BEGO TROUBLESHOOTING GUIDE

Preventive error management

Partners in Progress

BEGO

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Index

Tips and hints for BEGO crown and bridge investments

Problem	Cause	Remedy
Investment does not set or sets too slowly	• Working temperature of powder and/or liquid too low	• The optimal temperature for powder and liquid is 20 °C – colder extends the working time and warmer shortens the working time
	• Mixing time too short	• Follow the instruction for use of the investment. Normally spatulate for 15 sec. by hand and then mix under vacuum for 60 sec.
	• Incorrect liquid or concentration is used	• Adhere to the instructions for use! • Bellavest® SH/DR = BegoSol® HE • BellaStar XL = BegoSol® K • Bellavest® T/Bellasun = BegoSol®/BegoSol® HE
	• Incorrect powder/liquid mixing ratio	• Follow the instructions for use! Use the correct mixing ratio and adjust the concentration to match the alloy and indication
Investment sets too quickly	• Working temperature too high	• Adjust to the correct working temperature (20 °C/68 °F)
	• Mixing time too long	• Adhere to the mixing time in the instructions for use
	• Dry, rough inner surface of the mixing bowl	• Moisten (rinse) the inner surface of the mixing bowl before mixing
Castings too large or too small	• Liquid concentration not adjusted sufficiently to match the casting alloy	• Adhere to the instructions for use for the investment! A higher liquid concentration should be selected for non-precious alloys than for precious alloys: • 80–90 % liquid concentration for non-precious alloys and 50–60 % for precious metal alloys • High concentration = high expansion, low concentration = low expansion
	• Mixing time not according to the instructions for use • Variations in mixing time • Extreme variations in working temperature – e.g. summer/winter	• Adhere to the mixing times in the instructions for use: Longer mixing produces an unregulated reduction in expansion and shorter mixing produces an unregulated increase in expansion! • It is important to ensure uniform working parameters to produce castings of a consistent quality: • Working temperature • Mixing unit • Size of mixing bowl should correspond to the amount of mixture • Use a climate controlled cabinet for powder and liquid
Bridge rocks	• Stresses in the pattern due to thermal contraction of the wax	• Wax up with a uniform wax temperature • Separate bridge units to relieve stresses and reconnect immediately before investing. Allow wax or plastic runner bars to cool completely after adapting them to the shape of the arch before waxing them onto the bridge
Mould splits or cracks during conventional preheating	• Incorrect powder/liquid mixing ratio. Mixing time in the instructions for use not followed	• Follow the instructions for use! Hand spatulate for 15 sec. and then mix under vacuum for 60 sec.
	• Ring liner is not flush with the mould ring wall when using a metal ring – investment flows behind the liner and creates a slot – the forces produced by the setting expansion can cause cracks in this region	• Transition (overlap) of the ring liner should be sealed with wax

Problem	Cause	Remedy
Mould splits or cracks during conventional preheating	• Pattern has been placed to close to the walls or base of the mould	• The minimum distance to the base and wall of the mould is 5 mm – the optimal distance should be 5 mm–10 mm
	• Mould has been removed to early from the silicone ring (not fully set)	• Allow the investment to set fully and remove carefully from the silicone ring
	• Plastic parts used in the pattern have not been covered with wax	• Plastic parts (Adapta, pattern resin, solid plastic sprues) should be thinly covered with wax, as the plastic expands initially during heating and could cause the mould to crack
	• Temperature is too high when the mould is placed in the furnace	• The maximum temperature for placing the mould in the furnace should be 80–100 °C, (176–212 °F)
	• Heat rate of the furnace is too high	• Suggested burnout cycle: • 5 °C/min. to 250 °C, (482 °F) • Hold for 30 min. at 250 °C • 7 °C/min. to 575 °C, (1067 °F) • Hold for 30 min. at 575 °C • 7 °C/min. to final temperature • Hold at the final temperature for at least 30 minutes depending on the size of the mould
Mould splits or cracks during speed (Shock heat) heating	• Times for placing the mould in the furnace not following the instructions for use	• The times for placing the mould in the furnace vary • Adhere strictly to the recommendations in the instructions for use • Bellavest® SH after 20–30 min. • If the mould is placed in the furnace prematurely, the investment is still soft; if the mould is placed in the furnace to late, the mould dried out causing cracks
	• The mould former is too large	• Only mould former sizes 1, 3 and 6 can be speed heated (Shock heat)
	• Furnace temperature (for the rapid firing technique) is to high/low	• Select the temperature for placing the mould in the furnace according to the investment used: • Bellavest® SH = 900 °C, (1.652 °F) • BellaStar XL = 700–900 °C, (1.292–1.652 °F)
Bubbles in the investment	• Inadequate vacuum when mixing	• Check the mixing unit, mixing bowl and vacuum hose. Clean the seals and edge of the bowl!
Rough casting surfaces	• Molten alloy was overheated	• Adhere to the manufacturer's instructions (Alloy)
	• Proportion of reused alloy to high	• Reduce the proportion of reused alloy
	• Too much wetting agent applied and not dried completly	• Apply wetting agent gradually and uniformly and then blow dry immediately
	• Mould held at the final temperature for to long	• Do not hold the mould at the final temperature for longer than 60 min.
Investment inclusions in the casting	• Sharp edges of investment between the sprues were broken off by molten metal during the casting	• Round off sharp edges between the sprues
	• Contamination with impurities during the setting/ preheat stage	• Avoid contamination during the setting and preheat stage • Place the mould in the preheat furnace with the mould former facing downwards • Always keep the furnace clean

Tips and hints for veneering BEGO alloys reliably

Comprehensive information regarding fit accuracy can be found in the following broschure!

Guideslines – The crown and bridge technique REF 82093

Problem	Cause	Remedy
Horizontal cracks and porcelain splitting off in the incisal and cervical areas	• 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
Crescent-shaped porcelain splitting off at the tissue side of the pontics	• 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
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 • 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	
Porosity and bubble in the porcelain/Opaque	• 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 • Do not use instruments that have been used for preparing precious metals
	• Inadequate preparation of the framework surface	• Avoid sharp corners and edges when finishing the metal • Avoid deep notches or holes
	• Trapped air while mixing cermamic powder and carving liquid	• Mix cermamic powder and carving liquid homogeneously
	• Repeated mixing of ceramic	• Keep ceramic material wet, do not use dried out ceramics again
	• Dirty opaque surface	• Clean opaque surfaces before applying the ceramic (steam off - do not dry with compressed air!)

Problem	Cause	Remedy
Porosity and bubbles in the porcelain	• Inadequate sandblasting of the framework	• See above porcelain splitting
	• 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)
Note	The bond of the porcelain restauration 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.	
Bridge rocks following the oxidation and wash firing	• Framework design too thin and delicate	• Ensure junctions and connectors are high and wide enough – particuarly with pontics
	• Strong oxide formation intracoronal	• Sandblast occured oxide out, before attaching it onto the model
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 • Check the CTE for compatibility (only use compatible porcelains)
	• Tension in framework, due to improper cooling, right after casting	• Stress-relieving annealing of the metal restoration with sprues at 950–980 °C for 5 min. 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
	• Indications for higher firing temperature neglected	• Observe ceramics manufacturer guidelines; burn non-precious alloys 30–50 °C higer as precious alloys if necessary
	• Inadequate vacuum of the ceramic furnace/firing chamber	• Control the vacuum power of the firing chamber and vacuum pump regularly

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
Ceramic appeals milky/grey, no brilliance in the porcelain restoration	• Temperature of the object is to low or inadequate vacuum during the ceramic fire	• 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 – 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) • Check the vacuum of the ceramic firing chamber
Note	Bubbles form due to gas escaping during the different heat treatments – possible sources: • 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 Ask the porcelain manufacturer about firing recommendations for non-precious metals!	
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 – sand-blast 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

Tips and hints for processing BEGO CrCo materials

Service hotline:
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Further information	
Partial denture technique	REF 82068
Partial-Denture-Poster	REF 82926
Tips and hints for veneering BEGO alloys reliably	REF 83498
Tips and hints for BEGO crown and bridge investments	REF 83468

Problem	Cause	Remedy
Casting defects	• The temperature of the molten metal was too low	• Increase the casting temperature or extend the final heat time • Set the programme or temperature preset according to the alloy; when melting with a torch, optimise the flame setting
	• The temperature of the mould was too low	• Check the temperature of the preheat furnace and increase, if necessary • Hold the mould at the final temperature for an adequate length of time; do not place the mould too close to the furnace door

	• The cast delay time was too long	• Keep the cast delay time as short as possible
		  • Preheat the alloy
		  • Only remove the mould from the furnace immediately before placing it in the casting machine
		  • Preheat the crucible, if necessary

	• The material used for the wax-up did not fully burnout without residue	• Use only material that fully burns out without residue for waxing up

	• An unsuitable sprue system was used	• Adhere to the basic principles of casting:
		  • Cast from thick to thin
		  • Attach extra sprues to large sections like backings
		  • Do not taper connection points
		  • Avoid sharp edges and kinks in the sprue
		  • Use flat ribbon sprues for upper bases

	• Sprues were not adequately sealed with wax	• Completely seal the junctions between the crucible former/base and sprue with wax
	• Incorrect setting of the programme or starting torque/casting pressure on the casting machine	• Set the casting parameters according to the indication and alloy
	• The pattern was too thin	• Wax up the pattern to a minimum thickness of 0.4 mm; slightly increase the thickness of large upper palatal plates
	• An inadequate amount of alloy was used for casting	• Calculate the amount of alloy: wax weight x density of the alloy used; allow extra alloy for the sprue system
	• Inadequate centrifugal time or pressure	• Check casting parameters and adjust, if necessary
	• Ventilation sprues were used with the vacuum pressure casting technique	• Do not use ventilation sprues that extend to the crucible former or mould wall with vacuum pressure casting (as air enters the pattern more quickly than the molten metal)
	• When using the vacuum pressure casting technique, sections of the pattern (usually clasps) were placed too close to the outer surface of the mould (mould wall too thin; frequently with the foil technique)	• Air enters the pattern through the porous surface of the investment more quickly than the molten metal • The minimum wall thickness to the mould surface should be 5 mm when using the vacuum pressure casting technique!
Porosity in the casting	• Contamination inside the mould	• Always place moulds in the furnace with the opening facing downwards • Only use waxing up material that fully burns out without residue • Clean the furnace chamber and remove any contamination
	• The alloy was overheated	• Do not overheat the alloy • Shorten the final heat times • Check the flame setting when melting with a torch

	• Sprues were not optimally placed	• Adjust the position of the sprues
		  • Attach adequate reservoirs to thicker sections
		  • Avoid sharp edges in the sprue system

	• Contaminated alloy	• Recast alloy was not properly cleaned or has been recast too often

Problem	Cause	Remedy
Porosity in the casting	• Investment inclusions in the casting	• The investment was not fully set • Sandy model surfaces • Crucible scrapes the mould crucible former • Movement of the centrifugal arm carriage was not limited to 2–3 mm before the mould
Rough castings. Refer also to "Residue in the duplicating mould"	• The molten metal was overheated	• Reduce the casting temperature
	• Pattern was waxed up on a rough investment model	• Adhere to the correct liquid to powder ratio (refer also to "Residue in the duplicating mould")
	• The mould was held too long at the final temperature in the furnace/mould temperature was too high	• Hold the mould at the final temperature for 30–60 minutes and then cast
	• Inadequate vacuum when mixing the investment causing bubbles in the investment	• Ensure that there is an adequate vacuum when mixing the investment
	• Inadequate mixing of the investment	• Adhere to the premix and mixing times as well as any additional vacuum time required
Residue in the duplicating mould	• The duplicating mould was too cold • Gel was placed in cold water for setting	• Only pour the duplicating mould once it has reached room temperature – aim for as short a setting time as possible
	• The surface of the doubling was still too moist (residual wetting agent was in the silicone duplication)	• The surfaces of the doubling should be as dry as possible; allow the wetting agent to dry off completely
	• The model duplicated in the gel was not properly hardened	• Dry and harden models properly (models duplicated using silicone do not require extra hardening)
	• Mixing time was too short • Investment was too cold when mixed and poured	• Mix and pour the investment according to the instructions for use, the optimal working temperature is 20–22 °C
	• Shelf life of the liquid used had expired or incorrect liquid was used	• Check the shelf life of the liquid and check the liquid for contamination or crystal formation • Use the correct liquid
	• Incorrect mixing ratio was used for silicone duplication • Silicone was not fully set • Components were not mixed together homogeneously	• Mix and pour the silicone according to the instructions for use • Ensure that the components are thoroughly mixed together
	• Models were removed too soon from the duplicating mould	• Adhere to the setting times of the investments
Cracks in the casting	• Mould was cooled too rapidly after casting	• Allow the cast mould to cool slowly to room temperature – do not quench in cold water
	• Pattern was waxed up too thinly	• Wax up the pattern to as uniform a thickness as possible – minimum 0.4 mm
	• Fine investment has dried too much	• The fine investment should only be mixed "wet on wet" with the main investment
	• The button on the casting is too large	• The button solidifies quicker than the casting due to the large surface area and causes shrinkage cracks when compensating for volume loss
Cracks in the mould	• An initial crack was created at the overlap when using foils	• Connect the overlaps properly • Avoid sharp edges by using adhesive or adding wax
	• Mould was placed in the furnace too soon or the furnace temperature was too high when the mould was placed in the furnace	• Adhere to the setting times • Allow the furnace to cool fully before placing moulds in the furnace when casting conventionally

Problem	Cause	Remedy
Cracks in the mould	• Mould was heated too rapidly	• Heat the mould using the speed or conventional technique in accordance with the indication of the investment, adhere to the recommended temperature heat rate when using the conventional technique
	• Plastic pattern were invested or the pattern was placed too close to the mould walls	• Apply a little wax to the plastic part (pattern) • Maintain a mould wall thickness of approx. 5–10 mm
	• Mixing bowl was contaminated	• Only use the mixing bowl for mixing phosphate-bonded investments • Use a separate mixing bowl for plaster-bonded investments and silicone
	• Vaseline was absorbed into the investment	• Only coat the inside of the casting ring with a thin layer of Vaseline as a separator, the mould should be removed from the ring after approx. 10–15 min.
Moulds crack and split when using the speed casting technique	• Mould was placed in the hot furnace too soon/ too late or at the incorrect temperature	• Adhere strictly to the time window for placing the mould in the furnace! • Follow the instructions for use of the investment (the mould can generally be placed in the furnace after 20–30 min)
Flash on the casting, closed retention. Refer also to section "Cracks in the mould"	• The model and investment have separated	• When using foils, create undercuts as mechanical retention • Smooth foil overlapping with wax • Avoid strong mechanical vibration (heavy tapping)
	• Wax adhesive was applied too thickly or overlaid	• Only apply an even thin coating of wax adhesive • Wax adhesive sould be only applied on wax or plastic components • If possible thin the wax adhesive • Renew wax adhesive
	• The dipping hardener was not fully dried/ not fully absorbed into the model	• Dry and preheat models according to the instructions for use of the dipping hardener; dry models for approx. 5 minuntes after dipping, if necessary • The dipping hardener should be fully absorbed into the model • Models duplicated using silicone do not require extra hardening; the models only have to be dried at approx. 80–100 °C
	• Untidy wax-up	• Finish the wax-up cleanly at the model • Avoid excess wax or remove it completely before investing
	• Models or investment (mould) were placed in the pressure unit too late	• Do not place the poured duplicating moulds or casting moulds under pressure after the initial setting reaction • Do not move the mould during setting

Beads and voids on the casting	• Mixing unit does not build up an adequate vacuum	• Check the mixing unit
		  • Manometer
		  • Oil
		  • Hoses
		  • Seals

	• Pattern not sealed adequately with wax or fixed properly to the model	• Connect the wax and plastic units properly with wax • Avoid gaps between the pattern and model • The pattern should be fixed securely to the model
	• Investment sets too quickly	• Adhere to the mixing parameters, such as mixing ratio, temperature and mixing time
	• Silicone surfaces were not degreased	• Wetting agent has not been used or the wetting agent has not been allowed to dry completely before investing

Problem	Cause	Remedy
Beads and voids on the casting	• Pattern surfaces were not degreased	• Wetting agent has not been used or the wetting agent has not been allowed to dry completely before investing – alternatively, the fine investing technique can be used
Very large bubbles on the pattern	• Air was trapped as drops during investing. The investment set too quickly	• Fully block out the master model • Avoid areas with deep undercuts • Adapt the wax pattern correctly to the model • Invest the mould under pressure • Use the fine investing technique • Fix the investment models securely to the ring base • Adapt foils flush to the model • Moisten the investment model slightly using distilled water before investing
Casting too small	• The concentration of mixing liquid was too low for the model or only water was used for mixing	• Use the minimum concentration of liquid according to the instructions for use. Increase in small increments (5–10 %), if necessary
	• The duplicating material was too firm/hard	• Adjust the mixing concentration to the hardness of the duplicating material (harder duplicating materials usually require a higher liquid concentration)
	• Liquid had crystallised, as it had been stored at too cold temperatures or it was frozen. Check the frost protection	• Check the liquid for crystal formation – if in doubt, use a new bottle of liquid
	• Different pressure parameters were used during duplication and model fabrication with silicone	• Use the same parameters during duplication and model fabrication with silicone – either complete the two working stages with pressure or without pressure
Casting too large	• The concentration of the mixing liquid was too high for the model or only undiluted mixing liquid was used for mixing	• Use the mixing concentration according to the instructions for use or reduce it, if necessary
	• The duplicating material was not firm/hard enough • Old duplicating gel was used	• Check the gel mould for the correct consistency – it is better to reduce the recommended mixing concentration with very soft silicones. • Change the gel, if necessary
	• Different pressure parameters were used during duplication and model fabrication with silicone	• Use the same parameters during duplication and model fabrication using silicone – either complete the two working stages under pressure or without pressure
Casting distorted, irregular fit	• Deformation of the duplicating mould	• Use duplicating flasks that are suitable for the duplicating material • Always place duplicating moulds on a flat surface to avoid deformation. • Move the duplicating moulds as little as possible during setting (use a stabilising ring)
	• Failure to observe the required elastic recovery period of the duplicating material after removal of the model	• Allow an adequate elastic recovery period when there is a high degree of deformation (deep undercuts on the model)
	• Silicone had loosened from the duplicating flask (stabilising ring)	• Check for loose sections on the duplicating mould after removal of the master model • Always remove the master model carefully with the aid of compressed air
	• Error in the investment procedure (not mixed long enough, no premixing, powder/liquid too cold)	• Adhere to the instructions for use for theinvestment • Follow the technique parameters

Problem	Cause	Remedy
Casting distorted, irregular fit	• Deformation due to mechanical influences during devesting	• Do not devest the casting while the button is still red and hot; allow to cool fully • Devest the casting carefully – do not hit the button with a hammer • Only remove investment from clasps and stress distributer by sand-blasting
	• Deformation caused during polishing	• Avoid irregular, excessive pressure when polishing • Protect clasp tips (with a finger) • When polishing delicate framework sections, fabricate a stone model, if necessary, and use it to provide support
Casting rocks. Refer also to "Casting too small/ Casting too large"	• Mould was placed in the furnace too soon	• Adhere to the technique parameters and times for placing the mould in the furnace
	• The duplicating mould was moved during setting of the investment model	• If possible, do not move the duplicating mould during setting of the investment
Investment sets too quickly	• The storage or working temperature is usually too high. Do not clean/rinse the mixing bowl with warm water	• Store the powder and liquid in a cool, dry place; preferably in a temperature control cupboard at approx. 20–22 °C
	• The mixing ratio was not observed or the incorrect liquid was used	• Use the liquid and powder according to the instructions for use
	• Mixing time was too long	• Select the mixing parameters according to the instructions for use
Investment sets too slowly	• The working temperature is usually too low	• Store the powder and liquid in a cool, dry place before use; preferably in a temperature control cupboard at 20–22 °C; not in a refrigerator!
	• Liquid was incorrectly transported or stored	• Check the liquid for frost damage • Storage room should be frost free
	• The mixing ratio was not observed or the incorrect liquid was used	• Use the liquid and powder according to the instructions for use
	• The mixing time, including premixing, was too short/not thorough enough	• Adhere to the technique parameters
Wax patterns do not adhere to the investment model	• The investment model is not dry	• Models duplicated using silicone should also be dried before waxing up, only the additional hardening stage is omitted compared with models duplicated using gel • The pattern adheres best to hand-warm models
Bubbles in the duplicating material (gel duplication)	• The master models were not properly soaked before duplication	• Soak the master models (stone) for 10 min. at approx. 35 °C before duplicating with gel
Silicone duplication only partially set on the surface	• Silicone was not fully set – components were not mixed homogeneously or the surface of the master model was contaminated, e.g. due to residual impression disinfectant or use of unsuitable oils during milling	• Use silicones according to the instructions for use • Ensure that the components are thoroughly mixed • Completely clean the surfaces of the master models before blocking out

Problem	Cause	Remedy
Investments-general technique	• Apart from the mixing concentration of the liquid used, the following factors also influence the fit of the castings; storage and working temperatures, amount of mixing (premixing time and intensity, mixing time, mixing paddle design of the mixing unit) as well as the type of duplicating material used	• The only way to ensure consistent castings is by constantly maintaining these technique parameters and procedures
	• Use only distilled water for adjusting the concentration of the mixing liquid	• The quality of tap water can fluctuate
	• Opened investment bags, generally bulk packs, can absorb moisture and exhibit different expansion values during subsequent use	• Always close opened investment bags air tight after removing powder
Alloy – general technique	• Clasps fracture easily	• In addition to avoiding overheating of the molten metal or quenching after casting, the alloy should always be selected according to the specific indication (rigid alloys should be used for fixed/removable restorations and elastic alloys for clasp dentures) Use only new metal!
	• Complete repairs or extensions only using suitable solders or laser filler materials	• Use BEGO cobalt-chrome solder or Wiroweld wire laser filler material
	• Soldering on gold wire clasps	• Use BEGO gold solder 1 for soldering: temper castings at 400 °C for 15 min. after soldering on gold-clasps

Tips and hints for the safe use of ceramics, press and press-on ceramic on BEGO alloys and zirconium dioxide.

BEGO Technical Applications hotline +49 421 2028-380

Object not fully pressed

Cracks in the ceramics

Black spots in the ceramics

Cracks in the opaque

For answers to questions on the topic of ‘accuracy of fit’, please refer to the information listed here

Guidelines – the crown and bridge technique REF 82093

Problem	Cause	Remedy
Black spots in the ceramics	• Burnout furnace contaminated	• Ensure that burnout furnace muffle is kept clean • Remove the pieces of metal rings that fall to the floor of the muffle
	• C&B wax not completely burned out	• Choose a wax with very low ash content e. g. BEGO FC modelling wax
	• Old combustion residues on the modelling instrument	• Clean modelling instrument
Object not fully pressed	• Pressing time too short	• Increase pressing time (see instructions for use for the ceramics and the furnace used)
	• Pressing temperature too low	• Increase pressing temperature (see pressing recommendations)
	• Air pressure to pressing furnace too low	• Increase pressure
	• Hold time in burnout furnace too short	• Preheating time for: 100 g mould = 60 minutes 200 g mould = 75 minutes 300 g mould = 90 minutes
	• Temperature of burnout furnace too low	• Controll temperature • Increase preheating time if several moulds are in the furnace
	• Insufficient amount of pressing ingots	• Increase the amount of pressing ingots (density of ceramics ~2,4 g/cm^3, see instructions for use for spruing/wax weight/ amount of ceramic)
	• Pressing furnace too cool when mould inserted	• Start the “Warm-up” program or run at least one pressing program beforehand
	• Wall thickness for the pressable ceramics too thin	• Observe minimum wall thickness of 0.8 mm
	• Mould cooled during insertion of the ingot	• The entire process of inserting the ingot should last no longer than 1 min.
	• Wax sprues too thin	• Observe a minimum wax thickness of 3 mm
	• Incorrect spruing	• Use correct spruing technique (see instructions for use)
	• Attached too early/too late	• Observe guidelines set out in the instructions for use
Cracks in the opaque	• Drying times not followed	• Allow the pressing furnace to cool down to the starting temperature
	• Moulds were placed in a pressing furnace with too high temperature	• Apply opaques in the two layer technique stated in the instructions
	• Opaque layer was applied too thick	• Do not over dilute the opaque

Problem	Cause	Remedy
Cracks in the ceramics	• Overheating from grinding	• Avoid too much pressure and keep restoration cool with water • When making modifications to frames, use only a water-cooled turbine • Use new abrasives • Follow manufacturer's recommendations on grinding speeds
	• Blasting pressure is too high on devesting, causing flaking and chipping	• Air inclusions are caused becaused either the drying time is too short or the pressing temperature is too hot • Use a blasting material recommended by the manufacturer • Always use non-recycling sand blasters
	• Waxing of framework not anatomically reduced	• Make sure that the wall thickness of the restorations is at least 0.8 mm
	• Aluminium oxide plunger used	• Use a disposable plunger designed for the mould system used
Bubbles in the ceramics	• Refer to "Cracks in the Ceramic" fault in the opaque firings	
	• Pressing temperature too high	• Correct the pressing temperature, see instructions for use, check the temperatures of the pressing furnace if necessary
	• Wax-up not burned out completely	• Use a wax that completely burns out
Cracks in the muffles	• Micro cracks on the mould surface	• Let mould set (check IFU* of the used investment
	• Pressing power is to high	• Control press parameters
	• Press objects are to close to the mould surface • Distance between the press objects is to small	• Control the position of the press objects in the mould
Flash	• Plunger not designed for the mould system, different systems may display different diameters and lengths	• Always use a plunger and mould system made by the same manufacturer
	• Objects too close to one another	• Observe the minimum space requirement when spruing
	• Objects were moved while the investment material was still setting	• Leave the mould alone when setting
Ceramic surface is rough	• The firing temperature is too low	• Increase firing temperatures
	• The hold time is too short	• Increase hold time
Ceramic surface lacks lustre		• Calibrate furnace
	• Reaction layer not removed after pressing	• Remove surface
Ceramic surface is too shiny	• The firing temperature is too high	• Reduce firing temperature
	• The hold time is too long	• Shorten hold time
Edges and contours are rounded		• Calibrate furnace

*Instructions for use

Problem	Cause	Remedy
The colours are too light and are insufficiently transparent	• The preheating temperature is too high	• Reduce preheating temperature
	• The firing temperature is too low	• Increase firing temperature
	• The vacuum pump starts up too late	• Reduce preheating and/or vacuum start temperature
The ceramic is porous	• The vacuum level is too low	• Check vacuum pump and/or furnace for leaks
Bubbles in the layering ceramic	• Too much air trapped in the mixture when mixing the layering ceramic	• Mix liquid and powder carefully
Cracks in the layering ceramic	• Not separated interdentally	• When waxing up before preheating, separate interdentally down to the frame

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