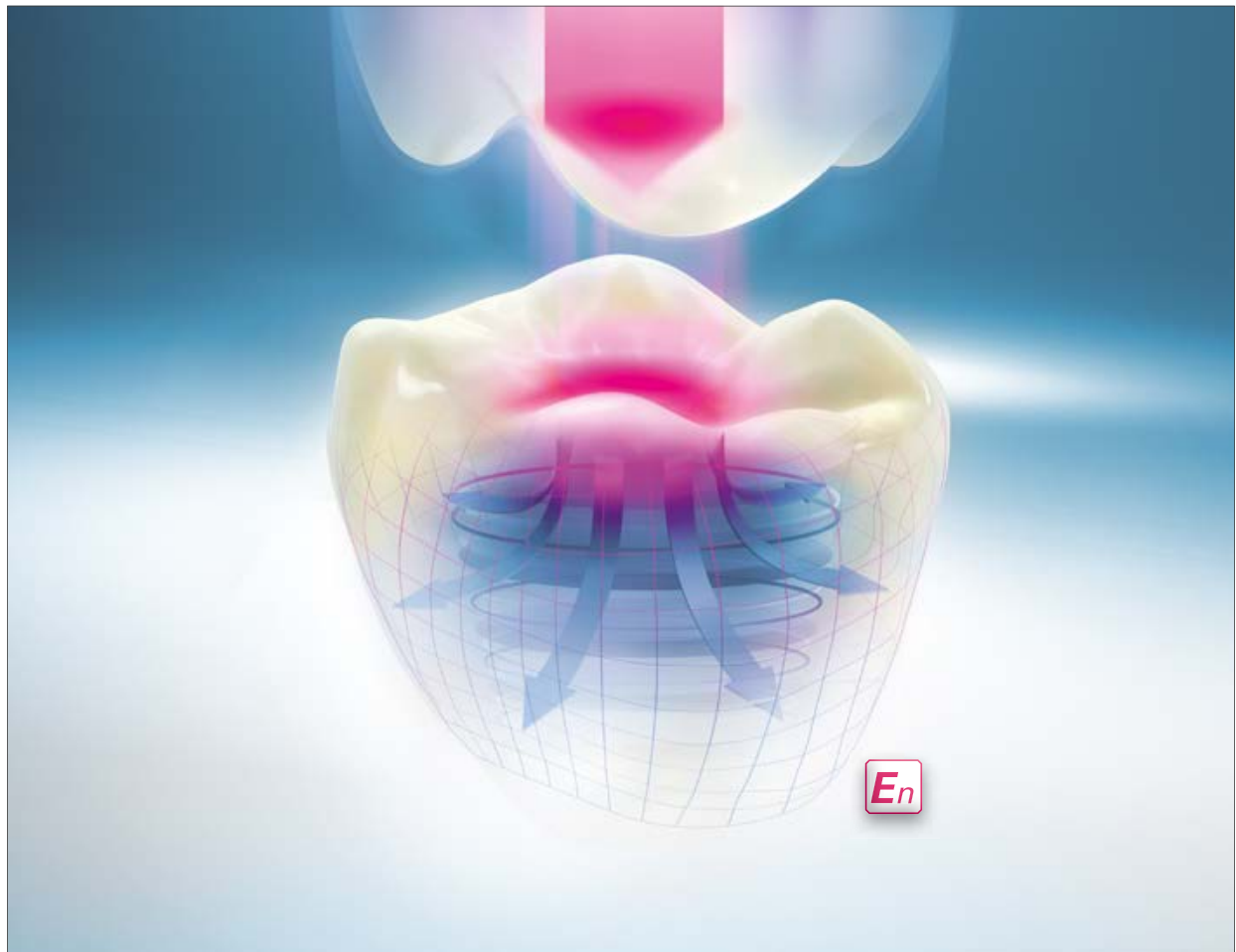


# VITA ENAMIC®

The Concept



VITA shade determination

VITA shade communication

VITA shade reproduction

VITA shade control

Date of issue: 07. 16

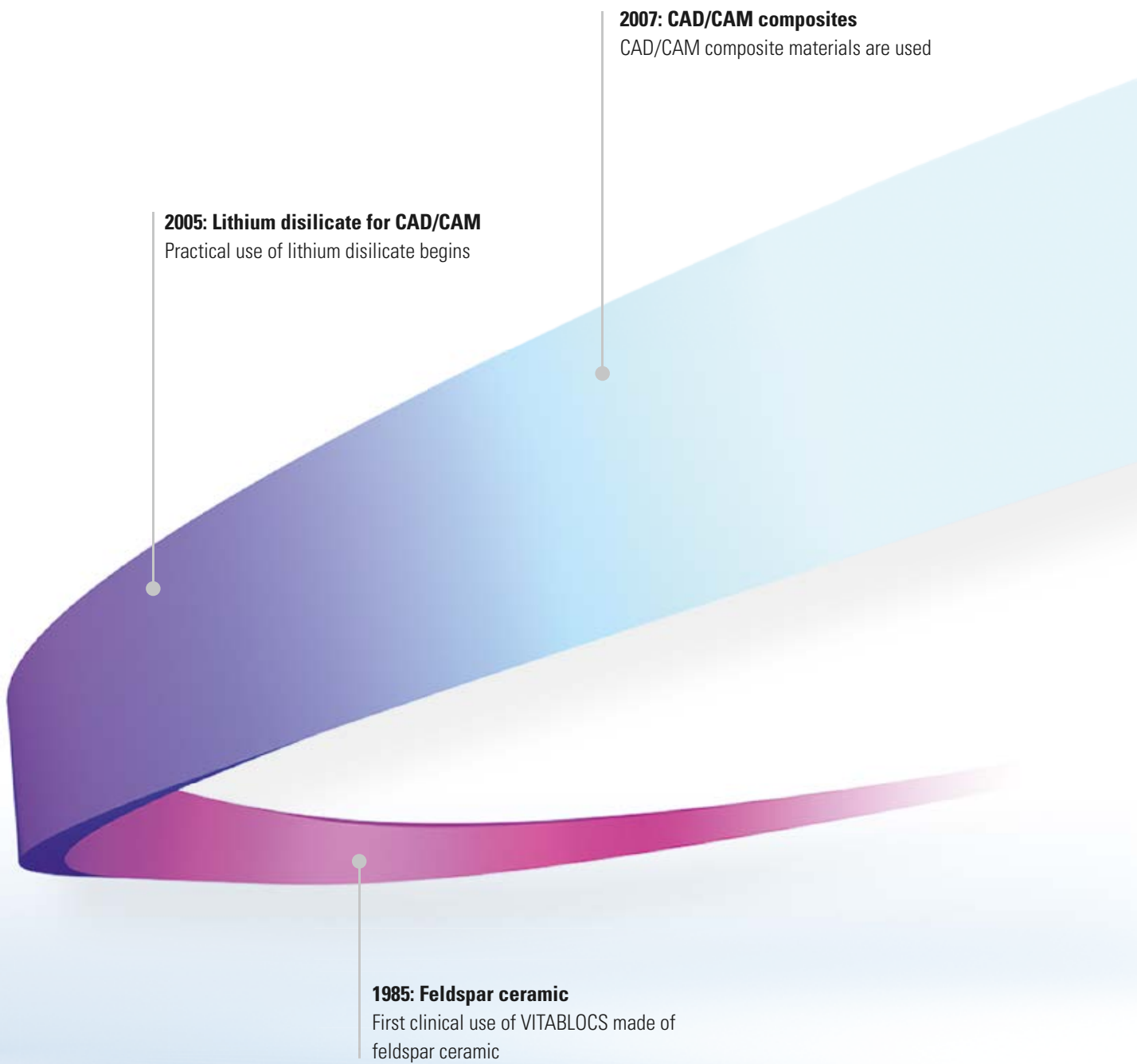


VITA shade, VITA made.

**VITA**

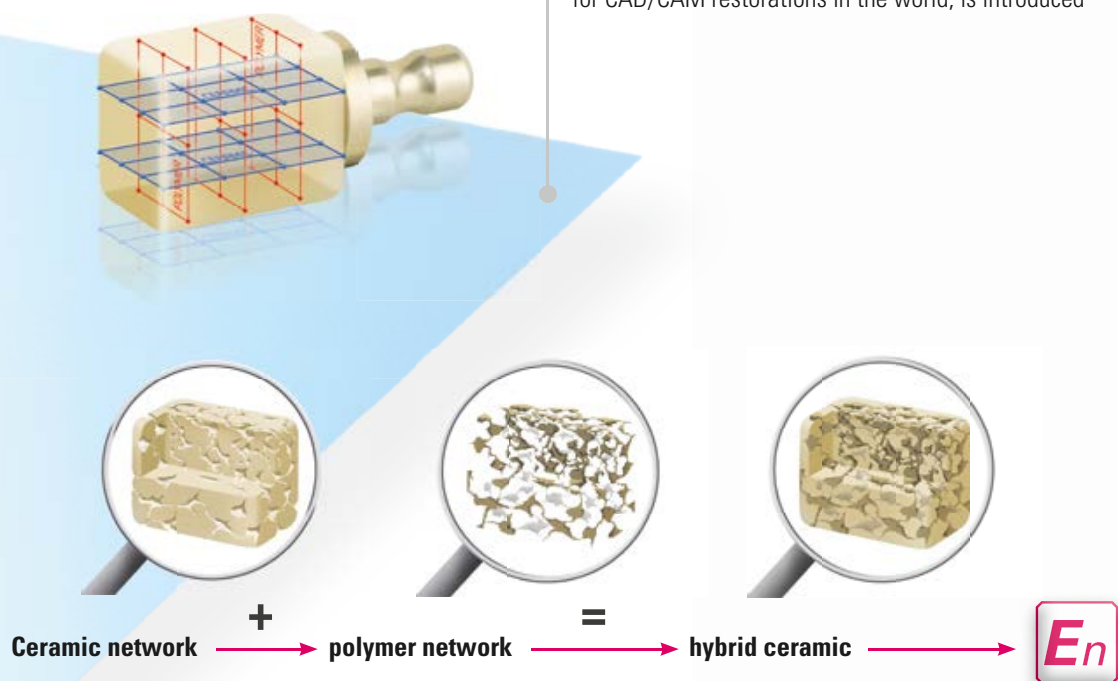
The **En** formula for success: strength + elasticity = reliability<sup>2</sup>

## 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 load capacity" \*

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

In addition to a high degree of elasticity, this innovative hybrid ceramic guarantees particularly high load capacity after adhesive bonding. 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 excellent features. Finally, this tooth-colored hybrid material offers material properties that are almost identical to those of natural teeth, ensuring a natural play of colors thanks to its excellent light conductivity.

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

\*) In addition to a high degree of elasticity, this innovative hybrid ceramic guarantees particularly high load capacity after adhesive bonding.

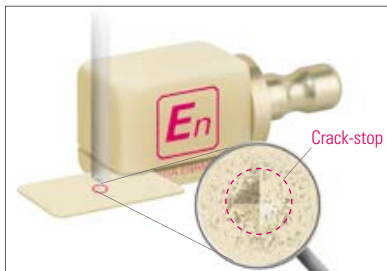
## VITA ENAMIC® Hybrid Ceramic Advantages



### VITA ENAMIC – overview of the benefits

#### Enormous load capacity

After bonding to the remaining tooth substance, VITA ENAMIC exhibits enormous load capacity 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.

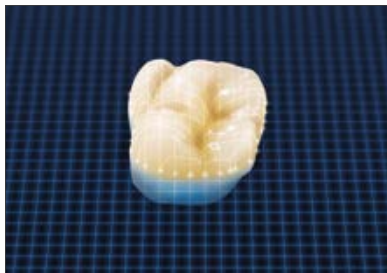


#### Excellent reliability

VITA ENAMIC is a very reliable material, offering an integrated crack stop function thanks to the special dual-network structure of the hybrid ceramic material.

#### Restorations that are gentle on oral substance

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



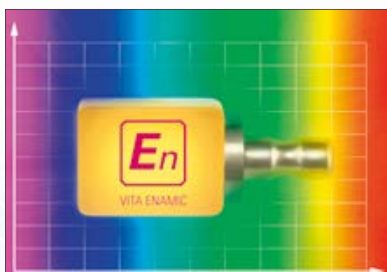
#### Precise and accurate restorations

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. 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
Implant-supported crowns*		
crowns		
Onlays/Inlays		
Veneers		

 recommended by VITA

\* Working instructions - VITA ENAMIC implant-supported crowns, prod. no. 10077.

### Geometries:

VITA ENAMIC is available in the geometries EM-14 (12 x 14 x 18 mm) and EM-10 (8 x 10 x 15 mm)\*.

\*) The EM-10 geometry is only available in the HT translucency level.

VITA ENAMIC IS is available in the geometries IS-14 (12 x 14 x 18 mm)\* and IS-16 (16 x 18 x 18 mm)\*.

\*With an integrated S or L interface for each geometry size

VITA ENAMIC DISC is available in the geometries Ø 98.4 x 12 mm and Ø 98.4 x 18 mm.












### Esthetic results in two translucency levels

#### Shades:

VITA ENAMIC is available in two levels of translucency HT (HT = high translucent) and T (T = translucent) as well as in the 10 VITA SYSTEM 3D-MASTER shades 0M1, 1M1, 1M2, 2M1\*, 2M2, 2M3\*, 3M1\*, 3M2, 3M3\* und 4M2.

Primary indication - high translucent (HT): inlays/onlays, veneers, partial and full crowns

Primary indication - translucent (T): masking discolored dies, in particular for crowns

	0M1	1M1	1M2	2M2	3M2	4M2
HT						
T						

\* Available from Autumn 2016

## VITA ENAMIC® STAINS KIT



### Natural play of colors - simple and easy to achieve

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 as part of a polymerization process. Surface sealing can be performed using the chemical glaze material VITA ENAMIC GLAZE, which 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! With this process, 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. As a result, the good flow characteristics ensure precise application of the stains.

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



### All instruments needed 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 restoration contact points. 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 ability to use without polishing paste enables 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, the risk of possible formation of microcracks is reduced.



## VITA ENAMIC® Materials Science findings

### 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 from others are based on its unique properties. The high load capacity, exceptional reliability and quality of the very natural restorative material, as well as high precision and economic efficiency are documented on the basis of the technical and material-scientific results.

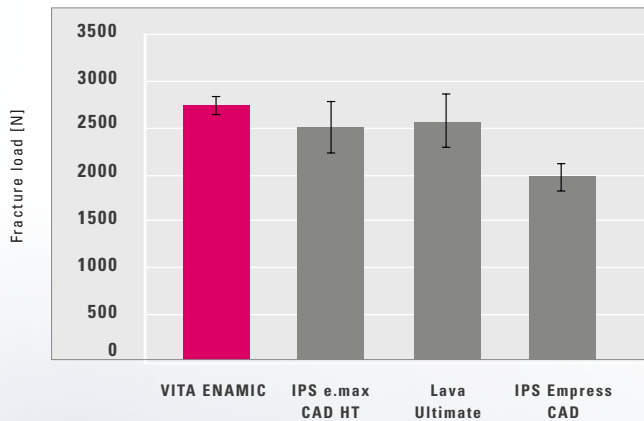
### Short overview of physical/mechanical properties of VITA ENAMIC

	VITA ENAMIC
Static fracture load [N] (SD)	2766 (98)
Flexural strength [MPa]	150 – 160
Modulus of elasticity [GPa] (SD)	30 (2)
Abrasion [µm]	In the same range as VITABLOCS 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 Posterior crown: 5:13 min
Milling tool service life: posterior crowns	Normal: 148 Fast: 132



## Unsurpassed load capacity even for thin walls

### Static fracture load



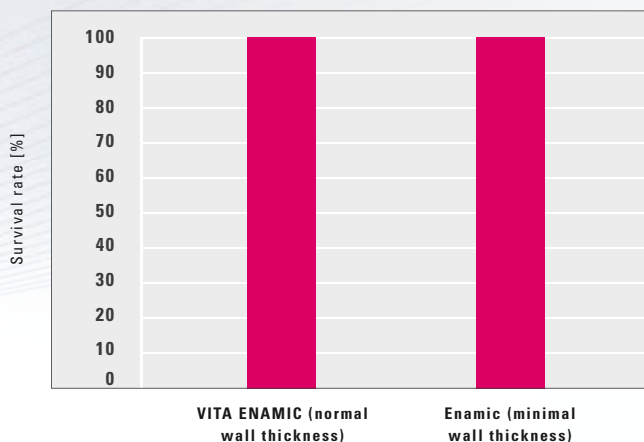
Source: Boston University, Prof. Dr. Giordano

#### Test method:

- Biogeneric, fully anatomical crowns from the respective materials were milled using the Sirona MC XL milling system and then polished / crystallized.
- Cemented to standardized, prefabricated and filled resin dies using Multilink Automix.
- Immersed at room temperature in water for 24 hours.
- In a testing machine, static load was applied to the crowns until fracturing occurred.

**Summary:** In this test setup, VITA ENAMIC demonstrates the highest fracture load of approx. 2766 newtons and the lowest standard deviation.

### Dynamic fracture load



Source: University of Freiburg, Prof. Dr. Gierthmühlen

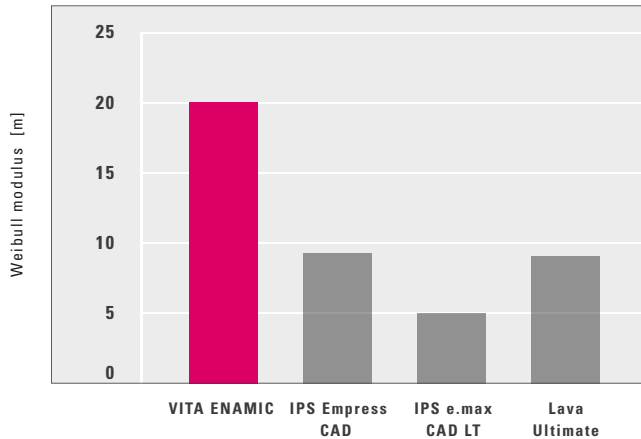
#### Test method:

- 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® Findings of materials science

### Utmost reliability and integrated crack-stop function



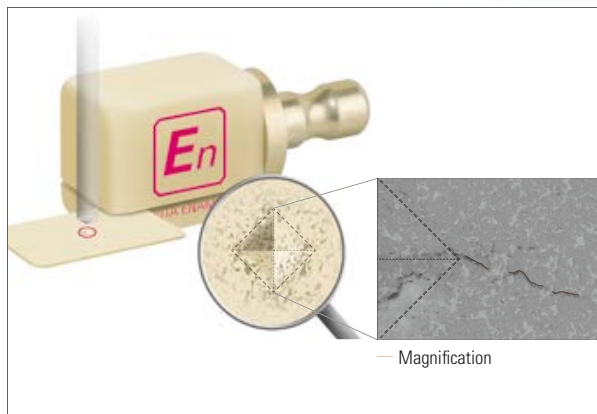
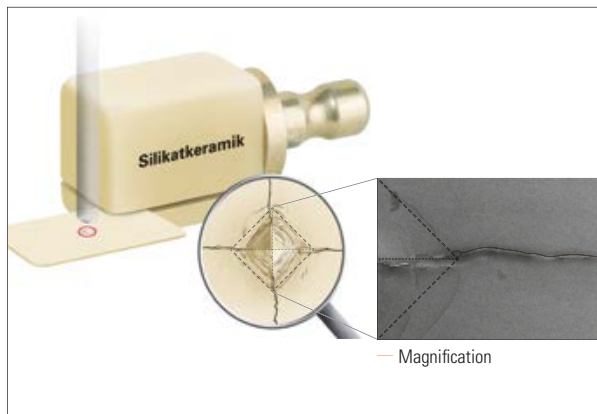
Source: Internal study, VITA R&D

#### Test method:

- The Weibull modulus describes the reliability of a material in a way that cannot be explained 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 highest reliability. The Weibull modulus is 20.

When evaluating the Weibull modulus, the flexural strength (in-house measurements of VITA R&D: VITA ENAMIC: 153.82 MPa (SD 7.56 MPa), Lava Ultimate: 188.42 MPa (SD 22.29 MPa), IPS Empress CAD: 157.82 MPa (SD 17.33 MPa), IPS e.max CAD LT: 344.05 MPa (SD 64.5 MPa)) should always also be taken into account.



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.

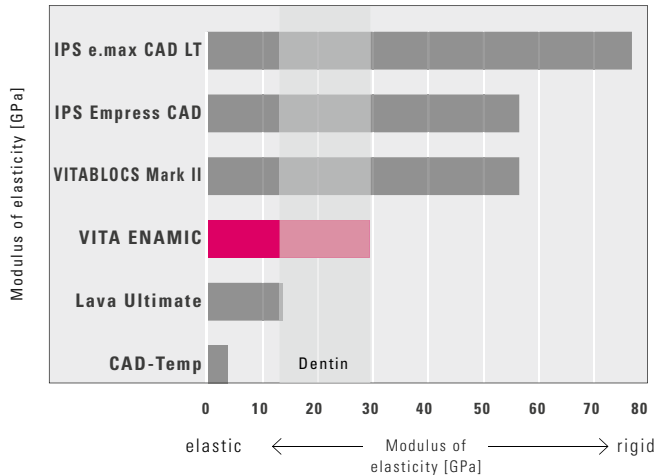
#### Summary:

In this test, ceramics exhibit a clearly limited indentation with sharp edges defined by crack formation and mostly straight-running cracks at the margins.

However, for VITA ENAMIC, the dual network structure results in an indentation that is not limited at the margins - a smooth transition is found.

Cracks that are typical for ceramics generally 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



### Test method:

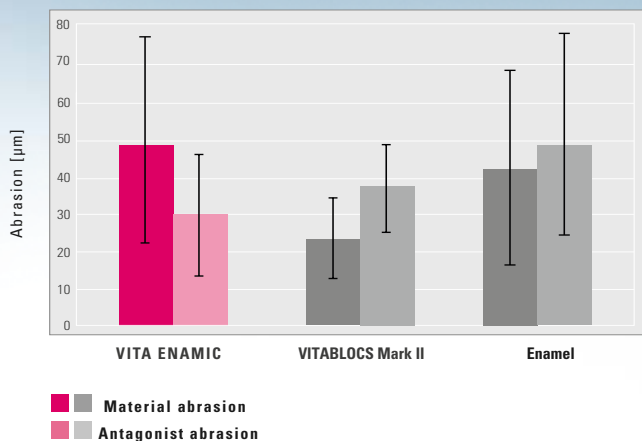
- The modulus of elasticity was determined based on the stress-strain curves of the measurements of flexural strength.

**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.

Note: There are big differences concerning the modulus of elasticity of human dentin in literature. Sources: Kinney JH, Marshall SJ, Marshall GW. The mechanical properties of human dentin: a critical review and re-evaluation of the dental literature. Critical Reviews in Oral Biology & Medicine 2003; 14:13-29



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



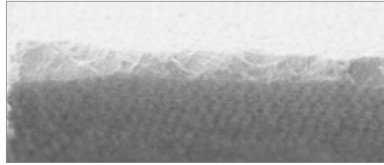
### Test method:

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

**Summary:** The abrasion level of VITA ENAMIC is 49 μm. The level of abrasion to the antagonist enamel caused by VITA ENAMIC is 30.2 μm. VITABLOCS Mark II causes a slightly higher level of abrasion to the antagonist of 38.1 μm. As a control group, the abrasion of enamel to enamel was measured in the study. The goal with VITA ENAMIC was to further improve on the antagonist-friendly properties of VITABLOCS Mark II without abandoning the ceramic behavior of the material.

## VITA ENAMIC® Findings of materials science

### Machinability and edge stability



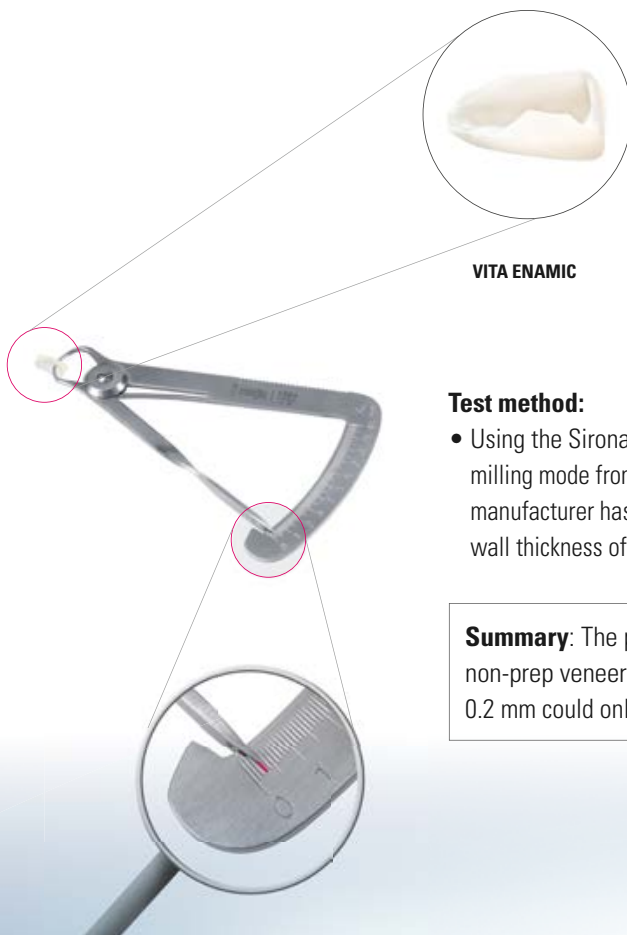
VITA ENAMIC, 30° wedge, lateral view (left photo); VITA ENAMIC, 30° wedge, top view, 200 x magnification (photo in the middle); IPS e.max CAD, 30° wedge, top view, 200 x magnification, (right photo): source: VITA R&D



#### 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 in areas with thin margins.



VITA ENAMIC



IPS Empress CAD



IPS e.max CAD

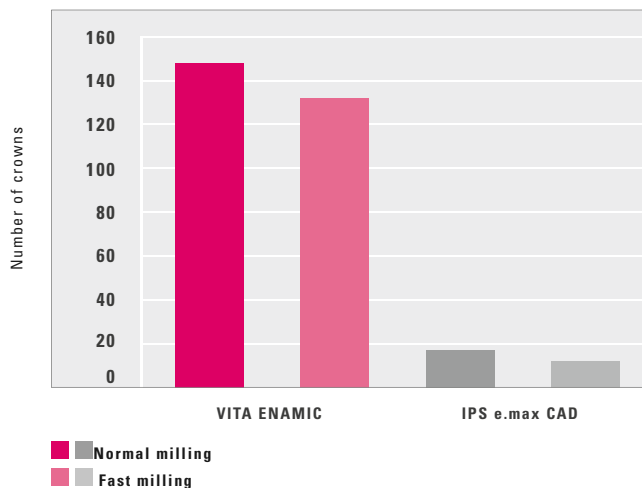
#### Test method:

- Using the Sirona MC XL milling system, non-prep veneers were milled in normal milling mode from various materials with a wall thickness of approx. 0.2 mm. The manufacturer has not approved the use of IPS Empress CAD and IPS e.max CAD for a wall thickness of approx. 0.2 mm.

**Summary:** The perfect edge stability of VITA ENAMIC is demonstrated by the non-prep veneers. The geometry in this case with a wall thickness of approx. 0.2 mm could only be fully milled 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.
- The lives of the milling tools indicate the results of a series of measurements.

**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
VITABLOCS Mark II	Normal	10:27	10:35	13:29
	Fast	6:24	7:03	9:26
IPS e.max CAD	Normal	12:17	12:36	14:58
	Fast	10:00	08:11	12:14
Lava Ultimate	Normal	10:39	10:10	11:55
	Fast	7:27	6:27	8:24

#### 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 VITABLOCS Mark II, Lava Ultimate and IPS e.max CAD, VITA ENAMIC restorations can be milled more quickly.

## VITA ENAMIC® Accessories



### VITA ENAMIC

The first hybrid dental ceramic in the world with a dual network structure creates a new definition of load capacity. With fast and economical processing and excellent results for users and patients, VITA ENAMIC is the denture material of the future.

- Enormous load capacity achieved by combining elasticity and stability
- Unsurpassed reliability thanks to an 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 ability to use without polishing paste enables simple and fast processing.
- These instruments, which were developed especially for VITA ENAMIC, ensure gentle and careful reworking. As a result, the risk of possible formation of microcracks is reduced.



### VITA ENAMIC STAINS KIT

The VITA ENAMIC STAINS KIT includes six stains and accessories for the reproduction of natural shade nuances of restorations made of hybrid ceramic. The stains are bonded to the restoration as part of a polymerization process. Surface sealing can be performed using the chemical glaze material VITA ENAMIC GLAZE,

- Simply apply the VITA ENAMIC stains to the restoration, polymerize and that's it! With this process, 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 controlled by the ratio of liquid to shade powder. As a result, homogeneous and smooth application of shades is ensured.

## VITA ENAMIC® Clinical studies

### In-vivo studies

a) Clinical study, University of Freiburg, Prof. Dr. Giertmühlen: VITA ENAMIC crowns

Start of the study: November 2011

Number of restorations fitted: 71

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

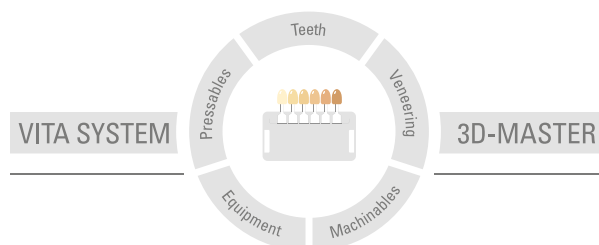
Start of the study: November 2011

Number of restorations fitted: 100

c) Acceptance phase: VITA ENAMIC crowns, implant crowns, partial crowns, inlays, onlays, veneers; approx. 594 restorations (as of December 2012) were inserted by various pilot users



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



**Please note:** Our products must be used in accordance with the instructions for use. We accept no liability for any damage resulting from incorrect handling or usage. The user is furthermore obliged to check the product before use with regard to its suitability for the intended area of application. We cannot accept any liability if the product is used in conjunction with materials and equipment from other manufacturers that are not compatible or not authorized for use with our product. Furthermore, our liability for the accuracy of this information is independent of the legal basis and, in as far as legally permissible, shall always be limited to the value as invoiced of the goods supplied, excluding value-added tax. In particular, as far as legally permissible, we do not assume any liability for loss of earnings, indirect damages, ensuing damages or for third-party claims against the purchaser. Claims for damages based on fault liability (culpa in contrahendo, breach of contract, unlawful acts, etc.) can only be made in the case of intent or gross negligence. The VITA Modulbox is not necessarily a component of the product.

Date of issue of this information: 10.13

After the publication of these information for use any previous versions become obsolete. The current version can be found at [www.vita-zahnfabrik.com](http://www.vita-zahnfabrik.com)

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

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# VITA

VITA Zahnfabrik H. Rauter GmbH & Co.KG  
 Spitalgasse 3 · D-79713 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)  
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