

GLASS IONOMERS  
**30** years  
MORE RELEVANT THAN EVER TODAY



## Product Dossier

**PHOTAC<sup>®</sup>-FIL** *QUICK*

*quick as lightning*



## Content

<b>1. Introduction</b>	<b>3</b>
1.1 Material class	3
1.2 Indications	3
<b>2. Chemical Background</b>	<b>4</b>
2.1 Composition of the product	4
2.2 Dual-Plus hardening	4
<b>3. Physical-technical data</b>	<b>7</b>
<b>4. Material aspects</b>	<b>8</b>
4.1 Adhesion and marginal sealing	8
4.2 Fluoridation	9
4.3 Aesthetics	9
<b>5. Working in practice</b>	<b>10</b>
<b>6. Summary</b>	<b>11</b>
<b>7. Packages</b>	<b>12</b>
<b>8. List of references</b>	<b>13</b>



## 1. Introduction

The light-hardening glass ionomer filling cement PHOTAC-FIL QUICK combines the advantages of a glass ionomer with the advantages of a composite. PHOTAC-FIL QUICK adheres without conditioning to enamel and dentine. The adhesion is vastly superior to that of conventional glass ionomers and is also demonstrably clearly superior to compomers with primer. It is time-saving and economical in use, can be applied to a broad range of indications, and is stable over a long period with good aesthetic qualities, which makes PHOTAC-FIL QUICK particularly suitable for general practice.

This self-adhesive filling material with fluoride release is also an important contribution to modern conservative preparation technology.

PHOTAC-FIL QUICK is available both in the APLICAP version and in the hand-mixed variant.

Restoration with alloy-free adhesive glass ionomers is becoming increasingly important for modern dentistry. PHOTAC-FIL QUICK is designed for the demands of modern filling therapy, and combines the advantages of glass ionomer cements, that is to say chemical adhesion to enamel and dentine as well as fluoride release, with the advantages of controllable and rapid light-curing, which have made composite materials so popular.

### 1.1 Material class

PHOTAC-FIL QUICK belongs to the class of modified synthetic glass polyalkenoate cements. These materials harden both under halogen lighting and in a longer process without the effect of light.

This light-curing glass ionomer filling cement is a further development of the tried and tested PHOTAC-FIL, with further improved adhesion, colour-stability and radiopacity.

### 1.2 Indications

PHOTAC-FIL QUICK is particularly suitable for fillings in the cervical area, in the case of erosions and wedge shaped defects (class V), for approximal fillings without use of the cutting edge (class III) for small occlusal fillings (class I), temporary restorations and fillings in deciduous teeth (Tab.1).

- Cavities of class III
- Cavities of class V (cervical lesions: caries at neck of tooth and wedge-shaped defects)
- Small fillings of class I
- Fillings in deciduous teeth
- Temporary fillings

**Tab. 1: Indications for PHOTAC-FIL QUICK**

In addition to being suitable for a broad range of indications, PHOTAC-FIL QUICK is also suitable for paediatric and geriatric dentistry, since it facilitates effective and rapid working methods.

## 2. Chemical Background

### 2.1 Composition of the product

Before use the two components, powder and liquid are mixed together.

The powder contains highly polishable, radiopaque glass particles (Na-Ca-Al-La-fluorosilicate-glass) and amines as activators for light-curing.

The liquid component contains copolymer acids (maleic and acrylic acid), camphor-quinone as an initiator of the light-curing and selected glass ionomer compatible monomers and oligomers (Tab. 2).

Powder	Fluid
Na-Ca-Al-La-fluorosilicate-glass Activator (Amine)	Glass ionomer compatible monomers and oligomers Copolymer acids (acrylic- and maleic acids) Camphor-quinone Stabilisers (radical captors, chelating agents) H <sub>2</sub> O

Tab. 2: Components of PHOTAC-FIL QUICK powder and fluid

### 2.2 Dual-Plus hardening

Hardening of PHOTAC-FIL QUICK takes place in three curing processes.

After the powder and liquid have been mixed together the chemical curing process of the glass ionomer cements begins. This acid-base reaction leads to hardening in areas that have not been exposed to light as well (Fig.1).

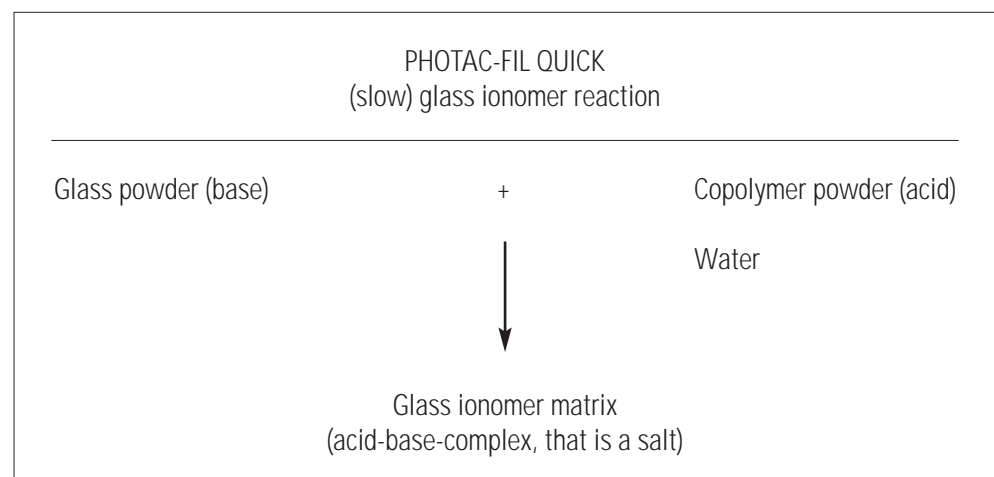
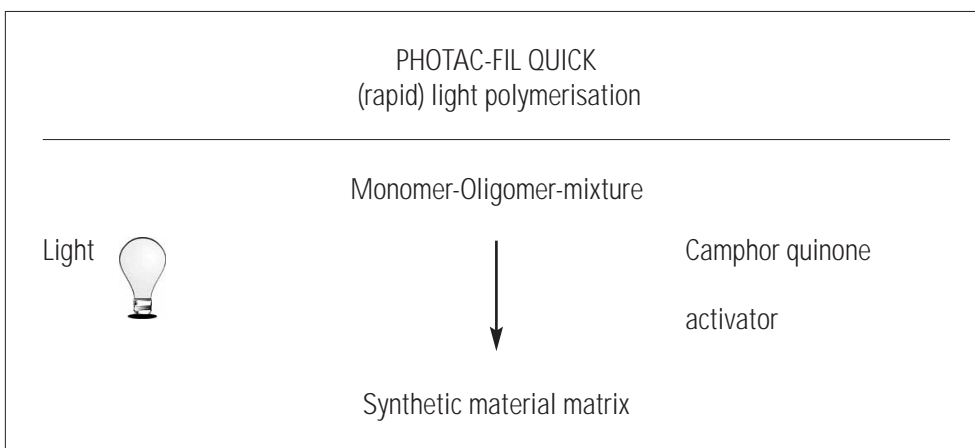


Fig. 1: The slow glass ionomer curing reaction

Independently of the slowly proceeding glass ionomer cement hardening, rapid polymerisation takes place under exposure to light which leads to immediate curing (Fig. 2). The rapid light hardening saves time, and within seconds protects the restoration against ingress of water and drying out.

The protons in the acid solutions attack the glass particles on the surface. Calcium ions and aluminium ions are set free in their fluoro-complex form. In turn the calcium and aluminium ions react with the carboxylate anions.

The individual co-polymer chains are spatially cross-linked. The glass ionomer matrix is formed, which from the chemical point of view is an acid-base complex, or salt.

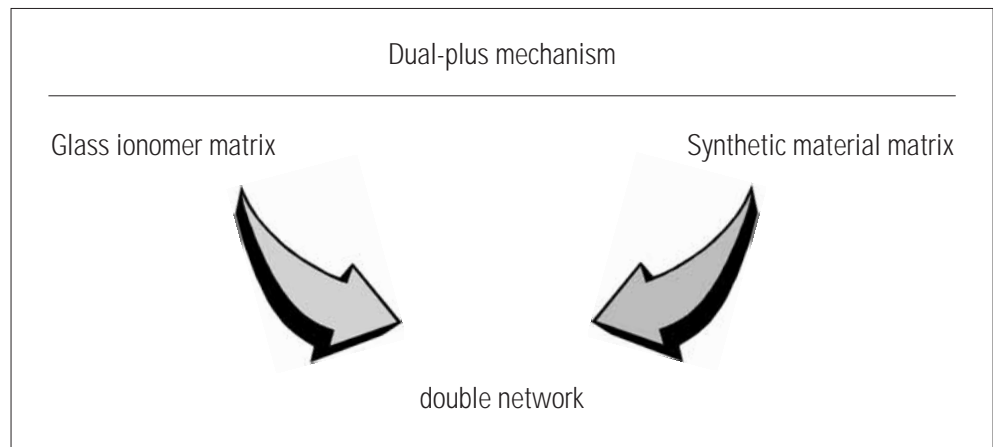


**Fig. 2: Rapid light polymerisation**

By mixing, the activator and initiator in the powder are brought into contact with the monomers and oligomers in the fluid. The exposure to light triggers the polymerisation. The individual molecules are joined together in this way in a three-dimensional synthetic material matrix. In addition the remaining monomers are polymerised by a third hardening mechanism (redox reaction).

This self-curing supports the mechanical stability of PHOTAC-FIL QUICK, because it ensures that even places that are sheltered from the light harden too. The combination of all hardening processes is important so that PHOTAC-FIL QUICK's properties are exploited to the full.

The monomers and oligomers have been so chosen that the synthetic material matrix and the glass ionomer matrix are securely bonded together by suitable bonding sites (Fig. 3). This bond between the two networks makes possible significantly lower solubility and better mechanical resistance than in the case of conventional glass ionomer cements. PHOTAC-FII QUICK's compressive strength and flexural resistance are therefore far above the ISO limit.



**Fig. 3: The stable double network**

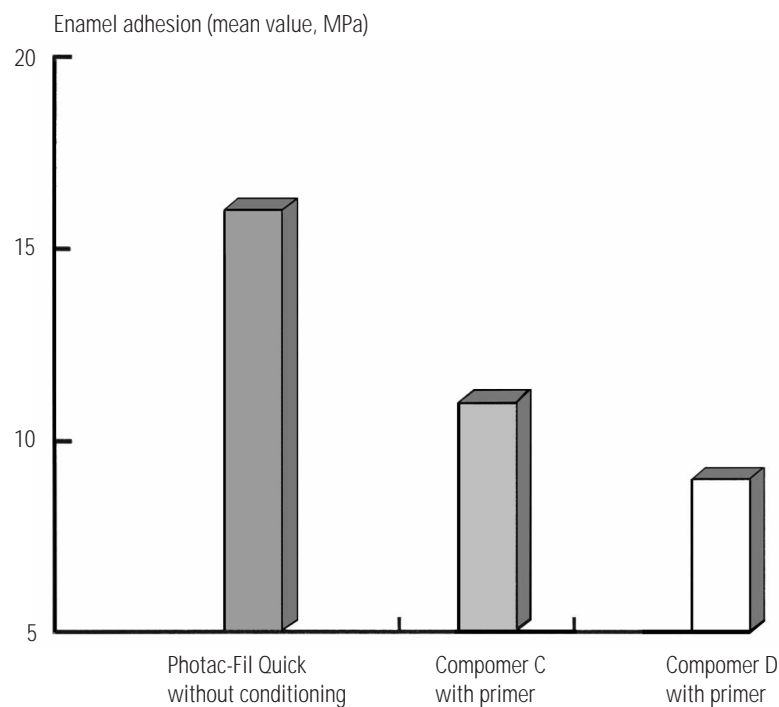
### 3. Physical-technical data

Property	APLICAP	Hand mixed variant
<b>curing time</b>	6 min 30 sec (according to ISO 9917-2)	9 min 30 sec (according to ISO 9917)
<b>polymerisation depth</b>	2 mm (ISO limit >1 mm)	2 mm (ISO limit >1 mm)
<b>adhesion to enamel without conditioning</b>	16 MPa	16 MPa
<b>adhesion to dentine without conditioning</b>	7 MPa	7 MPa
<b>flexural strength</b>	60 ± 3 MPa (ISO limit >20 MPa)	56 ± 4 MPa (ISO limit >20 MPa)
<b>flexural strength (without exposure to light)</b>	57 ± 5 MPa (ISO limit >20 MPa)	40 ± 4 MPa (ISO limit >20 MPa)
<b>radiopacity</b>	300% (ISO limit 200%)	300% (ISO limit 200%)
<b>compressive strength</b>	180 ± 9 MPa (ISO limit >130 MPa)	168 ± 4 MPa (ISO limit >130 MPa)
<b>compressive strength (without exposure to light)</b>	145 ± 5 MPa (ISO limit >130 MPa)	153 ± 8 MPa (ISO limit >130 MPa)
<b>surface hardness</b>	220 ± 11 MPa	205 ± 16 MPa
<b>surface hardness (without exposure to light)</b>	215 ± 3 MPa	213 ± 8 MPa
<b>polishability</b>	good	good

## 4. Material aspects

### 4.1 Adhesion and marginal sealing

Without the addition of bonding agents PHOTAC-FIL QUICK makes a lasting bond with the natural substances of the tooth. Expensive etching, bonding and priming procedures are no longer necessary. The light-curing glass ionomer flows very well on to the wet dentine and enamel. Adhesion depends on mechanical and chemical forces. The micro-retentive anchoring is reinforced by the chemical bond, in which the copolymer acids form bridges with the calcium ions of the hydroxyl apatites of the dentine and enamel.



**Fig. 4: Adhesion values of PHOTAC-FIL QUICK**

In-house research results show that PHOTAC-FIL QUICK (without conditioning) is distinguished by much better adhesion values than compomers (with primer) (Fig.4).

The adhesion to enamel and dentine favours a gentle preparation of the cavity, in which as little healthy tooth substance as possible is removed for retention.

Molecular anchoring to enamel and dentine and minimal shrinkage of the polymer make an impermeable perfect marginal seal of the filling. PHOTAC-FIL QUICK's tooth-like coefficient of thermal expansion prevents the formation of marginal fissures by thermal influences.

## 4.2 Fluoridation

PHOTAC-FIL QUICK releases fluoride ions on a permanent basis. It can also take up fluoride ions from toothpaste and release them later.

According to current opinion in learned circles, this function as a fluoride reservoir is one of the most important factors influencing caries prevention.

## 4.3 Aesthetics

PHOTAC-FIL QUICK is available in eight different shades: A1, A2, A3, A3,5, B2, B3, C4, DBO. Each filling is thus be matched to the natural colour of the teeth. Thanks to its excellent ability to take a polish, it is easy to achieve a smooth surface to the filling. The excellent marginal seal also avoids unappealing visual effects at the cavity margin.

PHOTAC-FIL QUICK has a higher translucency than other conventional glass ionomers thanks to the plastic modification.

## 5. Working in practice

No more time-consuming etching, bonding and priming. Because of PHOTAC-FIL QUICK's excellent adhesive properties no conditioning is necessary.

The tried and tested ESPE APLICAP system with measured dosages in capsules, the activator and the applicator make it possible to operate rationally and securely with constant quality in material and treatment.

With hand-mix variant of PHOTAC-FIL QUICK take 1 spoon of powder to 2 drops of liquid. With PHOTAC-FIL QUICK APLICAP, the capsule is activated for 2 seconds, mixed in the capsule mixer (ESPE Rotomix 10 sec., Capmix 15 sec.) and placed in the applicator. The material can be applied directly to the cavity right away. Finally the filling is shaped, exposed to light for 20 seconds using a halogen light unit, the ESPE ELIPAR HIGHLIGHT or ELIPAR TRILIGHT, for example, and then finished.

Thanks to light-curing the starting time for the hardening reaction is controllable. Under halogen lighting polymerisation begins immediately. The additional hardening of PHOTAC-FIL QUICK begins after some time, and leads to complete curing even in areas that have not been exposed to light.

## 6. Summary

PHOTAC-FIL QUICK offers the all-round best conditions for the long life of the filling. The rapid light curing saves time and gives immediate protection to the restoration against the ingress of water. The genuine glass ionomer bonds without any conditioning to the substance of the tooth.

The outstanding adhesion (16 MPa) and the excellent compressive strength (161 MPa) make for excellent ability to resist stress and remain stable over a long period.

The additional release of fluoride ions is highly prized in treatment where there is active caries in the teeth.

The ability to polish makes it possible to achieve a smooth surface to the filling, which guards against formation of deposits.

As an important aid to diagnosis, radio-opacity is particularly valuable. The radiopacity of 300% is better than the ISO limit by 50%.

## 7. Packages

### PHOTAC-FIL QUICK APLICAP

**Introductory pack** with 50 Aplicap capsules in shades A1, A2, A3, A3,5, B2, B3, C4, DBO; activator and applicator.

**Standard pack** with 50 Aplicap capsules in shades A2, A3, A3,5, B2 or B3

**Standard pack** with 20 Aplicap capsules in shades A1, C4 oder DBO

**Standard pack assorted**, with 50 Aplicap capsules in 8 different shades: A1, A2, A3, A3,5, B2 B3, C4, DBO

### PHOTAC-FIL QUICK Hand mixed version

**Introductory pack hand mixed version** with 12 g of powder in shades A2, A3, B2, B3; 2 x 6 g liquid; accessories

**Individual pack hand mixed version** with 12 g of powder in shades A1, A2, A3, A3,5, B2, B3, C4 oder DBO

**Individual pack** with 6 g fluid

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