PRECIOUS ALLOYS

DeguDent
GOLDSTANDARDS

Processing instructions

For ceramic-bonding alloys and crown-and-bridge alloys

DeguDent
A Dentsply Company

An idea that made all the difference.

Degulor®

The casting classic.

Still seductively aesthetic.

Degudent®

The ceramic-bonding classic.

Multi-talented in every respect.

Degunorm®

The multi-talent.

Powerful and naturally beautiful.

BiOcclus®

The powerful bioalloy.

Economical is better than cheap.

Econolloy®

The economical alloy.

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This manual was compiled to demonstrate our complete range of precious dental alloys and dental solders. It also provides the necessary processing instructions for fabricating high-quality restorations.

Gold alone will not make you happy, but as part of the perfect dental alloy, it will keep you satisfied for a long, long time.

High-gold alloys, reduced-gold alloys, palladium-based alloys, silver-palladium alloys

These are the types of precious dental alloys we offer. Use them to fabricate high-quality restorations in your laboratory. By doing so, you support our efforts to offer the very best in every area.
For more than a century, DeguDent has been developing metal alloys for dental restorations. Many members of the DeguDent staff today are active in research and development for materials in dentistry and prosthodontics – and successfully at that:
The biocompatibility, aesthetics and usability of our products are second to none. For things to stay that way our materials are tested by leading institutes and universitites. They are continuously improved in cooperation with dental laboratories and dental offices.

The work proves the craftsmen

For long lasting dental restorations, dental alloys must be processed correctly. You can achieve excellent results by following the processing instructions summarized in this manual.

For contraindications, precautions, adverse reactions and interactions, please consult the alloy cards and the information at the end of this manual.

Should you have additional questions about dental alloys or dental alloy processing, please do not hesitate to contact one of our technical advisors.

Workshops are available in order to demonstrate how our products are to be processed to ensure perfect results. When it comes to alloys and how to work with them, the most informative courses are our hands on session. Please enquire about our course schedule!

Technical specifications for constituent metals

Metal	Symbol	Melting point °C	Density g/cm³	CTE µm/m·K	Vickers hardness HV 5	Yield strength N/mm²
Copper Increases alloy hardness and strength. Increases the CTE. Red.	Cu	1080	8.9	16.4	35	220
Gallium Improves mechanical properties and temperability. Increases the CTE. Lowers the melting range and improves the mechanical properties. White.	Ga	30	5.9			
Gold Main component of precious-metal dental alloys. Extremely stable intraorally, extremely resistant to corrosion. Yellow.	Au	1060	19.3	14.3	25	131
Indium Improves mechanical properties. Increases the CTE. Excellent flow characteristics. White.	In	160	7.3	56.0	1	3
Iridium Decreases alloy grain size. Heat resistance, temperability, and melting range are all increased. White.	Ir	2450	22.4	6.8	172	490
Iron Increases strength and decreases grain size. White.	Fe	1540	7.9	11.9	60	210
Manganese Decreases the grain size and increases the strength of the alloy. White.	Mn	1250	7.4	22.8	100	100
Niobium Decreases alloy grain size. Increases alloy strength. Decreases the melting range and improves flow properties. White.	Nb	2470	8.6	7.1	80	105
Palladium Homogenizes the alloy and increases its hardness, strength, corrosion resistance, and overall intraoral stability. Increases the melting range. White.	Pd	1550	12.0	11.9	52	184
Platinum Increases intraoral stability, hardness and heat resistance and decreases particle size. Reduces the oxide layer. White.	Pt	1770	21.5	9.0	50	140
Rhodium Decreases grain size. Increases hardness. Improves flow characteristics and temperability. White.	Rh	1960	12.4	8.1	107	410
Ruthenium Increases alloy hardness, reduces tension-related cracks as the liquid alloy solidifies. Small grain size. White.	Ru	2310	12.3	9.1	220	378
Silver Improves flow characteristics and increases hardness. Improves soldering properties. Increases the CTE. White.	Ag	961	10.5	19.2	26	137
Tantalum Decreases alloy grain size. Increases alloy strength. Decreases the melting range and improves flow properties. White.	Ta	3000	16.6	6.6	90	393
Tin Increases hardness and strength and improves mechanical properties. Increases the CTE. White.	Sn	230	7.3	21.4	5	17
Titanium Decreases alloy particle size. Improves flow characteristics. White.	Ti	1670	4.5	9.6	120	442
Zink Improves mechanical properties and flow characteristics. Decreases the melting temperature. White.	Zn	420	7.1	29.1	35	40

Definitions

1. Elongation at fracture:

Elongation at fracture indicates to what extent an alloy can be subjected to tensile forces beyond the elastic range until fracture occurs. It is given in percent. Lower values indicate that the alloy is relatively brittle; higher values indicate that the alloy is relatively tough.

2. Modulus of elasticity:

The lower the modulus of elasticity of an alloy, the more easily it yields to a given load. The modulus of elasticity of a material indicates its rigidity (i.e. its resistance to elastic deformation).
At 110,000 N/cm², the modulus of elasticity of precious dental alloys is closer to that of dental ceramics (60,000 N/cm²) than that of base-metal alloys (220,000 N/cm²; all figures approximate). The smaller difference between precious alloys and ceramics has a positive impact on their bond and thus on the longevity of the restoration.

3. Yield strength:

The yield strength of dental alloys can be verified by tensile stress testing. High yield strength indicates that high stress must be applied to cause permanent deformation of the alloy.

The 0.2% yield strength indicates the tensile stress required to effect a permanent deformation of 0.2% in an alloy. The limit of elasticity is the point up to which deformation is (almost) exclusively elastic and hence reversible.

Common procedure for (1), (2) and (3): Specimens are mounted on a tensile-strength testing machine and subjected to tensile loading at a constant crosshead speed.

4. Hardness:

Hardness is defined as the resistance of a material to plastic (i.e. permanent) deformation caused by the impact of a harder test object. The hardness of dental alloys is usually determined using the Vickers hardness test (DIN 50133).
In this test, a pyramid-shaped diamond point is pressed against the levelled (ground or polished) surface of the alloy at a defined force. Softer alloys will allow the diamond point to penetrate more deeply and create a larger impression. This impression is then measured under a microscope and assigned a hardness value based on diagonal length by referring to a table given in the standard.
“HV 5” indicates that the Vickers hardness test was performed at a test load of 5 kg (about 50 N). Since the Vickers hardness test is not the only method for hardness testing, and since the hardness determined depends on the procedure and the test load, these parameters must be detailed as well.
The hardness of an alloy is one important criterion for its abrasion resistance. Hard alloys are usually more resistant to abrasion than soft alloys. Therefore, alloy combinations for construction elements should be similar in hardness in order to avoid excessive abrasion of the softer constituent.
The hardness of an alloy is usually correlated with mechanical strength – i.e., the harder the alloy within an alloy system (e.g. gold base), the higher its mechanical strength.

Coefficient of thermal expansion (CTE):

Like all materials, dental alloys will expand on heating and contract on cooling. The extent of expansion/contraction will differ across materials. The coefficient of thermal expansion (CTE) specifies the extent of temperature-dependent dimensional alteration. For example, a CTE of 14.1 µm/m · K indicates that a rod 1 m in length will expand by 14.1 µm as the temperature increases by 1°C. The higher the absolute temperature, the greater the thermal expansion of the alloy. In dental technology, CTE values are given for these two temperature ranges:
1. 25–500 °C, 2. 25–600 °C

Observe the ceramic manufacturers' recommendations.

Many goals can be reached by following the right path: Processing instructions.

1. Waxing up for crown-and-bridge alloys

Wax-up follows standard laboratory practices. For crown and bridge frameworks to be veneered with composite resin, the relevant manufacturer's instructions must be followed.

2. Waxing up for ceramic-bonding alloys

The wax model of the metal framework should be anatomically shaped to a reduced scale of the crown or bridge to be veneered. In this way, the ceramics can be applied in a uniform layer and cooled evenly without building up critical tension.

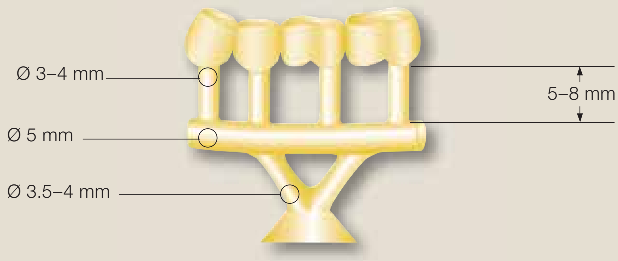
At wax-up, the minimum crown thickness of the metal framework after finishing should be no less than 0.3 mm for single crowns or 0.5 mm for abutment crowns. The interdental connectors should be sufficiently dimensioned for the alloy type used. Depending on the alloy type used, the interdental connectors must have a sufficient diameter. The recommended crown thickness is intended to maintain the stability of the metal framework. This will ensure that abutment crowns will not deform (marginal creep) during firing and that the framework will not distort. The structural stability of the framework during the oxidation and ceramic firings increases with larger wall thicknesses and cross-sections.
Adding palatal scallops lends additional rigidity to the framework.

3. Sprueing

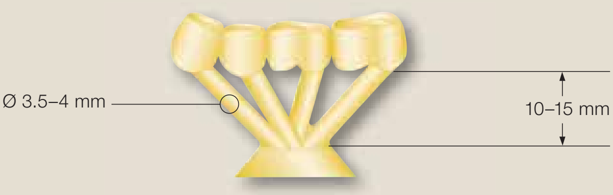
The waxed-up bridge framework must be fitted with adequately dimensioned sprues, as can be seen from Figs. a) to d). In Fig. d), heat sink fins with a diameter of 1 mm are designed for zones (interdental spaces and solid connecting parts) that should solidify during controlled cooling.

a) for single crowns

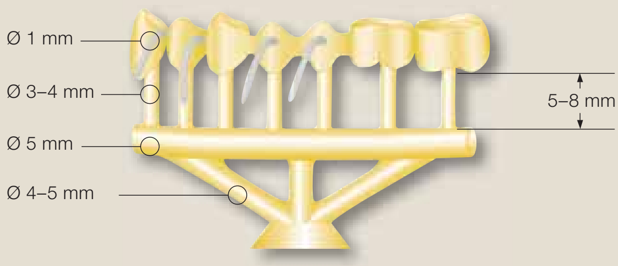
c) for small and medium-sized bridges



b) for small and medium-sized bridges

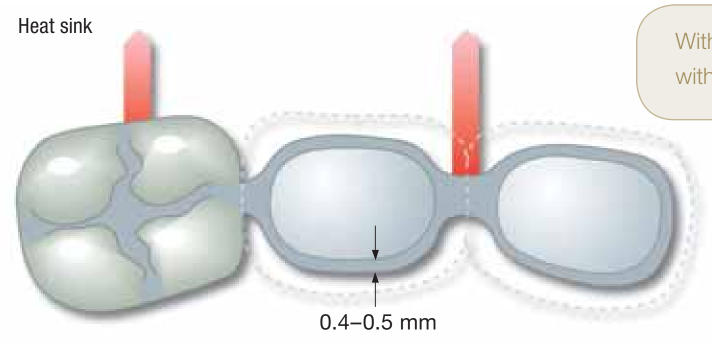


d) for wider bridges



The diameter and length of the sprues and the position of the object with the flask must be selected to ensure rapid progress of the melts and specific solidification.

These heat sink fins must not be exceed 10 mm in length in vacuum-pressure die casting machines. With centrifugal casting, they can be run from the object to the flat surface of the sprue former and mounted there.

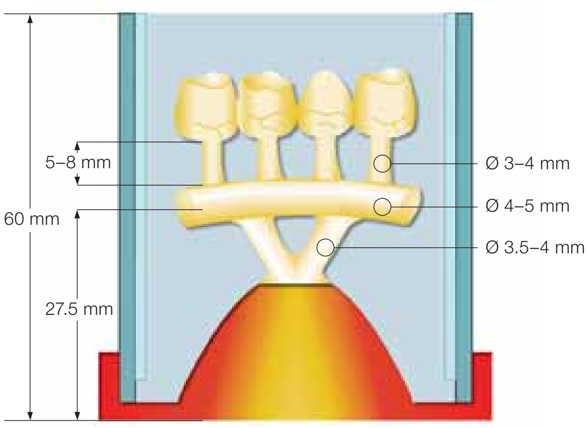


Effect of heat sinks

With Pd-based alloys, we recommend strict compliance with the maximum values for sprue placement.

4. Investing

We recommend the use of phosphate-bonded investment compounds such as Deguvest HFG, Deguvest F, Deguvest CF or Deguvest SR. For speed heating, we recommend Deguvest Impuls or Deguvest SR.
To create casting moulds, gypsum-bonded investment compounds can also be used, such as Deguvest California (do not use for AgPd-base alloys), if the alloy's pre-heating temperature does not exceed 740°C. When using casting units with rapid initial acceleration, the base of the casting ring should be no less than 1 cm in thickness.



5. Wax elimination

At 300°C depending on ring size:
Ring size
1x 20 min
3x 30 min
6x 45 min
9x 60 min

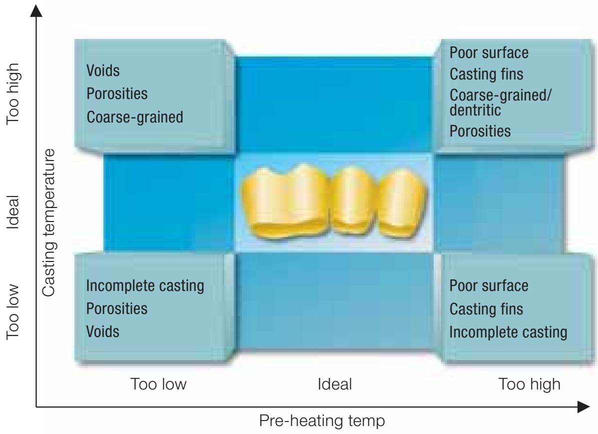
When using pattern resin or ringless casting, we recommend reducing the temperature in the pre-heating furnace by about 50°C.

Example: Solidification sequence in a single crown

The wax should be removed immediately after the setting period so that the casting result is not impaired by wax that is fully melted in the casting mould. When pre-heating the casting mould overnight, we recommend eliminating the wax from the mould beforehand for best results.

6. Pre-heating

Depending on ring size: Ring size
1x 20 min
3x 30 min
6x 45 min
9x 60 min
Alloy-specific temperatures as per the current table of alloys.



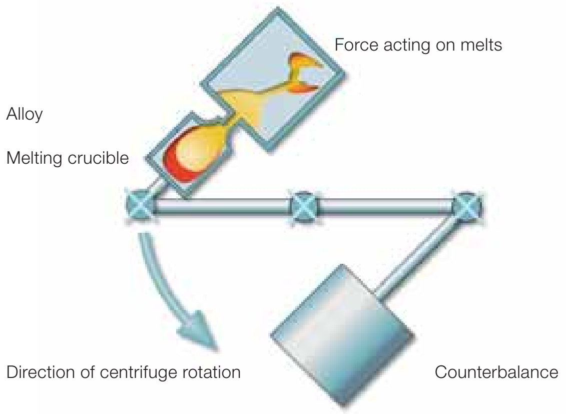
Eliminating wax and pre-heating a large number of rings requires extended wax elimination and pre-heating times. Once these have passed, cast as soon as possible.

7. Melting and casting

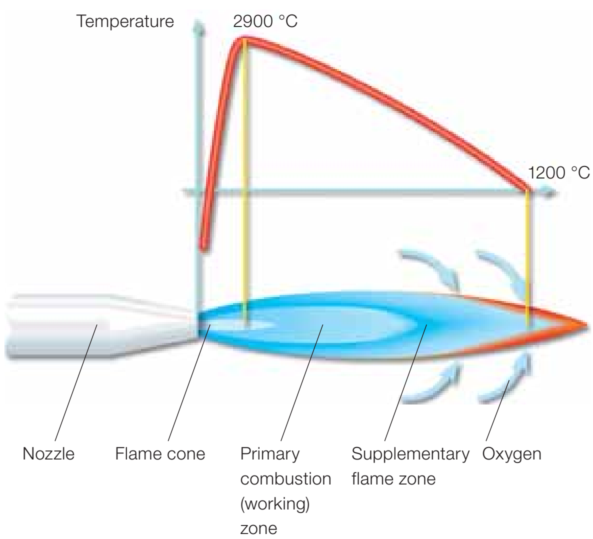
Process the alloys in either a graphite or a ceramic crucible and in a resistance heated furnace. Select a suitable crucible material for the specific alloy using the table of alloys. Cast using a centrifuge, either flame or induction, a vacuum-pressure casting unit, a HF casting unit such as the Degutron Eco or an arc-casting. Select a suitable crucible material for the specific alloy from the table of alloys. With centrifugal casting, the objects should be positioned against the direction of rotation.

Sprues/cones must be air-abraded before re-using. With any re-use, at least one-third of the material used should be new. When melting with a propane/oxygen flame, make sure the flame setting is correct and melt with the reducing flame zone (working zone).

Schematic illustration of the function of the articulated arm



For the DeguDent melting unit we recommend a pressure of 1.0–1.5 bar for propane and 2.0 bar for oxygen. This pressure is important for the correct flame setting.



8. Divesting

Allow the mould to cool to room temperature after casting. Soak the investing mould in water for approximately 15 minutes. Carefully split the mould in several places using plaster pliers. Use the same method to divest the cast object, making sure to create as little dust as possible. Any investment residue in the crowns can be removed with a stylus or carefully air-abraded using a jet polisher (50 µm/max. 2 bar). Ceramic-bonding alloys may be alternatively be air abraded with aluminium oxide (50 µm/max. 2 bar).

Do not use a hammer for divesting!

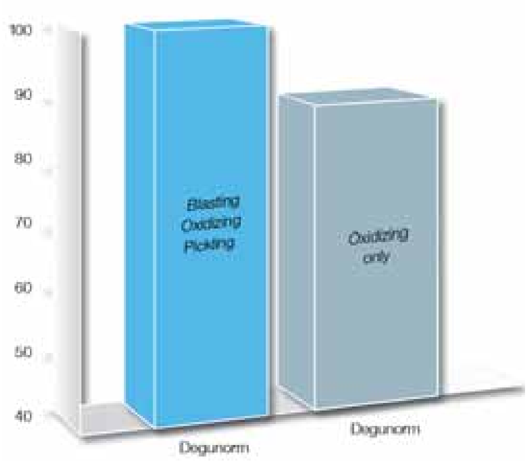
9. Pickling

Objects made of crown and bridge alloys should be pickled in Neacid, after casting or welding, for a maximum of 15 minutes. Objects made of ceramic-bonding alloys require no pickling after divesting.

Neacid pickling unit

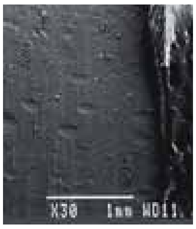
10. Finishing

Use carbide burs, ceramic bonded abrasive wheels, stones as well as cloth and rubber polishing cups for finishing crown & bridge alloys.
Air abrade the bonding surface with alumina in accordance with the manufacturer´s instructions.
Use a brush and paste to give a high-lustre polish to any surfaces not to be veneered.
The bonding surfaces of ceramic-bonding alloys are finished with carbide cutters.
The TwisTec range by DeguDent comprises a selection of rotating instruments specifically tailored to the individual materials and their processing needs.



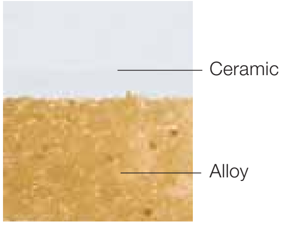
Metal-to-ceramic bond strength

After carefully finishing the object, air-abrade it with alumina 100–150 µm (at a pressure of approx. 2 bar). This step is important for improving mechanical adhesion, as the object's surface is roughened and enlarged by air-abrading.

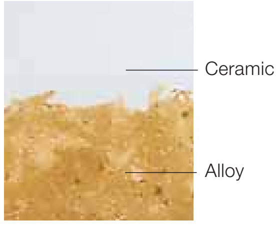


Unsuitable surface conditioning

Suitable surface conditioning



Sandblasted with 50 µm



Sandblasted with 150 µm

11. Cleaning

Brush off the cast under running water and clean with a steam jet.

- Always guide the rotating instruments in the same direction to avoid overlaps of metal debris and subsequent bubble formation in the ceramic material. In the case of soft alloys, we recommend using lighter pressure.
- Do not use a ceramic grit.
- Do not use any diamond instruments. Diamond particles may become lodged in the alloy and cause bubbles in the ceramic material during firing.
- Non-veneered aspects of the framework can be pre-polished before ceramic firing. In this way, the oxide can be gently removed after glaze-firing by using e.g. Neacid or by polishing with a buff wheel.

12. Composite veneering

Veneering with composite should be performed as per the composite manufacturers' recommendations.

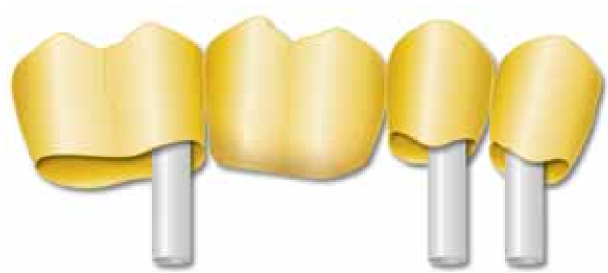
13. Oxidizing before ceramic veneering

Occasionally check the accuracy of the displayed furnace temperature and adjust (calibrate) as necessary. Avoid excessively large ranges when supporting the framework on the firing tray. Individual trays should be fabricated in these situations.

Oxidize the framework according to the oxidization parameters in the table of alloys. After oxidizing, check the framework for porosities and rework if necessary. The alloys Econolloy and Econolloy Au do not require oxide firing.

Frameworks of reduced-gold and palladium-based alloys are again air-abraded with 100–150 µm aluminium oxide after oxide firing. For high-gold alloys, the recommendations concerning the alloy type must be followed with regard to the ceramic materials used. At the same time, this will re-roughen the surface. Thoroughly brush off the metal framework under running water and carefully clean with the steam jet.

The sequence of sandblasting / oxidizing / pickling is recommended for the following alloys:
Degunorm, Degunorm supra, Degunorm pur, Degunorm logic, Degunorm eco, Degudent LTG, Stabilor LTG, BiOcclus Gold, BiOcclus Kiss, BiOcclus N, BiOcclus HT, BiOcclus 4, Biobond SG IV.



For wider-span bridges, make sure that the supporting pins fully engage the individual crowns.

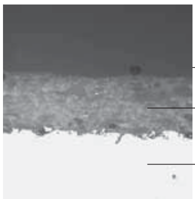
Note that the temperature of the object may exceed the selected oxidizing temperature in the ceramic furnace, especially in connection with high heating rates.

Oxidizing should also be regarded as purge firing for framework surface quality control.

14. Ceramic firing

Observe the ceramic manufacturers' recommendations. The opaque covers the framework better if applied in two layers. Apply a first, very thin layer, fire, then apply a second layer with coverage.

Good bond strength depends on a balanced ratio of the CTEs of the ceramic material and the metal alloy. The CTE values for ceramic-bonding alloys can be found in the table of alloys.



Optimized bond –
Degunorm supra/Duceragold

The CTE of the ceramic material* should be somewhat lower than that of the alloy in order to produce the desired compressive stress in the ceramic material. The CTE of high-melting ceramics is heavily influenced by the dwell time in the 800–900°C temperature range (e.g. Duceram® Plus or Duceram® Kiss) or at 720 °C for Duceragold® Kiss/Duceragold® love. The longer the object is exposed to this temperature (e.g. by soldering), the greater the CTE of the ceramic material.
* Exception Duceram® love

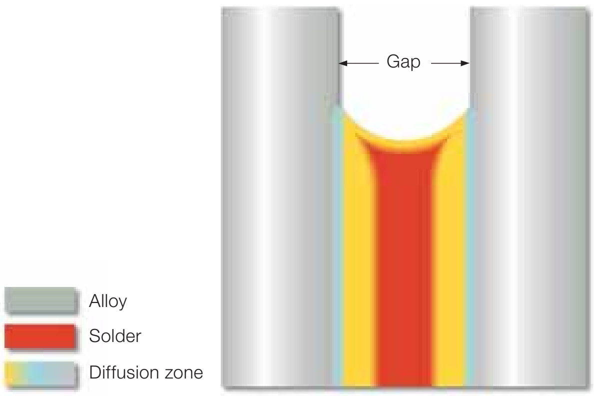
15. Jointing

a) Soldering

For a suitable alloy/solder combination, please consult pages 14 and 15.

Solder block

Shape the solder block as small as possible and preheat to 400 °C in a furnace.



Soldering gap: max. 0.2 mm

When selecting the solder, please note the difference between the soldering temperature and the alloy's solidus temperature.

There must be sufficiently large soldering areas for all solder connections. The ideal soldering gap is no wider than 0.2 mm.

Start by placing the fluxing agent.

Flame soldering

Make sure to avoid local overheating in flame soldering.

If a solder connection is to be made after firing, the firing temperatures and parameters of the ceramic material must be taken into account (influence on the ceramic CTE).

Connecting technology

	Alloy	Solders (working temperatures)	Post ceramic solders	Weldability by laser
		For alloys for ceramics: Solders before porcelain firing		with same type of material
Veneerable with high fusing ceramics				
High-gold alloys	BiOcclus Kiss	**Degudent solder G1** (1030 °C)	**Solder DG 750** (750 °C)	✓
	BiOcclus HT			✓
	BiOcclus 4			✓
	BiOcclus N			✓
	BiOcclus Gold	**Degudent solder G1** (1030 °C)	**BiOcclus solder G 710** (710 °C)	✓
	Biobond III	**Degudent solder N1** (1060 °C)/**N1W** (1,070 °C)	**Unilot 2** (760 °C)/ **Degulor solder 2** (745 °C)	✓
	Biobond SG IV	**Degudent solder G1** (1030 °C)	**Solder DG 750** (750 °C)	✓
	Degudent U	**Degudent solder U1/U1W** (1120 °C)/**N1** (1060 °C)/**N1W** (1070 °C)	**Unilot 2** (760 °C)/ **Degulor solder 2** (745 °C)	✓
	Degudent H	**Degudent solder N1** (1060 °C)/**N1W** (1070 °C)		✓
	Degudent U 94	**Degudent solder U1/U1W** (1120 °C)/**N1** (1060 °C)/**N1W** (1070 °C)		✓
	Degudent Kiss	**Degudent solder N1** (1060 °C)/**U1W** (1120 °C)	**Solder DG 750** (750 °C)	✓
	Degudent G	**Degudent solder G1** (1030 °C)		✓
	DG 88			✓
	Degutan	**Degutan solder 1** (1120 °C)	**Degutan solder 2** (800 °C)	✓
Reduced-gold alloys	Degudent Eco	**Degudent solder U1W** (1120 °C)/**N1** (1060 °C)/**N1W** (1070 °C)	**Degulor solder 2** (745 °C)/ **Stabilor solder 710** (710 °C)	✓
	Deva 4	**Degudent solder U1/U1W** (1120 °C)/**N1** (1060 °C)/ **N1W** (1070 °C)	**Degulor solder 2** (745 °C)/ **Stabilor solder 710** (710 °C)/ **Unilot 2** (760 °C)	✓
	Degubond 4			✓
	Degudor			✓
Palladium-based	Econolloy Pd	**Degudent solder U1/U1W** (1120 °C)/**N1** (1060 °C)/**N1W** (1070 °C)	**Degulor solder 2** (745 °C)/ **Stabilor solder 710** (710 °C) 2)	not available
	Degustar F	**Degudent solder N1** (1060 °C)/**N1W** (1070 °C)/**G1** (1030 °C)		not available
	Pors-on 4	**Degudent solder U1/U1W** (1120 °C)/**N1** (1060 °C)/**N1W** (1070 °C)		not available
	Degupal G	**Degudent solder N1** (1060 °C)/**N1W** (1070 °C)/**G1** (1030 °C)		✓
veneerable with low fusing ceramics				
High-gold alloys	Degunorm	**Degunorm solder 880** (880 °C)	**Degunorm solder 700** (700 °C)	✓
	Degunorm supra	**BiOcclus solder G 870** (870 °C)/**Degunorm solder 880** (880 °C)/ **930** (930 °C)	**BiOcclus solder G 710** (710 °C)/ **Degunorm solder 700** (700 °C)	not available
	Degunorm pur		**BiOcclus solder G 710** (710 °C)	✓
	Degunorm logic			✓
	Degudent LTG	**Degunorm solder 880** (880 °C)/**930** (930 °C)	**Degunorm solder 700 (700 °C)**	✓
Reduced-gold alloys	Degunorm eco	**BiOcclus solder G 870** (870 °C)/**Degunorm solder 880** (880 °C)/ **930** (930 °C)	**BiOcclus solder G 710** (710 °C)	✓
	Stabilor LTG	**BiOcclus solder G 870** (870 °C)/**Degunorm solder 930** (930 °C)		✓
	Econolloy	**BiOcclus solder G 870** (870 °C)		not available
Ag/Pd-based	Econolloy Ag	**Degunorm solder 880** (880 °C)/**930** (930 °C)	**Degunorm solder 700** (700 °C)	not available
	Degulight			not available

1) After pre-rinsing using Degudent solder N1W or for direct soldering using Oxynon® flux.

2) For soldering after porcelain firing with combinations Stabilor® G, GL/silver-free Au-Pd- or Pd-based ceramic-bonding alloy.

	Alloy	Solders (working temperatures)	Post ceramic solders	Weldability by laser
		For alloys for ceramics: Solders before porcelain firing		with same type of material
Crown-and-bridge alloys				
High-gold alloys	Degulor M	**Unilot 1** (820 °C)/**2** (760 °C)/**Degulor solder 0** (840 °C)/**1** (800 °C)/**2** (745 °C)/ **Degunorm solder 700** (700 °C)		✓
High-gold alloys	Degulor MO			✓
High-gold alloys	BiO Degulor M	**Biolor solder G 820** (820 °C)		✓
High-gold alloys	BiO Degulor nT	**Degulor solder 2** (745 °C)/		✓
High-gold alloys	BiOcclus inlay	**Lot DG 750** (750 °C)		not available
High-gold alloys	Degulor NF IV	**Unilot 1** (820 °C)/**2** (760 °C)/**Degulor solder 0** (840 °C)/**1** (800 °C)/**2** (745 °C)/ **Degunorm solder 700** (700 °C)		✓
High-gold alloys	Degulor C			✓
High-gold alloys	Biocrown IV plus			✓
High-gold alloys	Biolor SG	**Biolor solder G 820** (820 °C)		✓
Reduced-gold alloys	Stabilor NF IV	**Unilot 1** (820 °C)**/Unilot 2** (760 °C)		✓
Reduced-gold alloys	Stabilor IV plus	**Degulor solder 2** (745 °C)/**Degunorm solder 700** (700 °C)		not available
Reduced-gold alloys	Stabilor G	**Unilot 2** (760 °C)/ **Stabilor solder 710** (710 °C)		✓
Ag/Pd-based	Palliag M	**Unilot 1** (820 °C)**/Unilot 2** (760 °C)		not available
Precious-metal wires				
	Degulor i	**Degulor solder 0** (840 °C)/**Degulor solder 1** (800 °C)/ **Degulor solder 2** (745 °C)		
	Degulor			
	Permador			
Cobalt-chromium alloys				
	Biosil l	**Degudent solder N1W** (1070 °C)/**Degulor solder 0** (840 °C)[1]/**Degulor solder 1** (800 °C)[1] **Degulor solder 2** (745 °C)[1]		✓
	Biosil f			✓

1) After pre-rinsing using Degudent solder N1W or for direct soldering using Oxynon® flux.

2) For soldering after porcelain firing with combinations Stabilor® G, GL/silver-free Au-Pd- or Pd-based ceramic-bonding alloy.

Solder	Composition in mass %													
	Colour	Au/Pt metals	Au	Pt	Pd	Ir	Rh	Ag	Cu	Sn	Zn	In	Fe	Re
Degulor solder 0	Yellow	74.9	72.0	1.9	1.0			10.0	9.0		6.0			0.1
Degulor solder 1	Yellow	74.9	72.0	1.9	1.0			8.0	7.0		10.0			0.1
Degulor solder 2	Yellow	74.9	73.0	1.9				10.0	3.0		12.0			0.1
Biolor solder G 820	Yellow	75.0	72.0	2.9		0.1		8.0	7.0		10.0			
Degunorm solder 700	Yellow	73.1	72.5	0.4		0.1		10.0	3.0		12.0	2.0		
Degunorm solder 880	Yellow	79.0	76.0	2.9		0.1		10.0	6.0		5.0			
Degunorm solder 930	Yellow	60.5	60.0	0.4		0.1		34.2		0.8	4.5			
BiOcclus solder G 710	Yellow	70.2	68.5	1.6		0.1		13.8			16.0			
BiOcclus solder G 870	Yellow	92.8	90.7	2.0		0.1					7.2			
Unilot 1	Yellow	74.0	72.0	0.9	1.0	0.1		16.0			10.0			
Unilot 2	Yellow	75.0	73.0	0.9	1.0	0.1		13.0			12.0			
Degutan solder 2	Yellow	75.0	73.0	1.9		0.1		15.0			10.0			
Stabilor solder 710	Yellow	51.0	50.0		1.0			28.0	5.0		14.0	2.0		
Degudent solder U1	Yellow	81.7	75.8		5.9			17.0	0.5	0.1		0.1	0.5	0.1
Degudent solder U1W	White	80.4	66.1		14.1	0.2		14.1			1.4	1.3	2.8	
Degudent solder N1	Yellow	82.0	80.0	1.0	1.0			17.0	0.5	0.2		0.2		0.1
Degudent solder N1W	White	73.1	59.0		14.0	0.1		16.9	9.0		1.0			
Degudent solder G1	Yellow	64.6	64.0	0.4			0.2	34.9				0.5		
Lot DG 750	Yellow	60.3	60.0	0.2		0.1		27.2		0.5	12.0			
Degutan solder 1	Yellow	99.1	95.0	2.0	2.0	0.1				0.9				

b) Laser welding

Laser welding joins components without changing the composition of the alloy. No solder is required. Laser welding wires 190 mm long and 0.35 mm in diameter, made of all important precious dental alloys, are available for this purpose. Refer to page 14 and 15 for laser welding wires.

The Connexion II Ergo dental laser was developed specially for dental laboratory requirements. It is especially suitable for connecting components made of precious alloys. When doing laser welding, observe the device manufacturer's instructions and recommended welding parameters.

16. Annealing

The alloys are hardened by slow cooling of the mould after casting or ceramic firing (except for the alloys Degudent LTG, Biolor SG, Stabilor IV plus, Degupal G, Degunorm logic, BiOcclus Gold, BiOcclus Kiss, BiO Degulor M and BiOcclus inlay, BiOcclus inlay, whose hardness cannot be increased by "annealing"). Heat treatment to improve the mechanical properties is therefore not necessary within the given indication range. The hardness and strength after casting or ceramic firing are sufficient with these alloys for every physiologically reasonable bridge span, with adequate reserves being available even for extreme occlusal situations. However, additional hardness should be obtained for heavily friction-loaded parts (double-crown technique, spacer technique) by annealing. All objects are subsequently air-cooled at room temperature. If "annealing" is desired, this should represent the last thermal treatment phase for the respective object.

Connexion II Ergo dental laser

		Annealing temperature °C/15 min
Ceramic-bonding alloys, traditional ceramics		
High-gold alloys	BiOcclus Kiss	*
	BiOcclus HT	500
	BiOcclus 4	600
	BiOcclus N	450
	BiOcclus Gold	*
	Biobond III	500
	BioBond SG IV	600
	Degudent U	600
	Degudent H	500
	Degudent U 94	600
	Degudent Kiss	600
	Degudent G	600
	DG 88	480°C/10 min
	Degutan	600
Reduced-gold alloys	Degudent Eco	700
	Deva 4	600
	Degubond 4	700
	Degudor	600
Palladium-based alloys	Econolloy Pd	700
	Degustar F	600
	Pors on 4	700
	Degupal G	*
Ceramic-bonding alloys, high-expansion ceramics		
High-gold alloys	Degunorm	450
	Degunorm supra	550
	Degunorm pur	550
	Degunorm logic	*
	Degudent LTG	*
Reduced-gold alloys	Degunorm eco	550
	Stabilor LTG	450
	Econolloy	550
	Econolloy Au	550
Ag/Pd-based alloys	Econolloy Ag	550
	Degulight	550
Crown-and-bridge alloys		
High-gold alloys	Degulor M	400
	Degulor MO	400
	BiO Degulor M	*
	BiO Degulor nT	230°C/30 min
	BiOcclus inlay	*
	Degulor NF IV	500
	Degulor C	450
	Biocrown IV plus	450
	Biolor SG	*
Reduced-gold alloys	Stabilor NF IV	500
	Stabilor plus	*
	Stabilor G	500
Ag/Pd-based alloys	Palliag M	400

* Maximum hardness is achieved by cooling in the casting mould or by porcelain firing.

17. Oxide removal

After ceramic firing or final heat treatment is carried out, the oxide layer should be carefully removed in order not to reduce the alloy´s corrosion resistance.

18. Ease of polish

In order to maintain a smooth, shiny surface, carry out the polishing process to match the hardness of the particular alloy; that is, the softer the alloy, the lower the contact pressure. The rotating polishers should be used with a constantly changing polishing direction.

The object should be cleaned before every change of the polishing paste.

With high-lustre polishing, only put a little polish on the rotating buff wheel and work by constantly changing the polishing direction. In general, a good polish will not only result in a better-looking surface, but it will also benefit the chemical behaviour (e.g. better corrosion resistance) and the physical properties (e.g. fewer plaque deposits).

Contraindications
Do not use in known sensitivity to one or several metals contained in the alloy.

Precautions
Avoid inhaling dust and vapours while in contact with dental alloys. Use suitable extraction for protection against dust and vapours. Use a facemask or respiratory protection.

Adverse reactions
Reactions that may occur are allergic reactions against metals contained in the alloy or paraesthesia caused by electro-chemical reactions. Systemic side effects caused by metals contained in the alloy have been reported in isolated cases.

Interaction
Avoid occlusal and proximal contacts of different alloy types.

For dental use only!

Failures in metallo-ceramic systems and possible causes

Bubble formation in the ceramic material
- Caused by incorrect flame setting or use of a graphite crucible in reduced-gold and Pd-based alloys.
- Caused by porosities or framework design overlaps (see processing note 10).

Cracks in the ceramic material
- Caused by incorrect framework design (see processing note 2).
- Caused by incorrect framework design (see processing note 14).
- With soldering after firing and choosing the wrong solder temperature (see processing note 15).

Chipping or flaking of ceramic material
- Caused by incorrect framework design (see Processing, step #2).
- Caused by a contaminated framework surface (see processing note 11).
- Caused by an insufficiently sandblasted framework surface that is too smooth (see processing note 10).

Fascination Prosthetics

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