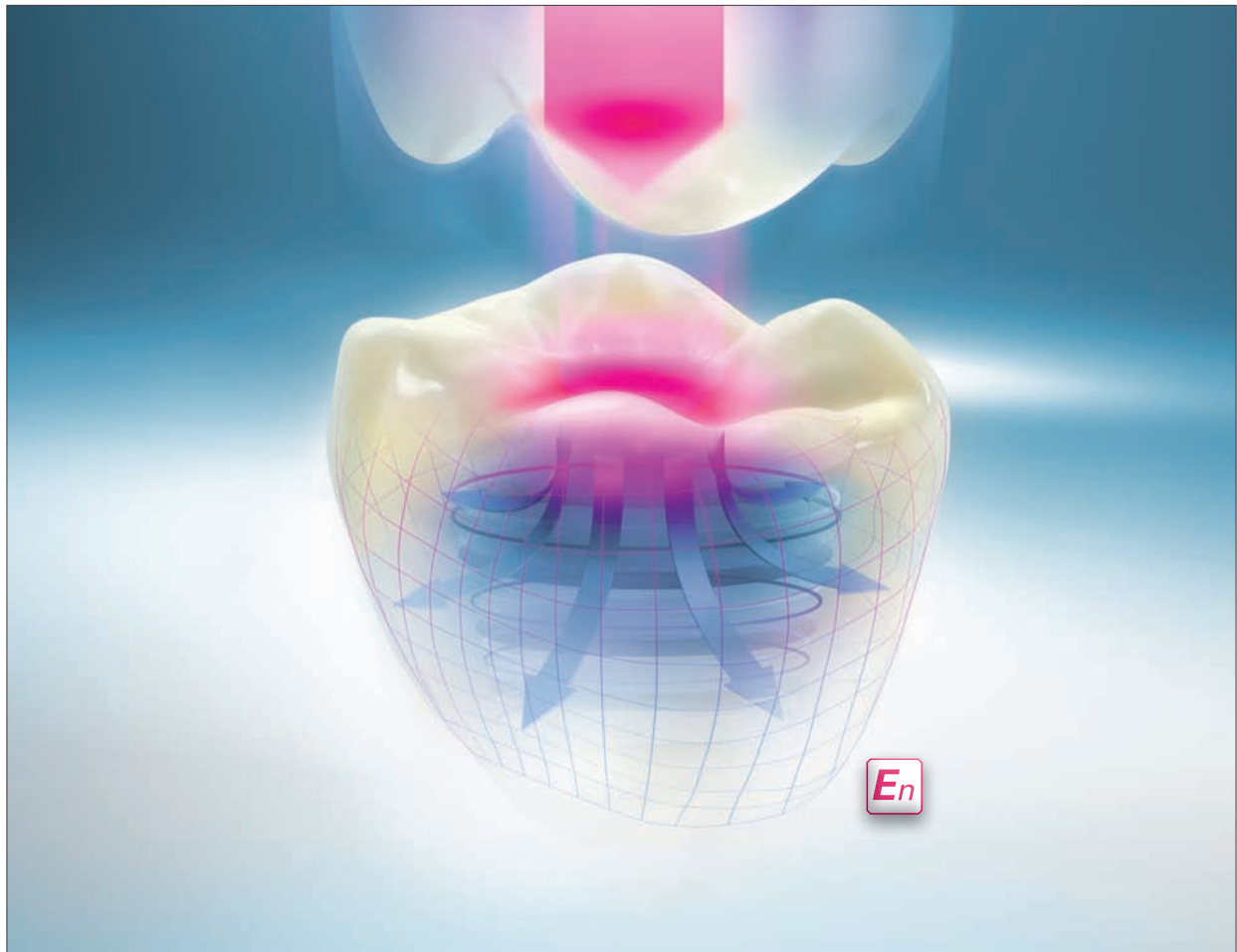


# VITA ENAMIC®

The concept



VITA shade taking

VITA shade communication

VITA shade reproduction

VITA shade control

Date of issue: 11.12

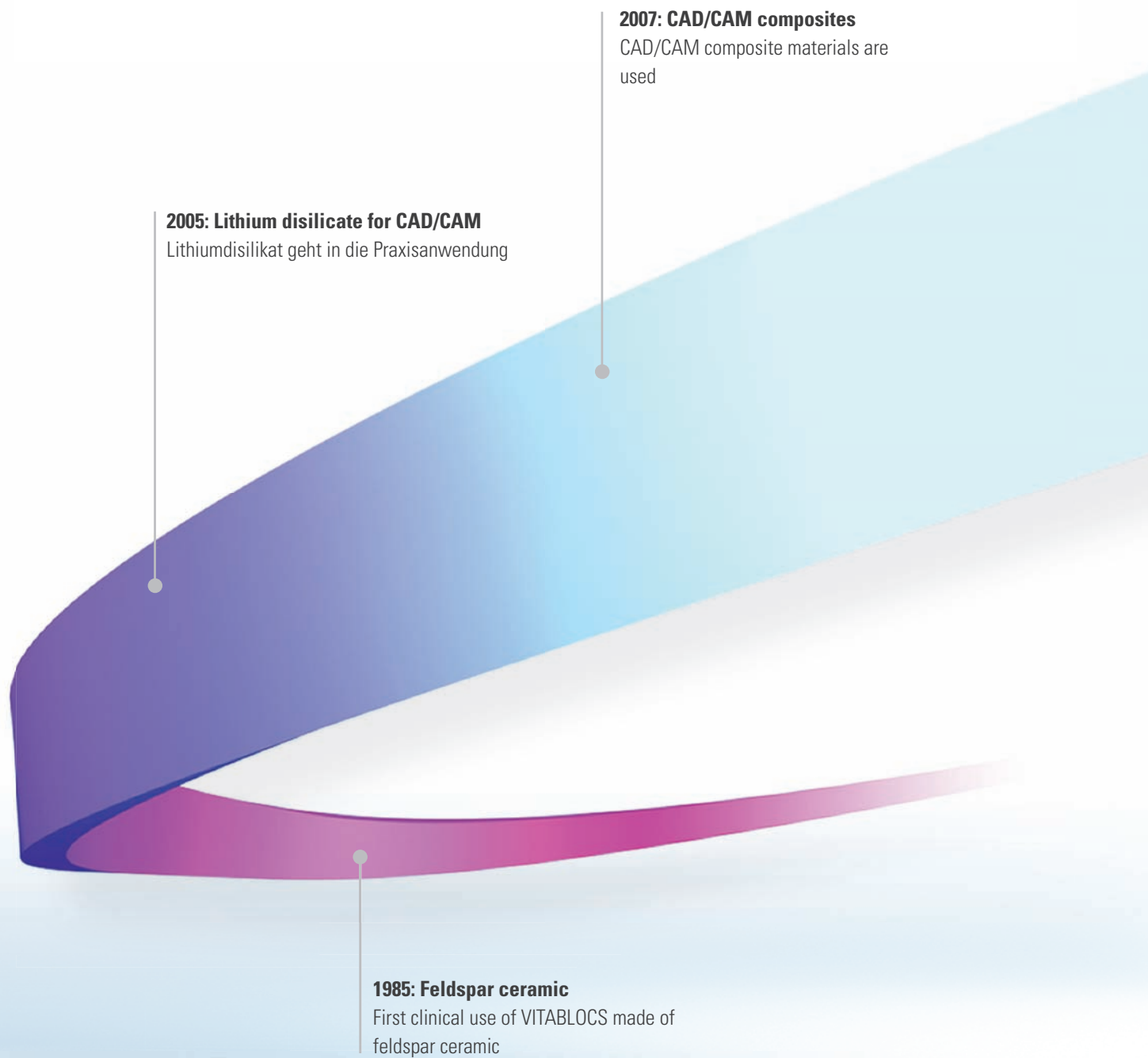


VITA shade, VITA made.

**VITA**

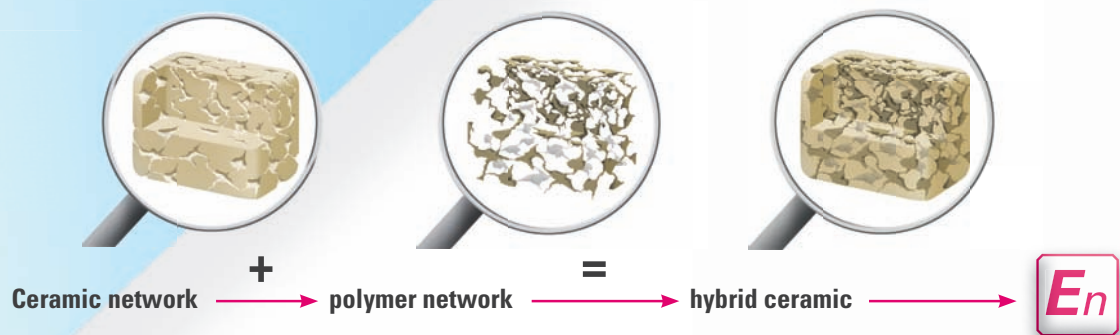
The **En** formula for success: strength + elasticity = reliability<sup>2</sup>

## MILESTONES OF DENTAL CAD/CAM MATERIALS



### 2013: VITA ENAMIC

With VITA ENAMIC, the first dental hybrid ceramic for CAD/CAM restorations in the world is introduced



#### „Hybrid ceramic provides a new definition of strength“

VITA ENAMIC is the first hybrid dental ceramic in the world with a dual network structure. With this dental material, the dominant ceramic network is reinforced by a polymer network with both networks fully penetrating one another. Accordingly, VITA ENAMIC is a dental hybrid material that combines the positive characteristics of a ceramic and a composite.

In addition to enormous strength, this innovative hybrid material also ensures exceptional elasticity. As a result, this material is perfectly suited for posterior crown restorations and also enables the reduction of wall thicknesses for minimally-invasive restorations.

The superior reliability of VITA ENAMIC, as well as its precision, edge stability and corresponding milling accuracy are also convincing features. Finally, this tooth-colored hybrid material offers material properties that are almost identical to those of natural teeth, and ensures a natural play of colors thanks to its excellent light conductivity.

The **En**-formula for success: strength + elasticity = reliability<sup>2</sup>

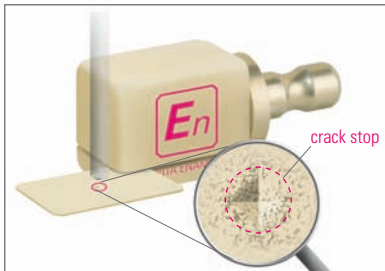
## VITA ENAMIC® Hybrid ceramic: Advantages for you



### VITA ENAMIC – overview of the benefits

#### Enormous strength

After bonding to the remaining tooth substance, VITA ENAMIC exhibits enormous strength and guarantees perfect distribution of masticatory forces. The polymer network offers outstanding absorption of intraoral load. As a result, this material is suited especially for posterior crown restorations.

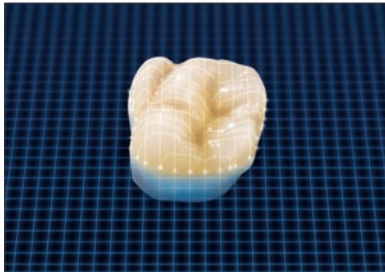


#### Excellent reliability

VITA ENAMIC is a very reliable material and, as a hybrid ceramic, offers an integrated crack stop function thanks to its special dual-network structure.

#### Restorations that are gentle on oral substance:

In addition to greater strength, VITA ENAMIC also guarantees the necessary elasticity thus enabling minimally-invasive treatment so that healthy tooth substance can be retained by reducing the wall thickness.



#### Precise and accurate restorations

Following the milling process, the VITA ENAMIC hybrid ceramic shows excellent edge stability – particularly in the case of thin restoration margins – and allows accurate morphology as well as an end result that offers a perfect fit.



#### Fast and efficient fabrication

The excellent milling properties of VITA ENAMIC guarantee that restorations can be fabricated more quickly and wear and tear on milling tools can be minimized. Moreover, the hybrid ceramic is also already at full strength and can be inserted immediately after milling.



#### Natural results that match the tooth shade







VITA ENAMIC is a tooth-colored dental material that offers superb light conductivity. As a result, VITA ENAMIC restorations blend in perfectly with the remaining tooth substance, enabling a natural play of colors.

## VITA ENAMIC® Indications and shades

### Range of indications:

In addition to classic single tooth restorations (inlays, onlays, veneers and crowns), VITA ENAMIC is particularly suitable for minimally invasive restorations and crown restorations exposed to high masticatory forces (molar area).



Indication		VITA ENAMIC
Crowns	 	●
Onlays/Inlays	  	●
Veneers		●











● recommended by VITA

### Esthetic results in two translucency levels

#### Shades:

VITA ENAMIC is available in the translucency levels HT (HT = high translucent) and T (T = translucent) and in the five VITA SYSTEM 3D-MASTER shades 0M1, 1M1, 1M2, 2M2 and 3M2.



	0M1	1M1	1M2	2M2	3M2
HT					
T					

## VITA ENAMIC® STAINS KIT



### Natural play of colors in a very simple manner

The VITA ENAMIC Stains Kit comprises six stains and accessories for the reproduction of natural shade nuances of restorations made of hybrid ceramic.

The stains are bonded to the restoration in a polymerization process. The chemical glaze material VITA ENAMIC GLAZE is available for surface sealing. The use of this material increases the durability and brilliance of the shade in the oral environment.

Processing is based on a simple 5-step principle: condition the surface, mix and apply the shades, carry out intermediate polymerization, apply chemical glaze material and perform final polymerization.

### Benefits



#### Fast processing:

Simply apply the VITA ENAMIC stains to the restoration, polymerize and that's it! This way the shade of VITA ENAMIC restorations can be quickly characterized.

#### High level of individuality:

The anomalies and shade nuances of natural teeth can be individually reproduced with the six VITA ENAMIC stains.



#### Simple processing:

The shade intensity of the VITA ENAMIC stains can be perfectly controlled by the ratio of liquid to shade powder. Moreover, the good flow characteristics ensure precise application of the stains.



## VITA ENAMIC® Polishing Set (clinical/technical)



### All instruments to achieve excellent results

The VITA ENAMIC sets of polishing instruments were developed for reliable, efficient and material-specific surface treatment of hybrid ceramic restorations in dental practices and laboratories.

The sets include various polishing instruments for pre- and high-gloss polishing. These instruments are suitable for careful and gentle polishing of occlusal surfaces, cusps, fissures and contact points of the restoration. The use of these polishing instruments results in surfaces with exceptional gloss.



### Benefits

#### Excellent final results:

Excellent and plaque-resistant surfaces are produced with these instruments. Precise concentricity, matched grit sizes and the individual geometries of the instruments guarantee results with superior precision.

#### Simple and safe handling:

The instruments guarantee superior material removal performance. Good handling and the use without polishing paste enable simple and fast processing. Safe use of the clinical instruments is guaranteed since they can be sterilized.

#### Gentle and careful processing:

These instruments, which were developed especially for VITA ENAMIC ensure gentle and careful reworking. As a result, for example, the risk of possible formation of microcracks is reduced.



## VITA ENAMIC® Material-scientific results

### Technical and scientific documentation of the hybrid ceramic

The hybrid ceramic is comprised of a porous ceramic matrix with the pores being filled with a polymer material. The mass percentage of the inorganic ceramic part is approx. 86 wt%, while the mass percentage of the organic polymer part is 14 wt%.

The advantages that distinguish VITA ENAMIC are based on its unique properties. The high strength, exceptional reliability and quality as a very natural restorative material as well as high precision and economic efficiency are documented on the basis of the technical and material-scientific results.

### Short overview of physical/mechanical properties of VITA ENAMIC

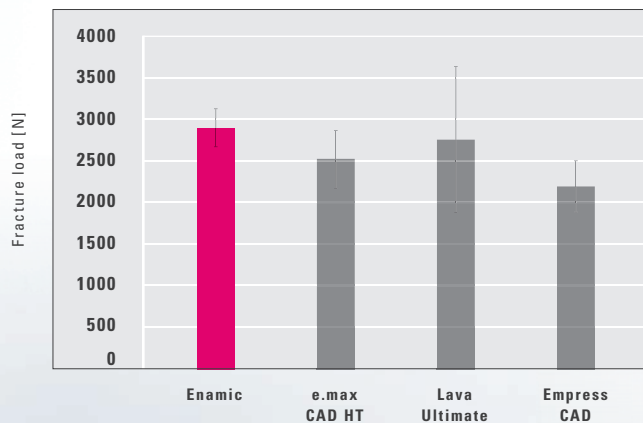
	VITA ENAMIC
Static fracture load [N] (SD)	2890 (232)
Flexural strength [MPa]	150 – 160
Modulus of elasticity [GPa] (SD)	30 (2)
Abrasion [ $\mu\text{m}$ ]	In the same range as Mark II, veneering ceramics
Weibull modulus	20
Hardness [GPa]	2.5
Shade stability	Excellent, $\Delta E < 2$
Machinability, edge stability	Excellent
Milling times, fast milling mode MC XL	Inlay: 4:40 min Anterior crown: 4:19 min Posterior crown: 5:13 min
Milling tool service life: posterior crowns	Normal: 148 Fast: 132





## Unsurpassed strength also for thin walls

### Static fracture load



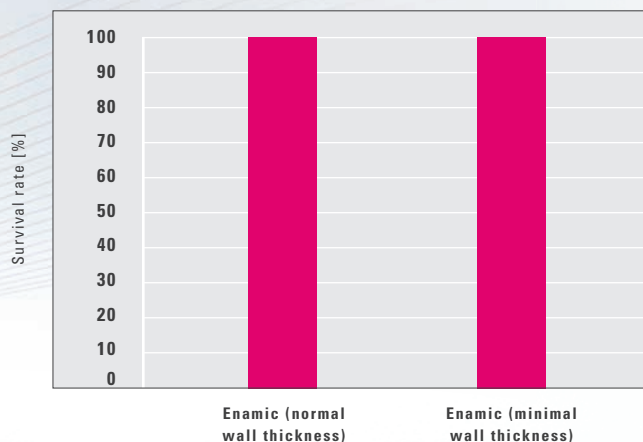
Source: Internal study, VITA R&D

#### Test method:

- Molar crowns from the respective materials were milled using the inLab MC XL milling system and then polished / crystallized.
- Cemented to hybrid ceramic dies (e-modulus similar to dentin) using RelyX Unicem.
- Stored in warm water (37 °C) for one week.
- Loaded statically in a testing machine until fracture occurred (The bars represent the average value obtained based on 6 crowns)

**Summary:** In this test setup, VITA ENAMIC demonstrates the highest fracture load of approx. 2890 N and the lowest standard deviation.

### Dynamic fracture load



Source: University of Freiburg, PD Dr. Güß

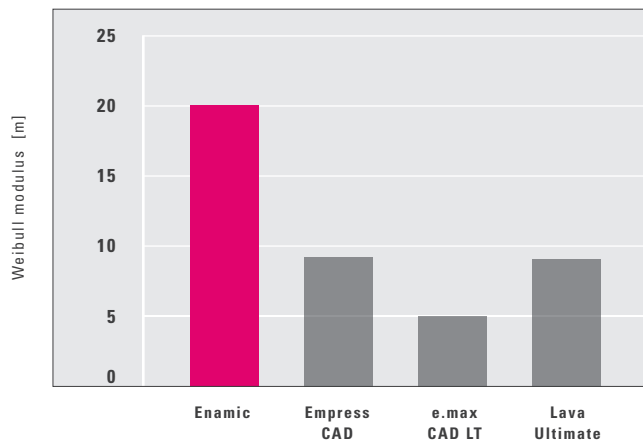
#### Test method:

- Following etching, 14 VITA ENAMIC crowns were cemented to composite dies using Variolink II.
- The crowns were embedded in Technovit 4000 (Heraeus Kulzer) and immersed in warm water (37 °C) for 24 hours.
- Exposed to a cyclic load in the chewing simulator: 198 N for 1.2 million cycles at a frequency of 1.6 Hz, with 3 mm steatite beads as the antagonist, TC 5 – 55 °C.
- Following the dynamic tests, static load was applied to the crowns until fracture occurred.

**Summary:** The survival rate of VITA ENAMIC crowns with walls of normal and reduced thickness is 100%.

## VITA ENAMIC® Material-scientific results

### Utmost reliability and integrated crack-stop function

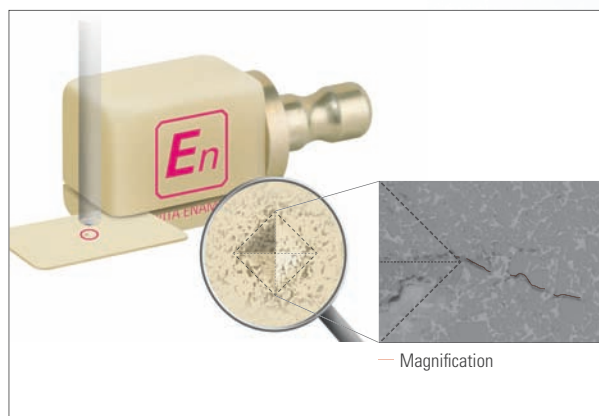
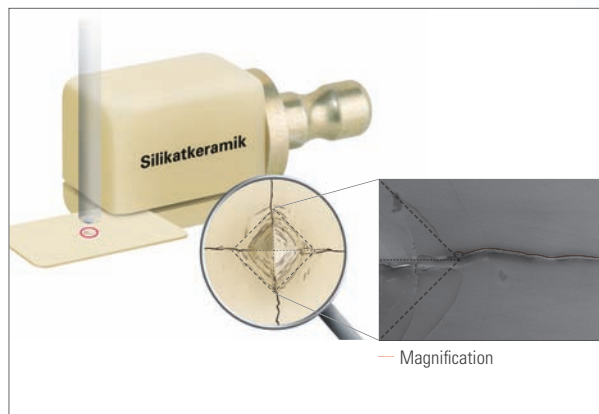


Source: Internal study, VITA R&D

#### Test method:

- The Weibull modulus describes the reliability of a material in a way that cannot be fully described based solely on flexural strength.
- The Weibull modulus was determined based on the flexural strength of 30 bending bars.

**Summary:** Of the materials examined in this test, VITA ENAMIC offered the greatest reliability. The Weibull modulus is 20.



Source: Internal study, VITA R&D

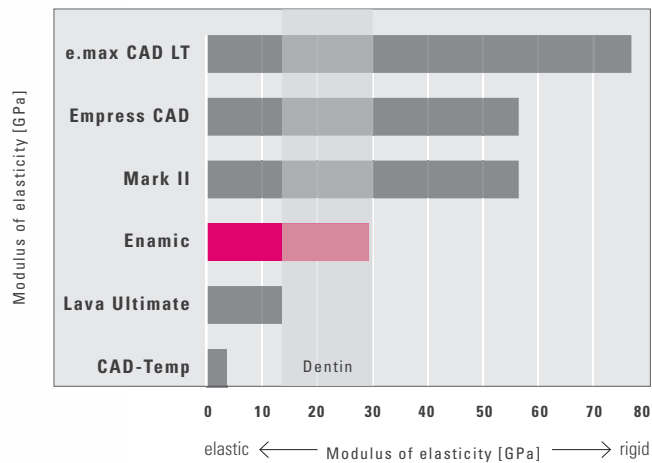
#### Test method:

- In the Vickers test an indentation in a polished surface is made using a pyramidal tip to determine the hardness of the material.

#### Summary:

In this test, ceramics exhibit a clearly limited indentation with sharp edges defined by crack formation and mostly straight-running cracks at the margins. For VITA ENAMIC, however, the dual network structure results in an indentation that is not limited at the margins; a smooth transition is found. Admittedly, cracks that are typical for ceramics occur in the corners of the indentations but they run only through the ceramic substructure and are always stopped by the polymer network.

## Modulus of elasticity and abrasion behavior



Source: Internal study, VITA R&D

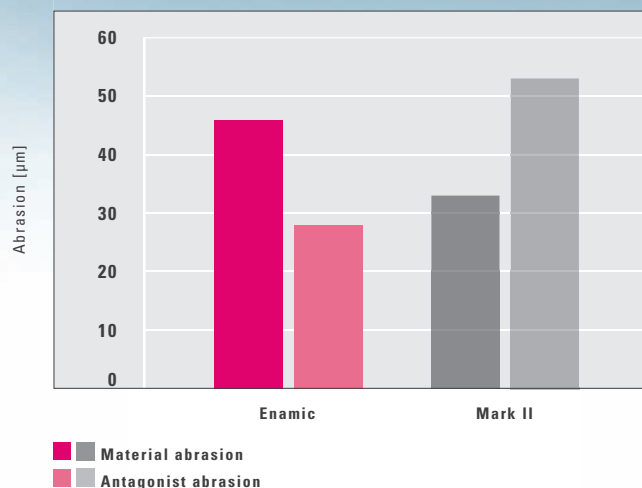
### Test method:

- The modulus of elasticity was determined based on the stress–strain curves of the measurements of flexural strength.

**Summary:** With an elasticity of 30 GPa, VITA ENAMIC is in the same range as human dentin. Up until now, no dental restorative material was in this elastic range.



- Enamel - enamel-like abrasion behavior
- Dentin - comparable flexibility (E-modulus)
- Pulp



Source: University of Zurich, Prof. Mörmann

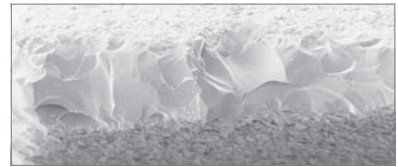
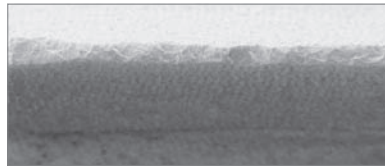
### Test method:

- In chewing simulator (Zurich), 1.2 million cycles, 1.7 Hz, load: 49 N, 6000 thermocycles
- Natural enamel as antagonist.

**Summary:** The level of abrasion to the antagonist enamel caused by VITA ENAMIC is 28 μm. Mark II causes a slightly higher level of antagonist abrasion of 53 μm. Accordingly, improvement on the antagonist-friendly properties of Mark II could be achieved without affecting the ceramic behavior of the material.

## VITA ENAMIC® Material-scientific results

### Machinability and edge stability



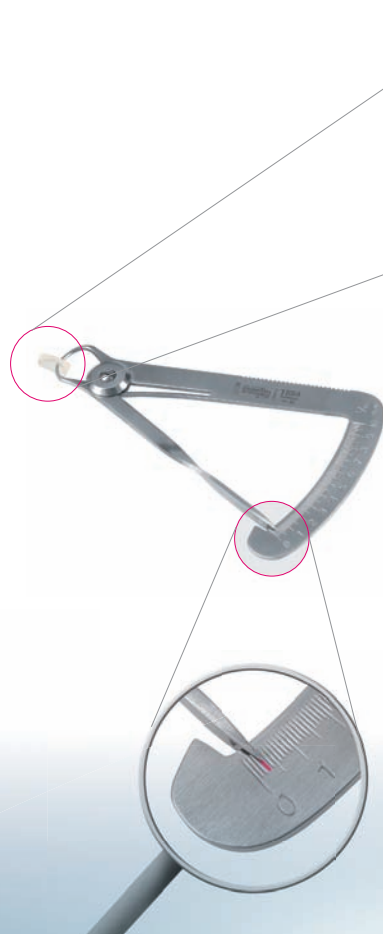
Top view: 30° wedges: left: VITA ENAMIC, right: e.max CAD



#### Test method:

- Using the Sirona MC XL milling system, 30° wedges were milled from various materials in normal milling mode.

**Summary:** VITA ENAMIC exhibits high edge stability also in areas with thin margins.



VITA ENAMIC



Empress CAD



e.max CAD

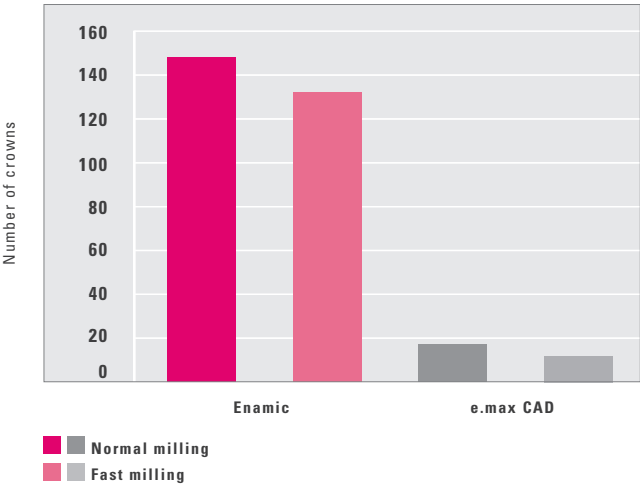
#### Test method:

- Using the Sirona MC XL milling system, non-prep veneers were milled from various materials in normal milling mode.

**Summary:** The perfect edge stability of VITA ENAMIC is demonstrated by the non-prep veneers. The geometry in this case with wall thickness of approx. 0.2 mm could only be milled fully using VITA ENAMIC.

Service life of milling tools and milling times

Number of milled molar crowns






Source: Internal study, VITA R&D

Test method:

- Using the Sirona MC XL milling system, one pair of milling tools in each case was used to grind as many molar crowns as possible from a variety of CAD/CAM materials in normal milling mode and in fast milling mode.

**Summary:** VITA ENAMIC enables more efficient milling than comparable materials. The milling time for VITA ENAMIC restorations is by far the shortest and also ensures a long milling tool service life of approx. 148 / 132 milled crowns for each set of milling tools.

				
VITA ENAMIC	Normal	7:56	7:10	9:07
	Fast	4:40	4:19	5:13
Mark II	Normal	10:27	10:35	13:29
e.max CAD	Normal	12:17	12:36	14:58

Test method:

- The milling tests were performed using the Sirona MC XL milling system. The block selection of the corresponding material was selected and five restorations of each material were milled. The milling times were taken from the log files. The times correspond to the average value determined on the basis of five measurements.

**Summary:** Compared to Mark II and IPS e.max CAD, VITA ENAMIC restorations can be milled more quickly.



## VITA ENAMIC® Products and Accessories



### VITA ENAMIC

The first hybrid dental ceramic in the world with a dual network structure creates a new definition of strength. It is the dental material of the future since it enables fast and efficient processing and produces perfect results for users and patients alike.

- Enormous strength by combining elasticity and stability
- Unsurpassed reliability thanks to integrated dual network structure with crack-stop function
- Efficient processing thanks to long service life of milling tools and short milling times
- Precise and accurate restorations also in cases of thin walls
- Excellent translucency results in natural restorations that match the tooth shade



### VITA ENAMIC POLISHING SET

The VITA ENAMIC sets of polishing instruments were developed for reliable, efficient and material-specific surface treatment of hybrid ceramic restorations in dental practices and laboratories. The sets include various polishing instruments for pre- and high-gloss polishing.

- Precise concentricity, matched grit sizes and the individual geometries of the instruments guarantee results with superior precision.
- Good handling and the use without polishing paste enable simple and fast processing.
- Gentle and careful reworking is ensured by these instruments which were developed especially for VITA ENAMIC. As a result, for example, the risk of possible formation of microcracks is reduced.



### VITA ENAMIC STAINS KIT

The VITA ENAMIC STAINS KIT comprises six stains and accessories for the reproduction of natural shade nuances of restorations made of hybrid ceramic. The stains are bonded to the restoration in a polymerization process. The chemical glaze material VITA ENAMIC GLAZE is available for surface sealing.

- Simply apply the VITA ENAMIC stains to the restoration, polymerize and that's it! This way the shade of VITA ENAMIC restorations can be quickly characterized.
- The shade nuances and anomalies of natural teeth can be individually reproduced with the six VITA ENAMIC stains.
- The shade intensity of the VITA ENAMIC stains can be perfectly adjusted by the ratio of liquid to shade powder. This way homogeneous and smooth application of shades is ensured.

## VITA ENAMIC® Clinical studies

### **In-vivo studies**

a) Clinical study, University of Freiburg, PD Dr. Güß: VITA ENAMIC crowns

Start of the study: November 2011

Number of restorations planned: 50 crowns (premolar and molar)

Number of restorations already inserted: 29

b) Clinical study, University of Freiburg, PD Dr. Güß: VITA ENAMIC inlays, onlays, partial crowns, table tops

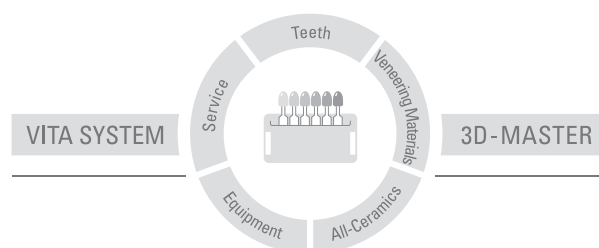
Start of the study: November 2011

Number of restorations already inserted: 51

c) Acceptance phase: VITA ENAMIC crowns, implant crowns, partial crowns, inlays, onlays, veneers; restorations were inserted by various pilot users



With the unique VITA SYSTEM 3D-MASTER, all natural tooth shades can be systematically determined and perfectly reproduced.



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Date of issue of this information 11.12

VITA Zahnfabrik has been certified in accordance to the Medical Device Directive and the following products bear the CE mark: **CE 0124**

**VITA ENAMIC®**

US 5498157 A · AU 659964 B2 · EP 0591958 B1

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# VITA

VITA Zahnfabrik H. Rauter GmbH & Co.KG  
Postfach 1338 · D-79704 Bad Säckingen · Germany  
Tel. +49(0)7761/562-0 · Fax +49(0)7761/562-299  
Hotline: Tel. +49(0)7761/562-222 · Fax +49(0)7761/562-446  
[www.vita-zahnfabrik.com](http://www.vita-zahnfabrik.com) · [info@vita-zahnfabrik.com](mailto:info@vita-zahnfabrik.com)