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Reprint

Bar with MK1 attachment
A streamlined production process for a successful bar-supported restoration

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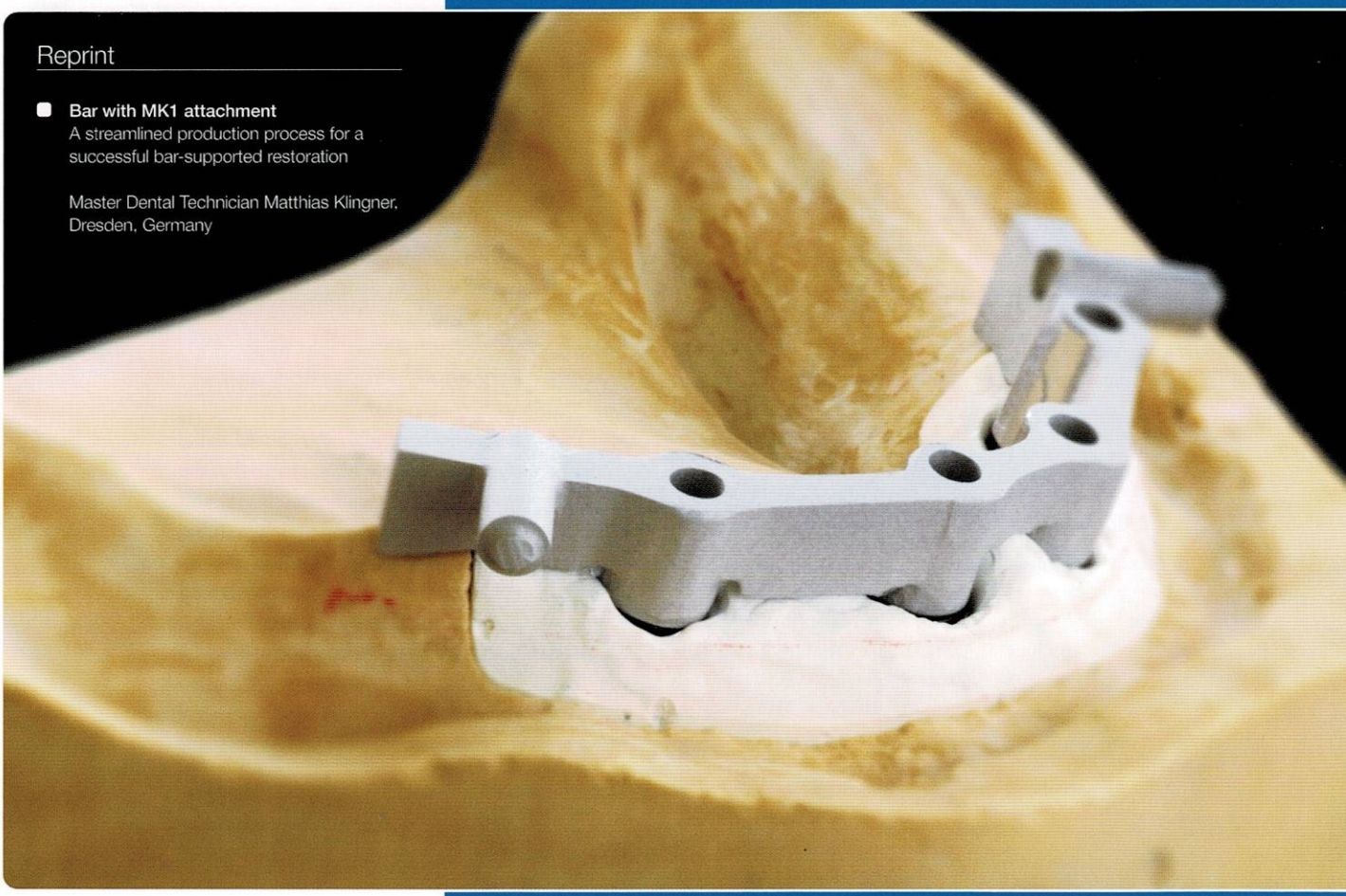

Presented by

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A streamlined production process for a successful bar-supported restoration

Bar with MK1 attachment

Matthias Klingner, MDT, Dresden, Germany

How can using the Ceramill Motion 2 be reconciled with the horizontal drilling required for the MK1 latch slots? Not at all? Should we go back to physical models and to casting bars? Probably not. – After discussing the various pros and cons with colleagues at great length, master dental technician Matthias Klingner found the solution for this problem. He describes it in his own words on the following pages.

Category

Product-related study

The patient, a man leading a very active life, had been wearing complete dentures for many years. His dental prostheses were inadequate by today's standards in terms of aesthetics, vertical dimensions, occlusion, retention, and material from the patient's as well the professional's point of view. Now that the patient had retired from his job, he found the time to address this problem. Denture retention in the lower jaw was his major concern. After extensive consultations, the patient decided on a retrievable mandibular prosthesis on four implants.

The patient's more than adequate motor skills allowed the dental technician much freedom in the planning of the superstructure. Taking a long-term perspective, we opted for an easy-to-use bar-retained version with a MK1 latch attachment. Before the prosthetic steps proper, we had to revisit the occlusion and the patient's aesthetic expectations. Only limited modifications could be made to the old mandibular denture. In the upper jaw, we simply produced a splint with integrated anterior teeth. With this low-cost temporary rehabilitation, the time it took to place the implants and allow them to heal passed without significant problems to the patient.

Procedure: Preparatory steps

Before the bar could be produced, some preparations were necessary so that the result would be fully functional and everything would end up where it belonged:

- Conventional drilling template, based on a duplicate of the upper denture, followed by implant placement

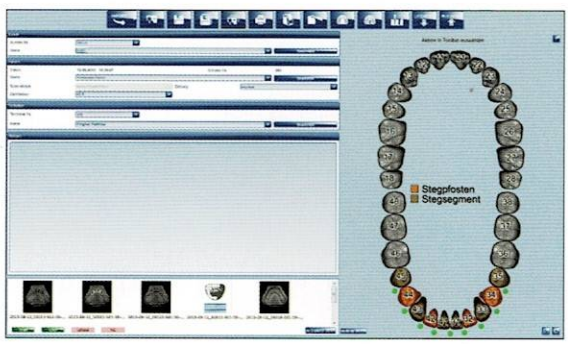


Fig. 1 The case is set up in the software, ...

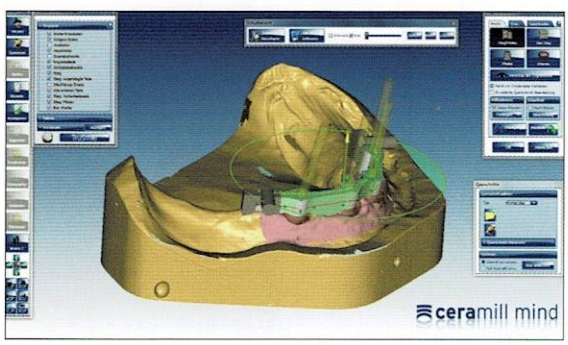


Fig. 2 ... establishing the path of insertion and the bar height, ...

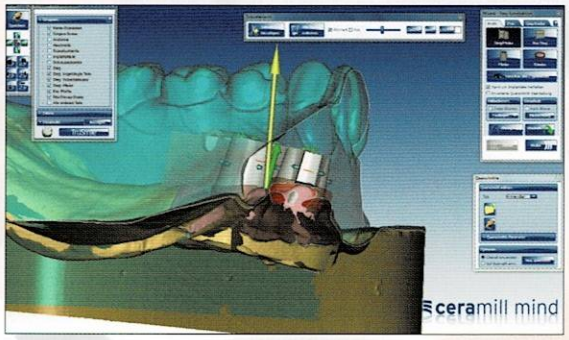


Fig. 3 ... and the bar is below the set-up and ...

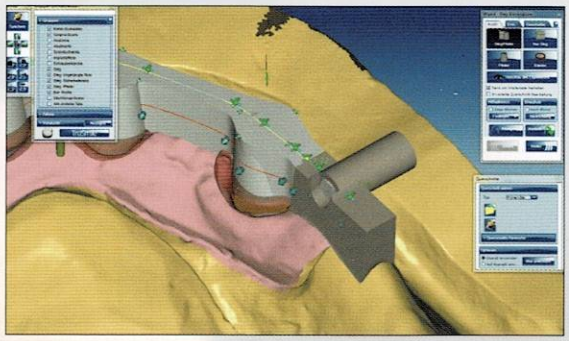


Fig. 4 ... the MK1 female component is positioned.

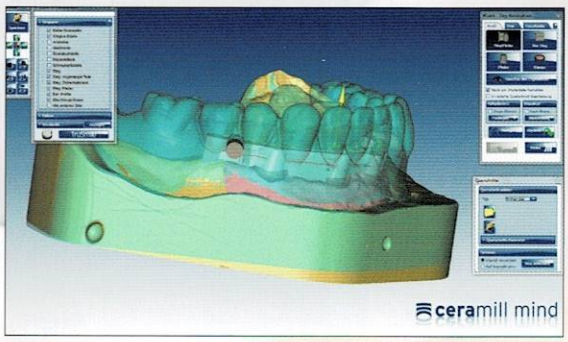


Fig. 5 The shaft serves as a positioning aid for the "keyhole".

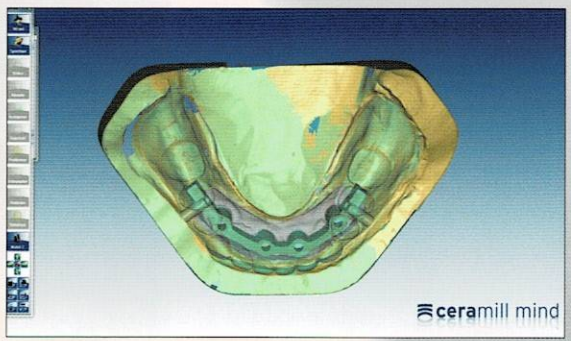


Fig. 6 The bar fits perfectly below the scanned set-up.

- Anatomical impressions of the upper and lower jaws for the production of functional trays
- Functional open-tray impressions of the upper and lower jaws
- Preparation of the models with fixed gingival masks
- Preparation of the bite templates and a control index
- Preparation of a support-pin index
- Wax-up try-in to correct the position of the teeth

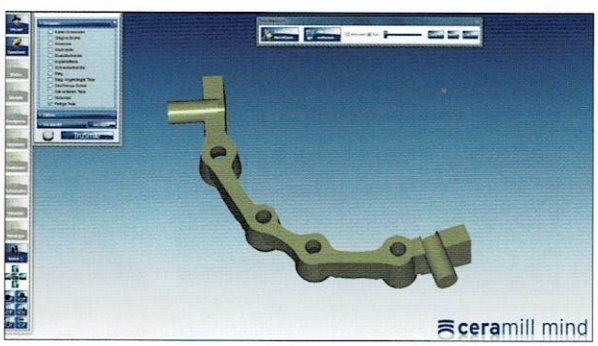


Fig. 7 The data of the completed bar design is sent to the Motion 2.

Backward planning prior to implantation had been our goal. Once the maxillary and mandibular try-ins had been completed, the bite and occlusion were correct, the patient smiled and was satisfied and problems could be largely excluded, the actual treatment could proceed – and not before.

Step 1: Scanning

The case was set up in the Ceramill database as usual (four bar abutments on implants 34, 32, 42 and 44 and bar segments in between). The model and the set-up were scanned (Fig. 1).

Step 2: Design

As always in the Ceramill Mind software, a wizard guides the construction process up to the point where the actual bar is designed. While a specific proposal is provided for the design of the bar, this proposal is not modified in a step-by-step manner but completely free-handedly. This makes the module fairly demanding to use for an inexperienced CAD designer. But once the basic principles have been mastered, not a single function appears expendable, including:

- Establishing paths of insertion and bar heights (Figs. 2 and 3)
- Modifying abutments
- Free papillae
- Different bar shapes and curves
- Adding attachments and drill holes
- Retentions and more

But let us return to the problem of horizontal drilling. Since this is an open module, any STL data can be used as an attachment. For this reason, we scanned a prefabricated MK1 component with a CAD program, but with one minor modification: Instead of the latch slot, we inserted a 3-mm shaft axial to the later bore (Figs. 4 to 7).

Step 3: Milling and sintering

Milling bars is just as simple as milling bridges. Depending on the size of the bar, a sintering aid must be provided to eliminate distortions. If the risk of sintering distortion appears to difficult to control, multiple segments should be planned right from the outset. Sintron

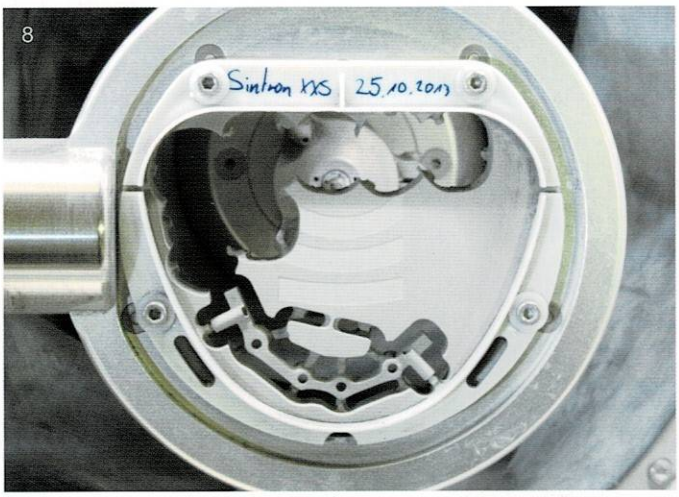


Fig. 8 The completed milled Ceramill Sintron bar is removed from the Motion 2 and ...

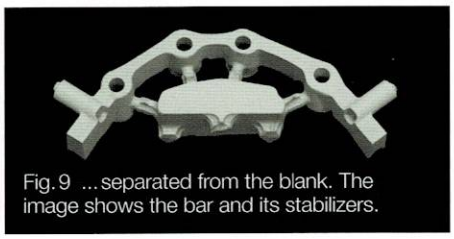


Fig. 9 ... separated from the blank. The image shows the bar and its stabilizers.

Fig. 10 The sintered web is fitted onto the model with the implant analogs, bonded in place and ...

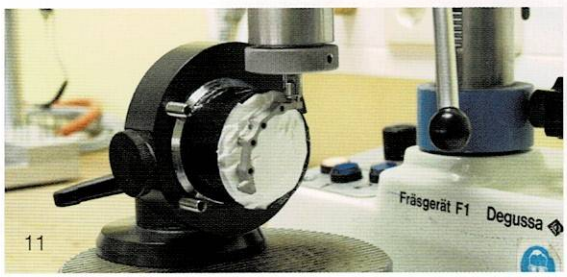


Fig. 11 ... secured on the milling table.

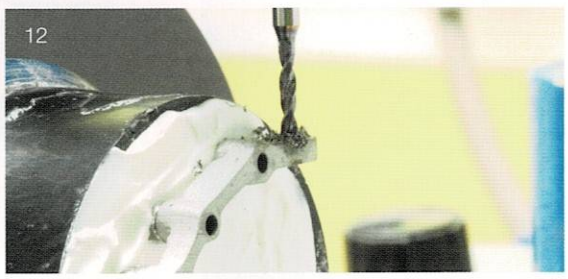


Fig. 12 The stop recess can now be drilled.

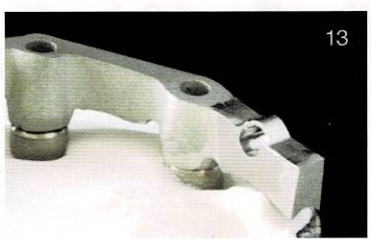


Fig. 13 The female component ...

Fig. 14 ... with the MK1 attachment in place attached and ...

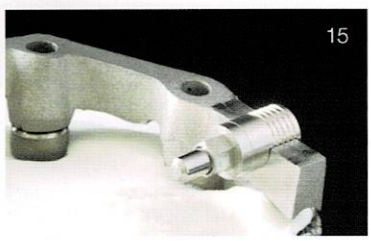


Fig. 15 ... locked in place.

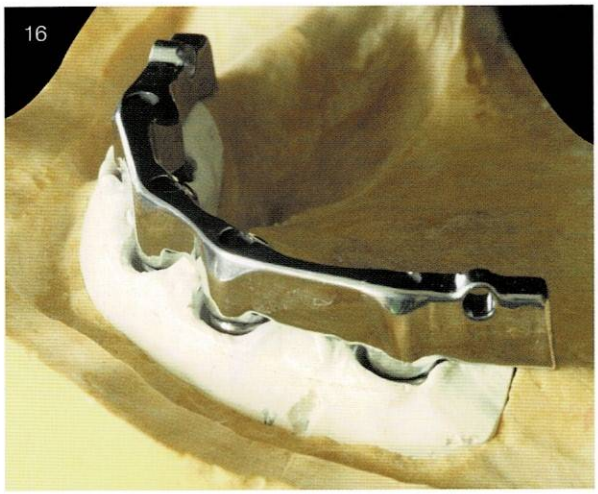
is easy to laser-weld or solder due to its alloy composition. Bonding with Ceramill Ti-Connect SR bonding bases compensates for the minor inaccuracies (passive fit) that inevitably occur when taking impressions or fabricating models. After milling, the superstructure was separated from the blank, the connector attachments were smoothed, all dust was carefully removed and the workpiece sintered in a Ceramill Argotherm for a bit over five hours (Figs. 8 and 9).

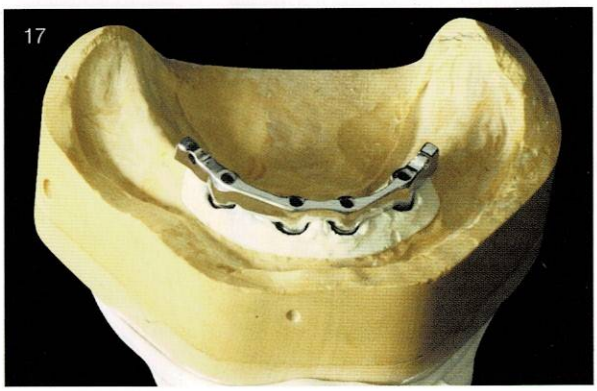
Step 4: Fitting and finishing

After the bridge was successfully sintered and checked for accuracy of fit, it was bonded to the model with adhesive caps. The edges were mechanically trimmed to size. An intraoral try-in to check for passive fit would have been ideal at this point. However, this was not desired: It would have required a different appointment sequence (Fig. 10). The auxiliary shaft on the bar was inserted in the collet of the F1 milling unit and secured in the plaster with the 90° milling table (Fig. 11). This aligned the bar axially to the drilling direction, positioning it exactly. The shaft was detached and the stop recess drilled with a suitable drill (Fig. 12). Thereafter, the latch was fitted on the bar and closed (Figs. 13 to 15). The external surfaces were smoothed and polished as usual (Figs. 16 and 17).

Step 5: Superstructure

The framework was cast using duplicating aids for the MK1 attachment and a core investment technique. The design was fitted and adjusted such that the framework exhibited no fraction on the bar and would drop on the bar lightly but end up securely in its intended position. Patients experience this so-called clearance fit as very comfortable when handling the denture. The attachment was fitted into the secondary structure and bonded in place (Fig. 18). The superstructure could of course also be milled, but this would not yet be economical in a laboratory that already has precision casting equipment in place.





Figs. 16 and 17 Before the bar is incorporated into the prosthesis, it must be finished and polished.

Step 6: Completion

The final step was easy enough. The opposing cast was placed on the wax-up, the wax was removed, the teeth were conditioned, the bar and superstructure were attached to the model, and blocked out where necessary, and then isolated and embedded in a slightly opaque casting resin (Megacryl N). The occlusion was adjusted, and the dentures were finished and polished (Figs. 19 and 20). Delivery was quick. There was simply nothing left that could be a possible misfit, as everything had been checked and double-checked ahead of time. The bar was connected, the screws tightened, and the access holes closed. The dentures were inserted and latched in place. The latching procedure was briefly practiced with the patient, who could then leave immediately. Additional adjustments can be performed at the recall appointment.

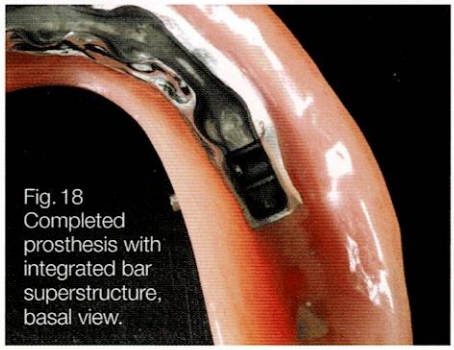


Fig. 18 Completed prosthesis with integrated bar superstructure, basal view.

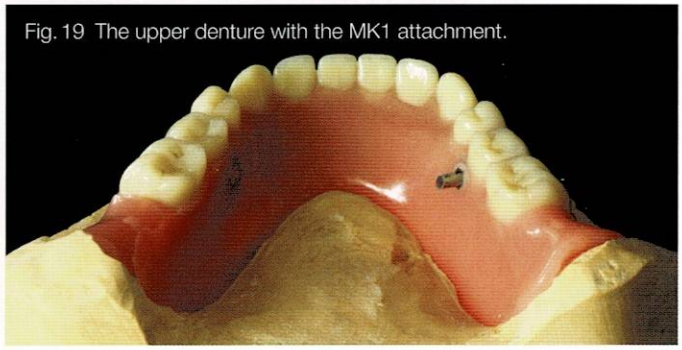


Fig. 19 The upper denture with the MK1 attachment.

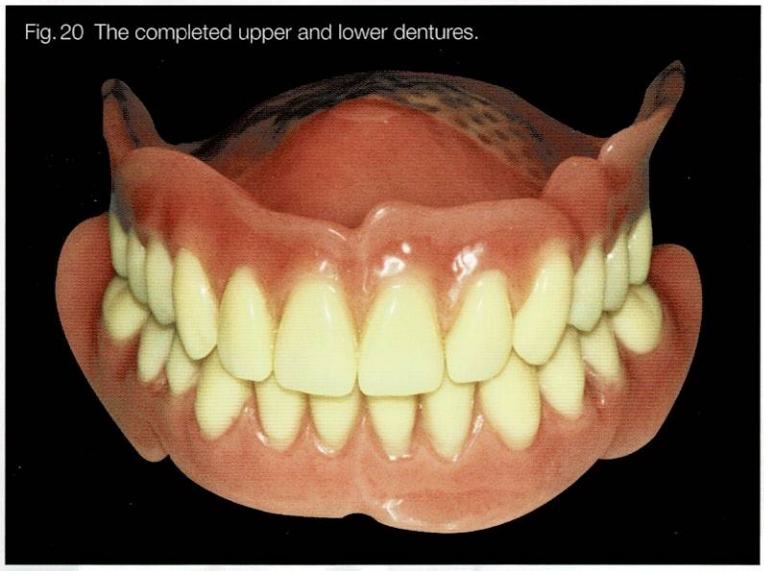


Fig. 20 The completed upper and lower dentures.

Conclusion

Backward planning takes time and effort in its early stages, but it is absolutely necessary. It allows most steps to be performed in one go – the bar and superstructure end up sitting right where they are supposed to, and the aesthetics is fine, too. Bar designs have often been controversial. Primary telescope crowns with electroplated abutments certainly have many advantages. Both function well if manufactured properly. With the new technology now available to us, bars have once again become economically viable – whether made of non-precious metal alloys or zirconia. In conjunction with the MK1 attachment, bars are easily inserted and removed by the patient while providing safe and long-lasting retention. The cost of any repairs to dentures, should they become necessary, is moderate and predictable. This is difficult to achieve with a telescopic prosthesis.

Products

Product	Name	Manufacturer/ distributor
CoCr blank	Ceramill Sintron	Amann Girrbach
Titanium bases	Ceramill Ti-Connect SR	Amann Girrbach
MK1 attachment	MK1	Dental-Attachment
CAM unit	Ceramill Motion 2	Amann Girrbach
Alloy	TEK 1	Siladent
Cold-curing pourable denture resin	Megacryl N	Megadenta
Denture teeth	Polystar Selection Delta-Form	Merz-Dental
Software	Ceramill Mind	Amann Girrbach
Software	Ceramill M-Plant	Amann Girrbach
Software	Ceramill M-Bar	Amann Girrbach

About the author

Matthias Klingner, MDT, completed his training as a dental technician between 2004 and 2008 in the Klingner Zahntechnik family laboratory in Arnsdorf near Dresden, Germany. During his training, Klingner had the opportunity to familiarize himself with CAD/CAM technology and gain experience with the production of CAD/CAM restorations. Having passed his dental technician certification exam, he expanded his knowledge through various internships, for example in the area of functional diagnostics at Zahntechnik Walther (Bad Lauchstädt, Germany). From 2012 to 2013 Klingner attended the master school in Ronneburg, which he successfully completed as that year with the practical degree of Master Dental Technician.

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