

# Carat Ecoline

Instruction of Use



## Introduction

Carat Ecoline porcelain provides the aesthetic and production qualities demanded of a premium, easy-to-handle restorative material combined with excellent economics. To achieve optimum results, observe the guidelines and instructions in this manual.

Carat Ecoline porcelain has been developed to provide the exceptional easy handling, thermal stability and aesthetic properties to the modern dental technician. The system is inherently resistant to discoloration by silver containing alloys, eliminating the need for special liquids, and other techniques and other accessories.

### Indication:

The Carat Ecoline porcelain may be used for porcelain fused to metal, veneer, inlay/onlay fixed prosthodontic restorations.

### Contraindications:

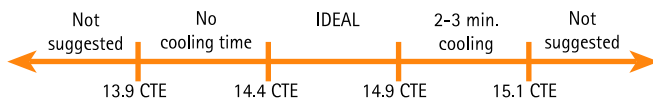
Only the indications listed above are suitable. This material should not be used with all-ceramic and porcelain enamel systems that are not thermally compatible with gold, palladium or mixed alloys for fixed prosthodontics.

### Cautions:

Ceramic masses which are already mixed with any type of a liquid should not be stored for more than two days. Even the storage in a humidor – type tray is not recommended. Chalky porcelain or white spots can result from wet storage of porcelain.

### Thermal Stability and Expansion:

Carat Ecoline is compatible with precious, non-precious and all other types of base alloys. Be sure to consult the alloy manufacturer for alloy compositions and coefficient of thermal expansions data. By taking the cooling cycles ( see below ) into consideration, alloys within a CTE range between CTE –  $13,9 - 15,1 \times 10^{-6}/K^{-1}$  ( 25 – 600 °C ) are applicable.



### Framework design and alloy processing:

- Design the wax patterns for copings and frameworks to support an even thickness of Carat Ecoline whenever possible. Total porcelain thickness, included opaque, dentine and incisal layers should not be less than 1.0 mm or greater than 2.00 mm in any area!
- Block out sharp angles on the preparation prior to the wax-up steps. Round off sharp angles on the coping or framework during the wax-up or alloy surface finishing steps.

- Design frameworks, which have multiple pontics or large single pontics, to have an exposed band of metall on the lingual side. This lingual band will support the porcelain and reduce checking caused by thermal expansion differences between the porcelain and the metall.

**We recommend to use Carat- Biopaque or Biopaque Uno, they are both ready-to-use opaque. With a highly simplified technique (simply paint on and dust) a thin, even layer can be achieved.**

## **Carat – Ecoline Dentine & Incisal Porcelains**

Mix the porcelains with the **Modelling Liquid UNF** to a paste-like consistency. Material should be remixed with distilled water only.

**Ecoline Chroma Dentine** is for intensifying the dentin color. The Chroma Dentine should not exceed 30% of the body porcelain.

The Dentine Porcelain may be built to full contour and then cut back for the incisal application, or slightly under contoured in some areas to allow for the immediate application of the incisal porcelain.

With either technique, the total porcelain build-up should be slightly larger than the expected final contour to compensate for normal firing shrinkage.

More shrinkage occurs along the incisal-cervical axis or occlusal axis than along the labial-lingual or mesio distal dimensions. Therefore, the most compensation for shrinkage should be in the vertical height of the crown.

**Note: Do not overbuild.** Excessive build-up of the porcelain promotes interproximal tearing on bridges and splints, and makes shade control difficult. By contrast, controlled and detailed build-ups save grinding time and labour and improve colour control.

### **Dentine Porcelain Application**

1. Apply the body porcelain if possible with a special brush out of the HAGER & WERKEN range. See our lab catalogue. Apply the body porcelain in small increments to avoid trapping air between layers.

**Note:** Blot excess moisture with absorbent tissue paper as you build, to prevent slumping of the mass. The blotting tissue should be placed on the surface of the build-up which is the farthest distance from the area where the porcelain is being applied. This technique improves the condensation of the porcelain mass and maintains a balanced moisture level throughout the build-up.

2. Build the dentine porcelain around the circumference of the coping or framework. Dentine body porcelain which has been modified in such a way to have more chroma may be applied to the occlusal or cervical surfaces, or in a small layer following the framework underneath the dentine.

## Multiple Unit Technique

1. To improve condensation of the porcelain in the hard-to-reach areas on bridges, apply and condense the porcelain at the cervical and interproximal areas before seating the framework on the model.

**Note:** Do not allow the porcelain in these areas to dry completely before the rest of the build-up is started.

2. On bridges where porcelain to tissue contact is required, isolate the tissue area of the stone model with **Carat Isolating Fluid**. Alternatively, soak the tissue contact area with water and adapt a piece of single-ply tissue paper to the model with a wet brush. Apply Dentine Body Porcelain to the saddle areas of the pontic and seat the framework on the model. If the bridge is not seated completely, tap the model gently while lightly pressing down on the unit until the framework is completely and correctly seated. Blot and tap again to remove excess moisture before proceeding with the rest of the build-up.

3. When the porcelain build-up is complete, cut between units at the proximal junction with a thin, sharp blade. This technique allows each unit to shrink to its own centre. It also prevents interproximal tearing and voids in these areas.

## Incisal Porcelain Application

The incisal porcelain may be used alone, mixed with each other, or blended with dentine porcelain. The table below suggest the combinations of incisal porcelain with other masses recommended for different shade prescriptions.

Dentin Shade	Suggested Incisal
A1	Extra Light
A2	Extra Light
A3	Light
A3,5	Medium
A4	Medium
B1	Extra Light
B2	Extra Light
B3	Light
B4	Light
C1	Extra Light
C2	Light
C3	Medium
C4	Dark
D2	Light
D3	Extra Light
D4	Light

## Cutback Technique

1. After building the body porcelain to full contour, cut away the incisal or occlusal tips of the Dentine Body Porcelain build-up with a thin blade. Make tapering bevelled cuts in the labial or buccal surfaces. The length and depth of the cut and the sharpness of the angle of the cut will affect the degree of translucency and contrast between incisal and dentine body colours.

**Note:** Do not make cutbacks too deep. Final shades will appear low in chroma or too grey if the incisal layer is too thick.

2. The incisal porcelain or the blended incisal mixture is then applied over this area. Using several incisal porcelains or layering one incisal porcelain next to another creates a more natural colour.

## Completing the Build-Up

1. Use a large, soft brush to smooth the incisal application over the dentine body porcelain build-up. However – it is not necessary to sweep the incisal porcelain down over the entire surface unless a custom shade requires extra translucency in the cervical area.

2. When the porcelain build-up is complete, remove the case from the model. If the mesial and distal contact areas are dry, lightly moisten them with a damp brush. Then add porcelain to the contact areas. This porcelain addition should be carefully condensed to ensure that no colour shift occurs between the contact area and the basic build-up.

## Drying the Build-Up

1. Dry the build-up on firing pegs away from direct heat for at least five minutes before bringing it close to the open furnace entrance. Increase the drying time to ten minutes for bridges or splints.

2. Fire the porcelain, using the porcelain firing schedule as a guideline. Properly fired Carat – Ecoline porcelain will exhibit a shiny but granular surface texture.

## Initial Contouring

- After firing, grind the excess porcelain that prevents correct seating on the model. Use fine-grit, non-contaminating stones, discs or carbide and diamond burs.

- Grind the case to achieve the proper occlusion, carving and accentuating the correct anatomical contours and details.

- If no porcelain additions are needed, the case may be glazed after thorough cleaning.
- If additions are required, clean the case by lightly blasting with non-recycled 50µ aluminium oxide, then with a steam cleaner or ultrasonic bath using distilled water.

**Note:** Caution must be exercised to prevent contamination of the grinding medium with silver-containing alloys to avoid discoloration in subsequent firing.

## **Second Application of Dentine & Incisal Porcelain**

- Apply the additional porcelain using the same steps and techniques described for the initial application.
- Care should be taken to match the layering of the incisal porcelain over the dentine body porcelain.
- Second applications of Carat – Ecoline require the same care in drying and firing as the first layer.

## **Final Contouring**

After all contouring and anatomical adjustments have been ground, clean the case thoroughly with distilled water in steam or ultrasonic cleaning equipment.

## **Stain and Glazing**

- Make sure the case is scrupulously clean and dry before attempting staining, applied or natural glaze steps.
- If desired, polish the porcelain before or after glazing steps. Porcelain polishing wheels, diamond polishing pastes, felt wheels or very fine-grit pumice compounds can be used for this technique.

### Carat-Ecoline Firing Schedule

Program Description	Time (min.)			Time (min.)			Vacuum		Set Temp		Temperatures			
	Dry	Pre Heat	Vac Hold	Hi Temp Hold	Hold	Cool	Set Point (in Hg)	Idle	Hi Temp	Vac Start	Vac Stop	Heat Rate (°C/min.)	Night	
First Main Firing	5	5	0	0	0	0	29	500	925	650	910	70	95	
Second Main Firing	5	5	0	0	0	0	29	500	920	650	900	70	95	
Glaze Firing	3	3	0	1	0	0	0	500	915	-	-	70	95	

## Carat-Ecoline Firing Schedule

You may prefer to alter these programs to meet individual requirements or circumstances. Visual results are most important criteria for judging the adjustment of a firing program to your individual needs.

The firing temperatures are recommended figures. If necessary, carry out a firing test, and adjusting firing temperature or times.



1. Prepared framework for a single crown.



2. Metal frame covered with Carat Biopaque Base Paste after first firing.



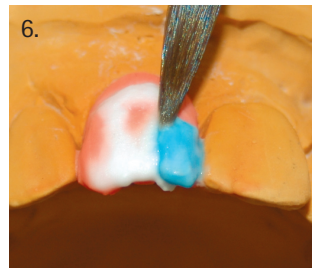
3. Metal frame second firing prepared with Carat Biopaque Shade Paste and powdering crystals.



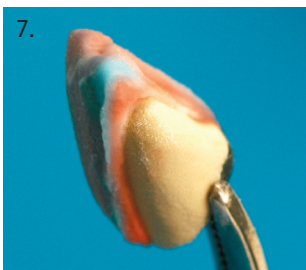
4. First layer with Carat Ecoline Dentine Material.



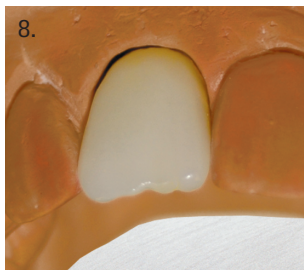
5. Crown totally covered by Carat Ecoline Dentin Material\*.



6. Application of Carat Ecoline Enamel Material and individualization



7. Cross-section of the whole layer\*.



8. Finished crown after the second main firing.



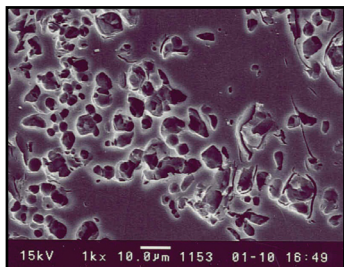
9. Comparison to the Vita Shade Guide.

\* Carat Ecoline masses coloured for better differentiation!

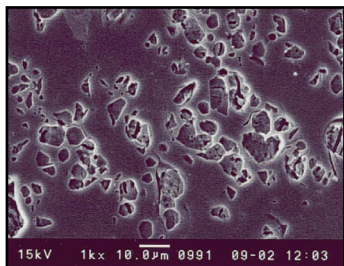


## Properties and Composition of Carat Ecoline Porcelain

The properties of Carat Ecoline are determined according to either ISO 6872 (Dental Ceramics) and / or ISO 9693 (Metal-Ceramics Dental Restorative Systems) wherever possible by either HAGER & WERKEN and / or extern labs. The results are listed in the table.



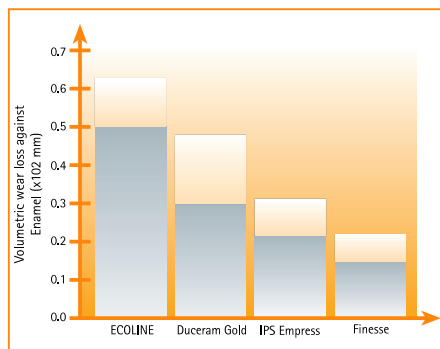
Ecoline Dentine Porcelain



Ecoline Enamel Porcelain

### Properties of Carat Ecoline Dentine Porcelain

Properties	Results
Firing temperatures	opaque: 975°C dentine: 940°C
Strength (ISO 6872)	70 ± 10 MPa (range: 60-82 MPa)
Thermal expansion coefficient (500°C)	12.5 ± 0.5 ppm/°C
Dilatometric softening point	642°C
Glass transition temperature	513°C
Hardness (Vickers)	570 kg/mm <sup>2</sup>
Microstructure	See SEM photos below
Leucite content (wt.%)	30-35%
Leucite crystal size	8-10 µm
Particle size distribution	Ecoline Dentine mean: 21.6 µm median: 19.4 µm
Bond strength (ISO 9693)	(Legacy) 26 MPa (Excel) 27 MPa (Bioclus 4) 30 MPa (Degudent SF) 39 Mpa
Chemical solubility (ISO 9693)	17 µg/cm <sup>2</sup>



### Chemical Composition of Carat Ecoline Dentine Porcelain

Oxide	Carat Ecoline Dentine Porcelain
SiO <sub>2</sub>	60 - 66
Al <sub>2</sub> O <sub>3</sub>	10 - 15
K <sub>2</sub> O	10 - 15
Na <sub>2</sub> O	5 - 10
CaO	0 - 2
MgO	0 - 1
Li <sub>2</sub> O	1 - 2
CeO <sub>2</sub>	0 - 1
Tb <sub>4</sub> O <sub>7</sub>	0 - 1
SnO <sub>2</sub>	-

## Troubleshooting

Problem	Probable causes	Remedies
Porosities, sink holes, fractures in framework	Recommendations for sprue positioning, heating and casting temperatures not observed.	See the instructions for use of dental alloys
Shades are too light and not transparent enough	Pre-heating temperature is too high	Reduce pre-heating temperature
Porcelain has porosities	Firing temperature is too low Vacuum pump sets in too late Vacuum levels are too low	Increase firing temperature Reduce Pre-heat/Vakuum start temperature Check furnace / pump for leakage
Porcelain has rough surface	Pre-heating temperature too low	Increase firing temperature
Not enough glaze on the surface	Holding time too short	Lengthen holding time
Too much glaze on the surface	Firing temperature too high	Lower firing temperature

<p>Ridges and contours are round</p>	<p>Holding time too long</p>	<p>Shorten holding time</p>
<p>Pressure stress cracks: horizontal cracks in the incisal area at the pontics</p>	<p>Long-term cooling not observed Cooling temperature too low Cooling phase too short</p>	<p>Long-term cooling or tempering Increase tempering temperature Lengthen cooling phase</p>
<p>Tensile stress cracks: craquelé cracks on the surface (crazing)</p>	<p>Wrong alloy Porcelain's CTE is too high due to wrong long-term cooling or heat rate Wall thickness of framework too thin</p>	<p>Check the compatibility of the alloy Observe minimum wall thickness levels</p>
<p>Bubbling</p>	<p>Contamination in alloy or in porcelain by use of false burs Paste opaque dried incorrectly Air trapped whilst layering Too much opaque thinner Paste applied too thickly</p>	<p>Only use burs which are specifically designed for use in metall ceramics Only use cross cut tungsten carbide burs Lengthen pre-drying time</p>

## Recommendations for working with non-precious alloys

### 1. Casting non-precious alloys

Always use ceramic crucibles.

Always use new material.

Only use adequate non-precious alloys.

### 2. Preparing the framework

Avoid sharp angles at the framework.

Only use burs intended for non-precious alloys ( e.g. Komet tool kit TD 1731).

Sandblast the framework with 250 $\mu$  aluminium oxide under 3-4 bar.

An oxide firing is not compulsory, however, it serves as control of the framework (s.respective recommendations for working with non-precious alloys ).

### 3. Opaque firing

The first opaque firing should be completed at 975°C (see **Carat-Biopaque** instruction) , to ensure a much better coverage of the framework surface.

### 4. Dentine firing

For larger restorations (e.g. from 6 units), the firing temperature for the first dentine layer should be increased by 10°C to compensate the poor thermal conductivity of non-precious alloy.

### 5. Preventing discoloration when facing non-precious alloys

Any exposed non-precious units (connectors/full crown cantilevers, etc.) should be ground or sandblasted after each firing.



## Carat Ecoline Order Form

### Powder:

Dentin A1	50 + 5 g	No. 604 530
Dentin A2	50 + 5 g	No. 604 531
Dentin A3	50 + 5 g	No. 604 532
Dentin A3,5	50 + 5 g	No. 604 533
Dentin A4	50 + 5 g	No. 604 534
Dentin B1	50 + 5 g	No. 604 535
Dentin B2	50 + 5 g	No. 604 536
Dentin B3	50 + 5 g	No. 604 537
Dentin B4	50 + 5 g	No. 604 538
Dentin C1	50 + 5 g	No. 604 539
Dentin C2	50 + 5 g	No. 604 540
Dentin C3	50 + 5 g	No. 604 541
Dentin C4	50 + 5 g	No. 604 542
Dentin D2	50 + 5 g	No. 604 543
Dentin D3	50 + 5 g	No. 604 544
Dentin D4	50 + 5 g	No. 604 545
Chroma Dentin A	15 g	No. 604 554
Chroma Dentin B	15 g	No. 604 555
Chroma Dentin C	15 g	No. 604 556
Enamel light	50 + 5 g	No. 604 546
Enamel medium	50 + 5 g	No. 604 547
Enamel dark	50 + 5 g	No. 604 548
Enamel extra light	50 + 5 g	No. 604 549
Enamel transparent	50 + 5 g	No. 604 550
Glaze	50 + 5 g	No. 604 551

### Fluids:

Stain fluid E	15 ml	No. 604 219
Stain fluid E	100 ml	No. 604 220
Stain fluid O	15 ml	No. 604 221
Modelling fluid U	100 ml	No. 604 216
Modelling fluid U	500 ml	No. 604 218
Modelling fluid UNF	100 ml	No. 604 217
VLC Liquid	5 ml	No. 604 224
Isolation fluid	10 ml	No. 604 222
Isolation fluid	50 ml	No. 604 223

Carat Ecoline Basis Kit	No. 604 552
Carat Ecoline Full Kit	No. 604 553

## Personal Notes

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# Carat Biopaque Carat Ecoline



## Carat Biopaque and Carat Ecoline

In many years, CARAT has become a synonymous for the reproduction of highest-quality dental ceramics. The unparalleled colour matching of the compounds and the reliability of its physical properties make CARAT with all its components a high-grade metal ceramic system – consisting of CARAT BIOPAQUE, one of the world's most successful and reliable ready-to-use basic compound systems, and CARAT ECOLINE, the easy-to-use, "forgiving" and economic ceramics for all alloys.

Today not only the best possible reproduction of the natural teeth but also the economic factor is of highest importance in the dental lab. As a key laboratory material, the ceramic system used should also be economic. CARAT BIOPAQUE and CARAT ECOLINE perfectly fulfil these requirements. Both systems are outstandingly attractive in price as well as easy-to-handle.

**The Economic Ceramic System**

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