

VESTAKEEP® Dental

BIOMATERIALS FOR
METAL FREE DENTAL APPLICATIONS
WITH **BONE LIKE ELASTICITY**



Evonik is one of the world leaders in specialty chemicals. The company goes far beyond chemistry to create innovative, profitable and sustainable solutions for customers.

More than 32,000 employees work together for a common purpose: We want to improve life, day by day.

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. Evonik's new VESTAKEEP® Fusion product line for next generation PEEK with osteoconductive properties extends the material portfolio.

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.

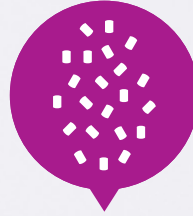
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**VESTAKEEP® Dental
VALUE CHAIN**



..... Resin



..... Compound



..... Stock Shape



..... Discs



..... Dental Industry (OEM)



..... Dental Labs



..... Dentist



..... Patient

SETTING NEW STANDARDS

Customized
for dental
applications



Biocompatibility, biostability and safety are all major criteria when a material is selected for dental applications.

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

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 guidelines. These test results attest to VESTAKEEP®'s excellent biocompatibility and biostability.

VESTAKEEP® Dental biomaterials with unique aesthetic and performance properties provide convincing advantages for the patients

Comfort

- light weight
- low thermal conductivity
- no metal taste

Aesthetics

- natural colors (e.g. teeth and gingiva)
- metal free

Durability

- natural elasticity for buffering effects that avoids stress shielding
- life long smooth friction
- no wear abrasion or corrosion
- low water absorption

Biocompatibility

- proven biocompatibility and biostability
- suitable for allergy patients

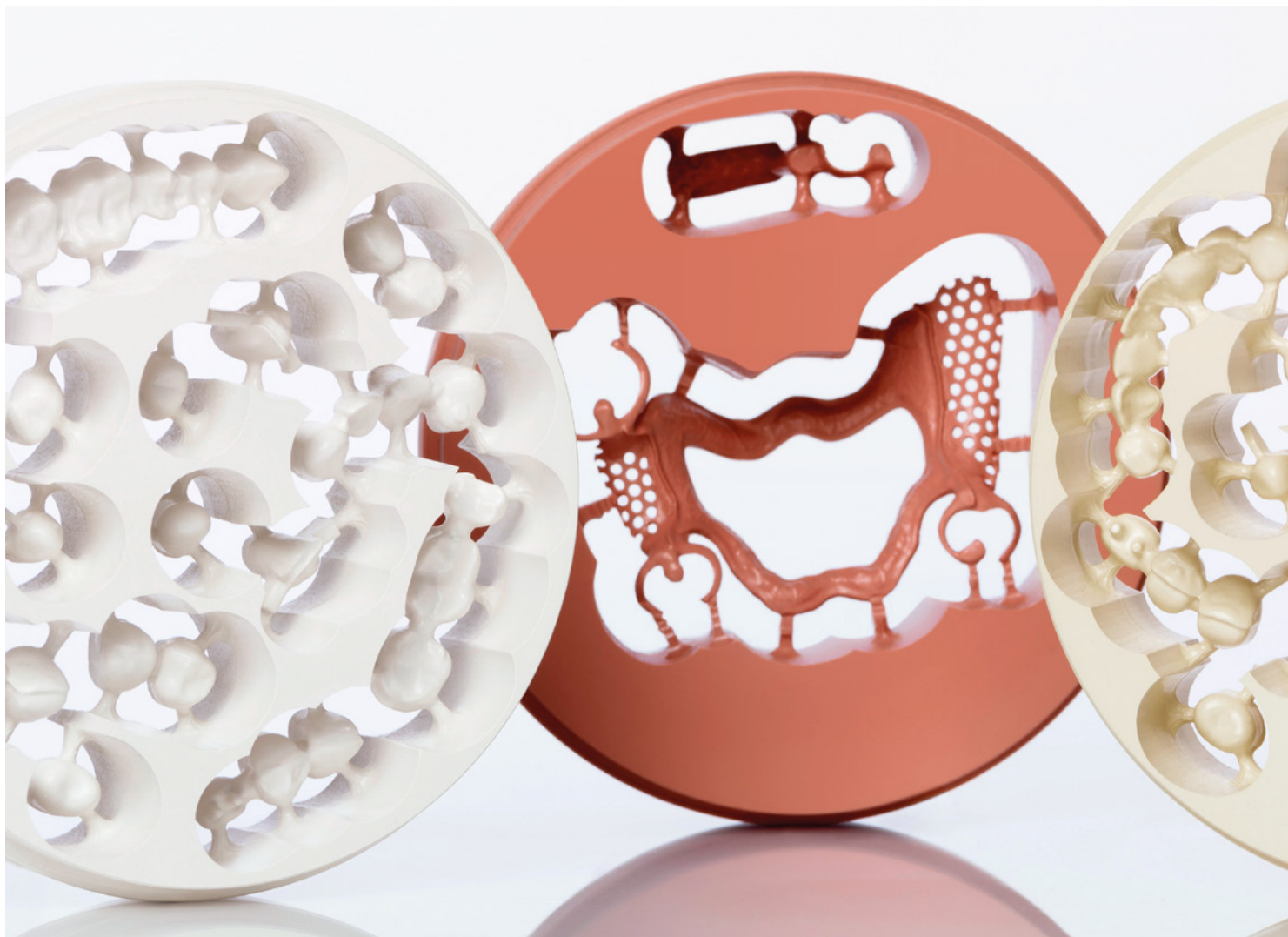


Biocompatibility tests

VESTAKEEP® Dental-Grades

Tests following ISO 10993 recommendations
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 10993-18	GC/MS fingerprint	+



BENEFITS IN APPLICATION

VESTAKEEP® Dental – metal free solution with a wide range of applications

VESTAKEEP® Dental materials are an excellent choice instead of metals such as CoCr. Applications range from temporary dentures to removable dentures as well as permanent implant-supported constructs. The dentures are light weight and tasteless, have an extraordinary wear comfort and no

sensation of high or low temperatures. The combination of the available colors provides a highly natural esthetic appearance in the patient's mouth. The gingiva colored VESTAKEEP® DC 4470 gives a natural appearance for all parts that are in contact with the gingiva. For base constructs or visible clamps in contact to other teeth, the tooth colored VESTAKEEP® DC4450 can be the material of choice.

VESTAKEEP® Dental – the ideal choice for implant supported applications

Implant-supported primary and secondary structures are among the best suited applications for VESTAKEEP® Dental based constructs because here most of the advantages come into play. The natural flexibility in combination with the outstanding durability and biocompatibility assure long lasting devices and high patient comfort.



VESTAKEEP® DENTAL FOR METAL FREE SOLUTIONS

Possible applications of medical devices based on VESTAKEEP® Dental

- | | |
|--------------------|----------------------------|
| → abutments | → cervical gingiva formers |
| → partial dentures | → crowns and bridges |
| → occlusal splints | → attachment restorations |
| → healing caps | → telescopic crowns |
| → dentures (basis) | → CAD/CAM blocks |



Due to excellent friction properties VESTAKEEP® PEEK is the material of choice for primary and secondary telescopes, bars, bridges and crowns as it is proven that the material does show virtually no wear abrasion or fatigue over the lifetime of the product.

→ *As a highly inert material VESTAKEEP® Dental will not be attacked by any chemical or substances present in the mouth and nothing will migrate into the material. In combination with a high gloss polished surface of parts in contact with the saliva and regular ultra-sonic cleaning of the dentures plaque formation becomes negligible.*

VESTAKEEP® Dental – full integration in digital workflows

The VESTAKEEP® Dental materials can be fully integrated in the standard digital CAD/CAM workflow in the dental laboratory. Milling strategies can be easily adjusted on common existing machines. Processing on standard lab equipment using com-

mon techniques including bonding, veneering and cementing is possible. Dedicated training is recommended.

Also extension and activation of VESTAKEEP® PEEK parts is possible. All VESTAKEEP® Dental materials can be freely combined for example in multi-colored dentures, extensions or repairs.

VESTAKEEP® Dental PRODUCTS

VESTAKEEP® DENTAL

We boost the
next generation
of dental biomaterials
for your dental
products to improve
the quality of life.



NEW



R ... Stock shapes
G ... Resins

Color

Description

VESTAKEEP® D4 R
VESTAKEEP® D4 G



natural

• unfilled resin

VESTAKEEP® DC4420 R
VESTAKEEP® DC4420 G



white

• increased flexural modulus

VESTAKEEP® DC4430 R
VESTAKEEP® DC4430 G



white

• x-ray opaque
• increased flexural modulus

VESTAKEEP® DC4450 R
VESTAKEEP® DC4450 G



tooth

• increased flexural modulus

VESTAKEEP® DC4470 R
VESTAKEEP® DC4470 G



gingiva

VESTAKEEP® DC4760 R
VESTAKEEP® DC4760 G



tooth

• x-ray opaque
• extra high flexural modulus

VESTAKEEP® DC4780 R
VESTAKEEP® DC4780 G



gingiva

• x-ray opaque
• extra high flexural modulus

SCIENTIFIC STUDY

Delivery forms

Rods

diameter	standard lengths
6 mm	3000 mm
8 mm	3000 mm
100 mm	1000 mm

Discs

available in different dimensions

diameter

98.5 mm (with step)

thicknesses

12 mm
16 mm
20 mm
24 mm
30 mm

Granules

supplied in 25 kg boxes
with polyethylene liners
(2 x 12.5 kg)

Patient specific and
other dimensions are available
on request.

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To date, there is limited scientific data on the use of PEEK in dental applications available. In a study, Charité in Berlin investigated several key aspects on applications of VESTAKEEP® biomaterials in dentistry. The study included bonding, friction and cementing. The results were evaluated in comparison to common materials like cobalt-chromium alloys and ceramic dental materials.

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VESTAKEEP® Dental PROPERTIES

Properties	Test method	Unit
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VESTAKEEP® DENTAL

Density		
23°C	ISO 1183	g/cm ³
Melt-flow volume-flow rate (MVR)		
380°C, 5kg	ISO 1133	
Tensile test		
Stress at yield	23°C, 50% r.h.	ISO 527-1/-2
Strain at yield	23°C, 50% r.h.	ISO 527-1/-2
Strain at break	23°C, 50% r.h.	ISO 527-1/-2
Tensile modulus		ISO 527-1/-2
Carpenter notched impact strength		
23°C	ISO 179/1eA	kJ/m ²
-30°C	ISO 179/1eA	kJ/m ²
Izod notched impact strength		
23 °C	ISO 180	kJ/m ²
Flexural test		
Flexural modulus	23°C, 50% r.h.	ISO 178
Flexural strength	23°C, 50% r.h.	ISO 178
Melting range		
Recrystallisation temperature	ISO 11357	°C
Tg onset, 2 nd heating	ISO 11357	°C
Tg midpoint, 2 nd heating	ISO 11357	°C
Tm 2 nd heating	ISO 11357	°C
Water absorption		
Saturation	23°C	ISO 62
Relative humidity	23°C, 50%	ISO 62

D4R	D4G	DC4420 R	DC4420 G	DC4430 R
1.30	1.30	1.51	1.49	1.51
	12		9.5	
110	96	110	95	110
4.8	5.0	4.2	4.8	4.2
>10	>10	>10	>10	>10
4800	3500	4800	4100	4800
	8.0		6.8	
5.5		5.2		5.2
4050		4700		4700
175		175		175
285	285	285	285	285
145	145	145	145	145
155	155	155	155	155
340	340	340	340	340
0.4	0.4	0.4	0.4	0.4



DC4430 G	DC4450 R	DC4450 G	DC4470 R	DC4470 G	DC4760 R	DC4760 G	DC4780 R	DC4780 G
1.50	1.52	1.51	1.36	1.36	1.70	1.70	1.70	1.70
9.5		9.5		11		5		5
95	110	95	110	95	115	95	115	95
4.8	4.2	4.8	4.5	5.0		4.0		4.0
>10	>10	>10	>10	>10	3.5	>5	3.5	>5
4100	4800	4100	4400	3600	7100	6000	7100	6000
6.8		6.8		7.5		6C		6C
	5.2		4.7		5.9		5.9	
	4800		4100		7500		7500	
	175		175		180		180	
285	285	285	285	285	285	285	285	285
145	145	145	145	145	145	145	145	145
155	155	155	155	155	155	155	155	155
340	340	340	340	340	340	340	340	340
0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

For more information on VESTAKEEP® resins please visit
our material database at www.plastics-database.com



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Evonik Operations GmbH
High Performance Polymers
45764 Marl, Germany
PHONE +49 2365 49-9227

Evonik Corporation
High Performance Polymers
299 Jefferson Road
Parsippany, NJ 07054
United States
PHONE +1 973 929-8000

**Evonik Specialty Chemicals
(Shanghai) Co., Ltd.**
55 Chundong Road
Xinzhuang Industry Park
Shanghai 201108, China
PHONE +86 21 6119-1000

www.evonik.com
www.evonik.com/medical-technology
evonik-hp@evonik.com