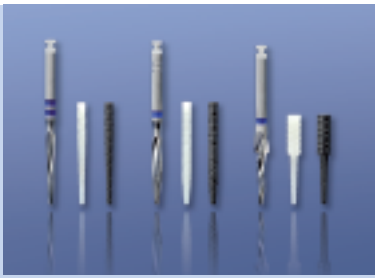

HAHNENKRATT
HAHNENKRATT.COM
CONTEC
CYTEC
EXATEC
THE BASE FOR AN UTMOST
STABLE RECONSTRUCTION

SINCE 20 YEARS HAHNEKRATT IS THE PIONEER IN DENTAL FIBRE-REINFORCED COMPOSITE TECHNOLOGY

- 1995: 1ST HT-CARBONFIBRE ROOT POST
- 1998: 1ST QUARTZFIBRE ROOT POST
- 2001: 1ST HT-GLASSFIBRE ROOT POST

▲
Natural fibre-reinforced material
Found: Cap Lardier, Mediterranean



YOUR ADVANTAGES AT A GLANCE

THE UTMOST BENDING STRENGTH

OPTIMISES THE FATIGUE AND FRACTURE RESISTANCE

Bending strength acc. to DIN 53 390:
Testing glassfibre reinforced composites. Bending test using unidirectional glassfibre reinforced round rod laminates.

Tests run with our Cytec carbon and Cytec blanco root posts, as well as glassfibre and quartzfibre root posts produced by various competitors, according to DIN 53 390 resulted in comparable bending strength values as shown in the graph.

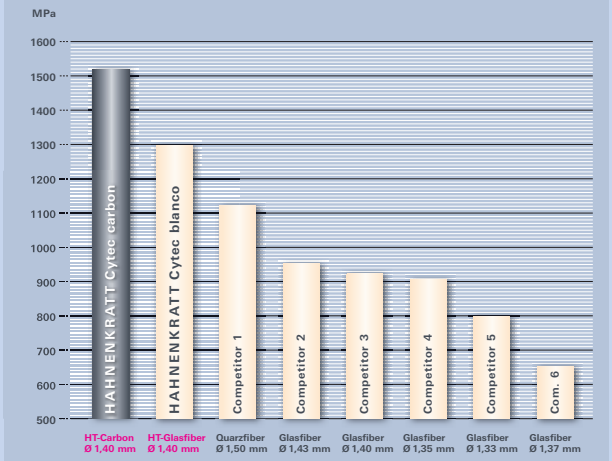
The test was carried out according to DIN 53 390. As its title implies (see above), this German standard is more suitable for determining the bending strength of glassfibre reinforced composite root posts than the ISO 178 standard.

Bending strength acc. to EN ISO 178:
Plastics – Determination of bending properties

The bending strengths of the materials we use were determined with the help of EN ISO 178:
HAHNENKRATT HT-Glassfibre: 1678 MPa
HAHNENKRATT HT-Carbonfibre: 1857 MPa

The test was carried out according to EN ISO 178 as this international standard is used in many scientific studies.

GRAPHIC 1 UTMOST BENDING STRENGTH



Highest bending strength acc. to DIN 53 390 for ▸
Cytec carbon: 1517.09 MPa
Cytec blanco: 1281.62 MPa
compared with other glassfibre and quartzfibre root posts

These tests were made at the IVW-Institute of the »Technische Universität Kaiserslautern«

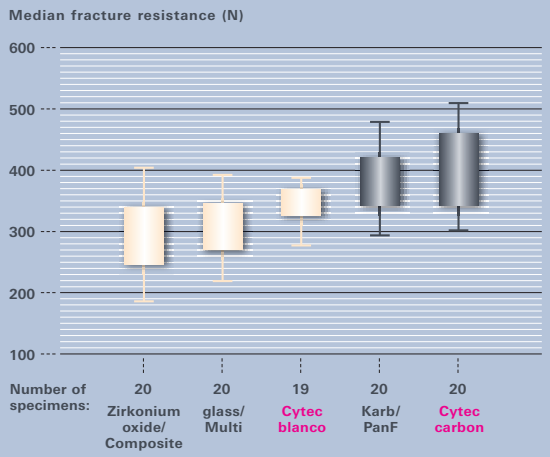
THE UTMOST FATIGUE AND FRACTURE RESISTANCE

FOR INCREASING THE STRENGTH OF POST AND CORE RECONSTRUCTION

As our materials exhibit high bending strength they are very highly fatigue and fracture resistant. This was proven by the results of comparative scientific studies carried out in-vitro.

Highest fracture resistance for Cytec blanco: 348.8 N (mean value)
Highest fracture resistance for Cytec carbon: 407.0 N (mean value)

GRAPHIC 2 FRACTURE RESISTANCE



Results of a scientific study performed by the Charitè Berlin. [1]

During another study, Cytec blanco specimen attained an even higher fracture resistance value of 509 N (mean), and this, despite the fact that, where the cement/tooth transition is concerned, the starting specimen only exhibited a »Perfect Margin before TCML« value of 72%. This value of 509 N was determined after simulating a period of 5 years in situ (TCML 6000 x 5°C/55°C, each 2 min, $1.2*10^6$ x 50 N). In addition, a porcelain crown was fitted to these specimen (ferrule effect).[2]

In comparison: Scientific studies indicate masticatory loading values of 30-80 N for premolars and canines and 150-250 N for incisors.

HOMOGENEITY DUE TO DENTINE-LIKE ELASTICITY

FOR REDUCING STRESS TRANSFER AND THE ASSOCIATED RISK OF ROOT FRACTURES

According to Professor Dr. Wintermantel from the faculty for »Biocompatible Materials and Building Techniques« of the University of Zurich, Switzerland, the following applies to a load-bearing implant: »Its homoelasticity is an important requirement for the structural compatibility of a load-bearing implant. This refers to the elastic deformation behaviour of an implant approaching that of the recipient tissue.«[5] This also applies to root posts.

Our HT-Carbonfibre and HT-Glassfibre materials exhibit a modulus of elasticity resembling that of dentine. This approaches the required homoelasticity. A core which is as homogeneous as possible reduces the risk of the root fracturing and promotes the stability of the post and core.

ELASTICITY IN COMPARISON:	E-Modulus
HAHNENKRATT HT-Glassfibre	13,6 GPa (according to DIN 53 390)
Dentine	≈18,6 GPa
HAHNENKRATT HT-Carbonfibre	26,7 GPa (according to DIN 53 390)
Titanium	117,0 GPa
Zirconium	190,0 GPa

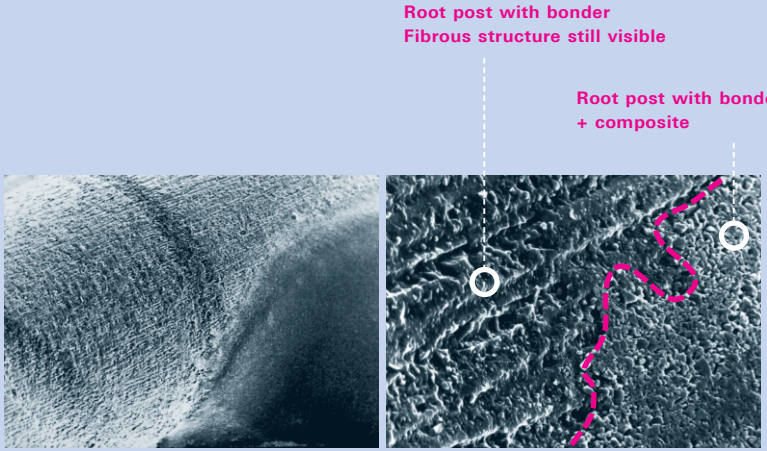
Bionics provides us with clues for converting the construction of biologic systems technically. Millions of years ago nature created fibre-reinforced »constructions« long before humans even thought about developing fibre-reinforced composite materials.

SECURE ADHESION

FOR MINIMISING THE RISK OF LOSS OF RETENTION OR REINFECTION

Exatec, Cytec and Contec differ from other root posts due to the special mesh structure of the post surface. This micro-retentive surface promotes adhesion between the post and resin (bonder/composite). This results in secure retention – even without the use of silane – very easily and efficiently.

The retentive recesses in the crown region provide for optimum bonding with highly filled core composite.



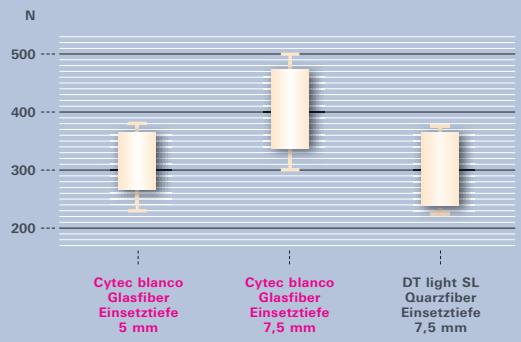
SECURE ADHESION
SCIENTIFIC STUDIES

Shows the status after the pull-out test:
The surface of the Cytec post is still almost totally coated with Panavia F 2.0 which shows its high bond strength without having to apply silane.

▼

SCIENTIFIC STUDY DETERMINED BY CHARITÉ BERLIN

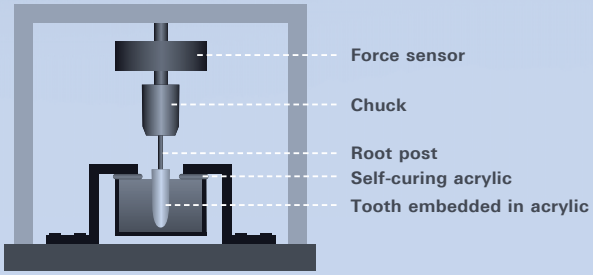
FIG.3 PULL-OUT TEST WITH VARIOUS DEPTHS OF INSERTION



Results of a scientific study performed by Charité Centrum 3, Berlin, Klinik und Poliklinik für Zahn- Mund- und Kieferheilkunde, Dep. of restaurative Zahnmedizin. Published in Endodontie Journal 2/2009 [4]

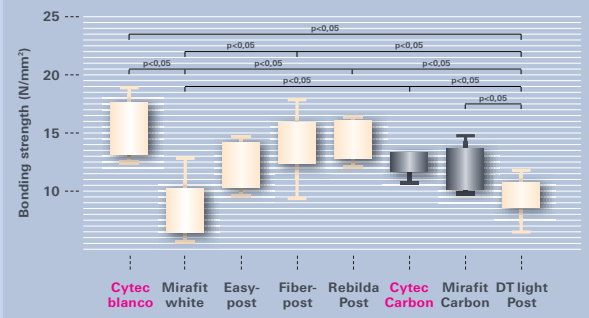
This scientific study published in the Journal of Endodontics 2/2009 [4] shows that, even when the post is bonded adhesively with composites, the retention is influenced considerably by the depth of insertion.

The comparatively high retention values achieved by Cytec blanco at the same depth of insertion leads to the conclusion that the **unique mesh structure** of our root posts has a positive influence and increases the values.



SCIENTIFIC STUDY AT THE UNIVERSITY OF ROSTOCK, GERMANY

FIG. 4 GRAPH OF THE BONDING STRENGTHS OBTAINED AND THEIR SIGNIFICANCE



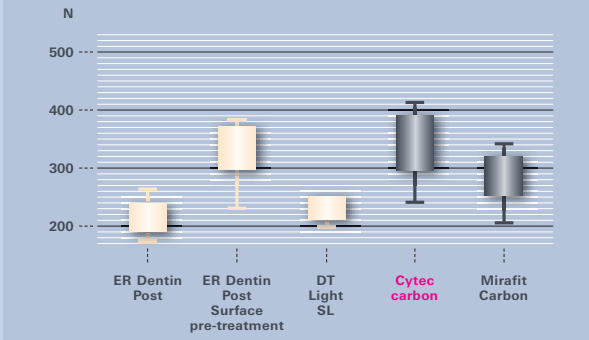
Published in Biomed Tech 2009
Scientific study at the University of Rostock[8]

This scientific study was developed in a cooperation between the Polyclinic and the Institute for Biomedical Technology of the University of Rostock.
It investigated »The influence of macro- and microstructure on the wetting and retention properties of root canal posts in vitro«. The values and significances of the bonding strength of the fibre posts shown in figure 4 were compared.[8]

◂ In the comparison, Cytec blanco achieved the highest bonding strength. This shows that the unique surface structure of our root posts supports micro-retentive adhesion, leading to optimised bonding between the post and the adhesive bonding material.

SCIENTIFIC STUDY DETERMINED BY MEDICAL UNIVERSITY OF HANNOVER

FIG. 5 PULL-OUT TEST



Results of a scientific study performed by Hannover Medical University, Dep. of Prosthetic Dentistry and Biomedical Materials Science[3]

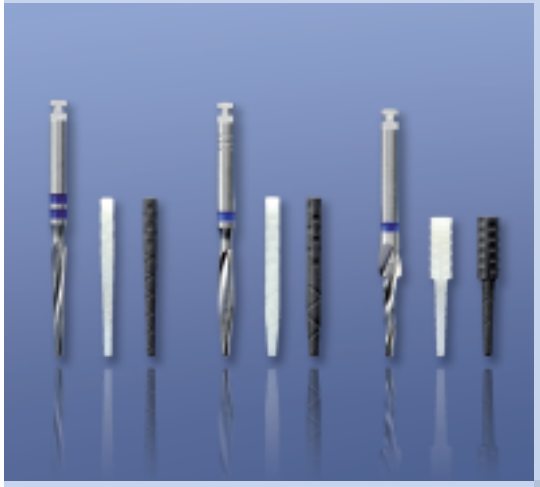
In this in-vitro study, specimen of Cytec carbon root posts – non-silanised – attained pull-out values of 322.94 N (mean) which indicates a significantly higher bond strength than the so-called »Safety lock« SL coated, quartz-fibre root posts.

Of the group of glass-fibre root posts which, unlike Cytec carbon, were silanised chairside, the best competitors' specimen achieved a pull-out force of only 305 N (mean). This value is still 5.5% lower than the value of 322.94 N attained by Cytec carbon.[3]

◂ The high retention values achieved by Cytec carbon show that the post does not have to be translucent to achieve optimum adhesive bonding between it and the resin. Dual-curing bonders or composites cure optimally without light, even deep in the root canal.

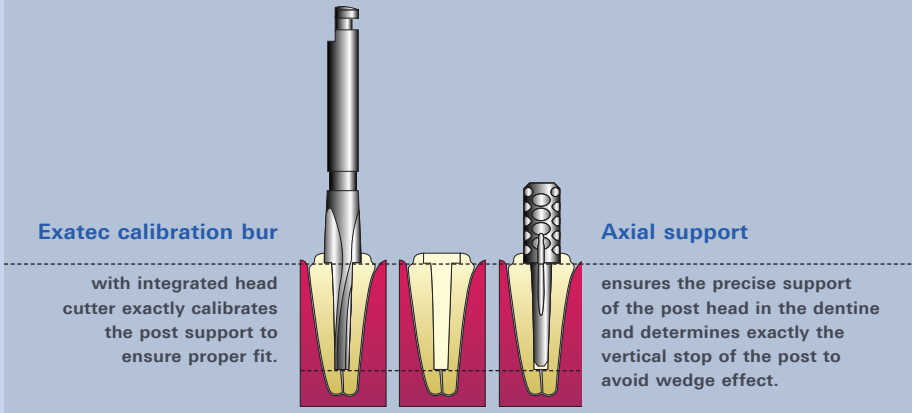
EFFICIENTLY AND SHARP CUTTING BURS

FOR THE MOST POSSIBLE DENTINE-CONSERVING PREPARATION OF THE ROOT CANAL



As the precise fitting of the root post in the prepared root canal enhances the stability of the post and core reconstruction, thus not only the quality of the fibre-reinforced composite, but also that of the burs is decisive. Sharp cutting burs with fully developed blade geometry and relief-ground blades ensure efficient yet dentine-conserving preparation.

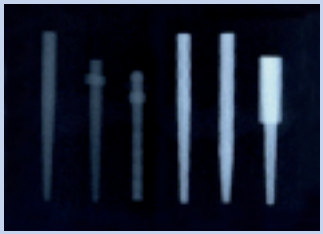
Contec with its double cone is more for conically-shaped roots and Cytec rather for cylindrical roots. Exatec is indicated for extensive coronal defects.



HIGH RADIOPACITY OF HT-GLASSFIBRE
FOR GOOD X-RAY CONTRAST WITH DENTINE

With HT-Glassfibre root posts the radiopacity increases with the diameter to achieve a maximum of 510% Al. The X-ray contrast to dentine is therefore very good. HT-Carbonfibre does not exhibit this degree of X-ray contrast.

▲
Retreatment of a root canal and placement of a 1.8 mm diameter Cytec blanco followed by recementation of the existing, fully functioning crown.



3 root posts of competitors / Contec / Cytec / Exatec ▸
From left to right

Contec sizes 1–4 ▸

SCIENTIFICALLY TESTED AND PROVEN IN DAILY PRACTICE

PROVIDES YOU WITH A FEELING OF SAFETY

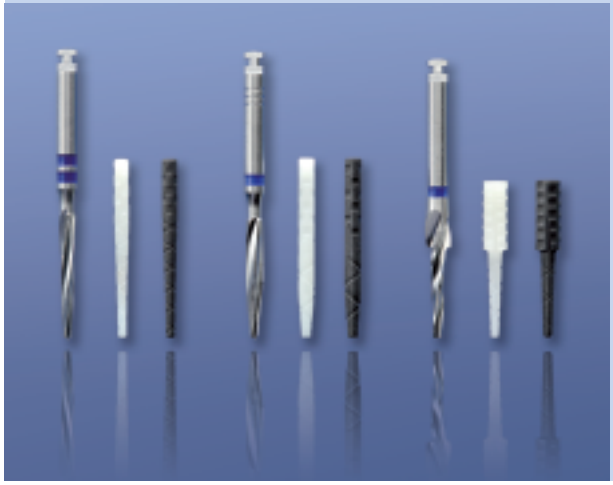
In 1995 HAHNENKRATT was the company to launch the first carbonfibre root post – which was trendsetting in Germany. This was followed in 1998 by quartzfibre root posts. In 2001, the first root posts were made from HT-Carbonfibre and HT-Glassfibre: Exatec and Cytec. These were followed in 2007 by Contec with the »Double Cone-Design«.

Scientific studies document the outstanding quality of our materials and hereby the advantages of our root post systems. Quote[1]: »This study allows the conclusion that HT-Carbonfibre posts are far superior to all other posts examined in this study regarding fracture-resistance and quality of fracture. It might also be interesting to consider using such posts for molars and premolars ... these studies have shown this post system to be the method of choice in the anterior region«

Quoted from »Conclusion and Clinical Indications« of the dissertation »Examinations regarding mechanical strength and the characteristics of fracture surfaces of different post and core systems after artificial ageing« presented by Katrin Babenhauserheide of the Charité University, Campus Benjamin Franklin, Berlin/Germany in April 2004.

QUINTESSENCE

Back in 1994 A. Stiefenhofer et al wrote the following about metal root posts in his scientific study entitled »Biomechanical tests of post and core restorations using finite elements analysis«: »... post crowns
exhibit a failure rate of 5.2-13.6%. ... failures in post retention can usually be accounted to **loss of retention, post fractures** and **tooth fractures.«**[6]



The quintessence of scientific results as well as many years of practical experience – for example, since 2003 at the Dental Prosthodontics Department of the Carolinum University of Frankfurt/Main, Germany[7] – demonstrate the decisive advantages of our root post systems. These advantages enable the three risks listed by A. Stiefenhofer et al to be counteracted successfully. The three properties are:

- **Utmost bending strength**
  to reduce the risk of post fractures
- **Dentine-like elasticity**
  to reduce the risk of tooth fractures
- **Micro-retentive mesh structure on the post surface**
  reduces the risk of retention loss or reinfection.

These three advantages allow Contec, Cytec and Exatec to provide the best prerequisites for a lasting, highly stable post and core reconstruction.

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(8) Felix Worm, Claudia Lurtz, Detlef Behrend, Lena Schmitt, Klaus-Peter Schmitz, Peter Ottl und Heinrich von Schwanewede
Der Einfluss der Makro- und Mikrostruktur auf die Benetzungs- und Retentionseigenschaften von Wurzelkanalstiften *in vitro*
Wissenschaftliche Arbeit an der Universität Rostock
– Biomed Tech 2009

EXATEC

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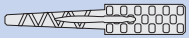	HT-Glassfibre	box of 10			42 611	42 612	42 613	
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CYTEC

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CONTEC

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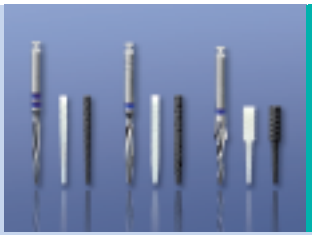

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