

TROUBLESHOOTING

Tips and instructions for reliable processing of BEGO-Wirobond® alloys

Problem	Cause	Remedy
Horizontal cracks and porcelain splitting off in the incisal and cervical areas Crescent-shaped porcelain splitting off at the tissue side of the pontics	– Inadequate support of the porcelain by the metal framework	– Wax up a scaled down anatomical tooth shape! Cervical metal margins and framework collars act as supports! It is very important to ensure that the framework is rounded at the incisal edges (incisal angles) to provide support for the porcelain! Avoid sharp edges!
	– Distortion of the metal framework after porcelain firing	– Follow the manufacturers recommended minimal wall thickness for the framework. Finished coping thickness should be 0.3 mm, interdental connectors should be waxed up with more height than width.
	– Heat retention during cooling after porcelain firing	– Building up porcelain on the tissue side of bridge pontics too thick is critical (greater susceptibility to cracking – crescent-shaped cracks). Pronounced deep chamfer preparations provide added stability! This type of preparation should always be used with only buccal veneered crowns!
	– Porcelain layer too thick	– Support the porcelain with the anatomically scaled down framework contour, maximum porcelain thickness 1.5 mm!
	– CTE of the alloy too high for the porcelain	– Check the CTE values! Complete long-term cooling to increase the CTE of the porcelain. Long-term cooling is indicated for large restorations! We recommend increasing the final firing temperature by approx. 10 - 20 °C with long-span bridges.
	– Oxide layer too thick	– Carefully remove all the oxides again after oxidation firing/degassing cycle by sandblasting with Korox® 250 µm at 3 - 4 bar, distance to the units should be not more than 30 - 40 mm.
<p>Note: Steam clean the units inside and outside every time before applying porcelain! The surface should then be allowed to dry from the heat of the framework. There is a risk of condensate contamination from the compressed air system if the surfaces are dried with compressed air.</p> <p>Do not use components from other systems. Use non-precious metal bonders or wash opaques of the system for the respective indication according to the porcelain manufacturer's instructions for use! Adhere to increased firing temperatures if required!</p>		
Porosity and bubbles in the porcelain	– Overheating of the alloy, burning individual components, rough surfaces	– Do not overheat the molten metal (alloy)! Heat the ingots uniformly! Focus on producing homogeneous, porous-free castings!
	– Contamination of the alloy due to investment residue and oxides when reusing the alloy for casting	– Use only new metal!
	– Overlapping/inclusions on the surface of the alloy	– Prepare the surface in one direction only – preferably with sharp tungsten carbide rotary instruments.
		– Do not use dull tungsten carbide burs.
	– Inadequate preparation of the framework surface	– Do not use instruments that have been used for preparing precious metals!
	– Avoid sharp corners and edges when finishing the metal. Avoid deep notches or holes!	

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Porosity and bubbles in the porcelain	– Inadequate sandblasting of the framework	– See above!
	– Vacuum of the porcelain furnace too low	– Check the actual firing temperature in the firing chamber of the porcelain furnace as well as the vacuum of the porcelain furnace.
Porcelain splitting off exposing the metal framework	– Use of improper abrasive, sandblasting pressure too low copings too far away from nozzle, when blasting	– Sandblast the prepared framework with Korox® 250 µm at an angle of approx. 45° at 3 - 4 bar. Inefficient compressors, such as those sometimes sold in DIY stores, may be inadequate! Use only new, sharp-edged abrasives. Do not use recycling sandblasters or microblasters! Risk of contamination from investment residue.
	– Oxide formation too thick after degassing cycle	– If the oxidation firing (5 min. with vacuum) is completed as a degassing cycle at 950 - 980 °C, remove all the oxides again by sandblasting with Korox® 250 µm!
	– Oxide formation and lifting of the opaque	– Use a stiff brush when applying the opaque - rub in well, especially when using paste opaque! Alternative: Use powder opaque instead of paste opaque!
<p>Note: The bond of the porcelain restoration is also based on mechanical retention! The bond is strengthened by shrinkage of the porcelain onto the metal framework, which is due to the different coefficients of thermal expansion (CTE). The chemical bond alone does not provide adequate retention.</p>		
Bridge rocks following the oxidation and wash firing	– Framework design too thin and delicate	– Ensure junctions and connectors are high and wide enough - particularly with pontics!
Open margins after firing	– Metal margins too thin, deformation caused by contraction of the porcelain	– Ensure metal margins are thick enough; fabricate a porcelain shoulder if necessary.
	– Tension in framework, due to improper cooling, right after casting.	– Check the CTE for compatibility! Only use compatible porcelains. – Stress-relieving annealing of the metal restoration with sprues at 950 - 980 °C for 5 minutes under vacuum (oxidation firing).
Isolated lifted layers of opaque	– Wash opaque applied too thick	– Apply a thin layer of opaque for wash firing (1st opaque firing), only cover fully at the 2nd opaque firing! Raising the final wash firing temperature by 50 °C improves the bonding strength! Refer to the porcelain manufacturer's instructions for use.
	– Drying temperature too high, drying time too short	– Use a different drying technique for powder and paste opaque. Allow longer drying times with paste opaques! Dry opaqued frameworks for approx. 8 min.! (Glycerine evaporates slowly and at higher temperatures of approx. 250 °C!). Caution: There should not be any steam vapour when the firing chamber is closing! Extend the drying time manually if necessary!

Problem	Cause	Remedy
Cracks in the opaque	– Paste opaque applied too thick	– Do not thin the paste opaque with water! Follow the manufacturer's instructions for firing – do not underfire the opaque! Do not apply opaque too thick! It is better to apply and fire three thin layers of opaque to attain the required degree of coverage. Contact the manufacturer directly to obtain information about the relevant firing recommendations. Certain porcelain suppliers provide firing charts for different porcelain ovens.
Discoloration caused by oxides - particularly at the margin	– Heavy oxide formation during porcelain firing	– Steam clean the units after every firing, inside and outside! The margins of the framework should not come into contact with the firing tray during firing. Completely cover the crown margins with opaque!
Cracks in the porcelain build-up	– Porcelain has become too dry during the build-up	– Make sure that the porcelain stays moist at all times.
Cracks interapproximately	– No separation before firing	– Ensure adequate interdental separation – down to the opaque – with a moist scalpel when building up. Control the shrinkage of the porcelain.
Round edges, no brilliance in the porcelain restoration	– Temperature at the restoration too low	– Clean porcelain furnaces on a regular basis, check and calibrate firing temperatures. Note: Some porcelains have to be slightly roughened before each firing! Avoid applying a thick layer of glaze. Note: Some porcelain manufacturers recommend higher firing temperatures when using non-precious alloys. Depending on the firing tray and size of restoration the final temperature may have to be raised by 20 to 50 °C e.g. Contact the manufacturer directly to obtain information about the relevant firing recommendations. Certain porcelain suppliers provide firing charts for different porcelain ovens.
<p>Note: Bubbles form due to gas escaping during the different heat treatments. Possible sources:</p> <ul style="list-style-type: none"> - Metal overheated during casting (e.g. inclusions of foreign bodies, voids or porosity) - Porcelain application (trapped bubbles or contamination) - Incomplete drying of the paste opaque - Inadequate porcelain furnace vacuum <p>Ask the porcelain manufacturer about firing recommendations for non-precious metals!</p>		
Porcelain splits off while contouring the units	– Excessive pressure applied when grinding, RPM setting too high when contouring the porcelain	– Use a low motor speed and apply minimum pressure when contouring porcelain, you may use water to cool units while contouring.
	– Excessive pressure applied	– Particular care is required when removing any overhanging porcelain from the inside of the crown!
	– Temperature build-up too high when grinding on porcelain units	– Great care is required when finishing: ensure metal sections are not overheated = apply minimum pressure! Avoid excessive heat build-up, e.g. when using hard rubber polishers!
Porcelain cracks when cleaning the finished units	– Cleaning into the ultrasonic cleaner – Steam cleaning too long at one point (overheating!)	– We recommend cleaning the finished restoration with a brush under running water. Do not use an ultrasonic cleaner! Steam clean large surface areas only – do not focus the heat on one area!

Problem	Cause	Remedy
Porcelain fracturing off / cracks intraorally	– Oxide formation too thick during porcelain firing	– Remove oxide from the inside of crowns before fitting – sandblast with Korox® 50 µm! Do not apply any pressure to the inside of the crown. Ensure the restoration fits passively in the final position during cementation. Tip: Prepolishing metal colars prevents excessive oxidation during porcelain firing.
	– Unfavourable occlusal relationships	– Use an articulator when working Check the occlusion Avoid high spots Do not place metal/porcelain junctions at contact points with the opposing dentition.

Comprehensive information regarding fit accuracy can be found in the following (sources) information!

“Non-precious Metal Alloys” Leaflet	REF 82093
Metal-Porcelain Poster	REF 83441
Troubleshooting for processing BEGO crown and bridge investments	REF 83468

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