Tight-fitting, safe, and easy

Gramm's Gold Electroforming System GAMMAT® optimo2 AU-SET





Manual of GAMMAT[®] optimo2 Instructions for use of ECOLYT SG200



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Certified according to DIN EN ISO 9001/9002





WEEE-Reg.-Nr. DE 73937458

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GAMMAT® optimo2 Equipment

The Gramm Electroforming System consists of perfectly coordinated components. Besides the GAMMAT® optimo2 unit and the **electrolyte SG200, this system also comprises the necessary consumable materials and accessories**. A constant quality can only be guaranteed if Gramm materials are used throughout the electroforming process.

The heart of the GES technique is the GAMMAT® optimo2 processor which controls the different processes of gold refining like the electric circuit as well as the temperature and the agitation of the solution inside the heating chamber.



Fig. 1.2



Chip card GES Electroforming Art. No. 955.00.201



Chip card GHP (Goldplating/ Friction renewal) Art. No. 955.00.203



Chip card Recycling Art. No. 955.00.202

⚠

Ensure power supply during the complete electroforming process!

Eventually the electroforming unit has to be connected to a separate socket which is not coupled to the main switch of the lab. SpecificationsLength39.0cmWidth31.0cmHeight27.0cmWeight4.5kg

Power consumption 200W Voltage 110/220V (changeable by fuse link)



Accessories GAMMAT[®] optimo2



Electrolytes



It is necessary to read the safety data sheets of the liquids used before filling. Store the gold solution in closed containers in a dark and cool area. Oxygen harms the liquid and causes its decomposition. After the electroforming or recycling process respectively the liquids have to be collected in closed containers and returned to the manufacturer or an appropriate authority for disposal.

ECOLYT SG200

The gold solution ECOLYT SG200 contains 16g gold per liter as a non-toxic sulphite complex as well as different supplementary ammonium salts and additives of smallest concentrations. The gold solution ECOLYT SG200 was certified according to the Medical Device Safety Act (CE 0483).

ACTIVATOR SG200

The ACTIVATOR SG200 necessary for successful electroforming contains an antimony salt in high concentration. The three different ACTIVATORS available are accurately coordinated on the according indication:

- ACTIVATOR SG200-C for ceramic-faced metal crowns (green)
- ACTIVATOR SG200-T for telescopic cases (blue)

– ACTIVATOR SG200-H for hard-gold-plating/friction renewal (orange)

The according amount of ACTIVATOR SG200 is added before starting the process (see page 8).

In order to increase the shelf life, ECOLYT SG200 and ACTIVATOR SG200 are delivered in separate bottles.

Basic Settings GAMMAT® optimo2



Check currency

Check the adjustment of the currency (110/220V) before first use.

Turn on

Turn the unit on at the mains switch on the back side of the unit. Insert the chip card to operate the unit or to change settings. Operation is effected via menu. The display informs you continuously of the actual steps and tells you to enter the settings required. The according keys are indicated in the bottom line of the display. Settings are entered by touching one of the five light action keys and are confirmed by an acoustic sound (which can be deactivated). Inputs can be made by the arrow keys. If in the display characters are set off by a black bar this means infor-

mation about the action chosen which is confirmed by touching the round enter key in the middle of the display.

In case data has been entered wrongly – which is indicated in the display –, it is possible to go one step back in the menu by using the left arrow key. If required data is missing, the unit can be reset by pressing both the left and right key for approx. 5s at the same time. Resetting the unit can be effected anytime during entering the settings.

Ensure power supply during the complete electroforming process!





Basic Settings

The GAMMAT® optimo2 unit is delivered with preset parameters. To change these predetermined settings, use the upper or lower arrow key to go to Settings. Then confirm with the round enter key. Now, the display shows the settings menu. Select a menu item by means of the arrow keys and confirm with the round key. Go back to the main menu via the "back" field.

It is impossible to change settings while an electroforming process is running.

7 Lab name Settings Enter new time and date Hour 14 Day Minute Month Second Year

Lab name Enter lab name New name: A

Time and date

Upon receipt of the GAMMAT® optimo2, the time is set to MET or MEST respectively. Changes are possible by pressing the up or down key as often as necessary to indicate the number desired. After confirming with the round enter key, the cursor automatically moves on to the next field.

▲ Do not forget to change from summer to winter time or vice versa if required.

Lab name

To enter the lab name, use the up or down key to show the next or previous letter of the alphabet and press as often as required to reach the according letter. After reaching the letter needed, press the right arrow key to enter the next letter of the lab name. When finished, save the lab name by pressing the round enter key.



Indication sur measu	Estimated face as per uring model
Premolar crown Molar crown Anterior crown Inlay	0.40 g 0.80 g 0.50 g 0.60 g
Total amount	2.30 g
This means that the to insert the large of into beaker GES 2.	operator has adapter ring

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Turning on and determination of the layer thickness

Switch on the GAMMAT® optimo2 unit with the on/off-switch on the backside of the unit. Insert chip card GES electroforming (please consider the version – see fig. 81 on page 24 as well). With the GAMMAT® optimo2 unit, electroforming items can be manufactured in two different layer thicknesses: layer thickness 1 approx. 200µm = normal layer thickness layer thickness 2 approx. 250µm The optimum layer thickness for most cases is approx. 200µm (choose "General GES layer thickness").

Entering the gold quantity

Use the up or down key to enter the according gold quantity in grams. Confirm with the round enter key. The quantity of items to be produced in that cycle is entered in the same way.

The determination of the bath volume, i.e. of the quantity of gold solution required, depends on the size of surfaces to be electroformed. For 1 cm² surface to be electroformed about 0.4g of gold are necessary. The measuring model shows the most common preparations; the quantity of gold required is engraved on the measuring model. These values are to be considered for both layer thicknesses. An inaccurate estimation of the gold solution causes changes of a few percent only and, in general, just results in slightly thicker or thinner copings.

In case of several crowns, the weights of the individual items are added. The total is the amount of gold to be entered in the display. The GAMMAT[®] optimo2 unit indicates the necessary amounts of ECOLYT SG200 and ACTIVATOR SG200 in the display.



Measuring model for crowns, inlays and telescopic cases



Checking the contacts

It is recommended to check for a proper contacting before attaching the prepared optiCLIC contact sticks to the plating head. Just click the prepared optiCLIC contact sticks on the gauging tool for this. Put one contact of the Contact check (Art. No. 910.00.094) on the Conductive Silver Lacquer of the die, and hold the other contact to the base plate of the gauging tool. The light-emitting diode of the continuity tester lights up in case of proper contacting. Furnish the continuity tester with three conventional AA batteries before use.

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Loading of the plating head

Please see examples on page 9.

▲ Please make sure that the magnets of the optiCLIC contact sticks are free from contamination. If not, clean the contaminated areas with the Gramm Cleaning Pen (Art. No. 910.00.090).













Dosing the liquid volume

According to the total weight determined before, the necessary amounts of ECOLYT SG200 and of ACTIVATOR SG200 are automatically calculated by the unit and then indicated in the display. Furthermore, the display indicates all accessory parts required. Please see page 9 as well.

- igta Use the ACTIVATOR as required for the according indication:
 - ACTIVATOR SG200-C for ceramic-faced metal crowns (green colour)
 - ACTIVATOR SG200-T for telescopic cases (blue colour)

Measure the according amount of gold solution ECOLYT SG200 with the measuring cylinder contained in the starter kit and pour it in an appropriate beaker.

Use the 5ml syringe (Art. No. 910.01.018) supplied to dose the ACTIVATOR SG200 and add it to the gold solution in the beaker.

- ▲ For each new bottle of ACTIVATOR SG200 a new syringe has to be used. Store the closed ACTIVATOR SG200 bottle in a cool and dry place. The syringe serves as cover.
- ▲ Please pay attention to the best-before date of the liquids! The date near the sandglass symbol indicates the shelf life of the liquid in the closed original packaging. Use within 4 to 5 months after opening the bottle.
- ▲ Please note that the unit automatically calculates the higher amount of gold solution required for the special layer thickness of 250µm.

Do not forget to consider this higher amount of gold when calculating your price.

Contacting the plating head

Put the magnetic stirrer into the gold solution.

▲ Depending on the beaker size chosen (GES 1 or GES 2), either one or two adapter rings have to be inserted to transfer the heat from the heating chamber to the beaker. Please refer to the indication on the display.

Place the filled beaker into the heating chamber. Use utmost care when inserting the plating head into the beaker.

Contact the plating head by plugging the plug into the jack. Then, the light-emitting diodes of the contacted places in the plating head illuminate.

Improper contact

If the unit indicates an improper contact, the reasons might be:

- no or insufficient contact between the Conductive Silver Lacquer and the optiCLIC contact stick
- plating head is not inserted in the gold solution



Important tips to ensure proper contact and position

- 1 Connect the optiCLIC carriers prepared according to the instructions (see page 13) at the contacts marked in black in the pictures above.
- **2** Make sure that the items are correctly washed around. Avoid turbulences.
- **3** Ensure that no object touches the beaker. This is especially important when using beaker GES 1 and the anode with the red mark.
- **4** Arrange the items evenly above the anode.
- 5 Mount bar coatings, bridges, and splints horizontally, with the surface to be electroformed looking downward.
- 6 If the correct beaker is used, all objects will be covered completely with ECOLYT SG 200 even during stirring.

24 Lab name General GES layer thickness Process information Amount of gold used: 0.40g Total process time 05:29:45 End of process: 19:57 Start Start electroforming process

Starting the electroforming process

Start the process by pressing the round key. Now, the heating chamber is heated. The display shows the actual time and the start of the process.

▲ After the electroforming process has started, neither the beaker nor the plating head may be removed from the unit.

After the final temperature is reached, the display indicates the approximate time when the process will be finished.

RESET

If the process is to be stopped or if you notice that the amount of gold entered is wrong, the electroforming process can be stopped by simultaneously pressing the left and right keys for 5 seconds.



End of the electroforming process

When the electroforming process is over, the unit turns off automatically. Then take the beaker with the plating head out of the heating chamber. However, the electroformed items will not be harmed if they remain in the electrolyte for several more hours.



Error during the electroforming process

If an error occurs during heating or during the electroforming process, e.g. a power failure of several hours, it will be indicated in the end of the electroforming process. The electroforming process is then continued and completed.

Master Die Preparation Example Crown

▲ Please use magnifying glasses!

For more preparation advice please consider also our informative brochure for dentists.



Chamfer preparation with edges rounded off (round shoulder preparation)

(The wall thickness of the electroformed framework is approx. 0.2mm, the porcelain facing will require at least 1mm.)



Anatomical preparation of the posteriors Chamfer preparation with parallel sides, no sharp edges or undercuts. For crown preparation of the anterior tooth follow its anatomical shape.



Finish line

The master model can be prepared according to the common model system used at your lab. Ditch the margin at the master die. Grind the die plinth slightly conical. Prepare a slight chamfer below the finish line. Mark the margin using a margin liner.



Sealing varnish

Sealing varnish is used to isolate plaster and silicone. Seal the complete die using Gramm's Die sealing lacquer (Art. No. 910.00.044). Let dry for approx. 15 min.



Blocking-out

Block out all undercuts as well as defects using Gramm's Galvanowax (Art. No. 910.00.046).



Spacing varnish

In order to gain enough space for the cement, apply Gramm's Spacer, free of metal (Art. No. 910.00.043) twice up to approx. Imm before the margin. With a thickness of 20µm this corresponds to the cement gap and may also be used as spacer for the glueing gap of telescopic cases. In such cases it is removed by means of acetone after finishing the tertiary construction.

Electroforming Die Example Crown

▲ Please use magnifying glasses!



Duplication

Remove the upper part of the duplicating flask set (Art. No. 910.00.007). Place putty into its lower part. Stick the prepared master die into the putty. Put on the upper part of the duplicating flask. Fill it with duplicating silicone. Please follow the manufacturer's instructions.



Casting with H4 plaster

When the silicone has set, very carefully lift off the lower part of the duplicating flask. After removing the master die, pour super hard plaster of class IV into the silicone mold. Let set according to the manufacturer's instructions.



GES working die

Separate the duplicate die from the silicone.



Aligning the die

In order to achieve a perfect position, the working die has to be trimmed accordingly. For this, place the working die on the gauging tool by aligning the incisal/occlusal edge at the dotted line and connect an optiCLIC contact stick at the vertical metal surface for a comparison of the length. Then, mark the surplus length of the plaster die.



Trimming the die

Trim the die at the mark made. After that, round off the edges of the die.



Drilling

Drill a hole with the drill (Art. No. 910.00.012) from below. *Drill just ones - since drill and contact stick correspond to each other!*



Contact stick

Glue in an optiCLIC contact stick using waterproof instant glue and let dry. Please see to it that the optiCLIC contact stick is completely glued in up to the end of the first step. Remove excessive glue.

▲ Check if the contact surface is clean before applying glue. If not, use the silver wire brush (Art. No. 910.00.093) to clean the metallic end of the stick in order to remove the (invisible) oxide layer which might have built on the stainless steel.



Conductive Silver Lacquer

After standing for some time, silver pigments separate from the solvent. Therefore, it is absolutely necessary to shake the Silver Lacquer (Art. No. 910.00.049) well before use. Use the brush (Art. No. 910.00.015) to cover the surfaces to be electroformed as well as the connecting area to the optiCLIC contact stick with Silver Lacquer. Cover the complete exposure area of the optiCLIC stick with Silver Lacquer Lacquer to ensure proper contacting.

- **M** Work under a microscope!
- ▲ Let the Silver Lacquer dry completely (60 minutes at least).
- Check the contacting by means of the Contact check (Art. No. 910.00.094).



Waxing

After the Silver Lacquer has dried completely, the area at the die plinth, where Silver Lacquer was applied, has to be covered with Galvanowax (Art. No. 910.00.046). The same applies to the exposed stainless steel areas of the optiCLIC stick.

Please make sure that areas that are to be electroformed are not covered with wax!

Continue with the electroforming process (see page 7).



Special note regarding the production of four electroforming parts with a total weight below 2.0 g

In general, three electroforming items with a total weight of up to 2.0 g can be produced in the smallest beaker (GES1) (see also page 9). However, in some rare cases – e.g. when producing four small implants or anterior teeth – it might also be possible that four electroforming parts have a total weight below 2.0 g. But there are only three contacting points in the plating head. In such cases, we recommend to connect two electroforming dies with Pattern Resin® and to contact them at one optiCLIC contact stick.

Then proceed with the electroforming process (see page 7).



Cleaning of the contact surfaces

It might be possible that an invisible oxide layer has built on the contacting areas. Therefore, clean the contact surfaces of the plating head and of the optiCLIC contact sticks before clicking them in. If the contact surfaces of the plating head or of the optiCLIC contact sticks are contaminated, clean them with the Gramm Cleaning Pen (Art. No. 910.00.090).

Finish



Rinsing the plating head

Remove the plating head together with the beaker from the electroforming unit. Take the plating head out of the gold solution and rinse the electroformed items and the anode under running water. Collect the used gold solution for later recycling. \triangle Keep the plug dry.



Removing the electroformed items

Disconnect the optiCLIC contacts from the plating head. Twist off the electroformed items with the plaster dies from the optiCLIC contacts.

Then, steamclean the anode. \triangle Keep the plug dry.



Preparing the optiCLIC contacts for reuse

optiCLIC contacts can be used several times. Use the silver wire brush (Art. No. 910.00.093) to carefully clean the stainless steel areas after each electroforming process in order to remove residues of the instant glue.



Dissolving the plaster die

Dissolve the plaster die with plaster dissolution (Art. No. 910.01.019). Heating the ultrasonic bath speeds up the dissolution process.



Removing the Conductive Silver Lacquer

In case Silver Lacquer is left, it must be removed carefully. Therefore the electroformed items are put into an acid-resistant receptacle with screw top containing 53% nitric acid (HNO_3); the receptacle is then put into an ultrasonic unit to remove the Silver Lacquer.

▲ Please comply with the safety regulations regarding acids. When using nitric acid, these works have to be effected under a powerful extraction system. Wear protective clothing! If after that there are still remainders of Silver Lacquer, these should be removed using acetone and a cotton bud.

Then steamclean all items.

▲ Check if the Conductive Silver Lacquer has been removed completely. If not, the remaining silver will diffund into the pure gold during baking. Silver that has not been removed may, in the oral environment, cause discolourations in case of outer telescopic crowns or flaking-off of the porcelain facing in case of crowns.



Checking the weight

Lay each single GES item on a weigh and take its weight down into your laboratory record book.

Finish



Bonder and Porcelain Bake



Sandblasting of electroformed items

The electroformed items are fit on to the master die. Then sandblast with 110–130 µm aluminum oxide (of 99.5% purity) at 2 bar (do not use a circulating sandblasting unit!). Steamclean the electroformed item and put it in alcohol (ethanol) for approx. 2 minutes. Just let it airdry (no compressed air – oil residues!).



Galvanobonder

Put the GES item either on a refractory tray or on a firing pillow. Follow the according instructions for use to make a viscous mix of the Gramm Galvanobonder (Art. No. 910.00.021) and apply a thin layer.





Drying

Let the Galvanobonder dry for 10 minutes in front of the open firing chamber or close the chamber for 10 minutes.

▲ Do not change the temperature setting (540°C) and/or the drying period! Otherwise the porcelain surface might flake off or crack later on.

Bonder bake

Heat rate: 50 – 60°C/min (122–140°F). Bake at 950°C (under vacuum, start at 540°C). Apply the same temperatures in case you use low-fusing facing porcelains. No delay required. Stagmalage the electroformed item after the border bake and

Steamclean the electroformed item after the bonder bake and clean it with ethanol.

Telescopic Cases (Direct Method)



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Inner telescopic crown

The inner telescopic crown is modelled and milled in the conventional way. In case of short parts an angle of inclination of 0° is recommeded, in case of long parts 2°. However, the angle of inclination may not exceed 2° and a chamfer-like step is recommendable. A smooth milling surface is required.

▲ The metal parts to be electroformed have to be completely free of milling oil and remainders of polishing agent. Thus, clean the telescopic crown with acetone.

۱.	Primary part	Treatment
۱.	gold	Give a high-gloss polish, mill the inclination angle
1	-	according to the adhesive surface. It is absolutely
11)		necessary to use Silver Lacquer as separating agent
		on the complete inner telescopic crown.
	non-precious	alloys see gold, however without Silver Lacquer
	titanium	see gold, however without Silver Lacquer
	zirconia	Give a high-gloss polish using specially supplied
		tools. Cover the complete surface to be electroformed
		with Conductive Silver Lacquer.



Measuring model (Art. No. 910.00.0

Preparing the electroforming process

Press the inner telescopic crown deeply into the upper part of the duplicating flask filled with modelling wax (Art. No. 910.00.041).



Pouring out

Pour Pattern Resin® acrylic in the telescopic crown and let set. Alternatively use superstone (class IV) or acrylic for it.



Divesting

Now, the telescopic crown poured out can be pushed out of the duplicating flask.



Alignment of the die

In order to achieve a perfect position, the working die has to be trimmed accordingly. For this, place the working die on the gauging tool by aligning the incisal/occlusal edge at the dotted line and connect an optiCLIC contact stick at the vertical metal surface for a comparison of the length. Then mark the surplus length on the die made of plaster or Pattern Resin[®].



Trimming of the die

Trim the die at the mark made. After that, the edges of the die are rounded off in order to avoid turbulences during the electroforming process.





Providing contact

Drill a hole with the drill (Art. No. 910.00.012) from below.
 ▲ Drill just ones because drill and contact stick correspond to each other!

Use waterproof instant glue (e.g. optiCLUE) to glue in an optiCLIC contact stick and let dry. Please see to it that the optiCLIC contact stick is completely glued in up to the first step. Remove excessive glue.

Conductive Silver Lacquer

Shake the Silver Lacquer (Art. No. 910.00.049) well before use. Use the brush (Art. No. 910.00.015) to create a connection from the telescopic crown to the optiCLIC contact stick.

- ▲ Let the Silver Lacquer dry completely (60 minutes at least).
- Check the contacting by means of a Contact check (Art. No. 910.00.094).
- ▲ In case of telescopic crowns out of gold, apply Conductive Silver Lacquer on the complete outer surface of the primary part which thus serves as separating layer. Use the Gramm brush No. 2 (Art. No. 910.00.215) for this.









Waxing

Cover the area at the die plinth, where Silver Lacquer was applied, with Galvanowax (Art. No. 910.00.046). The same applies to the exposed stainless steel area of the optiCLIC stick.

▲ Please make sure that areas that are to be electroformed are not covered with wax!

Continue with the electroforming process (see page 7).

After the electroforming process

Twist off the electroformed items with the plaster dies from the optiCLIC contacts. Then, trim the slightly gold-covered margin. Screw in a screw in the hole of the optiCLIC contact. The vibrations caused by the strokes of a riveting hammer on the tong jaws or on the screw will loosen the secondary telescopic crown from the primary crown. In case of plaster dies, use plaster dissolution to dissolve the plaster; use a flame in case of a Pattern Resin® die.

Processing the gold margin

Remove the Silver Lacquer by means of nitric acid (see page 14). After that, remove the excessive margin with a medium-hard silicone polishing wheel.

🛦 Work under a microscope!

Tertiary framework

After having removed the Silver Lacquer from the secondary telescopic crowns with nitric acid, the crowns are placed on the master model.

- Before duplicating (molding with light wax), a spacer out of varnish or wax is applied onto the secondary crown to provide enough space for the cement and to prevent annoying fitting work later on.
- In order to avoid back pressure of the glue when gluing in the secondary telescopic crowns, the tertiary framework must be furnished with "drain channels".
- An optimum intersection between the tertiary construction and the electroformed telescopic crown is achieved by designing the labial/palatinal crown parts as long as the electroforming crowns. Due to esthetical reasons, a tertiary construction is not recommendable for the vestibular area because of the cervical step.

Bar-Retained Dentures (Direct Method)



Preparation

Mold and mill the bar in the conventional way. Ensure a homogeneous milling surface.

▲ It is absolutely necessary to carefully remove residues of milling oil and polishing agent from the metal parts to be electro-formed. Clean the bar with acetone.

Primary part	Processing
gold	Give a high-gloss polish, mill the inclination angle
	according to the adhesive surface. It is absolutely
	necessary to use Silver Lacquer as separating agent
	on the complete inner telescopic crown.
non-preciou	s alloys see gold, however without Silver Lacquer
titanium	see gold, however without Silver Lacquer
zirconia	Give a high-gloss polish using specially supplied
	tools. Cover the complete surface to be electroformed
	with Conductive Silver Lacquer.

Pouring out

Pour Pattern Resin $^{\circ}$ acrylic in the bar and let set. Alternatively use superstone (class IV) or acrylic for it.



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Providing contact

Drill a hole with the drill (Art. No. 910.00.012).

▲ Drill just once because drill and contact stick correspond to each other!

Use waterproof instant glue (e.g. optiCLUE, Art. No. 910.00.092) to glue in an optiCLIC contact stick and let dry. Please see to it that the optiCLIC contact stick is completely glued in up to the first step.

▲ One optiCLIC contact stick ensures sufficient contact. It is recommendable to place it in the center of the object.



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Conductive Silver Lacquer

Shake the Conductive Silver Lacquer (Art. No. 910.00.049) well before use. Use the brush (Art. No. 910.00.015) to create a connection from the bar to the optiCLIC contact stick.
▲ Let the Silver Lacquer dry completely (60 minutes at least).
▲ Use the continuity tester to check the contacting.

Waxing

Cover the area, where Silver Lacquer was applied, with Galvanowax (Art. No. 910.00.046) or with Insulation Lacquer (Art. No. 910.00.063). The same applies to the exposed stainless steel areas of the optiCLIC stick.

In addition, the marginal area can be covered with Galvanowax to prevent an excessively formed margin.

A Please make sure that areas that are to be electroformed are not covered with wax!

Continue with the electroforming process (see page 7).

1	Insert	chip	card	"GES	Electro	forming".
---	--------	------	------	------	---------	-----------

- 2 Choose the layer thickness desired.
- 3 Determine the surfaces to be electroformed by means of the measuring model.
- 4 Enter the gold quantity at the display -> the unit automatically calculates the according amount of gold solution ECOLYT SG200 and ACTIVATOR SG200 (choose either -T or -C depending on the indication)
- 5 Put the suitable magnetic stirrer into the beaker according to the indication in the display.
- 6 Fill the determined amount of ECOLYT SG200 and of ACTIVATOR SG200-T or -C in a suitable beaker.
- 7 Place the according beaker into the unit.
- 8 Load the plating head according to the placement recommendations.
- 9 Contact the plating head.
- 10 Press start; the process runs fully automatically.

When electroforming, please follow this sequence of operations step by step.

Do not make any experiments!!

AU-SET

The AU-SET in combination with the GAMMAT® optimo2 offers optimum technical conditions for GHP gold-plating and GHP friction renewal.



Filling of the beakers

- 1 Cleaner removes plaque, cleans, degreases
- **2 Rinsing Water 1**, filled with tap water. Empty water after each process!
- **3 S-Act** Plating activator solution. Please see MSDS sheet!
- **4 Rinsing Water 2**, filled with tap water. Empty water after each process!
- **5 SG-Flash** Gold precoating solution. Please see MSDS sheet! Contact plating head!

6 Neutralizer

▲ After use, put the according lids on the beakers filled with the different liquids.

GHP Gold Plating Electrolytes



Please read the according material safety data sheets before using the liquids! Keep the liquids Cleaner, S-Act, and SG-Flash in closed containers. It must be ensured that no drops of one of these liquids get into another liquid. Therefore, rinsing is absolutely necessary when using this system. Another obligation is to keep the complete accessories clean.

ECOLYT SG200, ACTIVATOR SG200-H

The non-hazardous gold-plating solution ECOLYT SG200 contains 16g gold per Liter. This solution is used as concentrate for GES electroforming and diluted with SP-V Plating dilutant for the GHP electroplating in the GANWAT® optimo2. In both cases, ACTIVATOR SG200-H is required to ensure a successful deposition. The predetermined amount is added prior to the heating process.

SP-V Plating dilutant

The creation of the gold-plating solution bases on a mixture of the electrolyte ECOLYT SG200, ACTIVATOR SG200-H and the diluting solution SP-V.

Cleaner and decreasing solution

All parts to be plated (– if used or new –) should be degreased by simply submerging in Cleaner for 3 minutes. Besides degreasing of metallic objects, this cleaner also removes plaque deposits. The Cleaner allows approx. 50–75 cleaning cycles. Please note the date of expiry which is imprinted on the bottle.

S-Act – Plating activator solution

To obtain a homogeneous and adherent gold coating, the metallic components have to be activated by soaking in the S-Act solution for 3 minutes. No heating, stirring, or electrical current is required. To test its effectiveness, the water film should not disappear for at least 30 seconds after removal from the S-Act container. Please note the date of expiry which is imprinted on the bottle.

SG-Flash – Gold precoating solution

The precoating with the SG-Flash is conducted at room temperature. By connecting the plating head to the GAMMAT® optimo2 a homogeneous gold layer is plated onto the activated metal surface in 3 to 5 minutes.

Note: SG-Flash is very acidic (pH 1). Please use caution, wear rubber gloves and goggles. With a gold content of 2 grams per liter and if plating thin coatings only, about 50–75 precoating cycles are possible before the SG-Flash has to be replaced. If the SG-Flash is replaced, Cleaner, S-Act, and Neutralizer have to be exchanged as well. Take adequate measures for shipping and disposal of this solution, please see the according MSDS.

Neutralizer "Neutralisator"

To neutralize the surfaces prior to the gold-plating process.

GHP Gold Plating Positioning of CrCo Dentures

Analogous to the drawing, the base plates to be gold-plated are hung on the ligature wire (0.25mm) sent along, and then fixed as well. Practice has shown that it is helpful to form the ends of the wire to an eye so that the item to be plated can be hung there. (see fig. 74).

Hang the hanging device in the gauging tool (see fig. 75) to verify correct distance to the anode. The item to be gold-plated may rest on the base plate of the gauging tool. If the distance is correct, the item can be connected to the large plating head (see fig. 76).



Please note the following rules:

- 1 Do not cover any areas of the item to be gold-plated.
- **2** Make sure that there is a safe, electroconductive connection (verify with the Contact check, Art. No. 910.00.094).
- **3** Important: The item to be gold-plated may not touch the sensor or the anode. Risk of short circuit!



GHP Gold Plating Plating Chart

The amount of electrolyte needed depends on the size of the item to be gold-plated. Please see the three marks imprinted on the GHP beaker for reference.

	77		
Volume 1	\sim	Small Lower Dentur	e Partial
	\mathcal{A}^{2}	ECOLYT SG200	40 ml
	ST SOI	ACTIVATOR SG200	-H 0.8 ml
GHP	R(S)	<u>SP-V</u> total amount	4 10 ml ~450 ml
650 ml			
550 ml		FLASH time	6 min 1 h 00 min
		Koming inte	
		Stirrer	Δ 12 × 42
Volume 2	78	Medium Upper Den	ture Partial
	a.	ECOLYT SG200	60 ml
		ACTIVATOR SG200-	H 1.0 ml
GHP 650 ml		total amount	~550 ml
	$\left(\begin{array}{c}2\end{array}\right)$	FLASH time	8 min
450 ml	,	Running time	1h 00 min
		Stirrer	Δ 12 × 42
Valuma 2	79		
volume 5	B	Big Upper Denture	Plate
		ECOLYT SG200	80 ml
		ACTIVATOR SG200- SP-V	H I.2 ml 570 ml
GHP 		total amount	~650 ml
550 ml		FLASH time	12 min
450 ml		Running time	1h 00 min
		Stirrer	Δ 12 × 42

GHP Gold-Plating Sequence of Operations







Rinsing

Put the beaker into the heating chamber of the GAMMAT® optimo2 and cover the beaker with the according lid. Exchange the tap water in glass 2 (= Rinsing water 1) and glass 4 (= Rinsing water 2).

Start the heating process by pressing the round key.

Rinsing

Start the heating process by pressing the round enter key.



Degreasing

Insert the loaded plating head into beaker 1 "Cleaner". When pressing the round enter key of the GAMMAT® optimo2, the time starts to run down.

90	Lab name	
	Gold-plating system	
	Rinsing water 1	30 mm:ss START

Rinsing

The 3-minute cleaning process is followed by a rinsing process in glass 2 called "Rinsing water 1". Press the round enter key. Empty the water after each gold-plating process to prevent contamination of the baths.



Activating

Then, the surface is activated for 3 minutes in glass 3 called "S-Act". Press the round enter key. Consider the safety instructions!



Rinsing

It is then rinsed in tap water in glass 4 called "Rinsing water 2" for 30 seconds. Empty the water after each gold-plating process.



Pre-gold-plating (FLASH)

The time needed for pre-gold-plating (FLASH) depends on the surface to be electroformed (according to the table on page 23). The correct time is automatically indicated in the display. Insert the plug of the plating head into the jack at the GAMMAT[®] optimo2 unit. Press START.

▲ Consider the safety instructions!

94 Lab name START 95 START 97 Lab name Now insert plating head into gold soluti prepared and provide contact. START

Rinsing

It is then rinsed in tap water in glass 4 called "Rinsing water 2" for 30 seconds. Empty the water after each gold-plating process.

Rinsing

Then, rinse in glass 6 called "Neutralizer" for 30 seconds.



Visual check

If the pre-gold-plating is okay, press the round enter key; if not, start the pre-gold-plating (FLASH) procedure again.

Contacting the plating head

Insert the plating head into the preheated beaker in the heating chamber of the GANWAT® optimo2 and contact the plug to start the process.



Electroforming

Now, the electroforming process for the hard-gold-plating runs fully automatically.



Heating up

The display indicates a notice if the electroforming liquid has not reached the working temperature yet.

100	Lab name	
	Gold-plating system	
	Electroforming process finished properly	
	Amount of gold used: 0.60g	

End of the process

As soon as the gold-plating process is finished, the display shows the according message. If errors occurred during the gold-plating process, they are indicated

in the display.

Friction renewal of telescopic crowns

Clean the telescopic crowns requiring a friction renewal and sandblast them with polishing beads at 2 bars.

The friction of worn telescopic dentures is renewed by selective GHP gold-plating. For the selective GHP gold-plating it is necessary to cover all metal parts that are not to be gold-plated comprising all areas of the outer telescope that are not vertical, as well as brackets or surfaces that are in contact with areas to be gold-plated but do not require a gold layer themselves. For covering these areas that are not to be furnished with a 24-carat gold layer, you can either use the covering lacquer or the special electroforming wax.

For dividing certain areas as well as for covering the outlines or other small areas, we recommend to apply the electroforming wax according to the instructions. The covering lacquer is used to cover large metal surfaces.

Please avoid contact of the covering lacquer with the acrylic parts since it would build a compound in most cases. Cover the crossing lines of metal and plastic by means of electroforming wax. Please have a look at the following examples of an adequate coverage of areas that are not to be plated.





Gramm's insulation lacquer (Art. No. 910.00.063)

Gramm's Galvano-Wax (Art. No. 910.00.046)



Metal Acrylic There is no need to cover porcelain or acrylic parts since none of the liquids used will harm these materials.

GHP Gold Plating Friction Renewal

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102 Use pliers to bend the extra-hard stainless steel wire (Ø 0.6mm).

Friction renewal Positioning

All parts have to be fixed in the clamp so that no gas bubbles may pile up inside the telescopic crowns which means that the telescopes have to be put in horizontally, i.e. the openings look upwards. All surfaces to be gold-plated must be furnished with electric contact. Therefor, it might be necessary to attach several contact wires to the electrically insulated areas of the prosthesis.

Before the gold-plating process is started, the insides of the telescopic crowns that have to be gold-plated must be sandblasted using glass beads. Furthermore, it is important to clean the complete prosthesis in an ultrasonic unit, and then to steamclean it.

Please note the following rules:

1

Do not cover any areas to be gold-plated by the fixing clamp.

2

Put in the telescopes in a way that developing gases can escape upwards.

3

Provide contact to the telescopes to be gold-plated by means of contact wire.

▲ In case telescopes are bonded to the tertiary construction, it is necessary that all telescopes have adequate contact. Please make sure that the sensor of the plating head is not bent.



Place the object onto the perspex plate and fix it with a rubber band. Use the Contact check to verify if all telescopic crowns are properly connected with each other.



Contact the accordingly prepared stainless steel wires at the telescopic crowns. If the telescopic crowns do not have a conductive connection, they must be contacted separately.

Click in the perspex plate into the large plating head.

Volume of 450 ml

For the GHP friction renewal you will need a total volume of 450 ml solution consisting of:

ECOLYT SG200	40 ml	GHP
ACTIVATOR SG200-H	0,8 ml	050 mi
SP-V	410 ml	550 ml
Total amount	~450 ml	~450 m
Stirrer	∆12 x 42	

Number of telescopes

Au layer thickness (µm)

	5µm	10µm	15µm
1	Oh 40min	1h 35min	2h 30min
2	Oh 40min	1h 35min	2h 30min
3	Oh 40min	1h 35min	2h 30min
4	Oh 40min	1h 35min	2h 30min
5	Oh 40min	1h 35min	2h 30min
6	Oh 40min		
7	Oh 40min		
8	Oh 40min		
9	Oh 40min		
10	Oh 40min		

Time for FLASH gold: 5 minutes

Consider the size of the tooth:

The times mentioned above refer to telescopic crowns for incisors, canines and premolars. A telescopic crown for a molar requires twice as much time as a telescopic crown for a premolar.

Volume of 650 ml

For the GHP friction renewal you will need a total volume of 650 ml solution consisting of:

ECOLYT SG200	80 ml	GHP
ACTIVATOR SG200	DH 1,2 ml	~650 ml
SP-V	<u>570 ml</u>	550 ml
Total amount	~650 ml	450 ml
Stirrer	Δ 12 × 42	

Number of telescopes Au layer thickness (µm)

	10µm	15 µm
6	1h 35min	2h 30min
7	1h 35min	2h 30min
8	1h 35min	2h 30min
9	1h 35min	2h 30min
10	1h 35min	2h 30min

Time for FLASH gold: 5 minutes

Friction renewal Sequence of operations





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Lab name

Total process time End of process:



Cover the beaker "GHP/friction renewal" with the lid and insert it in the heating chamber of the GAWWAT® optimo2 unit. Exchange the tap water in glass 2 (= Rinsing Water 1) and glass 4 (= Rinsing Water 2).

Start the heating process by pressing the round key.

Rinsing

Start the heating process by pressing the round key.



Degreasing

Insert the loaded plating head into glass 1 "Cleaner". When pressing the enter key of the GAMWAT® optimo2, the time starts to run down.



Rinsing

The 3-minute cleaning process is followed by a rinsing process in glass 2 called "Rinsing Water 1". Press the round enter key. Empty the water after each gold-plating process to prevent contamination of the baths.



Activating

Then, the surface is activated for 30 minutes in glass 3 called "S-Act". Press the round key to confirm. **A** Consider the safety instructions!



Rinsing

It is then rinsed in tap water in glass 4 called "Rinsing Water 2" for 30 seconds. Empty the water after each gold-plating process.

119 Lab name Friction renewal Contact plating head! 05:00 mm:ss START

Pre-gold-plating (FLASH)

Insert the plug of the plating head into the jack at the GAMMAT® optimo2 unit. The time needed for the pre-gold-plating (FLASH) depends on the surfaces to be electroformed (according to the table on page 23). The correct time is automatically indicated in the display. Press the round enter key. Consider the safety instructions! 120 START 121

START

Rinsing

It is then rinsed in tap water in glass 4 called "Rinsing Water 2" for 30 seconds. Empty the water after each gold-plating process.

Rinsing

Then, rinse in glass 6 called "Neutralizer" for 30 seconds.

Visual check

If the pre-gold-plating is okay, press the enter key; if not, start the pre-gold-plating (FLASH) procedure again.



Contacting the plating head

Insert the plating head into the preheated beaker in the heating chamber of the GANWAT® optimo2 and contact the plug to start the process.





Electroforming

Now, the electroforming process for the friction renewal runs fully automatically.



Heating up

The display indicates a notice if the electroforming liquid has not reached the working temperature yet.

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End of the process

As soon as the gold-plating process is finished, the display shows the according message. If errors occurred during the gold-plating process, they are indicated in the display.

GHP Gold-Plating Checklist

Pre-gold-plating

Mode for pre-gold-plating

Give the surfaces to be gold-plated a high polish, then steamclean

Clean the beaker using paper

Insert the chip card for GHP goldhard-plating/friction renewal into the unit

Load the plating head

Carry out the instructions indicated on the display

Gold-hard-plating of model-cast bases

Mode for gold-plating/friction renewal

Give the surfaces to be gold-plated a high polish, then steamclean

Determine the quantity of gold solution required according to the surfaces to be gold-plated (see term chart)

Clean the beaker using paper

Insert the chip card for GHP goldhard-plating/friction renewal into the unit

Measure the gold solution ECOLYT SG200, SP-V, ACTIVATOR SG200-H and put the triangular stirrer into the GHP beaker

Load the plating head

Carry out the instructions indicated on the display

Friction renewal

Mode for gold-plating/friction renewal

Carefully clean the prosthesis, then steamclean

Sandblast the insides of the telescopes that are to be gold-plated using glass beads

Cover the metal areas that do not require a gold layer by means of electroforming wax or by covering lacquer (see illustration on page 27)

Clean the beaker using paper

Insert the chip card for GHP goldhard-plating/friction renewal into the unit

Measure the gold solution ECOLYT SG200, SP-V, ACTIVATOR SG200-H and put the triangular stirrer into the GHP beaker

Load the plating head

Carry out the instructions indicated on the display

Recycling



Recycling of Used Gold Solution

The Gramm Electroforming Technique allows almost complete output of the electrolyte ECOLYT SG200. However, an output of 100% is impossible since then the parts refined would no longer be shiny gold but only dull or even brown or black.

Do not use gold solution where ACTIVATOR SG200-T, -C or -H is added for another electroforming process! In order to draw the remaining gold out of the electrolyte, the unit series GAWWAT® optimo2 comprises a recycling cathode.

▲ Gold solution that was thinned down with SP-V must not be recycled.

Preparations

Steamclean the recycling stick before first use. We recommend further cleaning in an ultrasonic bath containing a degreasing solution, e.g. Gramm's Cleaner (Art. No. 910.00.031).

Connect the recycling rod to one of the outer contacts of the large plating head. Use the GHP beaker together with the triangular stirrer.



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Lab name

Recycling

Turning on the unit

Turn on the GAMMAT $^{\mbox{\tiny \ensuremath{\$}}}$ optimo2 unit at the on/off switch in the back of the unit.

Insert the chip card for Recycling. The chip card is read automatically, and the version of the chip card is indicated on the display (i.e. V3.0).

Choosing the mode	
Recycling	To draw gold residues out of used
	gold solution
Settings	Basic settings, see page 6
Service	To indicate the last electroforming processes



Lab name Recycling Insert beaker with electrolyte into unit. Snap in recycling rod at a marginal position of the plating head. START Start recycling process

Preparing the unit

Fill approx. 650 ml used gold solution into the beaker. After a long storage time, it is necessary to add 6.5 ml of ACTIVA-TOR SG200-T, -C or -H to the gold solution to be recycled.

Consider the maximum filling height of the beaker marked by the silicone tube. The plug of the recycling rod may not get in touch with the gold solution.

Preparing the unit

Place the recycling rod at a marginal position of the large plating head as described in figure 126. Use utmost care when inserting the thus loaded plating head into the beaker.

Put the filled beaker into the heating chamber. Contact the plating head by inserting the plug into the jack. Press the round key to start the recycling process.



Readiness of the unit

Now, the unit heats up. The display indicates the actual time as well as the starting time of the process.

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Run of the recycling process

When the unit has reached the according temperature, the display indicates the estimated end of the process.





End of the process

As soon as the recycling process is finished, the display shows the according message.



Removing the gold layer

Since, in general, the output rate of regular electroforming processes is very high, only a thin layer of gold will deposit on the recycling rod during the recycling process. Therefore, it would be wise to use the recycling rod for several recycling processes so that the gold layer gets thicker. After the recycling process, separate the recycling rod from the plating head and rinse it. Then, remove the gold layer from the recycling rod by striking onto the tong jaws with a riveting hammer.

Collect the recycled bath and dispose of it properly, e.g. return it to the manufacturer or give it to an according waste disposal authority.





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