

# VESTAKEEP® Dental

Biomaterials for Dental Applications



**VESTAKEEP®**

# VESTAKEEP® PEEK is setting new standards

Evonik, the creative industrial group from Germany, is one of the world leaders in specialty chemicals. Our activities focus on the key megatrends health, nutrition, resource efficiency and globalization.

As a technology leader for high-performance polymers, Evonik supplies polyether ether ketone (PEEK) materials for the medical sector. VESTAKEEP® PEEK for medical applications includes i-Grades for permanent surgical implants, Dental-Grades for temporary and permanent dental applications and Care-Grades for medical devices.

These materials are changing standards for medical technology applications due to their outstanding biocompatibility and biostability.

VESTAKEEP® Dental-Grades provide an innovative and metal-free solution for outstanding wear comfort. They are base materials for medical devices like crowns, bridges, and removable and permanent dentures alike. VESTAKEEP® Dental-Grades are offered in various colors to meet the aesthetic demands of the patient. Our VESTAKEEP® PEEK materials are driving high levels of innovation in medical devices and dental technology.



*„Within the limitation of a laboratory study, the results suggest that biofilm formation on the surface of PEEK (VESTAKEEP® PEEK) is equal or lower than on the surface of conventionally applied abutment materials such as zirconia and titanium.“*

Extract of the study „Biofilm formation on the surface of modern implant abutment materials“ by Sebastian Hahnel (DDS, PhD, Universitätsklinikum Regensburg) et al.  
Hahnel S, Wieser A, Lang R, Rosentritt M, Clin. Oral Impl. Res. 00 (2014) 1-5



## VESTAKEEP® PEEK Dental-Grades

### Advantages at a glance

A unique biomaterial with aesthetic and performance properties provides convincing advantages like:

- excellent wear comfort due to being metal-free, tasteless, light weight, and with low thermal conductivity
- biocompatible
- biostable
- compatible with common veneer and composite materials
- for use with permanent and removable devices
- easy to machine and finish
- X-ray opaque grades available

### Quality Management

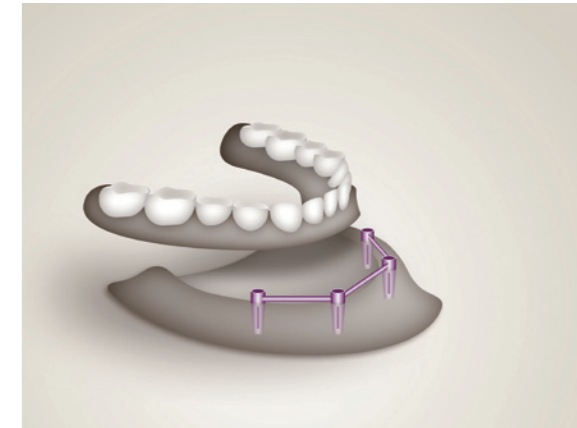
VESTAKEEP® stock shapes are produced under an ISO 13485 certified quality management system. The material is reliably supplied at a consistent quality. All production is fully traceable all its way back to the raw materials used for the resin polymerization.

VESTAKEEP® Dental resins and stock shapes have thoroughly been tested for biocompatibility and toxicity based on ISO 10993 and USP <88> Class VI.

# VESTAKEEP® Dental Examples for potential applications

Application examples of medical devices based on VESTAKEEP® Dental

- abutments
- cervical gingiva formers
- crowns and bridges
- attachment restorations
- partial dentures
- occlusal splints
- inlay bridges
- dentures (basis)
- healing caps
- telescopic crowns



## Some examples

### Crowns

Crowns – caps in tooth shape to restore its function, size and appearance. Crowns can be individualized with composite materials, vestibular veneering or used as full crowns of Dental for the non-aesthetic zone. Furthermore full crowns made of VESTAKEEP® Dental provide shock absorption properties beneficial for antagonist and TMJ.

### Bridges

Bridges are a combination of caps and pontics to restore grinded and missing teeth. Bridges of VESTAKEEP® Dental have similar application uses as metal: customizable with composite, vestibular veneering or full crowns of VESTAKEEP® Dental in the posterior region. Additional advantages over metal include light weight, being tasteless, and shock absorption.

### Partial dentures

A partial denture restores one or more of the natural teeth in combination with the existing teeth and the soft tissue. Partial dentures based on VESTAKEEP® Dental are light weight and tasteless, have an extraordinary wear comfort and no sensation of high or low temperatures. A perfect combination of stability and performance.

### Implants, Abutments

Implants are artificial roots of the teeth inserted into the jaw. Replacements for the tooth stumps on top of the inserted implants are called abutments. VESTAKEEP® Dental's biocompatibility makes it a good candidate base material for medical devices like abutments with hard and soft tissues as well as cervical gingiva formers.

### Bar restorations

Bar restorations are removable restorations on the inserted implants in the jaw. Bar restorations based on VESTAKEEP® Dental ensure removability without wear, no metal taste of the denture, light weight and minimal size for easy handling by the patient.

## Case examples

Partial dentures



VESTAKEEP® gingiva-colored

VESTAKEEP® white

## VESTAKEEP® Dental-Grades are biocompatible

Biocompatibility, biostability and safety are all major criteria when a material is selected for a medical device or a medical implant. In an extensive testing programme run by independent certified labs, biocompatibility has been tested according to USP <88> Class VI and following ISO 10993-1:2009 guidelines.

These test results attest to VESTAKEEP®'s excellent biocompatibility and biostability, which are principally attributed to the polymers` high chemical resistance and thermal stability.

### VESTAKEEP® Dental-Grade

Biocompatibility testing according to ISO 10993 for permanent mucosal membrane contact		
USP Class VI	Acute systemic toxicity / Intracutaneous reactivity / Muscle implantation	+
ISO 10993-5	Cytotoxicity	Lot control
ISO 10993-10	Sensitization: murine local lymph node assay (LLNA)	+
ISO 10993-10	Irritation: intracutaneous reactivity	+
ISO 10993-11	Acute systemic toxicity	+
ISO 10993-11	Subacute / Subchronic systemic toxicity	14 days
ISO 10993-3	Genotoxicity: reverse mutation assay (Ames)	+
ISO 10993-6	Implantation tests	Muscle 7 days
ISO 10993-12	GC/MS fingerprint	+

# VESTAKEEP® Service

## First-class service for manufacturers of dental products

Evonik provides a comprehensive service for the development and implementation of polymer technologies. **We support our customer from start to finish** in their search for new areas of innovative applications.

The service we offer includes the following:

- research expertise from decades of experience
- advice on materials selection, new material development
- support and guidance in processing
- technical service for optimizing the manufacturing process

## Customized solutions

We offer a wide standard portfolio but also help our customers with our material competence to develop the next generation dental applications.

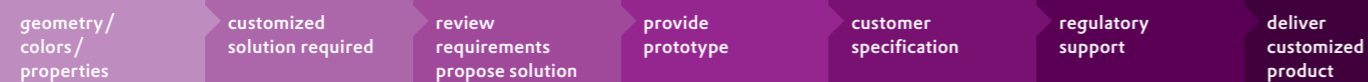
### Standard

customer uses VESTAKEEP® PEEK standard portfolio to develop dental applications

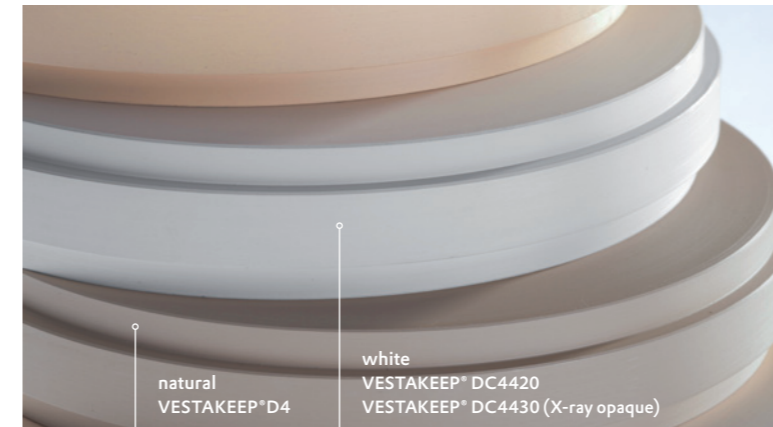


### Customized solution

customer asks for customized geometries/colors



# VESTAKEEP® Dental colors and delivery forms



## VESTAKEEP® for dental applications

color	injection molding and extrusion		turning and milling, CAD/CAM	
	VESTAKEEP® granules (G)	VESTAKEEP® rods (R)	VESTAKEEP® discs	
natural	● VESTAKEEP® D4 G	VESTAKEEP® D4 R	VESTAKEEP® D4 R	
white	● VESTAKEEP® DC4420 G	VESTAKEEP® DC4420 R	VESTAKEEP® DC4420 R	
white, X-ray opaque	● VESTAKEEP® DC4430 G	VESTAKEEP® DC4430 R	VESTAKEEP® DC4430 R	
tooth-colored	● VESTAKEEP® DC4450 G	VESTAKEEP® DC4450 R	VESTAKEEP® DC4450 R	
gingiva-colored	● VESTAKEEP® DC4470 G	VESTAKEEP® DC4470 R	VESTAKEEP® DC4470 R	
<b>detailed information on VESTAKEEP® Dental delivery forms</b>	VESTAKEEP® granules are supplied in 25 kg boxes with polyethylene liners  2 x 12.5 kg	VESTAKEEP® rods are extruded from VESTAKEEP® granules  diameter      standard lengths 6 - 20 mm    3000 mm 25 - 60 mm   2000 mm 70 - 100 mm   1000 mm	VESTAKEEP® discs are available in different dimensions with or without step  diameter 98.4 mm (with step) 99.5 mm (without step) 84.5 mm (without step) thickness 12 - 30 mm	

Customized dimensions are available on request.

## X-ray opacity

As most other plastics polyetheretherketones exhibit an X-ray absorption close to human tissue. Therefore the materials lack contrast and are invisible in X-ray examinations. Its barium sulphate content renders white VESTAKEEP® Dental DC4430 X-ray opaque. Unlike metals, the material does not generate X-ray artifacts and it is MRT-compatible.

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VESTAKEEP® materials are no medical devices and do not carry CE marks. It is in the sole responsibility of the purchaser to obtain regulatory approval.



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