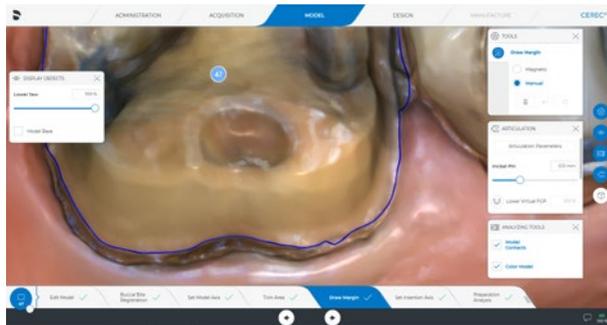
Control and adjust the model axis

### 3 Adjusting the preparation margin

Inspect the position of the preparation margin proposal. Zoom the model to the maximum to obtain an optimal resolution of the preparation margin. Correct the preparation margin if necessary. In the case of extensive corrections, it may be easier to delete the proposal and re-draw the entire preparation margin.



Zoom in on the model to display the preparation margin in more detail



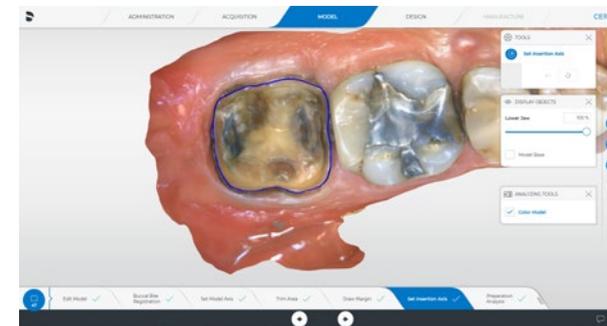
Manual re-editing of the preparation margin

### 4 Analysis of the preparation

This analysis is a helpful tool for inspecting the preparation. The most important aspect for crowns is the distance to the antagonist. The occlusal reduction can be controlled this way.

### 5 Adjusting the insertion axis

Review the insertion axis of the restoration. It should be as parallel as possible to the tooth axis. Make sure that any undercuts do not protrude beyond the preparation margin. The neighboring teeth should also not cover the preparation margin either. Problems may otherwise arise when inserting the milled restoration. Ideally, the distance from the preparation margin to the neighboring tooth should be spaced evenly, mesially and distally.



Review the insertion axis

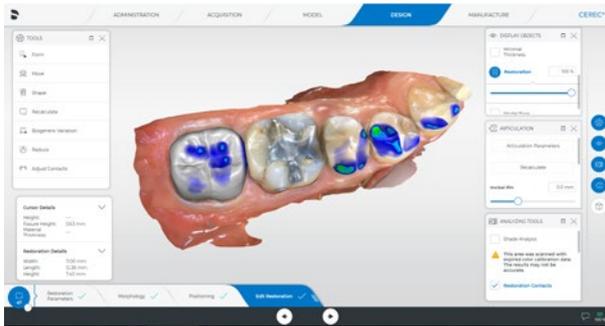


Opening the mesial proximal space and confirming with "OK".

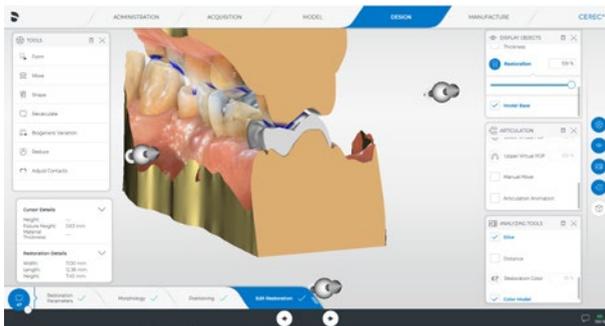
## 6 Adjusting the morphology and positioning

Review the initial proposal of the restoration. Pay attention to the alignment of the restoration in the dental arch, the relation to the opposing jaw, the morphology and the position of the occlusal contacts. Make adjustments according to the “from large to small” principle.

**Tip:** It is generally recommended to first revise the position of the restoration as well as the size and dimensions before proceeding with detail, such as adjusting occlusal and approximal contact points. The reason being that, in most cases, when adjusting the position and size, the contact areas will also change.



Review of the initial proposal



Cusp-fossa relation in section view



### Tutorials

Learn more about the workflow with CEREC® Software 5. These tutorials demonstrate the workflow from the Administration phase to the Manufacture phase in the case of a single-tooth restoration.

#### Workflow with CEREC Software 5

<https://youtu.be/jFKIm38KZwE>

This video will guide you through the most common tools and procedures in the design phase, as well as the functions in the system menu.

#### CEREC Software 5 - The design phase

<https://youtu.be/zEniJqgLzZY>



## Manufacture

For production with the chairside workflow, the two grinding and milling device types “MC XL family” and “CEREC Primemill®” are available. Both machines can process ceramic materials, zirconia as well as composite and acrylic materials quickly, and with high quality. The time required to produce a single-tooth restoration varies between 4 and 30 minutes, depending on the production process and material selected. Bridge restorations made of high-strength ceramics can be fabricated within 20-40 minutes. The indication, design and block size can also influence the processing times. A major advantage of this system is the coordination between design, restoration material and manufacturing process. It is continuously optimized and improved during the development of the hardware and software and precisely adapted to the technical conditions. This ensures optimal interaction of all components of the chairside system.

A distinction can be made between the grinding of ceramic and composite materials and the milling of zirconia and acrylics. Different tools are used for each material. An overview of the different materials and the associated instruments processed by the CEREC MC XL and CEREC Primemill are listed in the link below.

Depending on the material, further finishing steps are necessary after milling or grinding. These can range from mirror polishing of the restoration surface, to glazing or crystallization of reinforced glass-ceramics, to sintering of a zirconium oxide restoration. Instructions for the respective finishing steps are available from the material manufacturer.

### Tool and material tables

Use this link to get an overview of the tool portfolio with information on applications, materials and milling modes for CEREC Primemill and the CEREC MC XL family.

<https://www.dentsplysirona.com/en/explore/cerec/downloads.html>



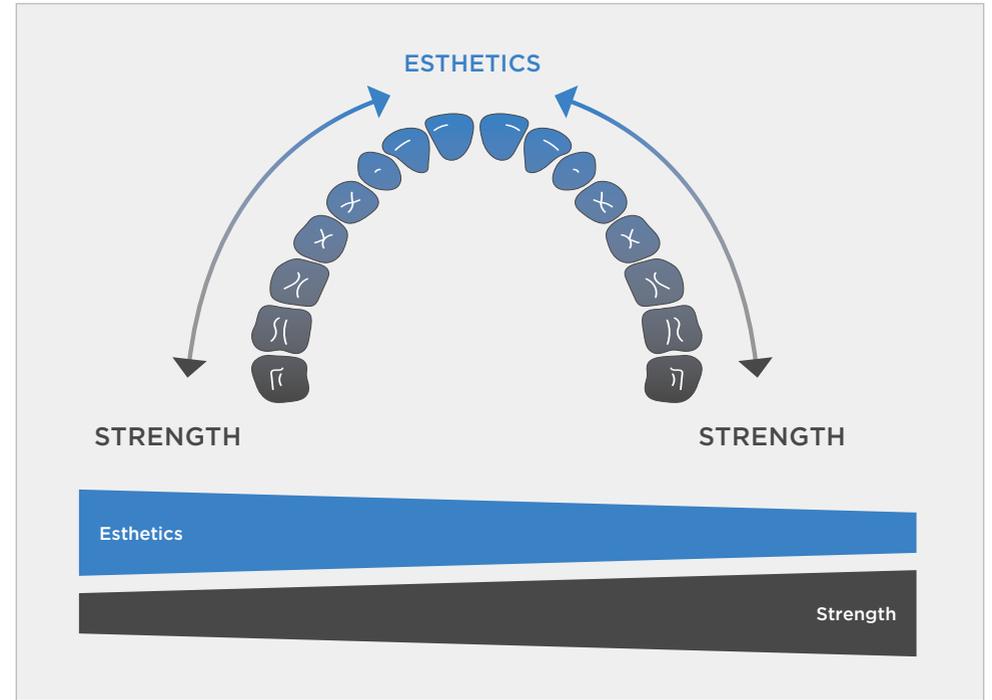
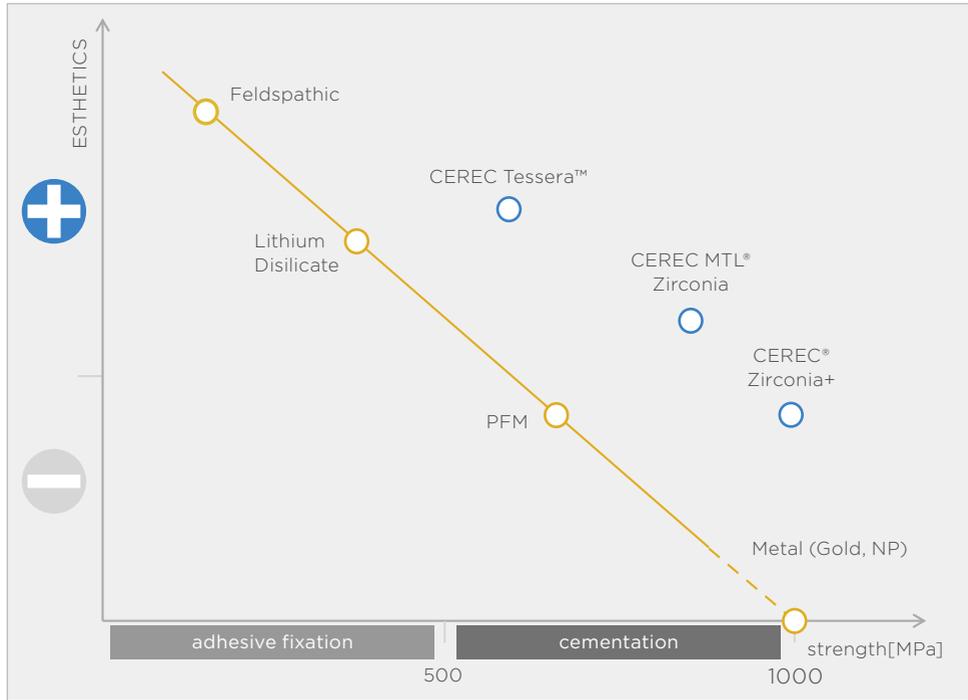
## Finish

### Material selection and cementation

A wide range of materials can be processed with the CEREC system. These materials differ in their properties and can therefore be used for different indications. The most frequently used class of material today is ceramic with all its different compositions. The fracture strength, measured in MPa, is often used to characterize the individual classes. The restorations produced must withstand the forces in the masticatory apparatus to ensure durability. At the same time, the esthetics of chairside materials is an important factor. Properties such as translucency, color gradation, opalescence, etc. are predetermined in chairside fabrication by the material block from which the restorations are milled or ground. They can be adjusted by staining or glazing after the restoration has been fabricated, but they cannot be customized to the same extent as a layered restoration from the dental laboratory. Finally, the cementation of the fabricated restoration is an important factor for both clinical durability and esthetics. Adhesive cementation with composite cement strengthens the restoration against the masticatory forces and improves the esthetic transition from the restoration to the remaining tooth. On the other hand, classical cementation, offers advantages for epigingival or subgingival restoration margins in terms of moisture control and excess removal. Therefore, the correct choice of material and cement are of great importance.

The two figures below can be used as a basic guideline. The fracture strengths and the esthetic appearance of the ceramic are shown relative to other ceramics. An increase in fracture strength is accompanied by a reduction in translucency and thus also the type and manner of definitive cementation. From this correlation, a rough field of application can be derived according to the localization of the restoration in the anterior or posterior dental arch. However, this is only a starting point and is additionally influenced by many other factors such as the age of the patient, existing restorations of the adjacent teeth, expansion of the restoration, functional parameters, and others.

Before any contact with the patient, it must be ensured that all materials, aids and restorations used have been cleaned, disinfected and, if necessary, sterilized in accordance with the manufacturer’s instructions. Furthermore, all local and national guidelines for post-processing must be followed.



## Summary

Partial crown preparations are one of the most frequent indications for restoration with the CEREC system. The loss of one or more cusps of the natural tooth poses a major challenge for direct composite restorations. The position, shape and height of the lost cusp are very difficult to reproduce manually. In this case, the biogeneric restoration of the original tooth morphology, by means of a workpiece, offers an invaluable advantage in terms of the function but also the fit of the restoration.

### Indication for partial crown preparation

Partial crown preparations are one of the most diverse preparation areas. They include all forms of preparation in which part of the occlusal surface is replaced.

The decisive factor for the indication of the partial crown is having sufficient stability of the remaining tooth structure. The remaining occlusion-bearing walls should have a minimum thickness of 2 mm. Otherwise, the risk of cracking and subsequent breakage of these areas is greatly increased.

Therefore, even when replacing large-surface fillings, it can be useful to shorten existing thin walls and cover them with the workpiece. This can increase the long-term stability of the tooth. Occlusal veneers are a special case.

In this case, the entire occlusal surface is replaced. However, in contrast to the classic crown preparation, it is not prepared down to the gingival margin, but the transition to crown restoration is fluid.

When shortening teeth, be it a single cusp, a tooth wall or a marginal ridge, it is very important to consider sufficient minimum thickness for the selected restorative material. In addition, the occlusal portion of the preparation margin should not be in the contact area to the antagonist, otherwise the risk of chipping in this area is increased. As with crown preparation, care must be taken to ensure a clean 90° preparation margin and to round off all internal transitions.

### Clinical example: CEREC Tessera partial crown



Initial situation



Final situation

## Case selection

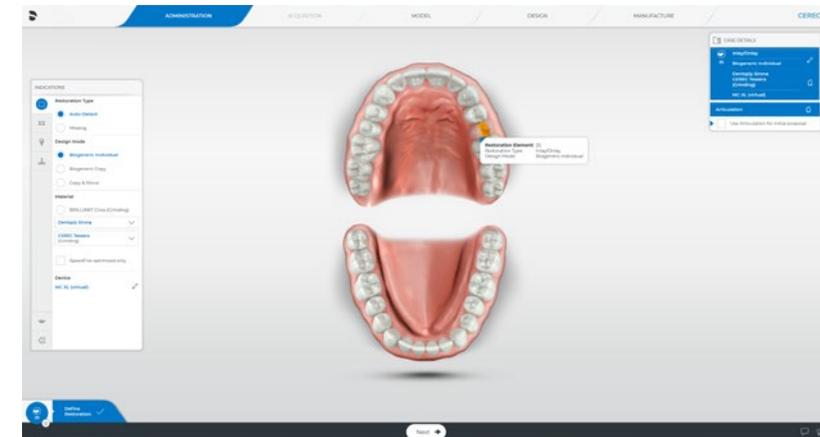
In the present case, a partial crown had to be fabricated due to fracture of the buccal wall of a premolar.

Due to the size of the defect, a ceramic workpiece was chosen, in this case, a partial crown. The palatal wall has no defects and is of sufficient size so that it does not need to be shortened. A reinforced glass-ceramic (CEREC Tessera) was selected as the material.



In the Administration phase of the CEREC Software, the necessary information (tooth number: 25, material: Dentsply Sirona/CEREC Tessera and milling machine: CEREC® MC XL) is entered and the “Biogeneric individual” design mode is selected. In addition, the “Articulation” option is selected to use the virtual mandibular movement in order to adjust the restoration.

For more information on the topic of impression taking, see the chapter on Clinical Workflow – Scan.



## Scan

### Preparation

The preparation includes the removal of the existing amalgam filling, and shaping. Finally, the preparation margin is finished.



A retraction cord is applied for the optical impression. This was impregnated with Astrigent® (ULTRADENT) to stop bleeding.

The preparation was carried out according to the general guidelines for ceramic workpieces with the corresponding minimum dimensions. The existing residual tooth substance was reduced as little as possible. The end of the preparation should have as perpendicular a transition to the tooth as possible. All inner transitions are rounded off.

## Design

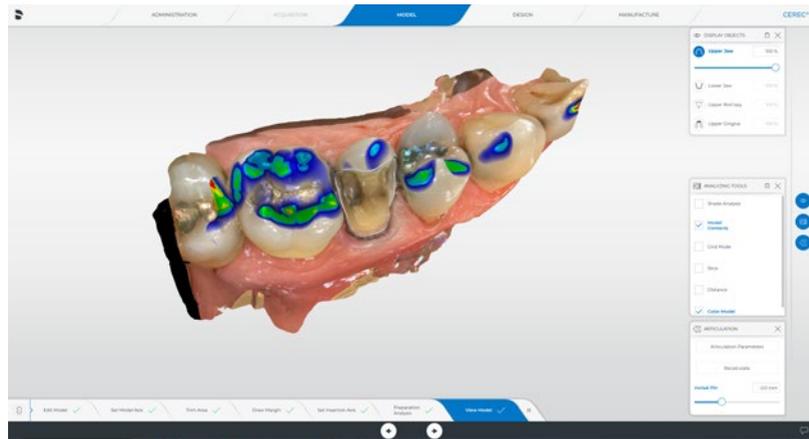
### Sequence in this case

- 1 Reviewing the virtual contacts of the upper and lower jaw
- 2 Examining for artifacts
- 3 Examining the model axis
- 4 Adjusting the preparation margin
- 5 Adjusting the insertion axis
- 6 Adjusting the proximal contacts and restoration proposal
- 7 Adjusting the occlusion
- 8 Adjusting the dynamic contacts through virtual articulation

### 1 Reviewing the virtual contacts of the upper and lower jaw

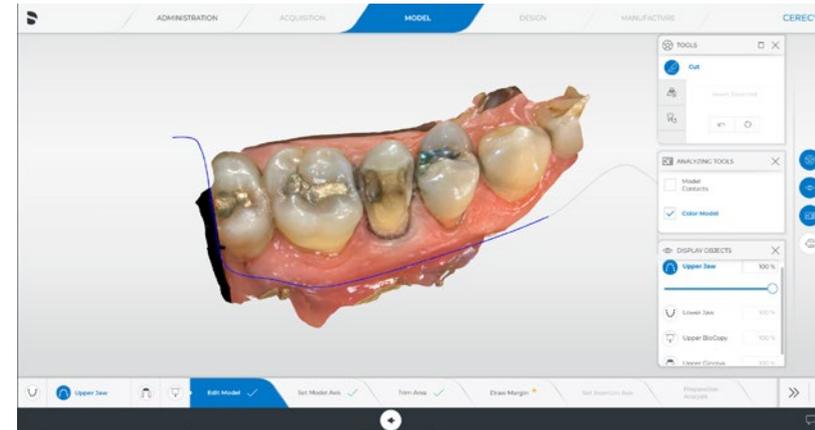
In the Model phase, the software automatically jumps to the “Draw preparation margin” step. However, some control steps should be performed beforehand.

The virtual contacts of the upper and lower jaw are reviewed in the “Model” tab. The position of the contacts can be compared with the intraoral situation and provide a good indication of the quality of the intraoral scan and the buccal impression. If the localization of the virtual occlusal contacts does not correspond to the clinical situation, the buccal impression should be reviewed first and repeated if necessary. Secondly, the jaw models should be inspected for acquisition artifacts (saliva, scan holes, artifacts).



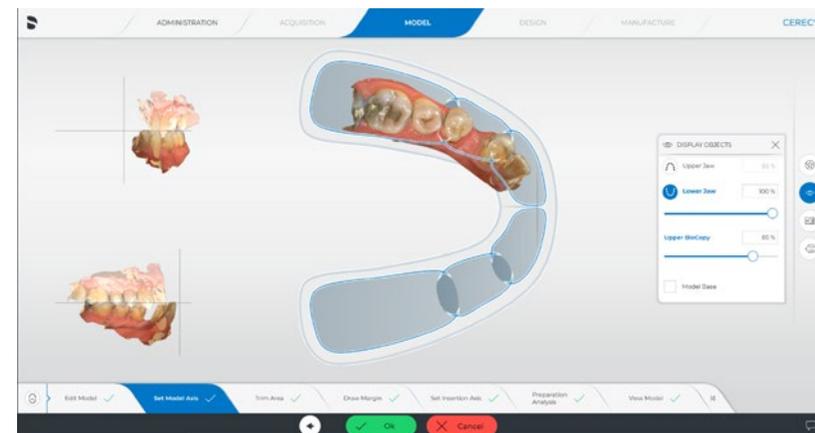
### 2 Examining for artifacts

The models are now inspected for artifacts, and any parts that are not required are eliminated. This is particularly important for virtual articulation, as scan artifacts can interfere with the virtual movement calculation. In this case, scanned cheek mucosa is removed in the distobuccal region of the maxillary model. The “Cut” tool is used for this purpose.



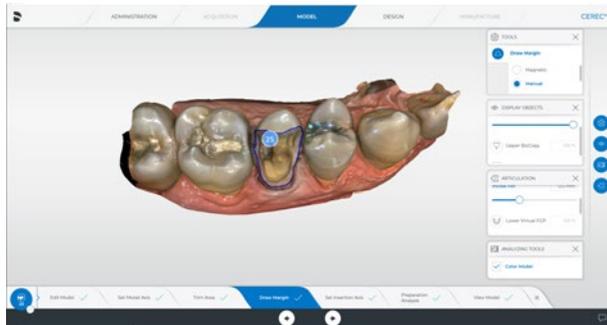
### 3 Examining the model axis

Always monitor the model axis in the “Set model axis” tab. In most cases, the software sets the model axis correctly. However, especially with partial jaw impressions, shifts can occur, which negatively affect the restoration proposal and the virtual articulation. In the “Display objects” window, switch to the lower jaw to control the correct alignment of the occlusal plane. By default, the software always displays the jaw with the restoration in this step.



#### 4 Adjusting the preparation margin

In the "Draw margin" tab, the position of the preparation margin proposal is reviewed.



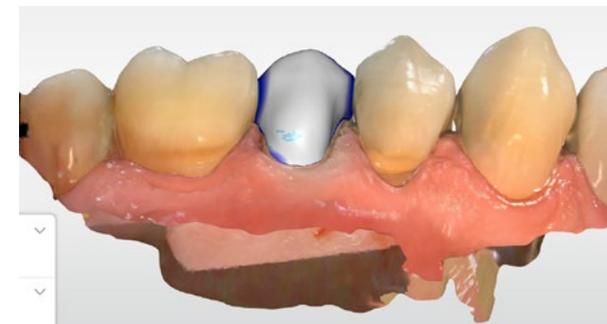
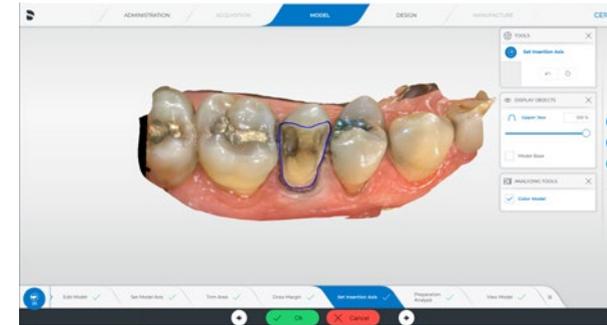
The preparation margin must be corrected in the distal proximal region.

Zoom in on the model to the maximum. The preparation margin will also be displayed in more detail.



#### 5 Adjusting the insertion axis

Set the correct insertion axis in the "Set insertion axis" tab. Ensure correct alignment, without undercuts, in the proximal preparation margin. Undercuts in this area will not be ground, and lead to increased marginal gaps in this area.



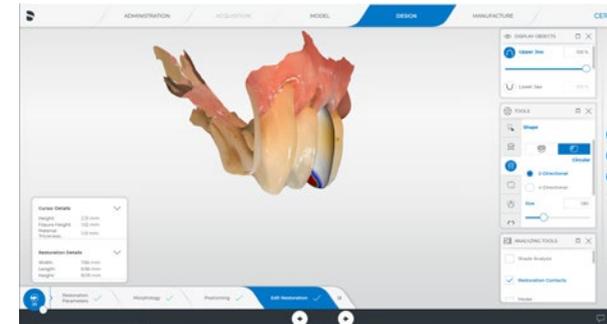
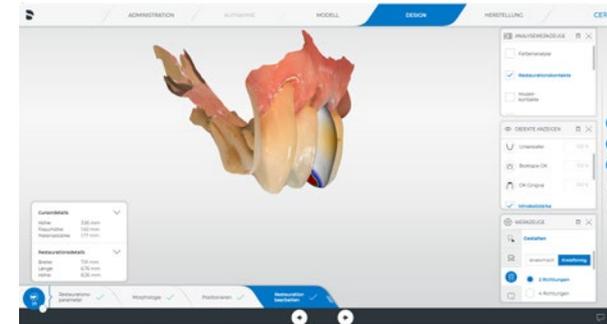
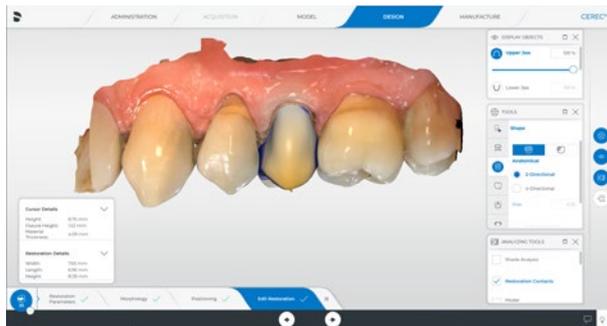
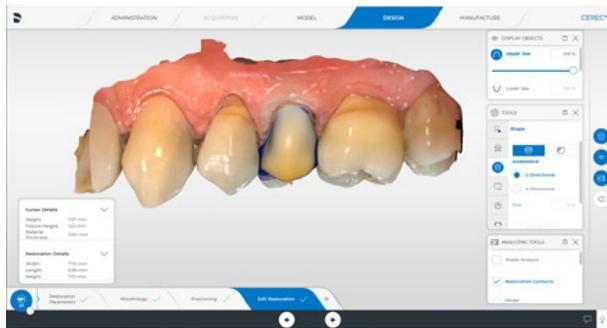
## 6 Adjusting the proximal contacts and restoration proposal

In the Design phase, the restoration proposal can be reviewed. To do this, inspect the restoration from all sides and superimpose the opposing jaw to examine the relation of the buccal cusps. Pay particular attention to the convex curvatures of the restoration below the proximal contacts from the buccal view. If these protrude beyond the contact point, the restoration cannot be placed.

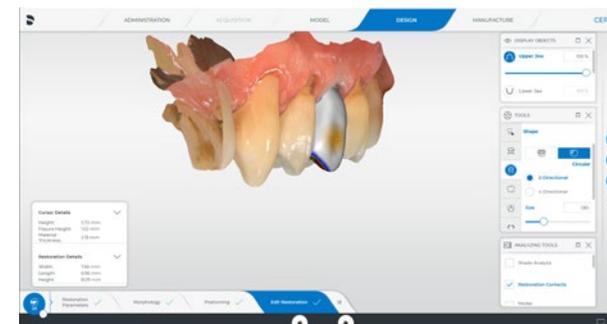
In the present restoration, some minor corrections must be applied to adapt the morphology better to the neighboring teeth.

This includes the contour of the buccal cusp, the height of the buccal cusp tip, and the position of the occlusal contacts.

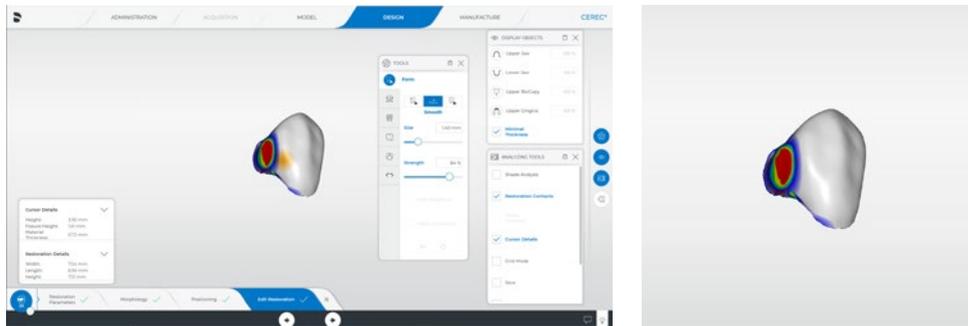
First, the height of the buccal cusp is adjusted. As the entire cusp is to be moved, the “Shape - Anatomical” tool is best suited. The cusp tip is adjusted to the level of the neighboring teeth.



The next step is to adjust the buccal contour, as it is still too bulbous. This can be reduced with the “Shape - Circular” tool.



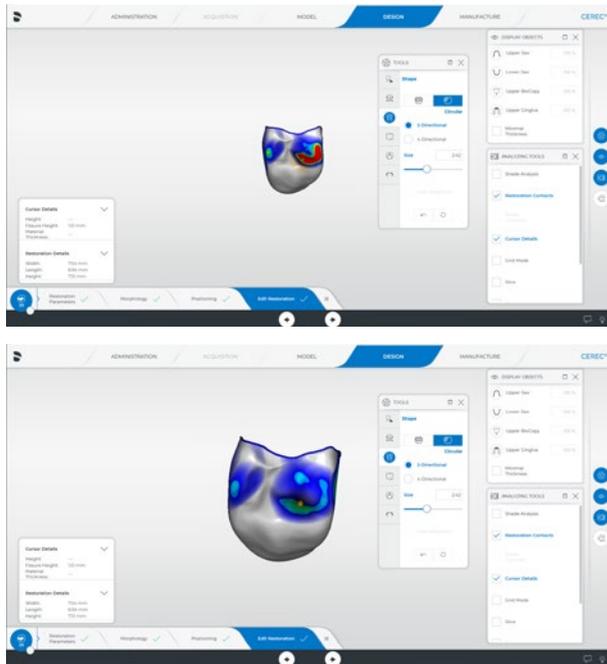
The buccal surface is now adjusted slightly to obtain a more natural relief using the “Shape – Circular” tool again



### 7 Adjusting the occlusion

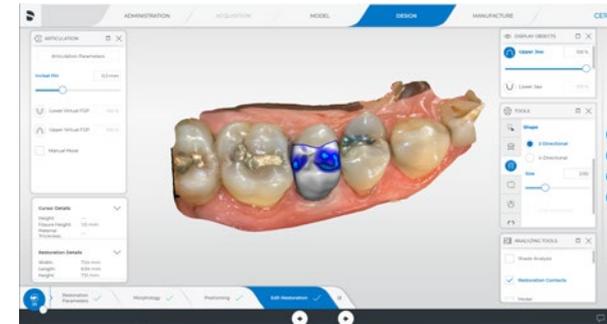
The proximal areas of the restoration are now processed with the “Form – Smooth” tool. This removes the bulges below the proximal contact and adjusts the proximal contacts to the correct thickness. In general, it is recommended to adjust the intensity of the contacts so that the occlusal area is dark blue with green dots and the approximal area is a large green surface.

The occlusal contacts are too strong due to the movement of the buccal cusp. The occlusal surface is first adjusted with the “Shape – Circular” tool.

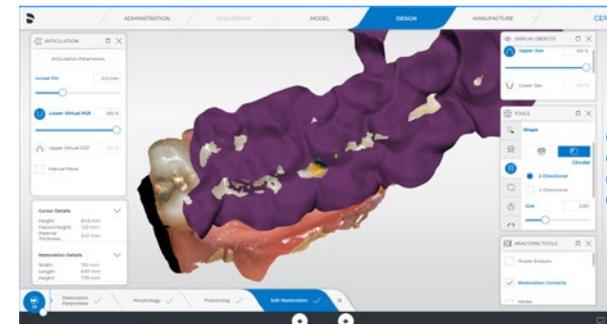


### 8 Adjusting the dynamic contacts through virtual articulation

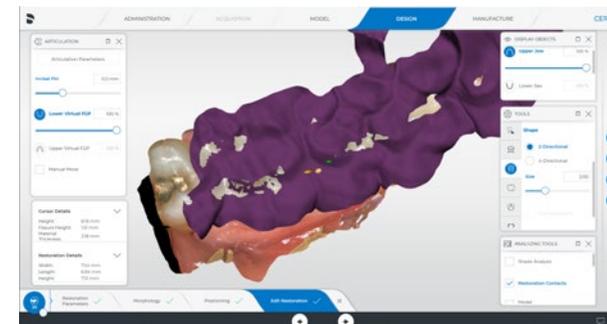
After adjusting the static occlusion, the virtual articulation is now used to adjust the dynamic contacts.



The “Virtual FGP” options for the opposing jaw are displayed in the “Articulation” window. The digital FGP technique (Functionally Generated Path) is the representation of the entire movement path of the mandible. This makes it possible to display areas of the restoration that come into contact with the mandible outside the final bite position during movement of the mandible. These areas can then represent potential dynamic interference points.



The neighboring teeth show that the movement path of the mandible runs evenly over the buccal cusps. In this case, the buccal cusp lies below the virtual movement path of the mandible and thus represents an interference contact. Therefore, the contour of the buccal cusp must be adjusted.



The penetration of the buccal cusp by the FGP is reduced until only the cusp tip is in contact with the FGP surface, thus allowing uniform movement over the restoration and the adjacent teeth.

## Manufacture

### Manufacturing preview

The position of the sprue is now checked in the manufacturing preview and adjusted if necessary. The buccal surface of the restoration is suitable for the sprue. Now the grinding job can be started, and the corresponding block inserted as prompted by the software.



### Preheat function

For a quick glaze in 4:30 minutes, the CEREC® SpeedFire® must be preheated, otherwise the glazing takes 10:45 minutes.

## Finish

### Try-in

After the restoration has been ground, it can be tried in. The approximal contacts and the marginal seal are inspected. Corrections and adjustments to the morphology can also be made.



### Insertion

In this case, adhesive placement was performed with a universal adhesive and dual-curing composite cement. The restoration was polished to a high gloss after adhesive placement.



## Summary

With increasing user-friendliness, automation, speed and a wide range of materials, the chairside restoration of crowns and bridges on natural teeth or implants is now possible even in difficult clinical situations. The clinical challenges for crown restorations often lie in soft tissue management, design with static and dynamic occlusion, optimal material selection, and restoration finish. The optimal material is also an important factor for a “simple” and successful completion of the case.

### Indications for crown preparations

Today’s techniques and materials make the distinction between crowns, partial crowns, occlusal veneers and other types of restorations very fluid and less rigid than in the past. The indication should therefore always be based on the individual clinical situation, the esthetic requirements of the patient and the technical feasibility.

#### Reference tip:

Margvelashvili-Malament M. “Choosing between complete (crown) or partial coverage (inlay and onlay) restorations: What will last?”. Dental Economics. February 2022 print edition.

### Material selection

The clinical situation, the expected load on the crown, functional and esthetic aspects and, as a special consideration for chairside treatment, the fabrication time, play an important role in the selection of materials.

Numerous studies are available on the survival rate of all-ceramic restorations. For all-ceramic full crowns, however, the choices are limited. For this type of restoration, the use of reinforced glass ceramics (e.g. IPS e.max® CAD) and oxide ceramics (zirconium oxide) has become established over the years. Particularly the use of fully anatomical monolithic zirconium oxide restorations is growing rapidly and can be carried out in a time-saving manner with the CEREC system in combination with the CEREC SpeedFire sintering furnace.



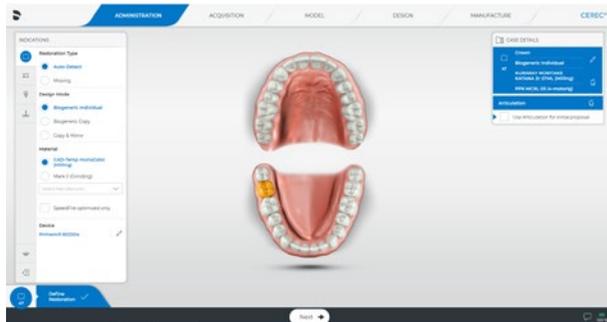
Initial situation



Final situation

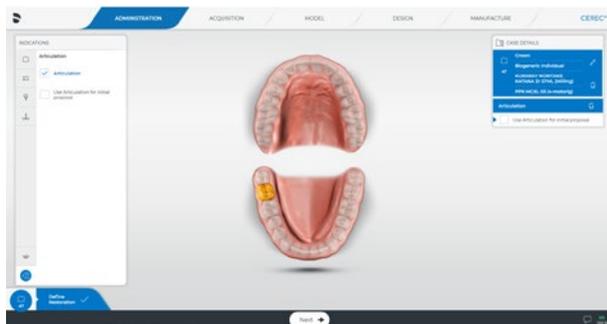
## Case selection

In this case, a crown restoration with the design mode “Biogeneric individual” was selected. Zirconium oxide was chosen due to the short height of the clinical crown, the vital pulp, and the preparation limits in the dentin area. Owing to its high fracture load, the material allows minimally invasive preparation and conventional or self-adhesive cementation. In return, however, the translucency is reduced compared to glass-ceramics. This must be considered when assessing the esthetic requirements of the patient and dentist. The optimal localization for chairside zirconium oxide materials is therefore in the maxillary molar region, followed by the mandibular molar region in patients with existing restorations and little translucent enamel.



Administration:

1. Design mode
2. Material
3. Select tooth



4. Articulation

## Scan

### Preparation

Preparation is performed under local anesthesia and follows the general preparation guidelines (shoulder or chamfer preparation, rounded inner edges, no acute inner angles, sufficient layer thickness according to manufacturer's specifications).



Rough preparation, removal of residual fillings and caries



Fine preparation, finishing, rounding of inner edges



Hemostasis and retraction of the gingiva with retraction suture and ViscoStat™ (Ultradent Products)

For more information on the topic of impression taking, please refer to the chapter [Clinical workflow – Scan](#).

[back to contents](#)

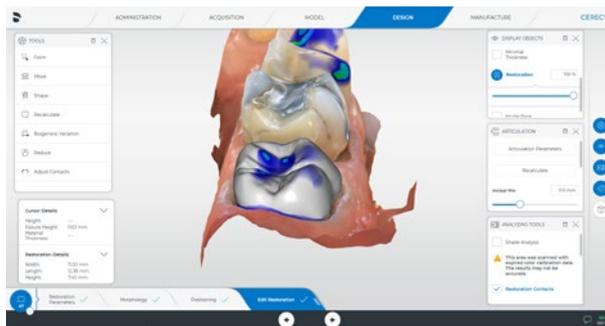
# Design

## Sequence in this case

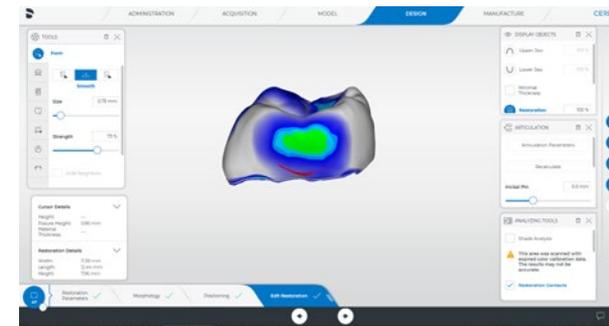
- 1 Adjusting the outer contour (fitting anatomical or individual)
- 2 Adjusting the proximal contacts (green flat contact thickness)
- 3 Displaying and adjusting the occlusal contacts
- 4 Adjusting the static and dynamic occlusion (green punctiform contacts, no penetration to the FGP of the opposing jaw)
- 5 Reviewing the entire outer surface (ideally without displayed contacts)



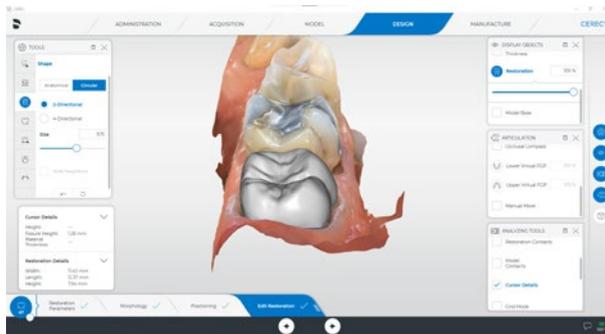
Hiding the jaw and inspecting the proximal contact



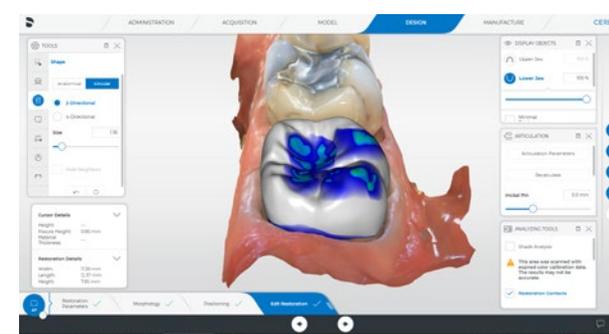
Adjusting the outer shape with the "Shape - Circular" tool



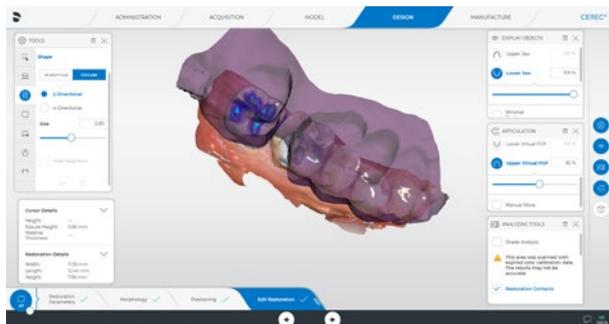
Adjusting the proximal contact with the "Form - Smooth" tool



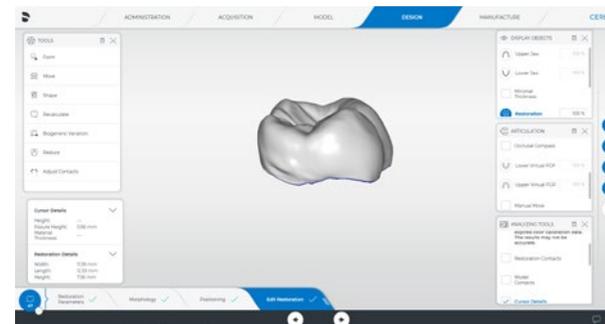
Lifting the marginal ridges and distal cusps



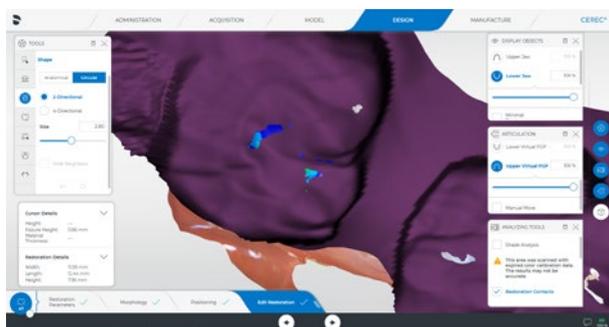
Reduction of occlusal contacts to 2-3 punctiform sites (green).



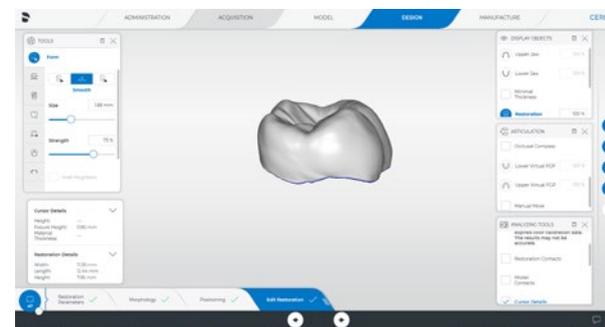
Show "Upper Virtual FGP" (shown here transparently)



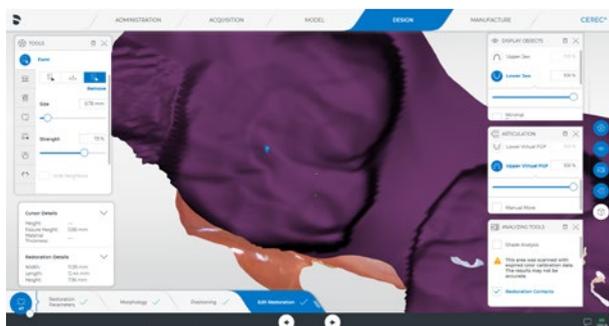
Control of the outer surface WITHOUT displaying contacts



Control of penetration areas to the virtual FGP (target: no dynamic contacts).



Smoothing of the outer contours

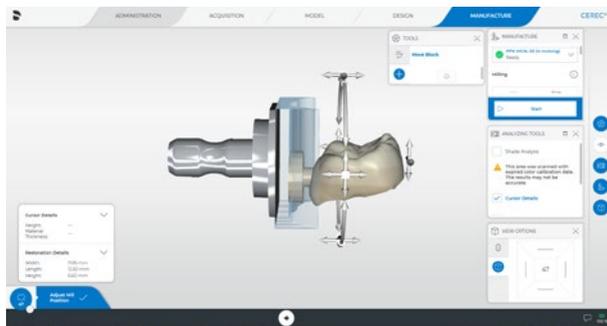


Elimination of penetrations in the FGP with "Form - Remove" tool

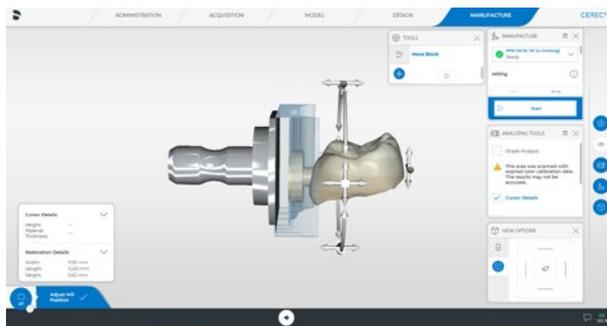
# Manufacture

## Manufacturing preview

Review the position of the restoration in the block in the CEREC Software. If necessary, position the restoration more in the cervical (darker) or incisal (lighter) area. This only applies to blocks with a color gradient. Avoid placing sprues in areas of proximal contacts by rotating the restoration. Confirm the connection to the CEREC SpeedFire furnace. The furnace order is automatically transferred once the milling process is finished, and requires the sintering furnace to be switched on and connected to the network. Select the correct color in the selection menu. Select the preferred milling mode and start production. The “gentler” milling modes “Fine” and “Extra fine” (CEREC Primemill only), reduce the need for manual rework to a minimum.



Control the block positioning



Confirm CEREC SpeedFire is ready

## Finish

### Sintering

After the milling process, the restoration is cleaned with compressed air or a brush. **Important: zirconium oxide dust is a hazardous substance and requires extraction with a vacuum.** Now the restoration can be separated from the remaining block.

Use a narrow rotary instrument, preferably with a high speed and little contact pressure. Hold the block with the restoration over a soft surface. This will prevent chipping, if the restoration falls off the block. Clean up the sprue with a coarse rubber polisher. You can smooth the surface further with a fine rubber polisher and very little pressure. However, leave out the approximal surfaces, as it is not possible to check the fit until after sintering. Now place the restoration with the occlusal surface facing downwards in the chamber of the CEREC SpeedFire. Select the restoration in the panel and start the sintering program (dry milling in this case).



Clean the restoration with a brush or compressed air



Separate the restoration from the block



Carefully smooth and polish the outer contours



Place the restoration with the occlusal surface down on the firing tray



Finished sintered crown, ready for try-in

### Try-in

After sintering, you can try in the restoration. Review the marginal fit, the shape, the proximal and occlusal contacts. Correct them if necessary.



Try-in of the restoration after sintering

## Polish and glaze

The zirconium oxide crown can be finished with a polish or glaze. A glaze can additionally be used to individualize the color. The occlusal contacts must be polished to a high gloss; the glaze wears off very quickly in this area and the long-term occlusion then takes place on the zirconium surface. Extraoral polishing with a handpiece is very time efficient.



In this case, polishing is carried out with the Zirconia Luster® Set (Meisinger).



The final high-gloss polish requires a zirconium oxide polishing paste and a goat hair brush (Zirkopol®, Feguramed).



A rough polishing of the restoration is performed. The contact points are polished to a high gloss.



The inner surface of the crown is filled with CEREC SpeedPaste® and the crown is positioned on the support. Make sure that the paste does not touch the outer surface of the restoration. Now spread the spray glaze evenly in a thin layer on the outer surface of the restoration. The spraying distance should be 6-10 cm; work with short spray bursts while rotating the restoration.



Select the glazing program for the restoration on the CEREC SpeedFire control panel, place the restoration in the chamber and start the program.



After the glazing program, confirm the glaze is evenly layered.

## Cementation

Depending on the preparation's geometry (stump height and taper), conventional or self-adhesive cementation can be used.

Self-adhesive cementation with RelyX™ Unicem® (3M) is used in this example. The inner surface of the restoration is mechanically cleaned by sandblasting with CoJet™ (3M) abrasive at 1.5 bar and a distance of approximately 10 mm. Now the inner surface is silanized with MDP

monomer (e.g. Monobond Plus®, Ivoclar Vivadent), a universal primer. The stump surface is cleaned and any enamel is etched with phosphoric acid (30 seconds). The luting cement is applied to the crown and evenly distributed. The restoration is placed on the stump. Any excess of luting cement can be cured briefly and then removed with a probe. The self-adhesive cement is both light and chemically cured.



Restoration after rough removal of the excess



Final polish



Contact situation after cementing

Carefully control for excess cement at the margin and review the occlusion. If you have administered an anesthetic, inform the patient that the practice should be informed immediately if any interfering contacts are noticed. It is recommended to check the restoration after 1-2 weeks for reevaluation.



Situation 2 weeks after insertion

## Summary

Implant restorations are another option within the CEREC Software. In contrast to tooth-supported restorations, however, some procedures have been modified to ensure an optimal bond between the restoration and the implant. These include the use of a titanium base to which the restoration (crown or abutment) can be bonded and then screwed onto the implant. The materials for this type of restoration are certified by Dentsply Sirona and, therefore, the full range of materials which can be used for tooth-supported restorations does not appear in the menu. In addition, the impression process is somewhat modified and involves the use of a specific scanbody to determine the implant position.

In the present clinical case, an older implant crown on tooth 15 needs to be replaced.

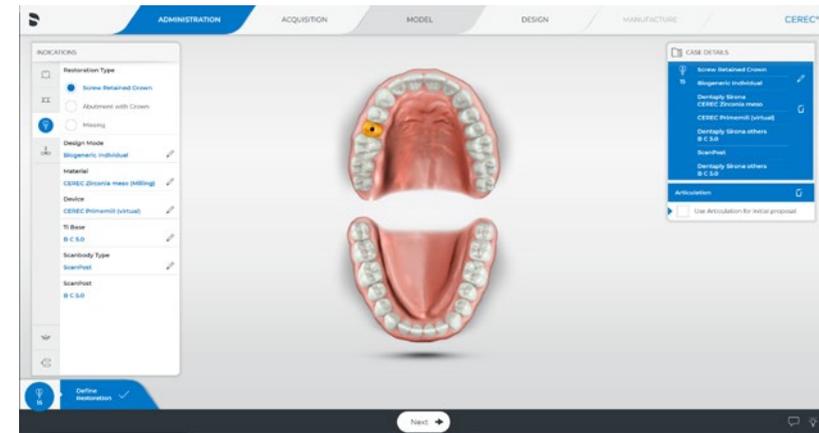
### Clinical example: Implant restoration with CEREC Zirconia Meso



Initial situation

## Case selection

The patient case is created in the CEREC Software during the Administration phase. In addition to the restoration material (CEREC Zirconia Meso), the software also requires information about the implant type (Zimmer/Biomet 3i with Certain® connection) with the corresponding diameter (5 mm) and the scanbody used (scanpost).

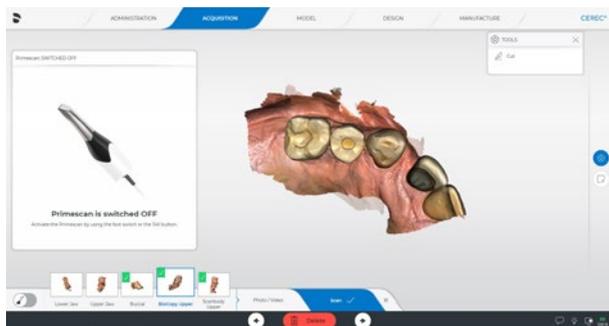


The activation of virtual articulation allows the adjustment of the dynamic contacts in the design phase and reduces the grinding necessary after fabrication.

## Scan

The scanpost is mounted on the implant. It is advisable to take a control X-ray to confirm the scanpost is mounted correctly. Finally, the gray scanbody is placed on the scanpost. The correct alignment is ensured by the matching lugs on the scanpost and scanbody.

Since this is a bone level implant, the use of the scanpost is recommended when taking the impression, as the height of the scanpost determines the correct position of the scanbody.



In the Acquisition phase, it is recommended that the existing initial situation first be recorded in the "BioCopy Upper" image catalog.



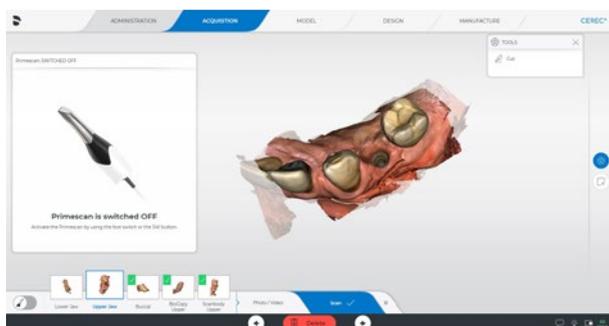
Mounting the scanpost and scanbody on the implant.



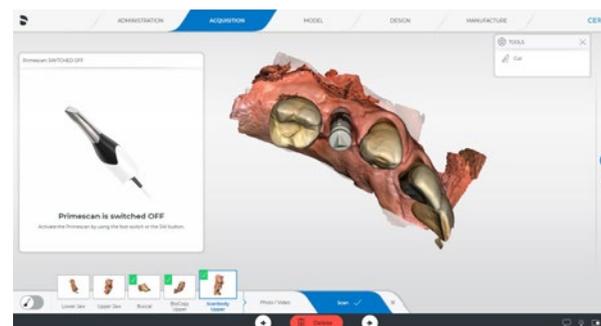
The old restoration is now removed and the current emergence profile is included in the "Upper jaw" image catalog.



The lugs of the scanbody and scanpost must match to ensure correct alignment.



The opposing jaw and the buccal bite are now recorded in the corresponding image catalogs of the CEREC Software.



The scanpost with attached scanbody is added to the image catalog "Scanbody Upper".

This completes the Acquisition phase. After manually saving the case, the Model phase begins.

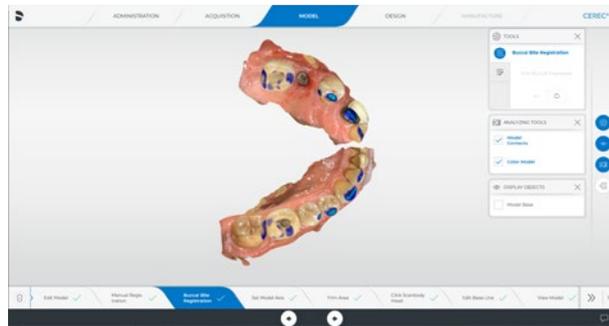
# Design

## Sequence in this case

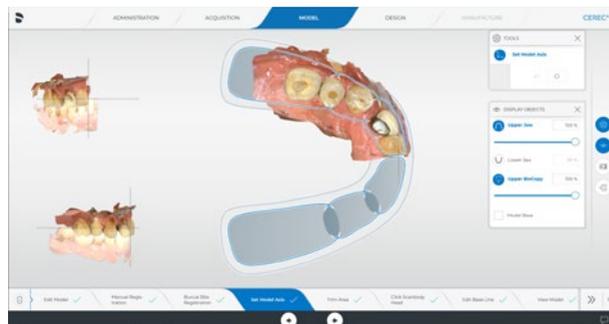
- 1 Reviewing the buccal bite registration
- 2 Control of the scanbody
- 3 Adjusting the baseline and emergence profile
- 4 Adjusting the proximal and occlusal contacts
- 5 Adjusting the dynamic occlusion

### 1 Reviewing the buccal bite registration

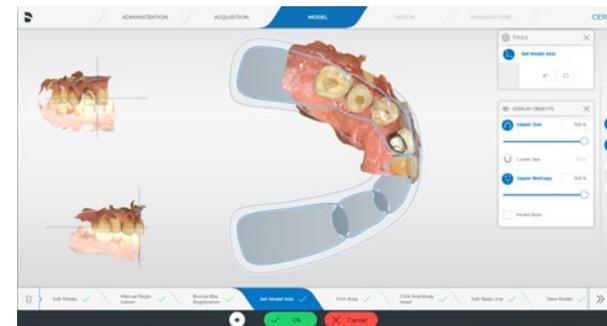
Check the designation of the upper and lower jaw and the position of the virtual occlusal contacts in the “Buccal bite registration” tab. If there are any deviations from the clinical situation, a new acquisition of the buccal bite registration should be considered.



In the “Set model axis” tab, there is a suboptimal positioning of the maxilla (distally too far). Due to the reduced dentition of the patient, a manual correction must be made here.

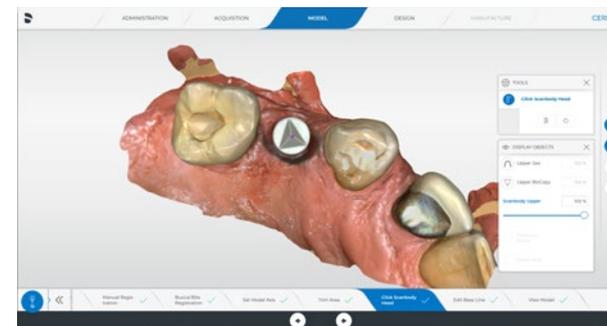


The corrected position of the maxilla determines the correct midline and positioning of the restoration in the premolar region.



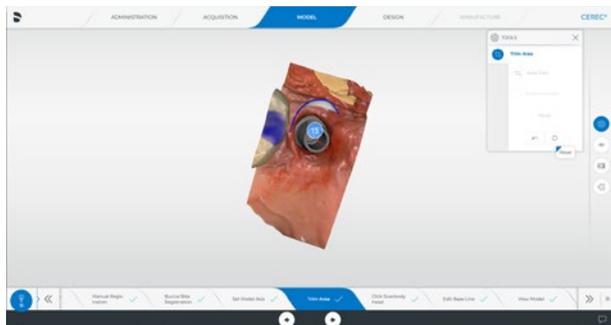
### 2 Control of the scanbody

With the “Click scanbody head” tool, confirm the correct position of the purple dot on the tip of the tetrahedron on the scanbody. If the tetrahedron is not marked correctly, you can correct the purple dot by double-clicking on the tip.

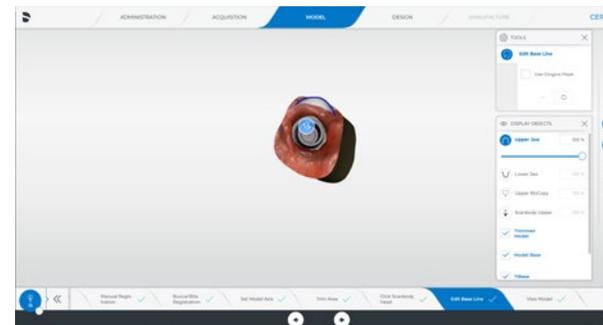


### 3 Adjusting the baseline and emergence profile

In the “Edit base line” tab, the subgingival portion of the new restoration can be defined. It is noticeable that the trimmed model (trimming is always automatic for implant restorations) contains a section of the distal tooth. This is due to the model axis being defined too far distally, which has already been corrected. However, the trimming should now also be corrected for the sake of clarity.



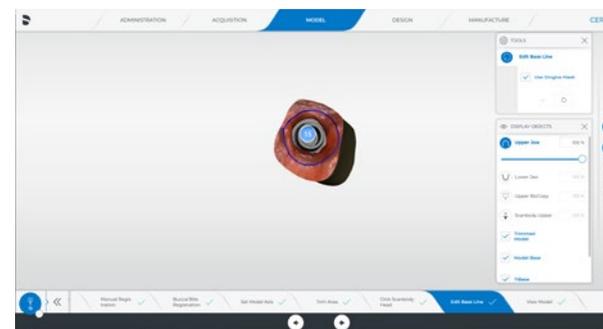
In the “Trim area” tab the model is reset. Then a new trim line can be drawn circularly around the implant.



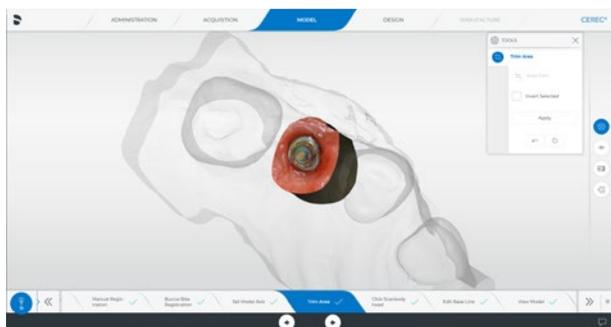
Since there is already a shaped gingiva from the previous restoration, tick the “Use gingiva mask” tool to transfer the existing emergence profile into the design of the new restoration.



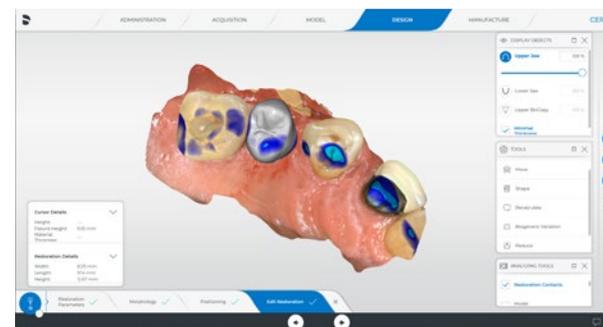
If the line intersects and is then terminated with a double-click, the surrounding model is hidden.



Adjusted baseline and use of the gingival mask.



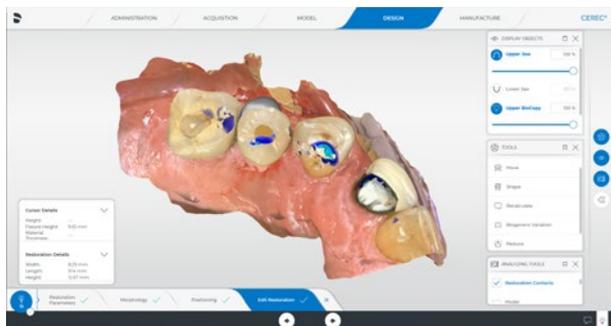
The “Edit base line” tab determines the design of the emergence profile. In this case, a generic emergence profile is proposed by the software.



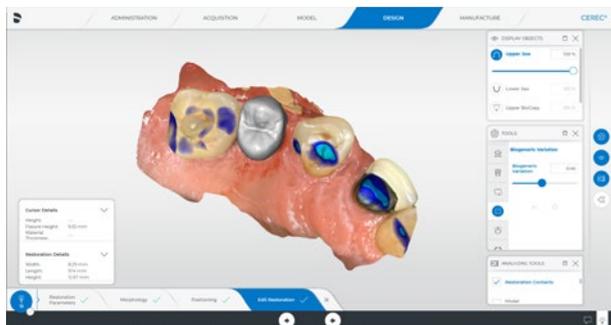
In the “Design” phase, the system proposal is calculated and displayed.

#### 4 Adjusting the proximal and occlusal contacts

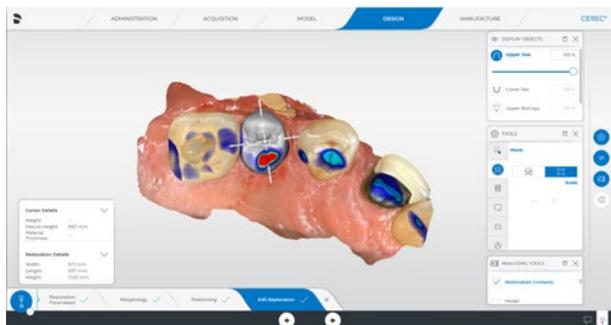
The previously scanned initial situation can be viewed via the “Display objects” window and thus be compared to the original restoration and the restoration proposal. In this case, various adjustments to the software proposal are necessary. The mesial proximal region is open and the outer surface of the restoration is shaped irregularly.



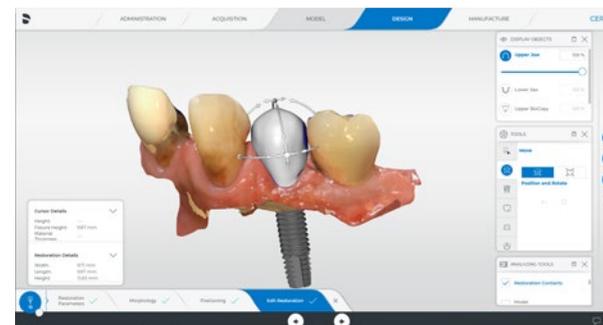
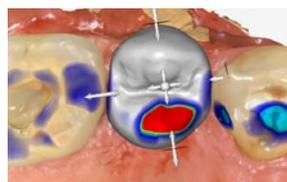
First, the morphology of the restoration is adjusted with the “Biogeneric variation” tool.



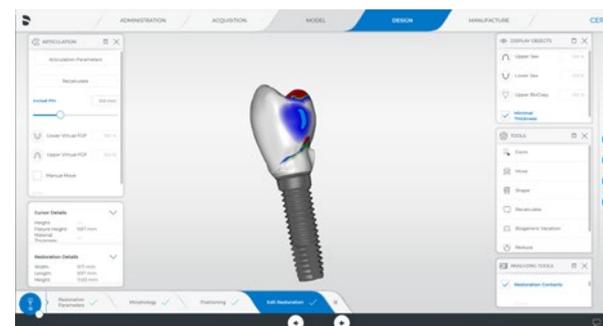
The size of the restoration is adjusted with the “Move - Scale” tool to close the mesial proximal region.



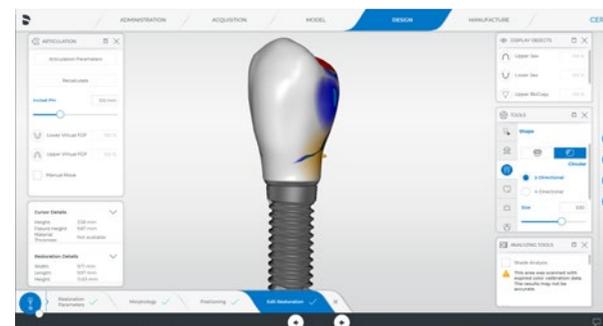
The restoration is now positioned in the occlusal direction to harmonize the cusp.

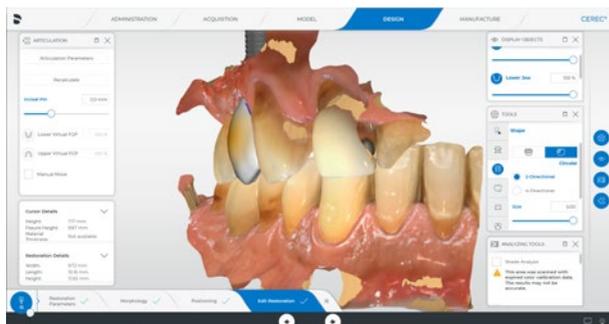


The outer contours are refined with the “Form - smooth” tool. It is important to repeatedly reposition the restoration with the “Move - Position and rotate” tool to check it from different angles.



In areas with too little emergence, build it up with the “Shape - Circular” tool. The approximal contacts are also adjusted in this phase. The same tool is used to adjust the buccal contour.



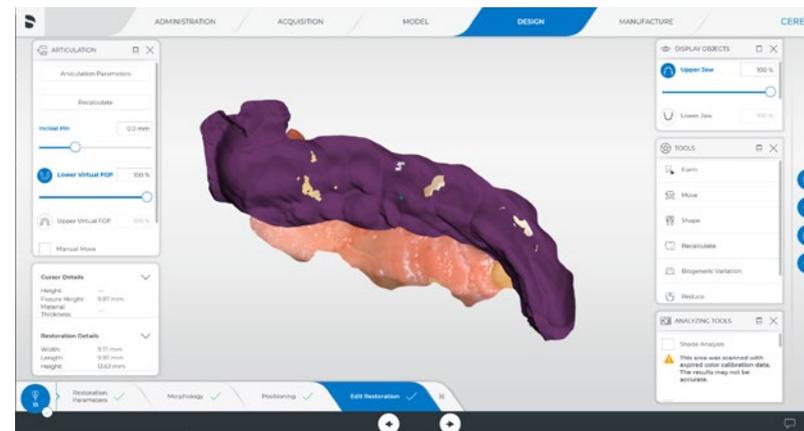
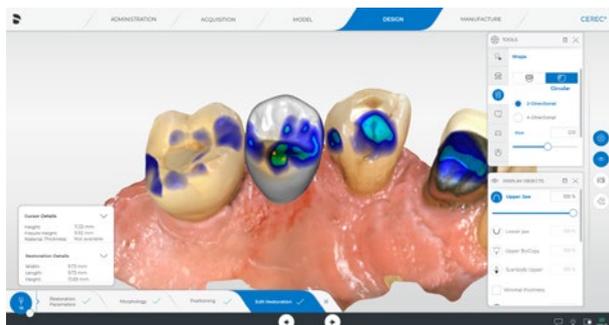
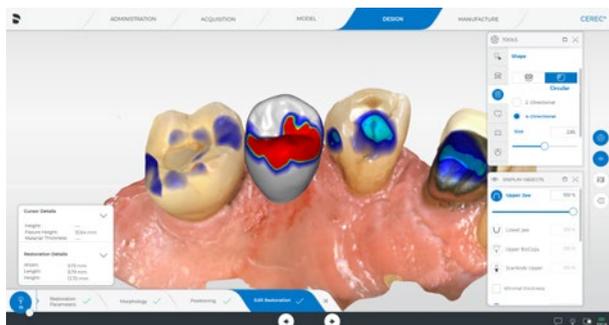


Now the adjustment of the static contacts takes place using the "Shape - Circular" tool.



### 5 Adjusting the dynamic occlusion

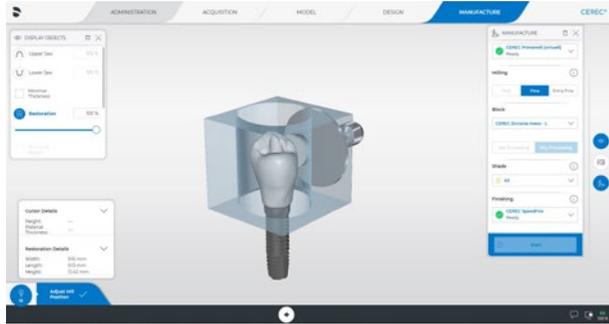
Now the dynamic contacts are reviewed. The virtual FGP of the opposing jaw is superimposed and the penetration of the restoration is checked. In this case the penetration of the buccal cusp tip is visible. This corresponds to the situation on the neighboring teeth and can therefore be left in place.



## Manufacture

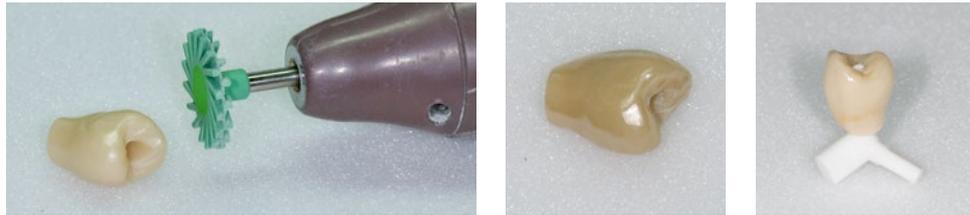
### Manufacturing preview

In the manufacturing preview, confirm the connection to the CEREC SpeedFire and select the shade of the restoration. This is necessary in order to transfer the correct sintering program to the CEREC SpeedFire.



## Finish

### Polish and glaze



After milling and sintering the restoration in the CEREC SpeedFire furnace, the restoration is polished to a high gloss. The restoration can now be customized with stains and glaze.



The abutment crown and titanium base are bonded with a composite cement (Ivoclar Vivadent's Hybrid Abutment cement in this case).

## Insertion

The completed restoration is inserted with the torque specified in the manufacturer's instructions.



Restoration in place



Cover with teflon tape



Close with composite and occlusion control



Lateral view of final situation

## Summary

With today's materials and the simplification of the treatment procedure with the CEREC system, it is becoming increasingly possible to tackle restorations in the anterior region, even with its especially high esthetic requirements. The design of the morphology in this area is particularly demanding, as the most important factor here is the symmetrical design of the restoration.

In addition, the factors of color, translucency and individual surface design are considered in order to match the restoration to the existing neighboring teeth, and to achieve the most harmonious overall appearance.

## Indications for anterior restorations with the CEREC system

The basic consideration here is the difference between direct restorative therapy and the fabrication of the final restoration in the dental laboratory. Today, a large number of clinical situations can be treated with direct composite materials. For example, the treatment of individual Class III, IV and V cavities is ideal. The CEREC system can be used for veneer and crown restorations. The design of individual anterior restorations in the maxilla is the most challenging. If you would like to approach this area, the restoration of a mandibular anterior tooth is a less precarious starting point.

The dentist's experience plays an important role here. As the number of completed restorations increases, the decision and the treatment process become increasingly easier.

An important advantage of the CEREC system is the ability to send the optical impression to the laboratory at any time and have the restoration fabricated there. The moment you feel that your own clinical skills are not sufficient to achieve satisfactory esthetics for the patient in the chairside workflow, you should choose this route and only fabricate the temporary restoration in the dental practice.

## Material selection

For anterior restorations, the esthetic properties of the CAD/CAM material are of paramount importance. These should be as close as possible to the optical properties of the neighboring teeth to enable good adaptation of the restoration. For this purpose, there is a wide selection of materials that differ from one another in color, translucency, opalescence, etc. The most important aspect is the esthetic properties of the restoration, which, however, is also the clinical limitation of chairside restorations in most cases. Depending on the clinical situation and the patient's wishes, it may be that only an individually layered restoration achieves the desired result.

### Clinical example: anterior crown with Vita Enamic® Multi A3

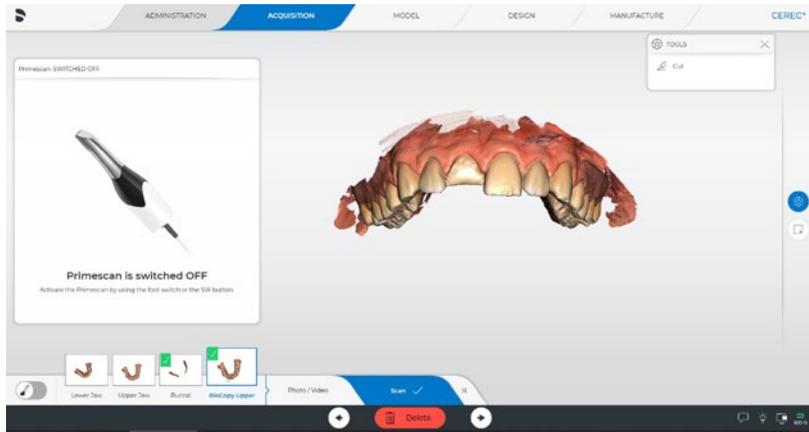


Initial situation

Final situation

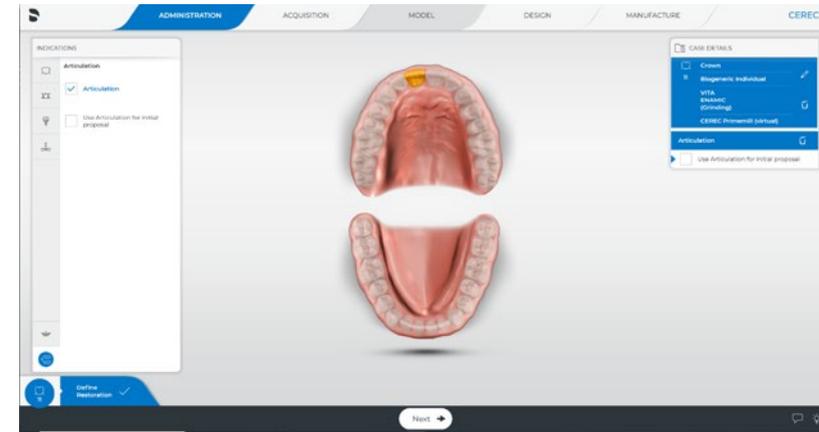
## Case selection

In the present case, the patient presented with a significant fracture of a pre-existing composite filling. Due to the extensive loss of substance, which reached the palatal part of the vital tooth, the fabrication of a crown as a definitive restoration was discussed.



Scan of initial situation

In principle, a scan of the initial situation should be made for all anterior restorations. This will later help in the design of the new restoration. The scan is also a good means of communication with the patient.



Administration of restoration and activation of virtual articulation

In the Administration phase of the CEREC Software, the design mode “Biogeneric individual” was selected and Vita Enamic® was chosen as the material. The material has a suitable shade for this case. In addition, thinly prepared marginal areas without chippings in the marginal area can be ground very well with this material. The activation of virtual articulation is advantageous for the design, as the restoration can be designed in such a way that only minimal corrections are required intraorally. This minimizes the risk of shape changes, especially in the incisal area of the final restoration.

## Scan

### Preparation

The preparation is carried out in compliance with the required material thickness specified by the manufacturer. The preparation margin is drawn epigingivally in the buccal region and slightly supragingivally in the palatal region.

Before fine preparation, the gingiva is displaced with a retraction cord and thus protected from injury.



Preparation of buccal area with epigingival preparation margin

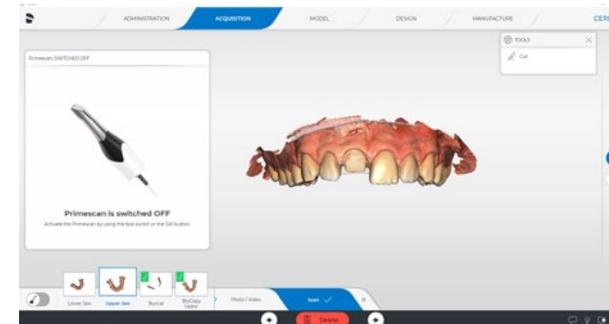


Occlusal preparation of with retraction cord already applied

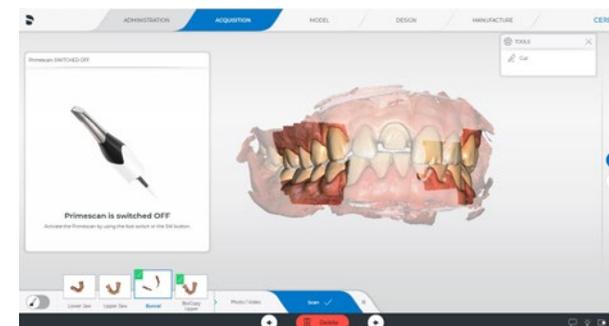
### Impression

A full-arch impression was taken in this case. This is not absolutely necessary, although it is advisable to always take an impression from premolar to premolar for anterior tooth restorations.

This ensures that the 3D model is large enough for good morphology matching and that the virtual articulation movement paths can be optimally calculated in all directions. In addition, bite registration can now be performed in the canine/premolar region. Make sure that the correct scanning technique is used for the jaw scan. Ensure that all surfaces of the preparation and neighboring teeth are completely scanned. Always take a bilateral bite registration, to define the designations of the upper and lower jaw as accurately as possible.



Scanning the preparation



Bilateral buccal bite registration in the canine-premolar region

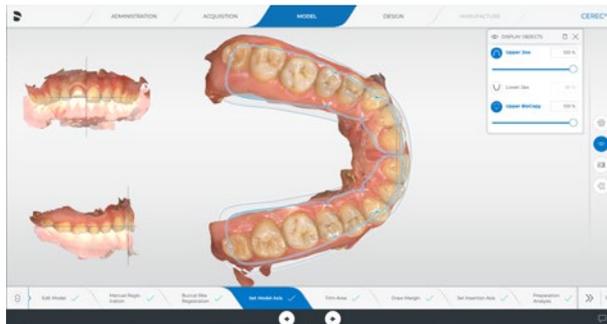
## Design

### Sequence in this case

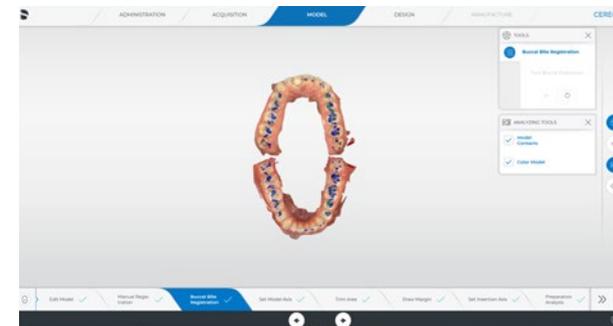
- 1** Reviewing the models
- 2** Adjusting the preparation margin
- 3** Adjusting the insertion axis
- 4** Adjusting the morphology and positioning
- 5** Adjusting the static occlusion
- 6** Adjusting the dynamic occlusion

#### 1 Reviewing the models

After model calculation, the digital models are checked for artifacts and completeness. It is then important to assess the model axis and the virtual occlusion. Ensure that the mandibular model is positioned correctly in the virtual articulator. The virtual occlusal contacts should correspond to those in the mouth. If there are large deviations, the buccal registration should be inspected and the models rechecked for artifacts. An incorrect scanning technique can also lead to distortion in the 3D model and thus falsify the occlusal contacts.



Control of the model axis



Virtual occlusion control

#### 2 Adjusting the preparation margin

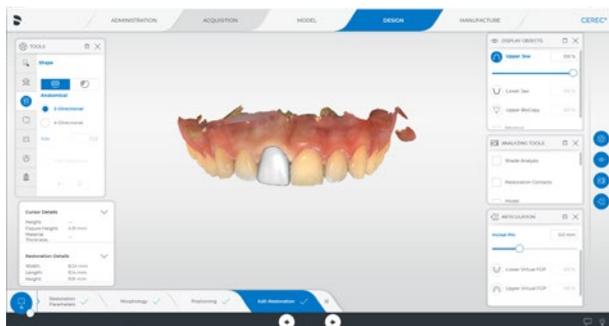
The preparation margin must often be corrected manually for epigingival and subgingival areas. To do this, zoom the model to the maximum and review the margin carefully from all sides. To do this, rotate the model frequently to use the reflections on the model to detect the preparation margin.

#### 3 Adjusting the insertion axis

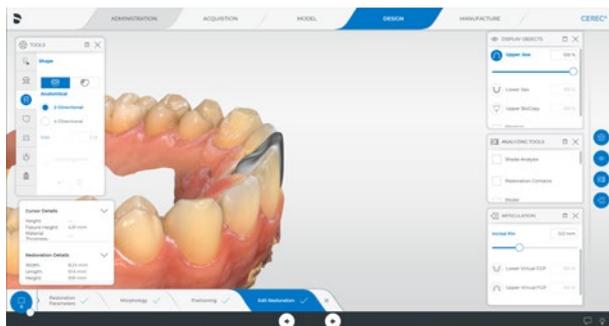
Review the insertion axis. Correct the alignment of the preparation, if necessary, ensuring there are no undercuts in the preparation area and the proximal areas are evenly spaced mesially and distally.

#### 4 Adjusting the morphology and positioning

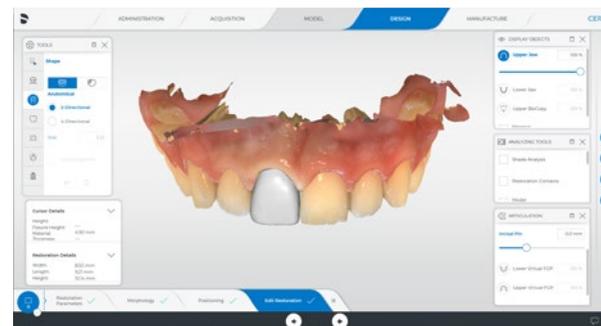
After calculating the initial proposal, the first review of the morphology is particularly important; shape, size, alignment in the dental arch and occlusal contacts. Inspect all these parameters before starting adjustments.



Buccal view of initial proposal



Lateral view of initial proposal



Apply "Biogeneric variation"



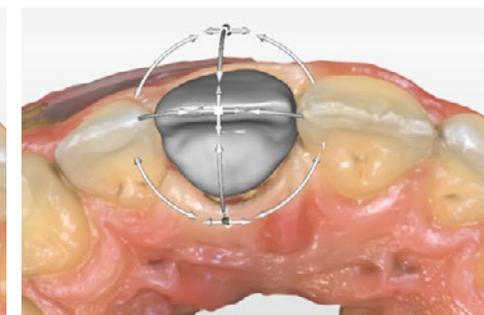
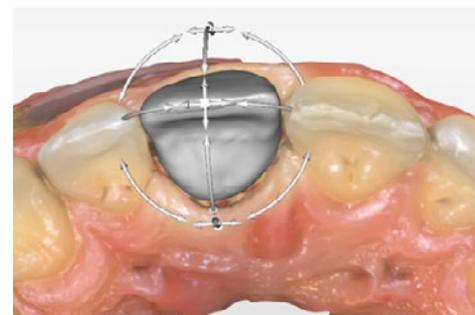
Initial proposal variation



Proposal after biogeneric

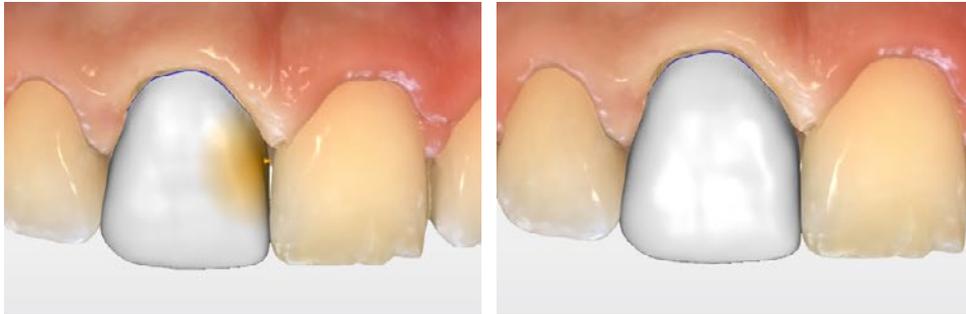
Now the position and size of the restoration in the dental arch is reviewed and corrected using the "Move - Position and rotate" and "Move - Scale" tools. When adjusting position and rotation, ensure the alignment of the incisal edge in the dental arch.

A tool frequently used in the anterior region is "Biogeneric variation". This allows the basic morphological shape of the restoration to be changed. It can be used to generate more structured initial proposals that require fewer subsequent adjustments. However, all previous adjustments are lost when this tool is used, so therefore, it must be applied first. In this case, the basic shape of the restoration is changed to a slightly more rounded incisal edge. In doing so, use the morphology of the lateral incisors, as a guide, since the original incisal edge morphology is still visible here.



Widening the restoration with the "Move - Scale" tool

The restoration is now shaped with the “Shape - Circular” tool. The marginal ridges in the buccal surface are particularly important for the appearance of the restoration. These are adapted to the contralateral tooth. In the present case, the marginal ridges in the lower third of the tooth are made somewhat more bulbous. In the distal transition to the incisal edge, the angle of the tooth is adapted.

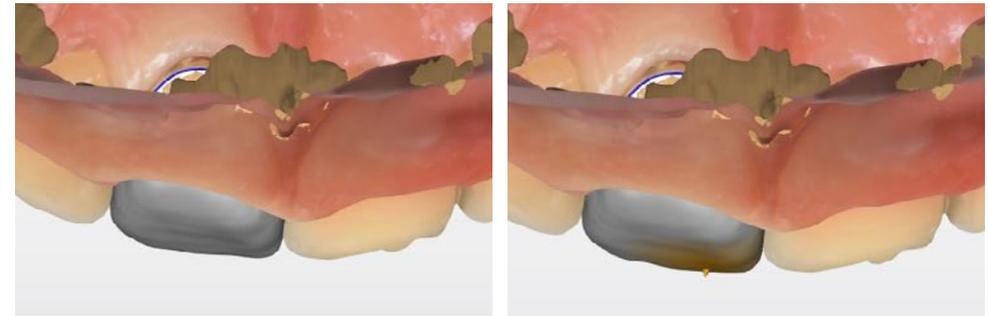


Adjusting the edge bars with the “Shape - Circular” tool



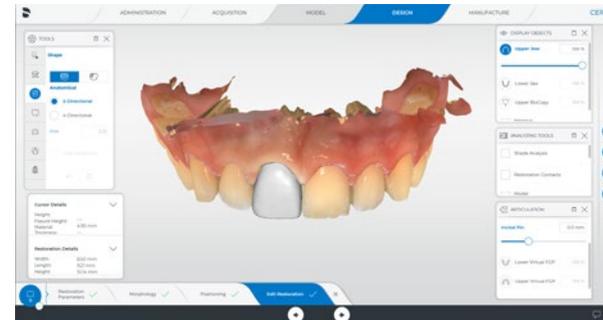
Optimize the distal incisal angle

Now adapt the buccal surface of the restoration. To do this, the restoration is best viewed from a cervical view and harmonize the buccal contour.

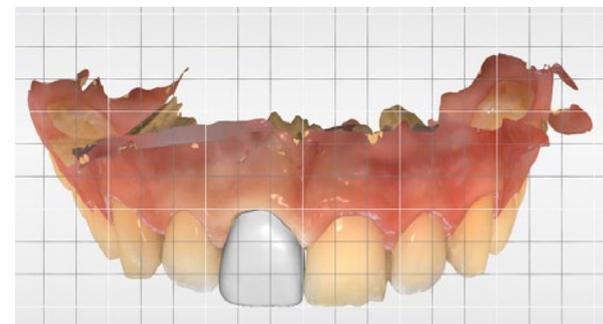


Fitting the buccal contour from a cervical view

Now review the length of the restoration. A grid can be overlaid for this purpose (“Analyzing tools - Grid mode”), as this allows a simple comparison of the incisal edge length of the restoration and the adjacent tooth.

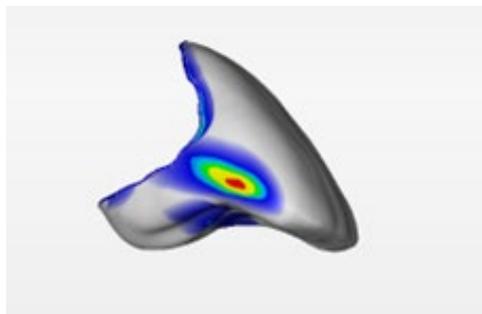


Buccal view to assess the incisal edge length

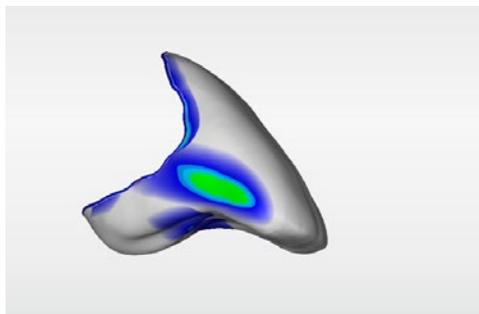


Activate the grid pattern to facilitate evaluation

Now the approximal contacts are adjusted. With the neighboring teeth hidden, assess the contact thickness and shape. The aim is to achieve a flat contact in the middle and upper third of the tooth with a green penetration thickness. In this case, the contact thickness must only be slightly reduced with the “Form - Smooth” tool.



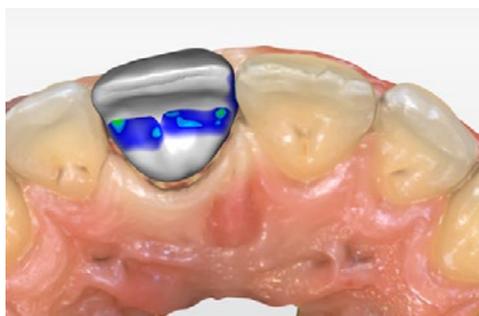
Display of proximal contacts



Adjusted contact strength

### 5 Adjusting the static occlusion

After adjusting the buccal contour, the contact points on the palatal side are reviewed and adjusted. Depending on the extent of the adjustments, the “Shaping - Circular” or the “Form - Remove” tools can be used.



Adjusting the palatal contacts with the “Shape - Circular” tool

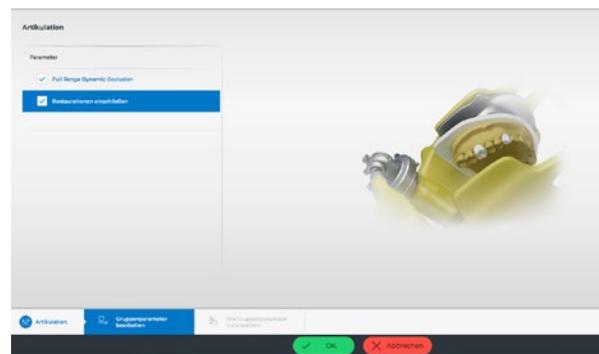
### 6 Adjusting the dynamic occlusion

Now the adjustment of the dynamic contacts takes place. For this purpose, the virtual FGP calculated by the software is displayed. The restoration penetrates this FGP very strongly.



Virtual FGP with restoration penetration

Restorations in the anterior region influence the movement path itself. The palatal surface of the restoration contacts the mandibular anterior teeth during protrusion and laterotrusion movements and “leads” in the process. To represent this movement, the virtual FGP must be calculated again, this time including the restoration.



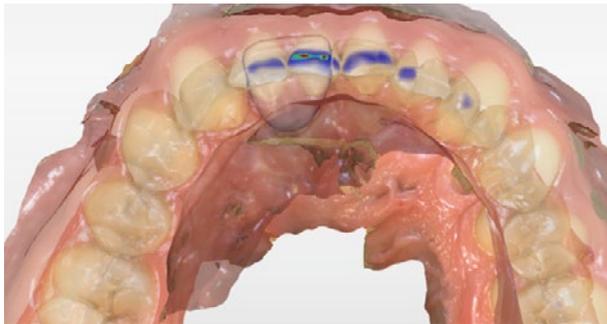
Recalculating the virtual FGP with “Include restorations” ticked

The current movement path now correctly displays the guide surfaces over the new restoration and can now be used for fine adjustment.

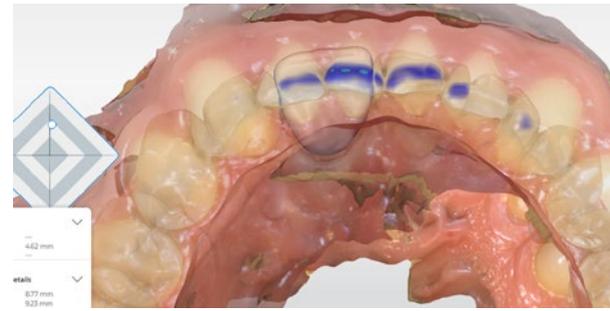


Virtual FGP with guide surfaces over the new restoration

The FGP shows the surfaces which contact the opposing jaw during dynamic occlusion. The strength is not displayed. If a defined guidance for jaw movements is to be constructed, use the “Manual move” tool. Analogous to a mechanical articulator, the mandible can be moved manually and the contacts at each movement point assessed and adjusted accordingly. For the local adjustment of the contact strength, the “Form - Remove” tool is useful.

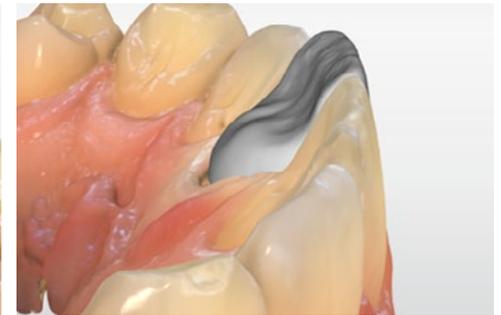


Manual movement with strong contact in protrusion

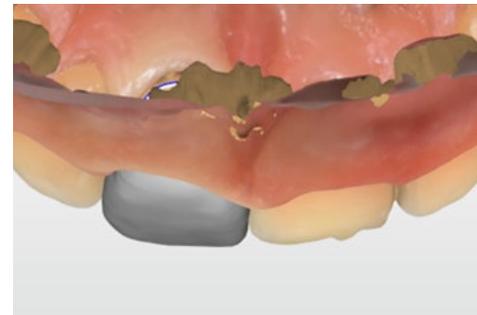


Adjusted contact strength of the protrusion

After adjusting the dynamic contact strength, the restoration is checked again from all sides. Ensure there are no sharp transitions or convex areas, especially in the area of the preparation margin, and correct such areas with “Form - Smooth” or “Form - Add”.



Check from all sides



## Manufacture

### Manufacturing preview

Whenever possible, use the “Extra fine” grinding mode in the anterior region. The use of the finer instruments in the second grinding cycle enables the small morphological details of the restoration to be rendered and leads to a better result. However, the grinding time does increase. If possible, place the sprue on the palatal side of the restoration.

## Finish

### Insertion

The restoration is placed using a composite cement and the classic adhesive technique (Variolink® Esthetic DC, Ivoclar Vivadent). The advantage of this method is that the marginal seal is very good and the risk of discoloration is very low. In addition, the shade of the composite cement can positively influence the shade of the final restoration. In this case, the restoration is polished to a high gloss after placement using rubber polishers (Vita Enamic® Polishing Set clinical, Vita Zahnfabrik).



Restoration directly after insertion



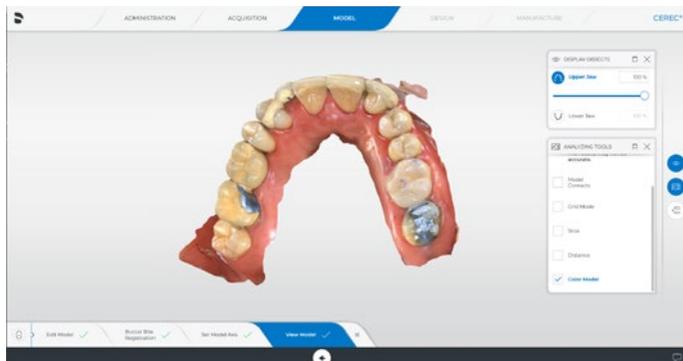
Restoration 2 weeks after insertion

## Summary

For bridge restorations with the CEREC system, users can now choose from a variety of material classes for the restoration of gap situations in the entire jaw region, enabling both temporary and definitive restorations. The optimal integration of all steps, from highly accurate intraoral scanning with CEREC Primescan, through restorative design with a high degree of automation in the CEREC Software, to the precise and rapid fabrication of the workpiece by milling or grinding in the CEREC Primemill, and the control of the CEREC SpeedFire, interlock ideally in order to treat the patient in a single appointment.

### Indications for bridge restorations

With the materials available today in the CEREC system, it is possible to restore single-tooth gaps in the anterior and posterior regions. Together with the patient, the clinician must choose between an implant restoration and a bridge restoration. Factors such as the clinical situation of the neighboring teeth, the soft tissue situation, the amount of bone available, the age of the patient, the cost framework, and the duration of treatment are all factors to consider. Only in rare cases is it necessary to differentiate between a removable restoration and a single tooth gap. Of course, leaving such a clinical situation with stable occlusal conditions, sufficient masticatory units, and the individual well-being of the patient must always be discussed.



Clinical scan prior to treatment

During a regular check-up, the situation presented itself that the extension bridge from 17 to 16 was clinically insufficient in the 1st quadrant. In addition to a fracture in the veneer which did not bother the patient, there was increased mobility of tooth 17, secondary caries at the crown margin and pain during occlusal loading. After discussion with the patient, the removal of the bridge and the long-term temporary restoration of tooth 17 was decided upon as therapy, to assess the prognosis of this tooth as an abutment tooth for the new bridge from 17 to 15. The temporary restoration was fabricated from a resin material (Vita CAD-temp, Vita Zahnfabrik) using the CEREC system. As a definitive restoration the patient requested a new bridge because they had been satisfied with the previous bridge for a long time.

### Material selection

There are 3 material classes to choose from for bridge restorations with the CEREC system.

#### 1. Synthetic materials

(e.g. Vita CadTemp, Vita Zahnfabrik)

This group of materials is suitable for temporary restorations (up to 12 months).

This allows even larger gap situations to be temporarily restored (up to 55 mm restoration length) as part of the digital workflow.

This material can be used for all provisional restorations. A great advantage compared to many other materials is the high mechanical stability and the perfect surface quality for direct fabrication.

#### 2. Glass ceramic

(IPS e.max CAD, Ivoclar Vivadent)

This material is approved as a permanent restoration for three-unit bridges in the anterior to premolar region.

#### 3. Zirconia (e.g. CEREC® MTL™ Zirconia (Dentsply Sirona), IPS e.max ZirCAD (Ivoclar Vivadent), Katana™ Zirconia Blocks (Kuraray Noritake)).

This material group is approved for permanent restorations with three-unit bridges in the entire jaw. For chairside use, the sintering of the restoration should ideally be carried out with the CEREC SpeedFire.

### Clinical example: Zirconia bridge (Katana™ Zirconia STML A3)



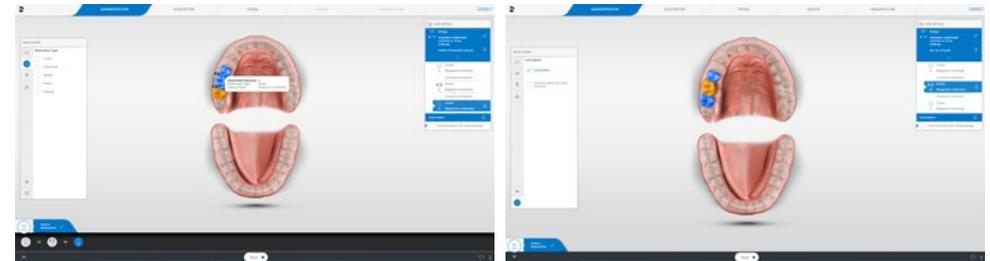
Initial situation



Final situation

## Case selection

In this case, a bridge restoration with the “Biogeneric individual” design mode was selected. The “Anatomic” type of connector was selected. This type of connector was considered the most suitable in this case, since the connector can be optimally designed as a separate element during construction. For intersecting connectors, the size of the proximal contact corresponds to the size of the connector. The use of zirconium oxide as a monolithic restoration in this situation has the advantage that the preparation of the premolar in particular can be carried out in a way that is very gentle on the substance. The clinical situation is favorable for the use of zirconium oxide since other fixed restorations with rather opaque ceramic materials are already available and the natural tooth structure is not too translucent. This must be considered before preparation. In the case of higher esthetic requirements, partial or complete veneering of the restoration can of course also be carried out in the dental laboratory, although this requires a correspondingly more invasive preparation. The optimal localization for chairside zirconium oxide materials is in the maxillary molar region followed by the mandibular molar region in patients with existing restorations and little translucent enamel.



Administration

1. Design mode
2. Material
3. Select tooth
4. Activate the virtual articulation

Virtual articulation is of great advantage when designing zirconium oxide restorations, as the occlusal contacts can only be adjusted after sintering and additionally minimizes reworking and thus the overall time required.

## Scan

### Preparation

Preparation is performed under local anesthesia and follows the general preparation guidelines (shoulder or chamfer preparation, rounded inner edges, no acute inner angles, sufficient layer thickness according to manufacturer's instructions).



Initial situation with full crown on the second molar and unprepared second premolar

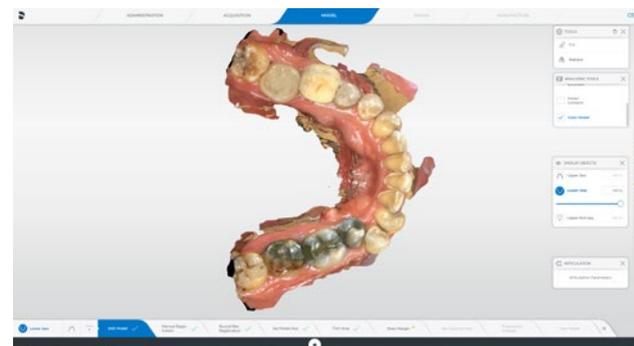


Fine preparation, finishing, minimal substance removal of the premolar

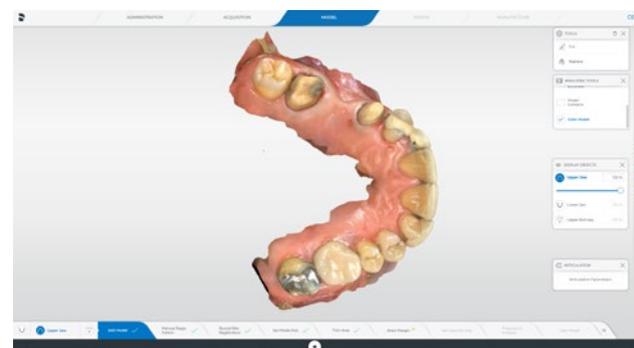
### Impression

A full-arch impression was taken in this case. Adherence to the optimal scanning strategy in the maxilla and mandible is decisive here. Scanning the entire anterior region and the contralateral support zone has the advantage that the virtual articulation can be optimally calculated in all directions. Furthermore, performing a bilateral buccal registration ensures the bite is optimally transferred.

Hemostasis using retraction sutures and astringents is necessary to accurately capture the critical areas of the preparation margin. If hemostasis is not possible, a longer-term provisional phase to create optimal soft tissue conditions should be considered. Only then should the definitive impression be taken.



Whole mandible scan



Preoperative scan for patient communication



Buccal bite registration

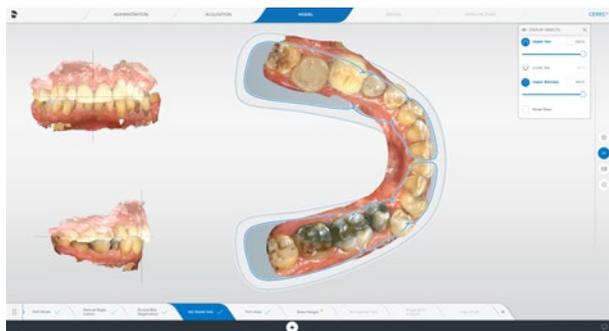
# Design

## Sequence in this case

- 1 Reviewing the model axis
- 2 Adjusting preparation margin
- 3 Analysis of the preparation
- 4 Adjusting the insertion axis
- 5 Adjusting the morphology and positioning
- 6 Adjusting the bridge elements (position/rotation, anatomical or individual)
- 7 Adjusting the pontic baseline
- 8 Adjusting the proximal contacts (flat green contact strength)
- 9 Adjusting the static occlusion (dotted green contacts)
- 10 Adjusting the dynamic occlusion (no penetration to the FGP of the opposing jaw, guide surfaces if required)
- 11 Adjusting the connector cross-sections
- 12 Reviewing the entire outer surface (ideally without displaying contacts)

### 1 Reviewing the model axis

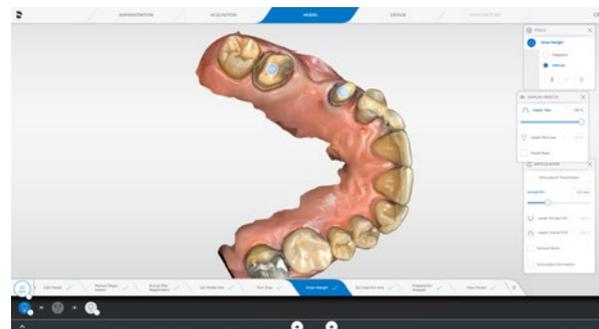
Inspect the position of the model in the virtual articulator. Correct alignment is important for an optimal restoration proposal, but also for calculating the movement paths of the virtual articulator.



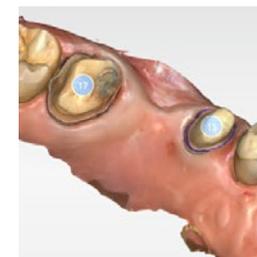
Review and adjust of the model axis

### 2 Adjusting the preparation margin

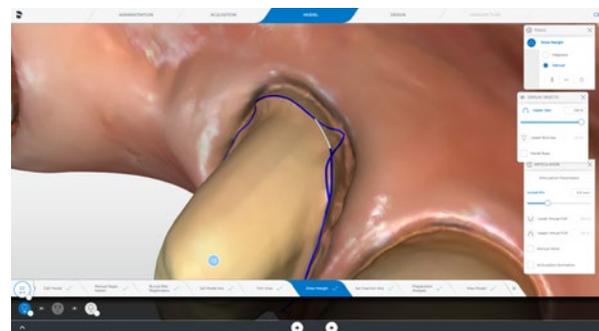
Review the preparation margin proposal. Zoom into the model as much as possible to obtain an optimal resolution of the preparation margin. Correct the preparation margin if necessary. In the case of extensive corrections, it may sometimes be easier to delete the proposal and redraw the entire preparation margin. If necessary, trim the model using the “Trim area” tab.



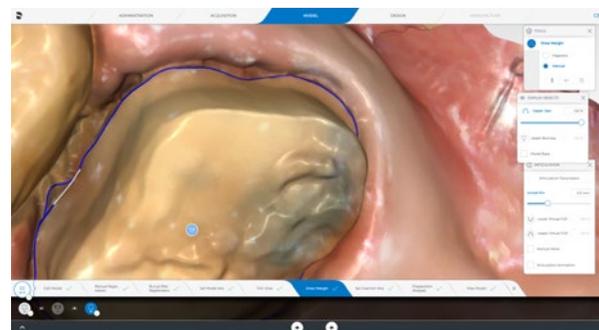
Reviewing the preparation margin



Adjusting the preparation margin on the mesial abutment



Manual editing of the preparation margin on the distal abutment

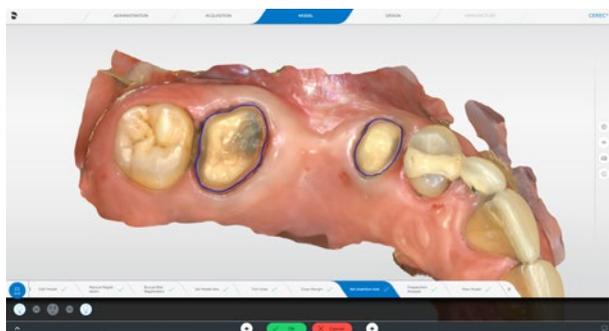


### 3 Analysis of the preparation

This analysis is a helpful tool for controlling the preparation. The most important aspect to consider is the distance to the antagonist. The occlusal reduction can be checked in this way.

### 4 Adjusting the insertion axis

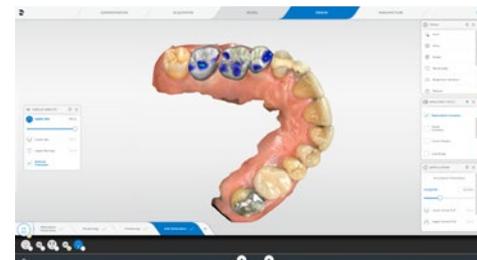
Review the insertion axis of the preparation. It should be aligned as parallel as possible to the tooth axis. Make sure that any undercuts do not protrude beyond the preparation margin. The neighboring teeth should also not cover the preparation margin. Otherwise, problems may arise when inserting the milled restoration. Ideally, the distance from the preparation margin to the neighboring tooth should be evenly spaced mesially and distally.



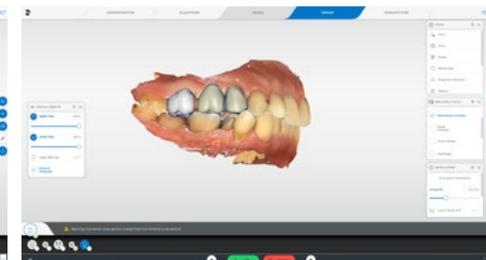
Checking the insertion axis

### 5 Adjusting the morphology and positioning

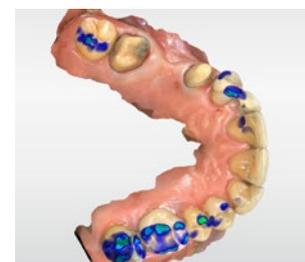
Check the initial proposal of the restoration. Ensure the correct alignment of the restoration in the dental arch, relation to the opposing jaw, morphology and position of the occlusal contacts. For bridge restorations, the size of the connector cross-sections is also important. These must be larger than 16 mm<sup>2</sup> for zirconium oxide in the posterior region. Adjust according to the “from large to small” principle.



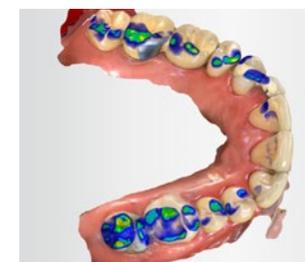
Control of the initial proposal



Position and location in the dental arch



Control of virtual contacts

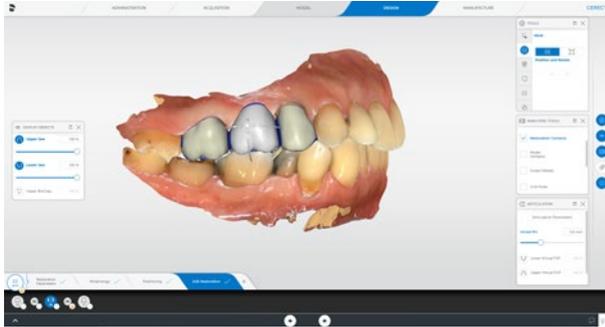


Checking the connector cross-sections



Comparison to initial situation

## 6 Adjusting the bridge elements



Positioning the bridge elements with the “Move - Position and rotate” tool



The pontic can still be optimized here. It is shifted orally and occlusally.



Adjusting the outer shape with “Shape - Circular” tool

The “Shape - Circular” tool can be used to adjust the contours and the static occlusal contacts. This reduces excessive contacts locally and builds up missing contacts. Pay attention to the position and number of contact points.

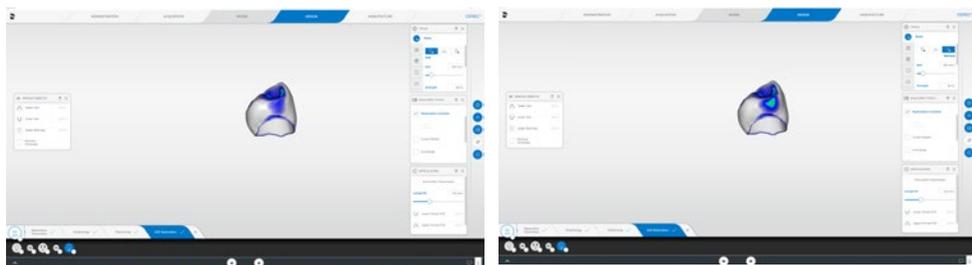


### 7 Adjusting the pontic baseline

The contact surface of the pontic often needs to be optimized. Depending on the clinical requirements, a point or flat-shaped rest can be created on the gingiva. To do this, activate the “Edit base line” tool and manually draw in a new baseline in the same way as if correcting a preparation margin.

### 8 Adjusting the proximal contacts

The contacts of the individual bridge elements to each other and the contacts to the neighboring teeth are shown below as green contact surfaces. Depending on whether you need to build up or level down, use “Shape - Circular” or “Form” tools.



### 9 Adjusting the static occlusion

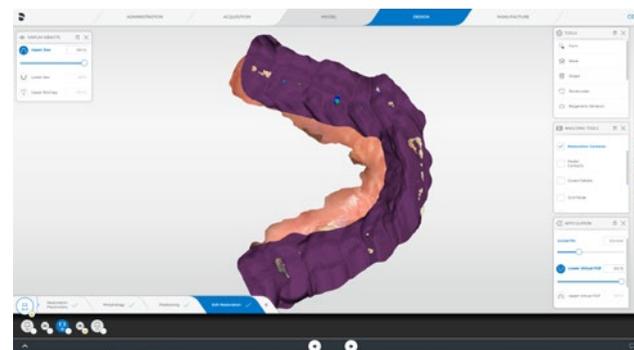
Fine-tune the static contacts to minimal green contact points with the “Form” tool.



### 10 Adjusting the dynamic occlusion

The dynamic contacts are displayed by superimposing the virtual FGP. Penetrations in the FGP represent areas that come into contact with the restoration during the movement of the opposing jaw. Depending on the clinical situation, this may be desired (e.g. to build guidance surfaces) or not.

In this particular case, the design of a guidance surface on the premolar as a grouped guide would be beneficial because the canine is missing. Other penetrations of the FGP, which do not represent static contacts, are eliminated.



Reduction of palatal FGP penetration

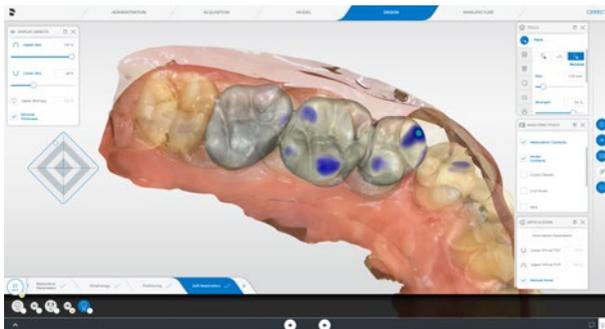


Transparent display of the FGP for better control

With the “Manual move” tool, the opposing jaw can be moved in all directions analogously to a physical articulator, thereby allowing, changes in dynamic contacts to be visualized.



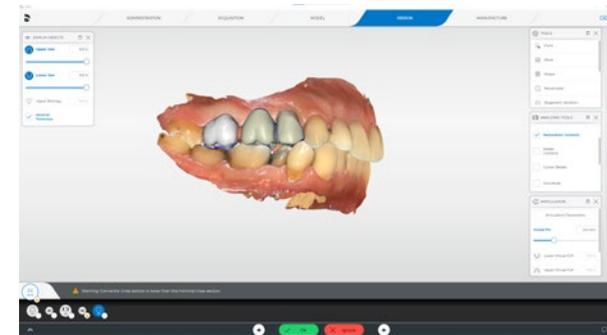
Activate the tool “Manual move”. The lower jaw is set transparently to make the contacts visible.



Movement of the lower jaw via the virtual compass on the left.

The dynamic contacts are displayed at the respective position depending on the lower jaw position. The strength of the dynamic contacts can also be adjusted here.

### 11 Adjusting the connector cross-sections



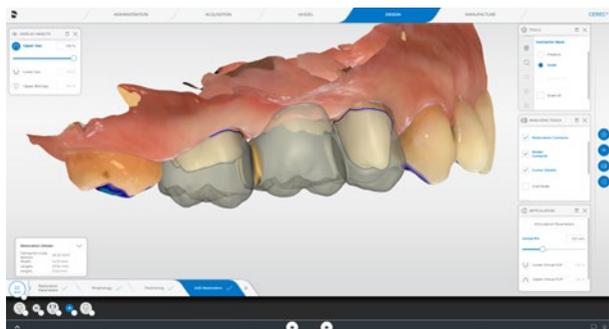
Examine the connectors. If the connection between the left abutment and the pontic is shown in orange, the cross-sectional area is insufficient.



Click on the connector and the details of the cross-section are displayed in the “Restoration details” window.



The “Connector move – Scale” tool can be used to adjust the size of the connector.



As soon as the minimum cross-sectional area is reached, the connector is no longer displayed in orange.



Using the “Connector move – Position” tool, the connector can now be moved cervically and orally.

This achieves maximal optical segmentation in the visible area of the restoration.

## 12 Reviewing the entire outer surface

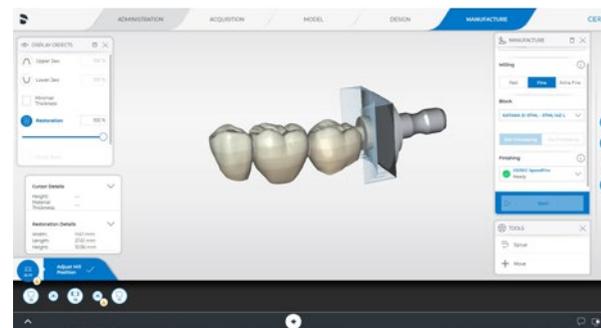
Now activate all elements of the bridge via the “Group” menu. Then you can hide the model and see the entire bridge reconstruction on the screen. Assess the contact points and morphology from all sides. Minor adjustments can still be made here with the “Form” tools. Then proceed to the “Manufacture” phase.



## Manufacture

### Manufacturing preview

Review the position of the restoration in the block. If necessary, position the restoration more in the cervical (yellow) or incisal (white) area. With this type of restoration, the sprue should always be placed in the largest proximal region due to its size. Check the connection to the CEREC SpeedFire furnace. The furnace order is automatically transferred after the milling process and requires the sintering furnace to be switched on and connected to the network. Select the correct color in the selection menu and the preferred milling mode. The “gentler” milling modes “Fine” and “Extra fine” (only available with CEREC Primemill), require minimal manual touch ups.



Manufacturing preview

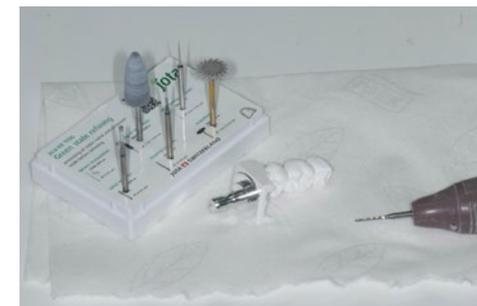
# Finish

## Sintering

After the milling process, the restoration is cleaned with compressed air or a brush. **Important: zirconium oxide dust is a hazardous substance and requires extraction with a vacuum.** Now the restoration can be separated from the remaining block. Use a narrow rotary instrument, preferably with a high speed and little contact pressure. Hold the block with the restoration over a soft surface. This will prevent chipping, if the restoration falls off the block. Clean the sprue separation area with a coarse rubber polisher. You can smooth the surface further with a fine rubber polisher and very little pressure. However, leave out the approximal surfaces, as it is not possible to check the fit until after sintering. Load the restoration with the occlusal surface facing downwards in the CEREC SpeedFire. Select the restoration in the display and start the sintering program.



Cleaning the restoration with a brush or compressed air



Separating the restoration from the remaining block



Separated restoration



Careful smoothing/polishing of the outer contours



Place the restoration with the occlusal surface down on the firing tray



Finished sintered crown, ready for try-in

### Try-in

After sintering, you can try in the restoration. Check the marginal fit, the shape, the approximal and occlusal contacts. Correct these if necessary.



Try-in of the sintered restoration



### Polish and glaze

The restoration is finished by means of polishing and glazing. The polish is important to create a homogeneous surface. In this case, color individualization is performed, which is only possible with stains and a ceramic glaze for long-term stability.



Color characterization and glaze of the restoration



## Cementation

Depending on the preparation's geometry (stump height and taper), conventional or self-adhesive cementation can be used.

Self-adhesive cementation with RelyX™ Unicem® (3M) is used here. The inner surface of the restoration is cleaned mechanically by sandblasting and silicating with CoJet™ (3M) abrasive at 1.5 bar at a distance of approximately 10 mm. Subsequently the inner surface is silanized with a universal primer with MDP monomer (e.g. Monobond Plus®, Ivoclar Vivadent). The stump surface is cleaned and any enamel is etched with phosphoric acid (30 seconds). The luting cement is applied to the crown and evenly distributed. The restoration is placed on the stump. Excess can be cured briefly and then removed with a probe scaler. The self-adhesive cement is both light and chemically cured.

Carefully control for excess cement at the margin and review the occlusion. If you have administered an anesthetic, inform the patient that the practice should be informed immediately if any interfering contacts are noticed. It is recommended to check the restoration after 1-2 weeks for reevaluation.

Before any contact with the patient, it must be ensured that all materials, aids and restorations used have been cleaned, disinfected and, if necessary, sterilized in accordance with the manufacturer's instructions. Furthermore, all local and national guidelines for post-processing must be followed.



Final situation after 2 weeks in situ



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