dental dialogue
community & competence
The International Journal of Dental Technology

Reprint

(Giro)form Perfect in Form
Model Management in the Lab: An efficient Model System by AmannGirrbach – Part 1

A contribution by dental master technician ZTM Stefan Schunke, Fürth/Germany

Kindly offered by:

AMANNGIRRBACH

Amann Girrbach AG
Herrschaftswiesen 1
6842 Koblach • Austria
Phone +43 (5523) 62333-394
Fax +43 (5523) 55990
www.amanngirrbach.com

Model Management in the Lab: An efficient Model System by AmannGirrbach – Part 1

(Giro)form Perfect in Form

A contribution by dental master technician ZTM Stefan Schunke, Fürth/Germany

Don't worry. Stefan Schunke is not going to bore you with grey theories on proper laboratory management in this series of articles. The experienced practitioner's objective is to demonstrate the correct management of processes in the laboratory by means of a proper system. In this context, he would like to refer to the etymological origin of the term "management", whose potential source may be taken from the Latin "manus agree", i.e. leading by the hand. This is the moment to lean back and be guided through the topics Model (Part 1), Framework (Part 2) and Articulator Management (Part 3).

Introduction

In our everyday routine, we are confronted with working instructions and, of course, models. And does the willing reader of this article not know the phenomenon of a customer saying something such as "look at the models and you know how the lab is working" or colleagues confronting you with the statement that "the models are the business cards of the laboratory"? This may sound like nonsense to some people. Is it really? Just take a look at the figures 1 - 3. I will comment on these figures individually.

Figure 1 shows the classical "saw-cut model". A dowel pin in the original sense was used to remove the model die. This is a pin that at the end of its retentive part takes the shape of a thin mandrel and may be directly put in the impression material. If several of these pins have to be used for one die, there may be the danger, due to divergences, that the die may no longer be removed or wider saw cuts are necessary. Of course such a pin does not guide properly and the die wobbles. Then the impression is only partially cast using the "oh so expensive" class IV plaster in order to save "costs". Finally, the remainder of the impression is cast with a class 2 plaster and then based, however, without removing the class IV segment and without using a separating agent. Those who look properly will recognize the pin in the centre of the preparation margin. Is such a model reliable? I received this model at the beginning of the 90s.

Figure 2 shows a further disaster model. This is a model upon which the finished unit was handed in. The colleague proudly told to me that "money played no part with this patient and everything was paid". What do you think? Is this a "reliable" model? The photo of this model was taken at the end of the 90s.

A model of the year 2009 is displayed in figure 3. This model was to provide the basis for a removable unit … If this were your personal model situation, would you trust the restoration constructed upon it? In as far as these parameters described at the beginning are concerned the comments made on behalf of the dentists and colleagues are more than appropriate. Models have to be considered and treated like the documents of a public notary. Only on the basis of intact documents, here models, may we document or prove processes, plans, preparations and so forth. This is equally true in the legal sense.

The author of this article is of the opinion that prosthetic dentistry requires precision saw-cut models. The production requires some effort and this is also documented in the costs for the patient. However, what happens if the work has to be repeated because of the model? This is why the author thinks Model Management should be taken on by responsible hands. In addition, the models have to be treated with great attention and professional care so that after the work has been completed it is still in one piece, and if possible, undamaged.

Different models and model systems

In diverse publications, the author has pointed out why he is in favour of a system with modern dowel pins. Until 2008, for various reasons, the author had been against a system with acrylic bases instead of plaster bases. However, this has changed.

In the event a good precision saw-cut model with a plaster base (fig. 4) is used, the pins are guided into acrylic sleeves embedded in plaster. As a rule,

Indeces

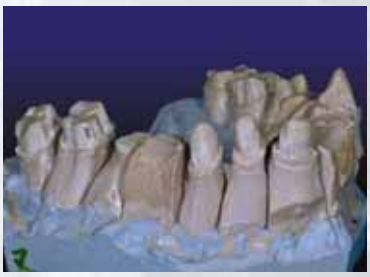
- Impression
- Dowel Pin
- Function
- Model management
- Model systems
- Split Cast
- Information on the gingivae

Categories

System related
Series of articles

Contact address

AmannGirrbach AG
Fon +43 5523 623 33-0
austria@amanngirrbach.com
www.amanngirrbach.com



Figs. 1 to 3 Do these models give the impression of reliable quality and expertise, or even accurately fitting dental restorations? The author's opinion: Not in that state!

Fig. 4 Clean and well made precision saw-cut model with additionally integrated block pins.

Figs. 5 and 6 Clean and well made precision saw-cut model from Giroform Systems.

there is an additional so-called block pin located between the dies in order to prevent the smallest movement between the dies. However, this is extremely difficult to implement when reconstructing lower anteriors with individually made veneers.

The methodology of the Giroform model facilitates the procedure in such a case (figs. 5 and 6). The author initially was very sceptical about this technology. Costs were one reason. If one compares the high-quality systems with one another in this aspect, this feeling of resentment cannot be confirmed. However, the exact calculation and the proper construction of a Giroform model will not be discussed further in this three-part article. Nevertheless, it is a fact for the author that the production (time and costs) as well as the proper workflow in the laboratory have become much more efficient with the system. Former systems did not allow for any reasonable split cast specimen, for example, this is a decisive feature of the restoration focused on function.

A further problem the system presented was that the delivered dental arches could not be based accordingly. As may be seen from the photos, this issue can be mastered (figs. 7 to 10).

It should be mentioned in this context that the author has always required uncut models (master models) in addition. The problem with the Giroform system is that in order to produce an upper jaw saw-cut model the palatinal area had to be removed from the impression. How to proceed if there is only one impression? Even here, AmannGirrbach's model system offers the proper solution. As a rule there are always two identical impressions.

The Giroform system user then has access to two models – one uncut and a saw-cut model (figs. 11 and 12). The reason why both models are so important becomes clear, once a saw-cut model is compared to the situation in the mouth (fig. 13). This picture clearly shows how many biological pieces of information are lost through sawing and opening the preparation margin on the cast model. Information about the biological width, the emergence profile, approximal contacts, light ridges and much more, may not be interpreted and taken over correctly by means of the saw-cut model. Therefore, two models are unavoidable – a saw-cut model and an uncut one. The additional work that occurs through this complex model production, and the working on both models, has to be mirrored in a clearly improved result on the one hand but also in the price of the restoration on the other hand.

The author sees a further advantage of the Giroform system in the simplified production of individually constructed veneers. The difficulties encountered with the production of veneers on a saw-cut model with dental plaster base are of different origin. On the one hand, in particular with the lower anterior teeth the refractory dies cannot be made with sufficient stability. A further problem is that the dies have to be kept damp, however, a plaster model should not come into contact with too much water for precision reasons. The author uses a transparent film on the model as an intermediate solution with Pindex models (fig. 14).

The solution the Giroform model system provides for this problem, looks relatively easy. However, despite all this, one has to take into account a few de-

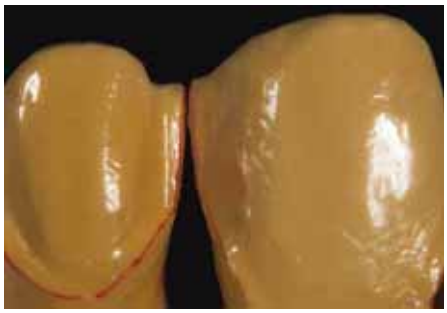
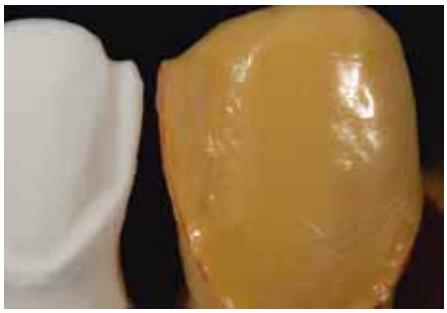



Figs. 7 to 10 How can the cast dental arches be transferred onto the Giroform System? Easy, the dental arch is cut to accommodate, and can then be based and finished as usual.



Figs. 11 to 13 Uncut models are a must if you wish to include the biological factors in the restoration.

Fig. 14 A transparent film protects the saw-cut models with the plaster bases from excess water and prevents the refractory dies from drying out.

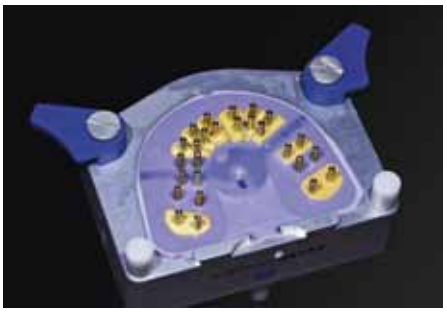
Figs. 15 and 16 If you wish to achieve exact results with the Giroform System, it is necessary to observe and follow the manufacturer's instructions, as with any other system. Otherwise inaccuracies will occur, such as in this case, not necessarily with the fit, but with the approximal contacts.

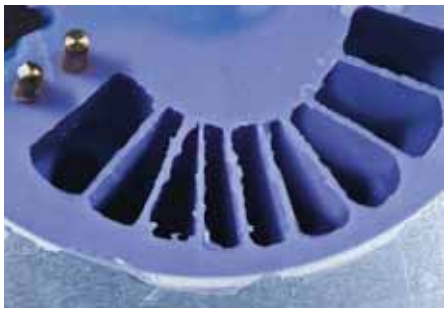
tails that seem to be all the more important. The model system incorporates a duplicating form that may be used with the previously made base plate. In addition, the system also has refractory pins, so that the dies may be re-aligned perfectly and reproducibly, which is beneficial to the reconstructed function. When constructing the refractory dies, it is essential to ensure there are two reference pins in the duplicating material, in this case silicone. The base plate has to be exactly positioned on the duplicated form. If this is not observed, the original position of the plaster die may not correspond with the actual position (figs. 15 and 16).

It is surprising that the saw-cut and the based Giroform models are duplicated in such a good way (fig. 17). The author would not have expected the thin saw slits to fill with duplicating material (fig. 18). For this purpose, a 1:1 silicone from the company Dreve with a shore hardness of 32 was used. The initial worry that the silicone was possibly too hard was unfounded. For exactly the thin silicone lamellae (also the positive of the saw-cuts) require a silicone material with a high degree of hardness.

A further problem had to be solved. For it is almost impossible to cast out all refractory dies at once and without any mistakes. Furthermore, there is the danger that the thin lamellae will bend when casting the refractory die material at various stages. Even if the dies fit more or less correctly on the base plate, it is not possible to alternate with plaster dies. As the author duplicates all his dies, there are always second and third dies available. Exactly these plaster duplicate dies are positioned as dummies in the duplicated form on an alternating basis. This means the thin lamella is supported by the plaster dummies, and the hollow moulds are stabilized (fig. 19).

The result is simply convincing. We are now in a position to combine our working model according to our gusto, and





Figs. 17 and 18 Duplication with 1:1 silicone and a Shore hardness of 32, set in a pressure pot, produces stable results.

Fig. 19 With too many refractory dies, duplicated second dies act as plaster dummies and stabilise the thin silicone lamella.

Figs. 20 to 24 Results which speak for themselves

to pin refractory and plaster dies on an alternating basis, to apply the corresponding gingival mask, or to simply use refractory dies (figs. 20 to 22).

It is unbelievable how the veneers that had been constructed on a Giroform model correspond to the saw-cut model or the uncut model without much reworking required (figs. 23 and 24). By the way, the corresponding oral situation is shown in figure 13.

Model Management

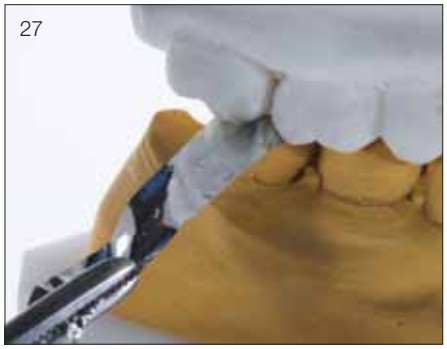
In this context and way, it was, in particular, *Jörg Mannherz* of AmannGirrbach, who first introduced the author to the term Model Management. The author renounces a detailed description of the models because AmannGirrbach's field service is much better at this.

What is really meant by the term management? The term is defined in the (German) dictionary. It says: "ma|na|gen ['mɛnɪʤən] English to manage = to handle; manage < ital. maneggiare = handle, process, master, carry out, complete, get ready, master, organize, create, realize, bring about;"

If we apply this to our model system, it says that we are dealing here with a useful handling of models and the opportunities involved. The case presented involves an anterior and a posterior crown. However, the function is only described with the posterior crown. The posterior crown is located in the third quadrant. In order to meet Model Management, one does not only pin and later on saw the prepared tooth, but also all the remaining part of the dental arch, as well. The latter is divided into two anterior segments and the posterior teeth of the fourth quadrant as an individual block (fig. 25).

The upper jaw is in one piece. As only one individual crown is to be constructed in the front, this model is designed as a single die model. If you look at this more closely, then you recognize that it

Fig. 25
It is essential to divide the saw-cut models into anterior and posterior segments so that better control of the different functions and the vertical dimension is possible later.



Figs. 26 to 28
System imminent discrepancies usually lead to uneven occlusion in the plaster models. The teeth will therefore not be able to hold the rescue foil evenly. The articulator pin is on zero.

is not perfect in the gingiva area (fig. 26) as is the case in real life. After the mounting of the models, the models first of all have to be ground in order to adjust the vertical distance correctly. Here it is best to use small strips originating from a rescue foil. Normally the supporting pin is put into the zero position to begin with (figs. 27 and 28).

If this foil is used to control the jaw situation of the overall dental arch, one mostly finds that the rescue foil is not held by all teeth in the same manner. The reasons for this are diverse and sufficiently known. It is correct that the dentist had to establish a so-called grinding in protocol. The protocol shows the teeth that hold the foil in the mouth and where this is not the case. This information is then marked on the teeth status order with a plus or a minus.

If you do not get this information, this is the moment where Model Management becomes valid. Step by step, the segments are taken out of the acrylic plate and the lowest position of the remaining teeth is determined by means of the rescue foil and via the supporting pin. As a rule the supporting pin is readjusted in the region of 0,5 - 1 millimetre. Depending on the state of the remaining teeth this area may also be accounted for three millimetres. In this case, the lowest pin position was determined with the lower anterior tooth segment (figs. 29 to 31).

The question arises, how much the overall teeth really should be ground in. In this context, it is necessary to examine the entire dentition carefully. In most cases the facets provide more precise information that allows us to recognize the degree of sensible grinding required.

Figs. 29 to 32
With the aid of the individual model segments, the dental technician is able to find the best possible vertical dimension, despite the lack of information. This results in a distinct improvement in occlusion and less grinding for the dentist.

Fig. 33
The teeth move out of occlusion wonderfully evenly due to the anterior canine guidance.

Figs. 34 and 35
When checking the eccentric movement it becomes apparent which tooth is guiding.

On the basis of the defined supporting pin height the porcelain onlay is produced on the refractory die in the centric position (fig. 32). If the eccentric position is also checked, then one may see wonderfully even tooth guidance. The canine guides and thus protects the overall posterior teeth area (fig. 33).

However, wouldn't it be interesting to find out what happens in the occlusal close-up region? What does the author mean by this? In the following digression you will find more food for thought.

Figure 33 shows an articulated case situation. How do we know that this is the same situation as in the patient's mouth? It could be that this is the actual position, but maybe it isn't. If the upper canines are situated directly over the lower canines, then the teeth are already classed as misaligned. Fact is that the articulator does not and cannot reproduce every mandibular movement. This topic will be dealt with in depth in part 2. Another mystery: What happens if the patient has a parafunctional bite and then applies pressure in the masticatory system? It is a well known fact for example, that the lower orthodontic appliance moves and twists with chewing movements. In addition to this it is not unimportant to take a closer look at the occlusal region to understand exactly what happens directly at the beginning and at the end of each movement. For this reason all the model segments are removed from the model, apart from the die with the porcelain onlay – in this case the last tooth in the third quadrant. Starting from the centric articulator position, the eccentric movements are then reproduced (figs. 34 and 35).

Fig. 36
Once the next segment is inserted, 1st molar moves out of occlusion. The occlusion plane is correct, however uneven.

Figs. 37 and 38
This type of model segmentation enables a clear view from the palatinal direction.

Figs. 39 to 41
This is Model Management par excellence: The other movements can also be checked in unison and individually.

This distinctly shows that both the molars guide the movements (group guidance).

If you take a look at the buccal structure of the first upper molar, you will see that the mesio-buccal cusp is too long. The dental technician cannot change this fact. It might be possible to inform the dentist of this, so that he may shorten the cusp for the lateral protrusive movement.

But is it really necessary in this case? There are two reasons why this wouldn't bear much relevance. Firstly, the second molar is there to protect, and secondly, don't forget that this is a simulated situation and doesn't represent the actual situation. All other teeth have been removed from the model. Once the third quadrant model segment with the premolars has been re-inserted, a completely new picture unfolds. First it appears that the guiding tooth is not the 1st premolar but the 2nd premolar, and through this guidance the molars are lead out of occlusion. The 1st molar is further out of occlusion than the second (fig. 36). Usually in this type of model it is the 1st premolar which is the guiding tooth and the other posterior teeth are led gently out of occlusion. Apart from the porcelain onlay, there is nothing we can change about the rest of the dentition. Ideally, natural dentition will show an even distribution of wear and abrasion. In a case such as this, the author feels it is his duty to protect the new restoration to be constructed. Otherwise the entire bite would require alteration. If the situation in the patient's mouth really is similar to the situation in the articulator, then the onlay will always be protected by the surrounding structures (cf. fig. 36).

The models have been segmented accordingly so that it is also possible to check the lingual situation in the centric and eccentric position. Figure 37 shows clearly how only the buccal cusps remain in contact during laterotrusion. In addition to this, the lingual cusps of the 2nd molar glide past much closer than the 1st molar (fig. 38). Once again this shows that the onlay is well protected – even if the bite were to be lowered. In

Figs. 42 to 44
The retrusion is examined

Figs. 45 and 46
It is apparent that the 1st premolar protects the joint and the other teeth in the retrusive excursion.

general, all other movements are examined using this method. For example, the lateral excursion to the right can be initially carried out through canine guidance (fig. 39). Once again the teeth part adequately wide out of occlusion (fig. 40).

As soon as all segments are removed, except for the last molar, the guidance becomes familiar on the latter. This means that even in a parafunctional situation the new porcelain onlay will be protected. In this case it is due to the fact that the palatinal cusps of the first upper molar were made too short (fig. 41). This can also be seen in figure 38. Finally, further excursions, such as retrusion, can be examined (fig. 42). In particular straightforward retrusion can be observed very well from the oral view. Then the segments are replaced one after the other (fig. 43). From a buccal view it is clear to see that the 2nd molar guides this movement as long as no other segment is in the model (fig. 44).

The neighbouring mesial segment, both premolars, is inserted and it then becomes apparent that these teeth resume guidance during the retrusive movement from the centric position (fig. 45). At the same time there is no occlusion throughout the entire posterior dentition (fig. 46). In other words: If the patient should move his lower jaw backwards, for whatever reason, it will be guided back into the centric position over the 1st premolars.

If coloured articulation foil is used, the various areas can be identified (fig. 47). These areas could only be made visible because there was next to no other segment in the model base. It was only possible for the patient to wear these areas as the anterior and canine guidance had been removed (for one particular reason). This could be due to a parafunction, twisting of the lower jaw or general "wear and tear" in the close-up occlusal region. With the aid of the occlusal compass these facets can be analysed as such. The movements merge seamlessly and cannot be distinctly held apart (fig. 48). In this case it is apparent that


47


48


49


50

Figs. 47 to 50 Understanding occlusion and function along with correct Model Management produces long-term stability and reliable restorations.

the buccal cusps had the most contact areas (fig. 49). The author believes this to be an advantage as the stronger buccal parts of the crown are used most. Hence these structures protect the joint and the lingual cusps, acting as a final bastion (fig. 50).

In the next part, *Ztm. Stefan Schunke* will approach the topic of adequate framework management. Using various case situations the reader will be introduced to the methodology and its implementation.

To be continued…

About the author

Dental master technician Ztm. Stefan Schunke began his training in 1976 in Leverkusen. In 1981 he successfully completed his apprenticeship. He then moved on to work with the dental master technician Ztm. Bölte in Düsseldorf. During this time he successfully completed his master's examination in dental technology as an external student. He recognised the importance of the biomechanical wax-up concept according to M. H. Polz. In 1988 he started work at the Zahntechnische Laboratorium M. H. Polz and went on to become a partner in the company. Since 1997, he has been the sole owner of this laboratory. Stefan Schunke is the author of several publications since 1987, the main topic being wax-up and milling techniques according to functional aspects. In 1991 he received the Pfannenstiel prize for his publications. In 1993, after a year's break, he became an instructor for occlusal function and morphology at the Johann Wolfgang Goethe University in Frankfurt. In 2003, he was certified by the DGÄZ (Deutsche Gesellschaft für Ästhetische Zahnheilkunde eV – The German association for aesthetical dentistry) as "Specialist for Aesthetical Dental Technology". Furthermore, he also became the Vice President of the DGÄZ.

Contact address:

Ztm. Stefan Schunke • Zahntechnisches Labor Stefan Schunke • Alte Reutstr. 170 • DE-90765 Fürth, Germany
Fon +49 911 79037-51 • Fax +49 911 79037-52 • www.schunke-stefan.de

Well built.

artex® giroform®

The proper system in your territory.

Model Management

Perfectly evolved Model fabrication which avoids hyper occlusion from the beginning.

artex®

Due to the transfer of patient data from the surgery to the laboratory, the Artex® becomes a substitute patient.

giroform®

Outsmarts plaster expansion and allows for rapid production of precise and inexpensive high-quality models.

smartbox X2

Saves time and material. Meters plaster and water with maximum precision at the touch of a button.

smartmix X2

Perfect mixing results at the touch of a button due to programmable material-specific mixing parameters.

AMANNGIRRBACH

d-lab24.com

The complete range of user know-how in e-learning format.
Information under: www.amanngirrbach.com

Amann Girrbach AG | Fon +43 5523 62333-399
www.amanngirrbach.com