Sensor Technology is Reaching New Heights

DEXIS

DEXIS Titanium by KaVo continues a legacy of innovation with improvements to sensor durability and image quality

VIDEO

See an introductory to the next-generation design of the DEXIS Titanium intraoral sensor.

DEXIS

From Aerospace to Intraoral Excellence

DEXIS Titanium is built to last with leading-edge technology

New designs and materials are changing the landscape of intraoral sensors. Understanding how these components are engineered and interact may help you make the important decision of choosing a sensor that will function best for your patients, your team, and your practice.

In the pages ahead, we'll delve into the engineering attributes of the next-generation DEXIS Titanium by KaVo, including the leveraging of materials and technologies outside the dental realm, the science behind this sensor's excellent image quality, and the extensive testing of its components.

We begin in new territory: aerospace. It's a human effort in science and engineering to fly into the atmosphere of Earth and surrounding space. Countless hours of research and development are required to reach new heights. With a similar commitment to innovation, the engineers at DEXIS designed DEXIS Titanium, even taking inspiration from a material used in the aerospace industry.

This amorphous engineering thermoplastic is called polyetherimide (PEI), and DEXIS worked with a specialty manufacturer to formulate a version that could be used intraorally. PEI is known to have 4 key benefits: broad chemical resistance, strength and stiffness, dimensional stability, and environmental stress and cracking resistance.

"I have this saying: In dentistry, the only thing that doesn't end up on the floor is the floor itself. We drop things. It's unfortunate but it happens," said John Flucke, DDS, a dental technology expert. "That's why I don't like fragile dental equipment. In fact, I don't think the words 'fragile' and 'dental equipment' should be used in the same sentence together."

That's why Dr. Flucke, also known as dentistry's "Technology Evangelist," has been spreading the word about DEXIS Titanium, a highly durable and resilient sensor that leverages recent advancements in plastics and materials. To Dr. Flucke, improved durability translates to increased reliability.

"We rely on these devices every day. We need them to accurately diagnose and practice on a

regular basis, and if that isn't working, then that affects our ability to treat patients, make our diagnostic judgments, and do the best we can do," Dr. Flucke explained.

Reliability Within Reach

Much like starting up your car and driving to the office, the reliability of your digital sensor is not only needed but expected. It's the turn-key predictability of the technology that impacts workflow efficiency. When you turn the key to the ignition on a car, a chain of events occurs among parts that were designed to work together in harmony. Similarly, there's a high degree of engineering compatibility "under the hood" of DEXIS Titanium.

Preservation of these parts begins with the hood, or in this case the sensor housing. The slightly domed surface is capable of bearing a tremendous amount of stress while distributing the weight or force out evenly in all directions. This dimensional stability gives the sensor more durability that resists cracking and minimizes the risk of breakage. Central to the housing's strength is the aforementioned PEI housing that's chemically resistant and up to 4 times stronger than the resin used on the award-winning DEXIS Platinum.

Whereas some sensors might be built with random off-the-shelf components, each layer of DEXIS Titanium has been custom built to ensure pixel design optimization and optimal image quality. You'll read more about these features in the pages ahead.

While DEXIS Titanium has new-to-market features, several design elements have carried over from DEXIS Platinum. The TrueComfort design of the PerfectSize sensor allows for utmost comfort and the use of one sensor for the capture of all intraoral images. The engineers fine-tuned DEXIS Platinum's shape and size to provide even more comfort with DEXIS Titanium, allowing for a quick and comfortable placement that leads to a more efficient, less-stress workflow.

TESTS OF **STRENGTH**

A DEXIS engineer tests the strength of DEXIS Titanium.

With the goal of making DEXIS Titanium the strongest, most reliable sensor on the market, here are 3 tests that were conducted:

Bite Testing

To counter bite-force events, DEXIS engineers raised the manufacturing specifications for DEXIS Titanium. The result is a sensor that's capable of withstanding much more bite pressure.

Impact Events

Because most sensors experience an impact event on a daily basis, the sensor housing in DEXIS's testing endured significantly more impacts and still performed well.

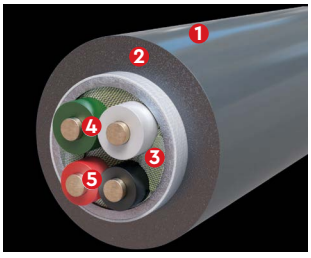
Soak Tests

The sensor, cable, and holder for DEXIS Titanium were subjected to chemical resistance testing with the most commonly used dental disinfection liquids and wipes. Soak tests were also performed in order to check for material, color, and function degradation.

Safeguarding Signal Integrity

As seen in the diagram, DEXIS engineers thoughtfully considered DEXIS Titanium's cable design, ensuring that the advanced internal components retain the best signal performance to deliver reliable imaging results over time. To combat separation, the cable's external jacket material extends over and is "welded" to the USB housing.

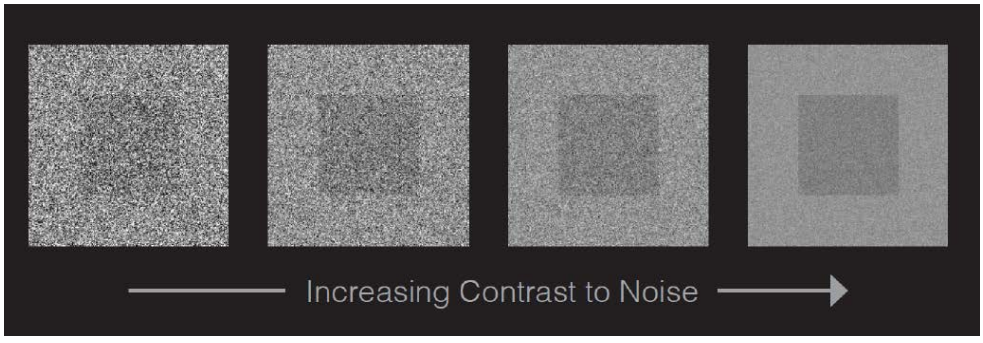
1. Tough, durable external jacket covers the internal components and better handles external forces like biting, twisting, tugging, plus eliminates cable drag and tangling
2. Inner protective shield made from tinned soft copper alloy
3. Kevlar-reinforced strands fill in open areas inside the cable jacket
4. Signal and signal-return wire
5. Power and power-return wire



Strength Test: DEXIS Titanium's cable withstood being flexed over 100,000 times and maintained image signal strength.

Quieting the Noise

Excellent image quality is achieved with proprietary components and intelligent engineering



A high contrast-to-noise ratio is one of the most important characteristics of a high-quality digital radiograph. The top illustration shows how more noise results in loss of visible detail and contrast. The inner box becomes more defined and clearly visible as the contrast-to-noise ratio increases. Images acquired with DEXIS Titanium have a high contrast-to-noise ratio which contributes to a clearer, more defined radiograph.

"The contrast is like analog music," Dr. Flucke described. "If you're listening to a vinyl album, there's that crackle, pop, and hiss that you hear which you don't hear if the music is produced digitally. For some people, that crackle and pop is fun and gives you an ambiance, but you don't want crackle and pop in your digital x-rays because it just distorts things so that you can't see as well."

With DEXIS Titanium's technology, all the components are designed in a proprietary way to drastically reduce noise. To gain excellent image data for clinical diagnosis, DEXIS Titanium's advanced pixel design targets the "sweet spot" for dental imaging—the ideal balance of pixel size and scintillator performance. To provide as much diagnostic information as possible, the sensor captures efficiently across all pixels and allows high-resolution data to be collected and processed as the x-ray is taken. DEXIS Titanium actually cleans the data bits so that it is significantly concentrated before it ever reaches the software—all without loss in process time.

From a signal-to-noise performance standpoint, a noisy image with pixelation is countered by a low-noise CMOS and low noise from the scintillator, so the initial image provides much clarity. The DEXIS team updated the latest design of the CMOS, making sure that the scintillator was perfectly integrated to improve image quality.

The proprietary design of the CMOS expands DEXIS Titanium's dynamic range, giving the sensor the ability to capture consistent images with improved tissue contrast across a broader spectrum of radiation levels. DEXIS aims to provide excellent and consistent image clarity using low-dose radiation, while still giving operators the option of using a higher dose for denser anatomical structures.

DEXIS Titanium's CleanCapture consistency over a broad range of exposures (at 70 kV) is seen in the images below:

Images taken with DEXIS Titanium

.025 seconds **.080 seconds** **.320 seconds**

"I think it's really amazing that the scintillator, fiber optic plate, CMOS sensor, and the on-board electronics were all custom-designed and custom-built to work with each other. If you make a mistake in any of those components, you're going to end up with a sub-optimal image," Dr. Flucke commented. "When you get the kind of synergy you have with all the components working together, you get incredible images like the ones you see on the screen. That makes a tremendous difference because you need the best images possible to diagnose."

DEXIS Titanium's cable was completely redesigned in an effort to keep the captured image's integrity when sending it to the software. Through evaluation and testing of materials, DEXIS created a narrow USB cable with signal performance that safeguards data packets as they are transferred down the wire. There are 3 critical connection areas:

1. DEXIS Titanium continues to use the patented WiseAngle feature that helps reduce stress for the sensor-to-cable connection.
2. Another area of stress is the cable-to-USB connector. DEXIS added additional protective strength by covering these areas with the same jacket material and "welding" them to avoid separation.
3. The latest USB 3.0 connector technology is still compatible with the USB port on your computer, and is designed to be more durable.

Protecting the Patient

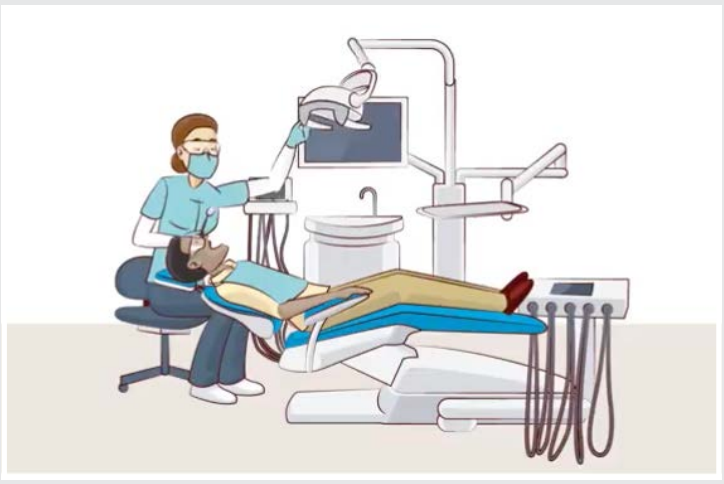
Patient protection is provided by both the dynamic range and the SMART USB, both of which can save dose. The sensor is capable of automatically turning off to protect patients from unnecessary radiation. Greater protection is achieved by the LED indicator light. Green conveys that the sensor is adequately connected, while red will indicate if a power issue has been detected.

In the end, designing a sensor is all about getting the best possible image quality. The better the image capture and signal transfer from the device to the PC, the better the image. With DEXIS Titanium, all of the engineering components were thoughtfully designed to improve signal quality, resulting in better image quality.

BACKED BY KAVO COMPLETE

KaVo Complete Premier level coverage, a universal protection plan, is included in your first year of ownership with DEXIS Titanium. Benefits include unlimited telephone and live remote technical assistance, primary software upgrades, online training access beyond the initial in-office training, and discounted fees for onsite technical support. Learn more by watching the video to the right.

Remember: While some manufacturers only offer extended warranty coverage for a limited number of years, DEXIS offers this warranty on all of its sensors for a lifetime.



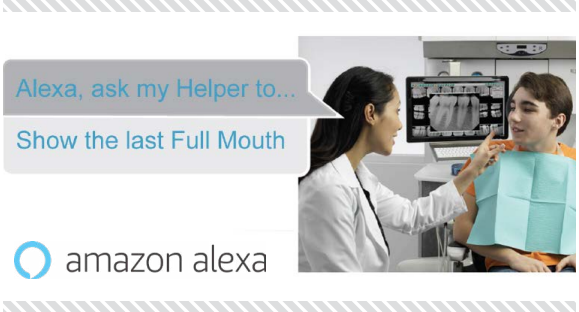
First-to-Market Motion Technology for Intraoral Sensors

GESTURE RECOGNITION TECHNOLOGY

Inspired by mobile technology, DEXIS added a motion detection device similar to what cell phones have. Watch the video to the right to see how SMART gestures, using the sensor and simple hand motions, initiate image acquisition within DEXIS software.

DEXvoice

The voice-activated DEXvoice system, a subscription service, is the latest enhancement to the DEXIS Imaging Suite software. DEXvoice provides hands-free workflows for your dental team and a more personalized experience for your patients. DEXvoice is compatible not only with DEXIS Titanium but with all DEXIS products within DEXIS software: DEXIS CariVu, DEXcam 4 HD, and DEXIS Platinum.



The Takeaway

"I want my patients to understand that when they come into my office they get state-of-the-art technology. When a patient sees the gesture control of DEXIS Titanium or a patient sees you control the sensor by an Amazon Alexa, they're just blown away by it and they tell friends...We have a constant commitment in my office to stay on the leading edge and provide the very best technology for the very best outcomes for the patients. They know that. They can tell when you've made an investment in providing the best for them... I can't imagine what DEXIS has for us next. I am as blown away by DEXIS Titanium as anything out there. I'm excited to see what they have coming down the pike."

—John Flucke, DDS

Why Wired Sensors **Are Still the Way to Go**

WITH JOHN FLUCKE, DDS

Q: Why isn't there a wireless sensor on the market yet?

A: Some companies have tried them, but they didn't work as well. There was a lot of interference. One of the key problems is that wireless technology requires the sensor to be thicker. Companies need to work around that and get to the point where a wireless sensor is a thin, tiny piece like we have with wired sensors. The other thing is that the wire does provide incredible quality. In addition to the thickness of the sensor, the wireless sensors that have been tested were noisy and just not as diagnostic as we like.

Q: Does the gesture recognition technology for DEXIS Titanium work with DEXIS Platinum?

A: No, there's an accelerometer built into the DEXIS Titanium, so it's the only sensor that has gesture recognition technology. However, the Alexa feature will work with DEXIS software now, so you can control the DEXIS Platinum with voice control.

Q: Can 3D imaging replace intraoral sensors?

A: I'm a big fan of 3D. I have cone-beam unit in my office that I use it all the time. 3D does some things really well and some things it doesn't do so well. One of the things it doesn't do very well right now is provide lateral views that you can see interproximally with, like you can with the standard bitewing. In my opinion, the bitewing is going to be the gold standard for the forseeable future. We're going to continue to use them on a regular basis.

We'll also need something like the DEXIS Titanium size to take PAs for endo and for emergencies. I do think that cone beam is incredible and we do use it. It's just that it's not going to replace, anytime soon, the ability to take a 2D image with a sensor and see what you need to see from a cavity detection standpoint with speed and ease. You're not going to take a cone beam scan on someone every time they need an x-ray during a root canal or an emergency. But for things like implants, the treatment planning aspect for endo, surgery, and ortho, cone beam is huge and the future for that is bright.

John Flucke, DDS, maintains a private practice in Lee's Summit, MO, where he spends four days per week in direct patient care. He writes, edits, and produces video demos of technology products, and is the creator of the "Ramblings of Dentistry's Technology Evangelist" dental blog. He lectures on clinical technology aspects of dentistry at regional, national, and international dental meetings, and uses technology in every aspect of his practice and personal life. He also consults with manufacturers in the development of techniques, technologies, and products, from concept to completion.

John Flucke, DDS

DEXIS

Additional Resources

SCHEDULE A DEMO

Visit DemoTitanium.com to schedule an in-practice, hands-on demonstration of the DEXIS digital x-ray system.

DOWNLOAD THE BROCHURE

"RAMBLINGS OF DENTISTRY'S TECHNOLOGY EVANGELIST" BLOG

Follow Dr. John Flucke's thoughts and travels as he practices, writes, lectures, tinkers, and experiments with technology in dentistry.

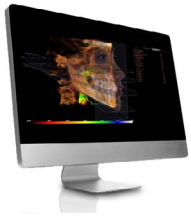
MEET THE KAVO KERR IMAGING SOLUTIONS FAMILY

The award-winning products of DEXIS recently joined the KaVo imaging portfolio, complementing the existing KaVo, Gendex, and i-CAT solutions. DEXIS software seamlessly integrates with the company's extraoral 3D solutions. Choose a product line below to learn more.

Panoramic X-ray

Cone Beam 3D Imaging

Intraoral X-ray



Imaging Software

Intraoral Cameras

Caries Detection

KaVo Kerr Preferred Loyalty Program

KaVo Kerr brings value to customers not only as a reliable manufacturer, but also as a one-stop-shop for all their dental equipment and consumable needs. Just like frequent flyer miles programs, customers can earn and collect loyalty reward points for nearly every purchase of KaVo Kerr products, and redeem them for cash, products, or CE. Learn more by watching this video.