

Occlusal splints with and without adjusted occlusion

Materials & Accessories

Fabrication:

- Hard splints: Erkodur, adjusted splints 1.5 - 5.0 mm, stabilization splints 0.8 - 1.5 mm
- Hard / soft splints: Erkoloc-pro, adjusted splints 2.0 - 5.0 mm, stabilization splints 1.0 mm / 1.3 mm (2-layered)
- Semi-soft splints: Erkoflex-95, adjusted splints (biting) 2.5 and 4.0 mm
- Tough-hard splints: Erkolign, 1.0 and 2.0 mm (at extreme stress, most resistant, but only limitedly adjustable)
- For adjustment by addition: auto-polymerizing resin for Erkodur and Erkoloc-pro, Erkoflexsticks-95 (177 006) with commercially available fusing gun, ≥ 500 W with screw-top (special top for fusing gun 177 010) for Erkoflex-95. If necessary, hot air burner (177 540) for the adjustment of Erkoflex-95.
- For adjustment by grinding (biting): Erkoform units serie 3 / Occluform-3
- For model insulation and shrinkage compensation thermoform the ex works applied insulating foil together with the desired plate, in doing so the insulating/shrinkage compensation foil has to show towards the model (otherwise alginate based insulation, only insulation).
- Cover templates (110 900) to cover the granules when using Erkoloc-pro and Erkoflex-95 (less loss of granules).



Model preparation:

- With large undercuts and hard splint material, parallelometer for marking the prosthetic equator.
- Erkogum (110 844) for blocking out, high-fusing wax (725 080) to fill bubbles in the plaster.
- Erkoskin (625 050) to relieve the gingival margin.

Finishing:

- Recommendation: Finishing set Quick 3 (110 830) with fissure bur, rightward cutting, left spiral (110 836) for rough cutting out, HSS-twist drill (110 876) to cut out the desired form, crosscut tungsten carbide bur (110 837 for fine grinding, Liskosil-I (223 240) to prepolish the edges and Liskosil-m (223 230) to prepolish narrow interdental spaces and Liskosil-s (223 220) for treatment of occlusal premature contacts and insides of splints.
- Pear-shaped tungsten carbide bur (110 835) for grinding-in.
- Take-off pliers (110 880) for taking off the splints of the model.
- Polishing set (110 878) to polish Erkodur and Erkoloc-pro, hot air burner (177 540) to shine Erkoflex-95.

Hints

- This instruction is limited to the general fabrication of splints. Functional individualizations as required for the therapy with **reflex, repositioning, distraction, centric (Michigan) and many other types of splints** can be realized except for a few types of splints only with materials that are at least in the occlusal area hard.
- Areas of the model (exterior vestibulum, oral floor), which obstruct the thermoforming process have to be removed. Remove sharp plaster edges.
- In order to have transparent splints out of Erkoloc-pro or Erkoflex-95 **without** insulating foil, the model should be insulated with alginate insulation.
- For splints that exceed the gingival margin apply a layer of Erkoskin to the margin to relieve tension.
- To prevent stress cracking, moisten the area to be built up with auto-acrylics with very little monomer. Do not blast, do not roughen!
- For splints out of Erkoloc-pro the hard layer may be ground through.

Occlusal splints without adjustment, for ex. stabilization splints

Thermoforming material: Erkodur, 0.8 - 1.5 mm, hard - Erkodur-0M1/-A1/-A2/-A3, 1.0 - 2.0 mm, hard - Erkoloc-pro, 1.0 - 1.3 mm, hard/soft - Erkolign, 1.0 mm, tough-hard. In regard to fabrication the materials do not differ, in regard to finishing only slightly.

1. Pay attention to the hints for model preparation at page 1.

When there are thick undercuts, mark the prosthetic equator with a parallelometer and block out large undercuts.

3. If applicable, cover granules with a cover template (Erkoloc-pro / Erkoflex-95).

Thermoform.

5. Use the twist drill HSS without pressure ($> 20\,000$ rev/min) to cut out the desired shape.



2. If necessary (see hints), apply Erkoskin on the gingival margin.

Embed the models so far into the high grade steel granules that only the thermoforming area plus 3 mm protrude from the granules.

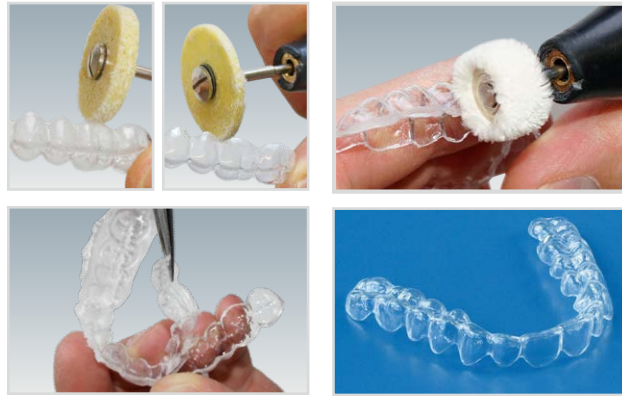
4. Cut in the thermoformed plate with the fissure bur ($> 20\,000$ rev/min) for an easier removal of the model and take off the model with take-off pliers.

6. If necessary, grind the edges with the crosscut tungsten carbide bur ($> 20\,000$ rev/min).

7. Smooth the edges with Liskosil-I (10 000 rev/min). Smooth narrow interdental spaces with Liskosil-m or -s (10 000 rev/min).

Erkolign: smooth with Liskosil-m and -I and white silicone polishers.

9. It would be best to now take off the insulating foil.



8. If necessary, polish the matt areas with the polishing set using a lab handpiece, however, for these relatively thin splints a polish is mostly superfluous.

10. Finished stabilization splint.

Pay attention to the cleaning and maintenance instructions.

Occlusal splint with adjustment by reduction (grinding), for ex. centric splint

Thermoforming material: Erkodur, 1.5 - 5.0 mm, hard - Erkodur-0M1/-A1/-A2/-A3, 2.0 mm, hard - Erkoloc-pro, 2.0 - 5.0 mm, soft/hard - Erkolign, 2.0 mm, tough-hard. In regard to fabrication the materials do not differ, in regard to finishing only slightly.

9. Same procedure as up to point 6.

Grind the splint as per the usual manner in the articulator according to the prescriptions.

Recommendation: pear-shaped crosscut tungsten carbide bur (110 835).

11. Polish the matt areas with the polishing set using a lab handpiece.

Or polish at the polishing lathe according to the technique for plastics.



10. Smooth and pre-polish the edges with Liskosil-I and -m (10 000 rev/min) and the grinding areas with Liskosil-s.

12. Finished splint, adjusted by grinding.

Pay attention to the cleaning and maintenance instructions.

Occlusal splint with adjustment by addition and grinding, for ex. Michigan splint

Thermoforming material: Erkodur, 1.5 - 5.0 mm, hard - Erkoloc-pro, 2.0 - 5.0 mm, soft / hard
In regard to fabrication the materials do not differ, in regard to finishing only slightly.

13. Same procedure as up to step 6.

Brush areas that have to be adjusted with an autopolymer resin with little monomer.

Note the second last point of the hints!

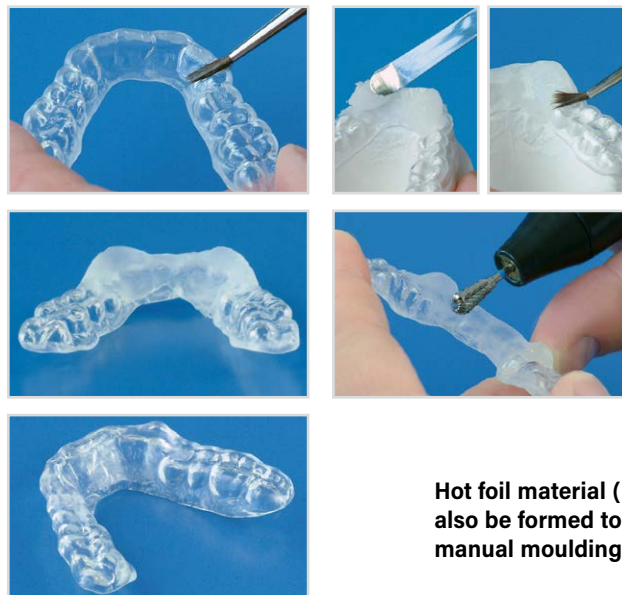
15. Close the articulator and cure in the polymerisation pot at 40 - 50 °C. After curing open the articulator carefully (model may break!) and remove the splint.

17. Finished adjusted Michigan splint produced by addition, with restored cuspid guidance.

Pay attention to the cleaning and maintenance instructions on page 34.

18. ... for this purpose it would be best to work with an Occluform installed at the Erkoform units (also see other chapters).

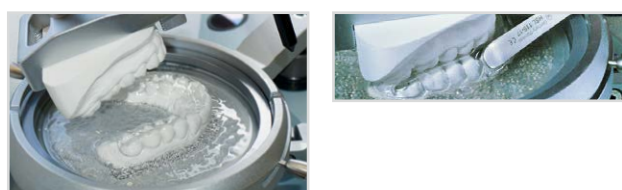
Take the bite with the Occluform ...



14. Insulate the opposing bite (alginate insulation), put the splint back on the model, apply the mixed autopolymerising resin and brush the plate with monomer. Put the models in the articulator.

16. Finish the area that has been adjusted by addition and the splint (9 to 12).

Hot foil material (Erkodur, Erkoloc-pro, 4.0 / 5.0 mm) can also be formed to a cuspid guidance in the unit by a manual moulding ...



19. ... and immediately press the hot plastic foil material in the cuspid area with a suitable instrument against the antagonistic jaw.

20. After cooling take it off the unit and finish as described in step 9 to 12.



21. Finished adjusted Michigan splint without addition, the splint consists in the occlusal area only of one material type.

Pay attention to the cleaning and maintenance instructions on page 34.

Soft occlusal splint with imprinted adjustment, for ex. relief splint

Thermoforming material: Erkoflex-95, 2.5 and 4.0 mm, Shore A 95

22. Addition: Erkoflex-95, 2.5 mm
Embed the models so far into the high grade steel granules that only the thermoforming area plus 5 mm protrude from the granules. Cover the granules with the cover template.

24. Pull the insulating foil off.

Put the splint back onto the model and degrease well with degreasing agent (613 050). Put the models into the articulator. Insulate the opposing bite (Isolac).

26. In the articulator immediately imprint the opposing bite ...

... or build up all areas step by step and later on imprint the opposing bite as shown in step 31.

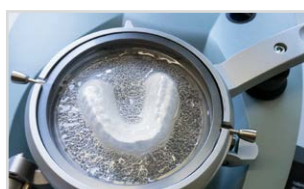
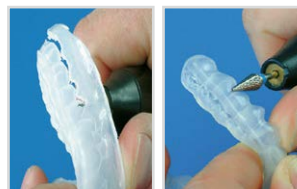
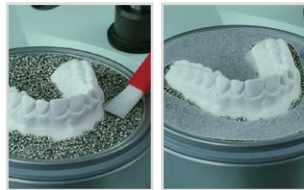
28. Smooth with Liskosil-I and -m (10 000 rev/min).

Carefully shine with the hot air burner.

30. Imprint: Erkoflex-95, 4.0 mm

Same procedure as step 22 to 24, however, without degreasing.

32. The imprint can also be done in the mouth. Therefore put the splint finished up to step 23 on the model into a flat bath with cool water. The occlusal area has to protrude from the water, ...



23. Thermoform, after cooling take it off the model and roughly cut out the shape with the fissure bur or the scissors, leave the shape longer than the final splint.

25. Apply material onto the required areas using the Erkoflexsticks-95 and a fusing gun (max. 2 cm length per application). Hold the point of the fusing gun very close to the splint.

27. Cut out the final shape of the splint with the HSS twist drill (> 20 000 rev/min). Work the built-up with the crosscut tungsten carbide bur (> 20 000 rev/min).

29. Finished adjusted splint by addition.

Pay attention to the cleaning and maintenance instructions on page 34.

31. Warm occlusal area with the hot air burner until it becomes clear and imprint the opposing bite, see also step 26.

Finish as shown in step 27 and 28.

33. ... warm the occlusal area, see 31. Briefly pour cool water over it, immediately remove the splint from the model and place it into the mouth. Obtain an occlusal registration. Allow to cool for 2 min. in the mouth and finish as shown in step 24.

Imprint of the opposing bite in the Erkoform units serie 3 and Occluform-3

Thermoforming materials: all types of materials that are listed in "Materials & Accessories" from 0.8* mm thickness and more, in the example Erkodur. The thinner the material is the quicker the Occluform-3 device has to be closed after adaptation. *0.8/1.0 mm, fast proceeding required

34. In the example, fix the upper jaw in the model pot.

For the fabrication of an adjusted occlusal splint the model only has to protrude of the model pot by height of the teeth plus 3 mm.



35. Put the model pot that way into the unit that the markings (arrows) are opposite.

36. Fix the antagonistic jaw onto the upper model plate. Prefix the model in a preferably high position with the arrest joint.

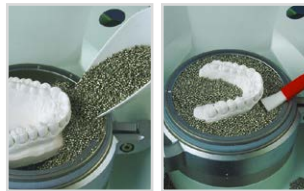
Close the Occluform.

38. If a construction bite is available the models are articulated in the same way (3).

That way the imprint corresponds exactly to the bite registration.

40. Fill as many high grade steel granules in the pot that only the thermoforming area plus 3 mm is visible. Ensure that also the hollow spaces under the model are filled with granules.

42. After the thermoforming material has cooled down open the Occluform. The imprint corresponds to the bite elevation or the construction bite.



37. Point the supporting pin on the 0-line (arrow), open the arrest joint and articulate the models.

The bite can be elevated to a median value.

39. Hold the upper model plate in position and firmly close the arrest joint.

Open the Occluform.

41. Insulate the opposing bite.

Now it can be thermoformed. **Immediately** after adaptation close the Occluform until the supporting pin gets contact.

43. Open the foil securing ring, lift the foil frame of the unit together with the model pot and take off the foil frame with the foil.

Finish as described in step 9 to 12.

Imprint of the opposing bite with plane occlusion in the Erkoform units serie 3 and Occluform-3

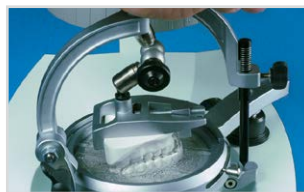
Thermoforming material: Erkodur, 3.0 - 5.0 mm, hard - Erkoloc-pro, 3.0 - 5.0 mm, soft / hard
In the example: Erkoloc-pro. The working steps have to be carried out quickly one after the other.

44. The plane occlusal surface will be pressed on with an Erkolen-foil, 0.8 mm or 1.0 mm and the Occluform. Thereto pull the insulating foil off (the Erkolen-foil can be used several times).

46. ... and **immediately** close the Occluform so far that the supporting pin does not have contact yet (app. 3 mm opening) ...

48. ... **immediately** close the Occluform until the supporting pin gets contact.

By this mode of operation a plane occlusal surface with imprint of the cuspid tips will be obtained.



45. Carry out working steps 34 - 41 analogically.

The Erkolen-foil and foil frame should possibly be held and operated with one hand. Apply the Erkolen-foil **immediately** after the adaptation ...

47. ... **immediately** open the Occluform a little again, remove the Erkolen-foil and ...

49. Take it out of the unit after cooling down and finish as described in step 9 to 12.

Pay attention to the cleaning and maintenance instructions.

Thermoforming technique

The instructions in this brochure are the suggestions of the Development Team of Erkodent.

The fields of use as well as the fabrication procedures in Thermoforming Technique are not limited to the instructions that are shown and may vary.

Please do not hesitate to contact us if you have any suggestions.

Please find videos to the fabrication of several applications at: www.erkodent.com > Service/Download > Videos



Basic principles of thermoforming:

- The **models** should consist of **hard plaster** (class 3).
- For thermoforming the **hard plaster** can contain residual moisture but **must not** be **wet**.
- For a good adaptation the **hard plaster** must be **permeable to air**, especially hard plasters for the orthodontic field do not always ensure this. Like when using plastic models or varnished models that are impermeable to air, this leads to incomplete adaptation because in most cases air cannot escape completely between the model and the foil.
- 3d print models are placed centrally on the model plate for the adaptation (pressure and vacuum forming units). Please ensure that the model base entirely fits all around to the model plate. If necessary, close not fitting areas with Erkogum. 3d print models with socle can also be adapted in granules. Further auxiliaries for the use of 3d print models are Occ3-4p and Occ3-aM.
- The removal of hard materials very often leads to a **break of models**. The use of super hard plaster does not solve this problem, it is better to thermoform on a duplicated model.
- It is useful to **embed the models** for thermoforming as far into the **high grade steel granules** that only the area that has to be thermoformed plus 3 mm is visible.
- The **granules** allow a **quick adaptation** of the thermoforming materials and a very simple limitation of the model height.
- When working on the **model disc** ensure that the **model base** is **trimmed flat**.
- **Model preparation:** Areas of the model (exterior vestibulum, oral floor) which obstruct the thermoforming process have to be removed. Remove sharp plaster edges.



Fill narrow gaps between the teeth with Erkogum (transparent 110 844 / lilac 110 847).



Remove positive plaster bubbles.



Fill negative plaster bubbles and small defects with blocking out wax (transparent 725 080 / lilac 725 055).



If the splint covers the gingival margin, relieve it with Erkoskin (625 050).



When there are large undercuts, mark the prosthetic equator to limit the height.

- The adaptation of thermoforming materials always means a **stretching** respectively a thinning of the original material thickness. A rough orientation is: **1 cm model height corresponds to 20 - 25 % loss of thickness**. For this reason it is expedient to embed the models into the granules.
- All **Erkodent thermoforming materials** are tested on their biocompatibility and are **physiologically harmless** in their intended use. They are CE marked based on the EU regulation 2017/745 concerning medical products, the directive 93/42/EEC concerning medical products and the EU regulation 2016/425 concerning personal protective equipment (Playsafe triple sports mouthguard). Up to now (2023) there is no knowledge of confirmed allergic reactions on the materials, but allergic reactions cannot be excluded.
- Pay attention to the regulations for operational safety.

November 2023 - Current version of the thermoforming manual: www.erkodent.com

