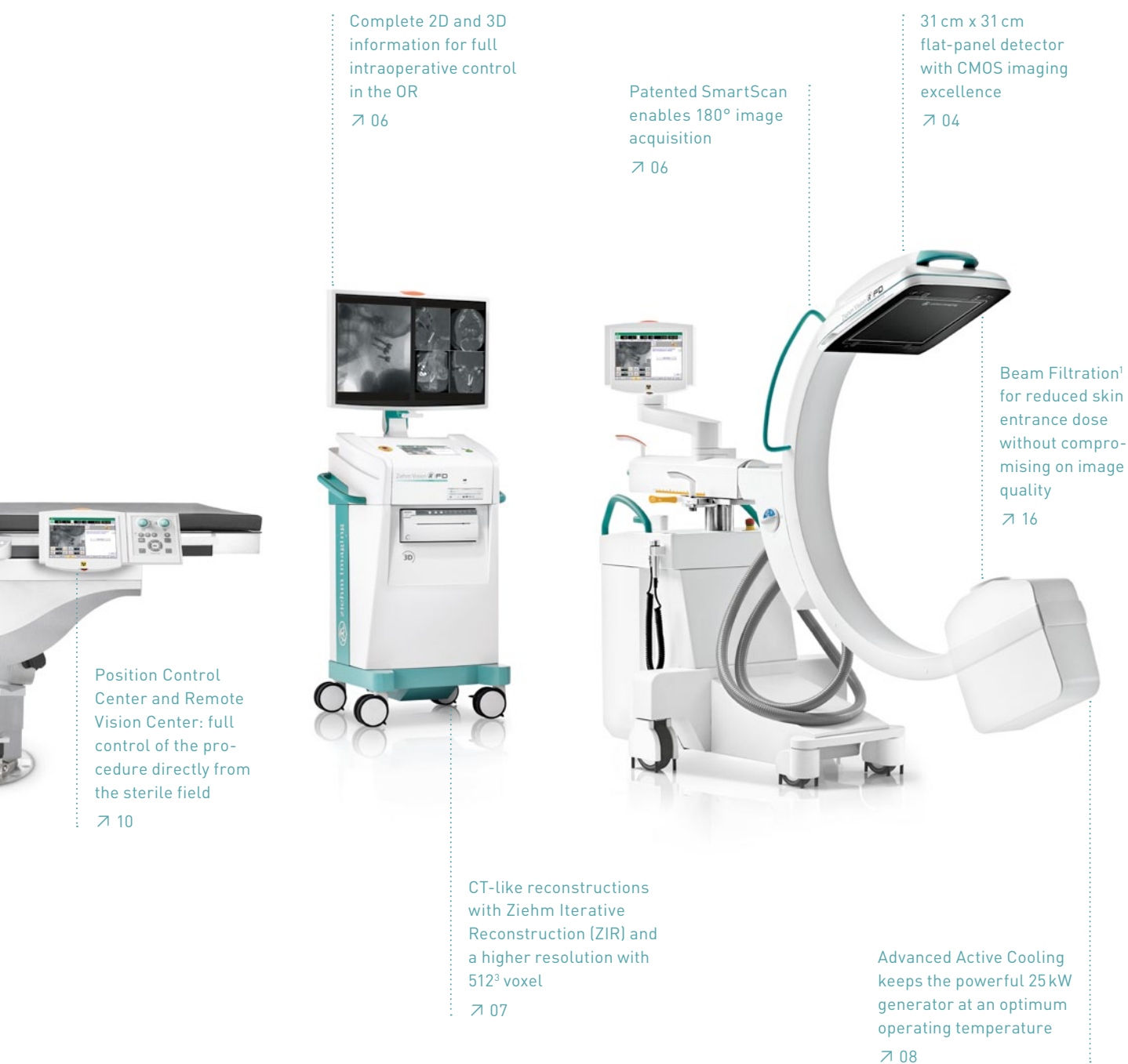




## Ziehm Vision RFD 3D

The revolution in 3D imaging

CMOSLINE



Ziehm Vision RFD 3D. Healthcare providers are challenged to cut costs, meet the needs of an aging demographic, improve the accuracy of clinical outcomes and reduce X-ray exposure during surgical procedures. The answer – led by the Ziehm Vision RFD 3D – lies in balancing cost efficiency with improved patient care, shorter hospital stays and less-invasive approaches. This groundbreaking mobile 3D C-arm helps to improve surgical outcomes and patient satisfaction while optimizing costs. Building on more than a decade of experience in 3D imaging, the Ziehm Vision RFD 3D features cutting-edge CMOS technology, bundling 2D and 3D functionality for greater intraoperative control, reducing the need for postoperative CT scans, and costly corrective surgeries. This mobile C-arm is thus ideal for high-end orthopedic, trauma and spinal interventions as well as for highly specialized maxillo-facial and cochlear procedures, for instance.

## 01 / Move to the forefront of mobile 3D imaging with CT-like image quality

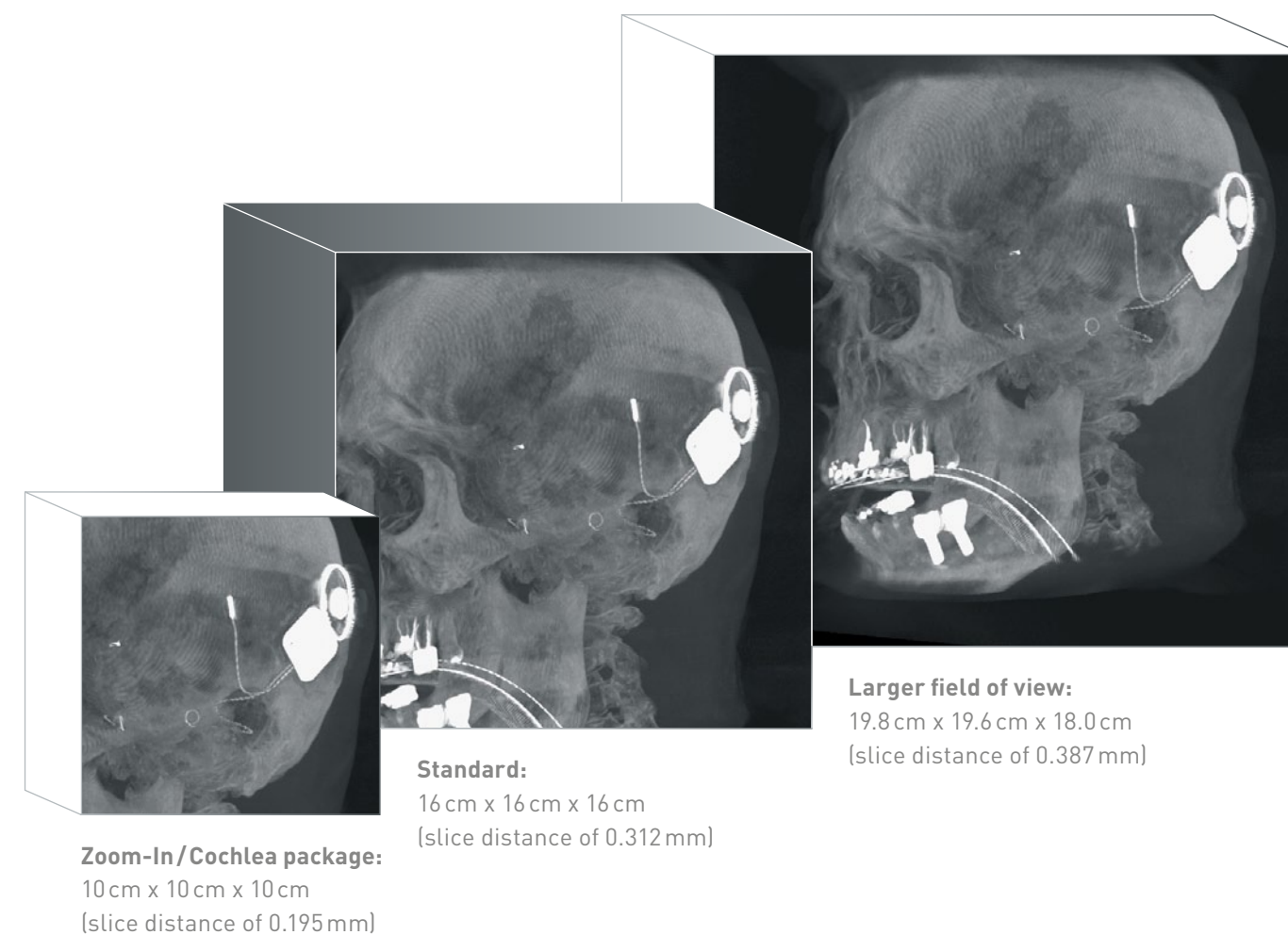
With an installed base of almost 1,000 systems, the Ziehm Vision RFD 3D is the first mobile 3D C-arm with a flat-panel detector. By featuring the latest CMOS technology for imaging excellence, the enhanced imaging chain optimizes resolution with crystal-clear visualizations of the finest anatomical structures, complemented by SmartScan functionality for the complete imaging information in real time. The powerful 25 kW C-arm propels today's surgeon to the forefront of intraoperative 3D imaging.

### → CMOS flat-panel technology

Image quality and efficiency are the most important, but also challenging, factors in daily clinical routine. In comparison with conventional C-arms, the latest CMOS flat-panel technology achieves higher spatial resolution due to smaller pixel sizes combined with lower noise levels and a higher read-out speed at full resolution. True resolution, especially in the magnification modes, makes interpolation unnecessary. Because of these features, CMOS technology enables improved overall efficiency. In addition, the Ziehm Vision RFD 3D CMOSline<sup>2</sup> comes with an enhanced version of our comprehensive SmartDose<sup>3</sup> concept. Our dose-saving technology, Beam Filtration, supports the latest improvements in our enhanced CMOS imaging chain, thus enabling an exceptional reduction in the skin entrance dose. In this way, the Ziehm Vision RFD 3D provides excellent image quality with a lower dose.

### → Different volume sizes for the ideal resolution

Ziehm Imaging offers the freedom to choose from a range of 3D volume sizes to meet diverse needs in clinical routine. In addition to the standard volume of 16 cm x 16 cm x 16 cm, the Ziehm Vision RFD 3D now also provides two further volume sizes for specialized applications. A dedicated larger field of view with 19.8 cm x 19.6 cm x 18.0 cm (axial x sagittal x coronal) covers larger anatomical regions and delivers more structure for procedures such as pelvis surgery with 512<sup>3</sup> voxel. The higher number of voxel in all volume sizes guarantees a better resolution without increasing dose levels from those used with the conventional 320<sup>3</sup> voxel. Further, with an edge length of 10 cm x 10 cm x 10 cm, the mobile 3D C-arm provides a suitable option for zoom in or intraoperative imaging in cochlear implantation.



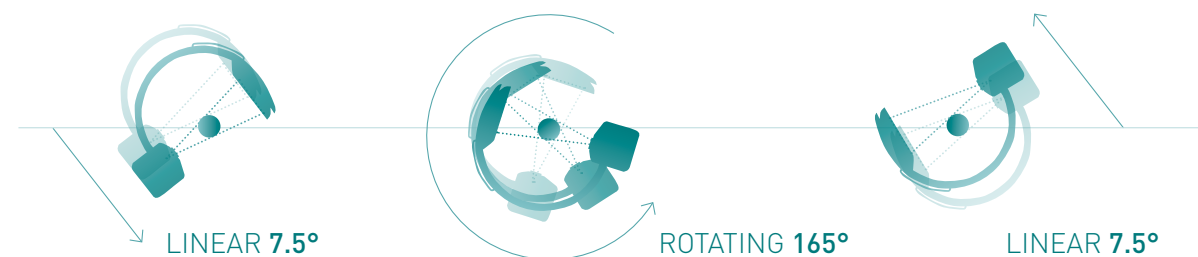
“Due to its higher resolution the Ziehm Vision RFD 3D CMOSline allows a much more precise localization of the electrode carrier for cochlear implants, especially in demanding anatomies.”

**PROF. DR. ARWEILER-HARBECK, ESSEN UNIVERSITY HOSPITAL, GERMANY**

### → 180° scan for complete 3D information

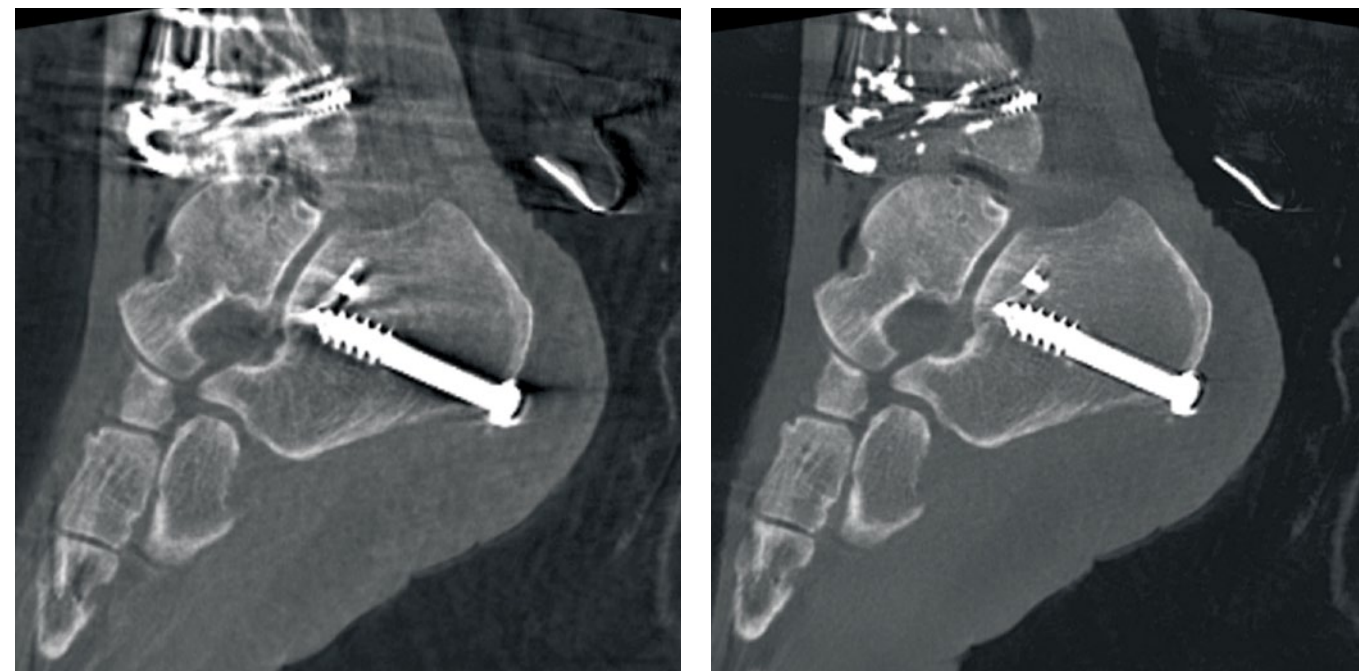
180 degree scan is required to create a complete, informative 3D dataset. Ziehm Imaging's SmartScan is a revolutionary concept that enables the Ziehm Vision RFD 3D to generate the complete 3D information of even the smallest anatomical structures while keeping the geometry of a conventional 2D C-arm. The intelligent combination of linear and rotating movements enables 180 degrees of scanned information – at every point in the field of view. With this dataset, procedures can be assessed intraoperatively: Fine details, like cortical rims, pedicle diameters or even orbital floor, are optimally visualized.

With this benchmarking enhancement, surgeons can create full 3D datasets while retaining the benefits of our C-arms: the most compact 3D devices with an up to 31 cm x 31 cm flat-panel, generous C-arm opening, and the advantages of a variable isocenter.



### → More distinguishable anatomy in 3D reconstructions

The specially developed algorithm ZIR (Ziehm Iterative Reconstruction) optimally minimizes fan and metal artifacts in 3D reconstructions. Additionally, this feature leads to significantly more distinguishable anatomy, defined bone crests and optimum slice views in the coronal, axial, sagittal and individually adjustable planes.



ZIR – Reducing artifacts



## 02 / Extend your intraoperative imaging capabilities for 2D, 3D and multidisciplinary use

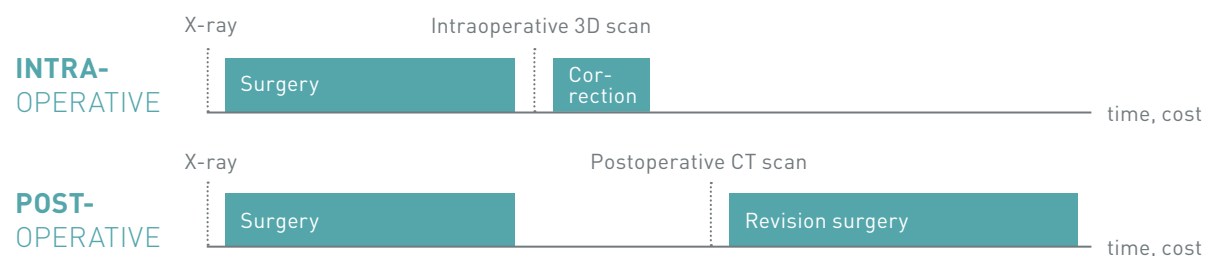
The Ziehm Vision RFD 3D offers unprecedented performance across the most varied and challenging application spectrum. This versatile device combines 2D excellence with advanced 3D technology, delivering high-end multidisciplinary capabilities for hybrid room applications and specialized procedures such as cochlear and maxillofacial surgeries. Precise information from every angle during the procedure helps to avoid unnecessary postoperative CT scans and corrective surgery.

### → 2D excellence for demanding hybrid procedures

The Ziehm Vision RFD 3D generates high-quality 2D images that support not only orthopedic, trauma or spinal procedures, but also most demanding interdisciplinary hybrid applications. By configuring the unit with additional visualization tools and options, like the Interventional Package or SmartVascular Package with DSA, MSA and RSA (roadmapping), the system is also ideally prepared for hybrid room applications. The new Anatomical Marking Tool (AMT) supports aortic stent graft implantation without RSA by, for example, marking aneurysms or side branches right in the live image on the touchscreen - now also enhanced with color.

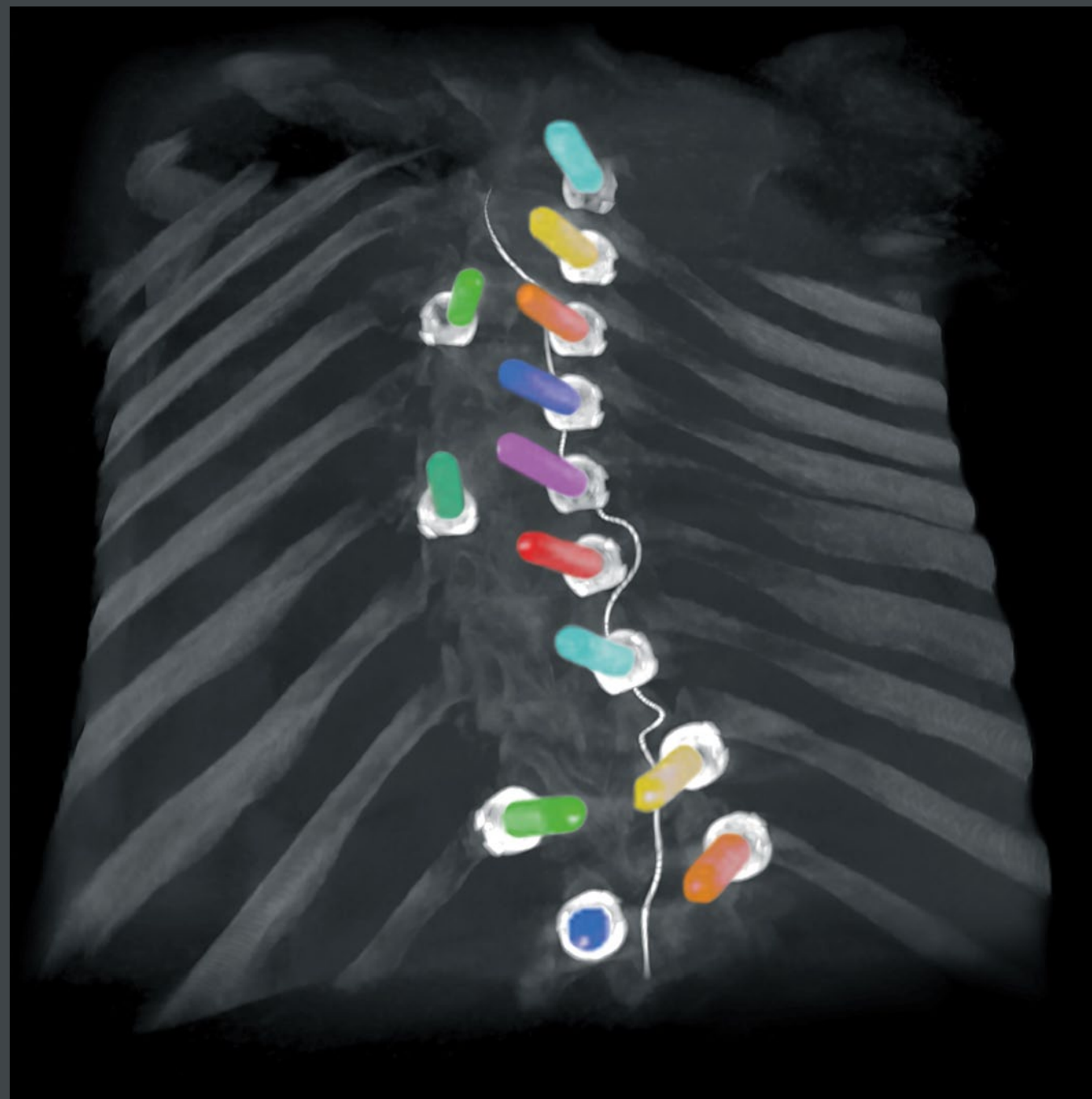
### → Prolonged use of powerful generator

C-arms are in continuous use during lengthy, demanding procedures such as vascular interventions. The Ziehm Vision RFD 3D is ideal for these applications. Its Advanced Active Cooling (AAC) system keeps the powerful 25 kW generator at an optimum operating temperature. In the event of a temperature increase, the pulse frequency is automatically reduced until the generator's temperature has cooled down.



MULTI-DISCIPLINARY USE

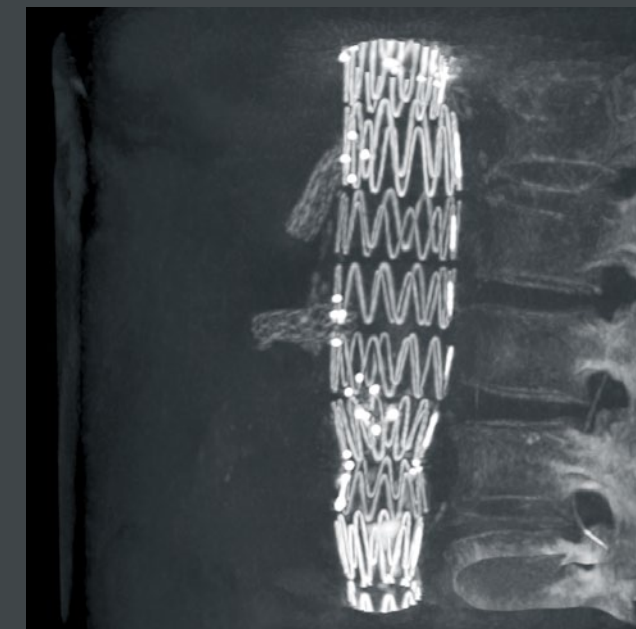




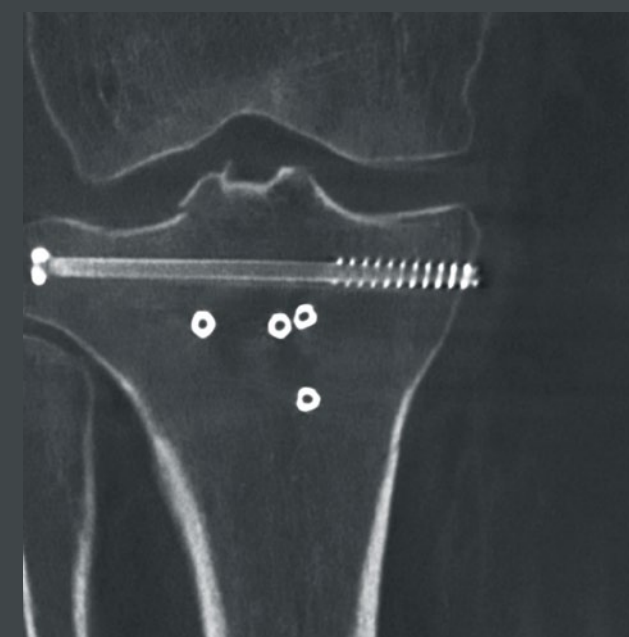
Color brings new clarity: Enhanced Screw Visualization for intuitive screw evaluation in 3D imaging



High resolution imaging with  $512^3$  voxel (volume size 16 cm x 16 cm x 16 cm)



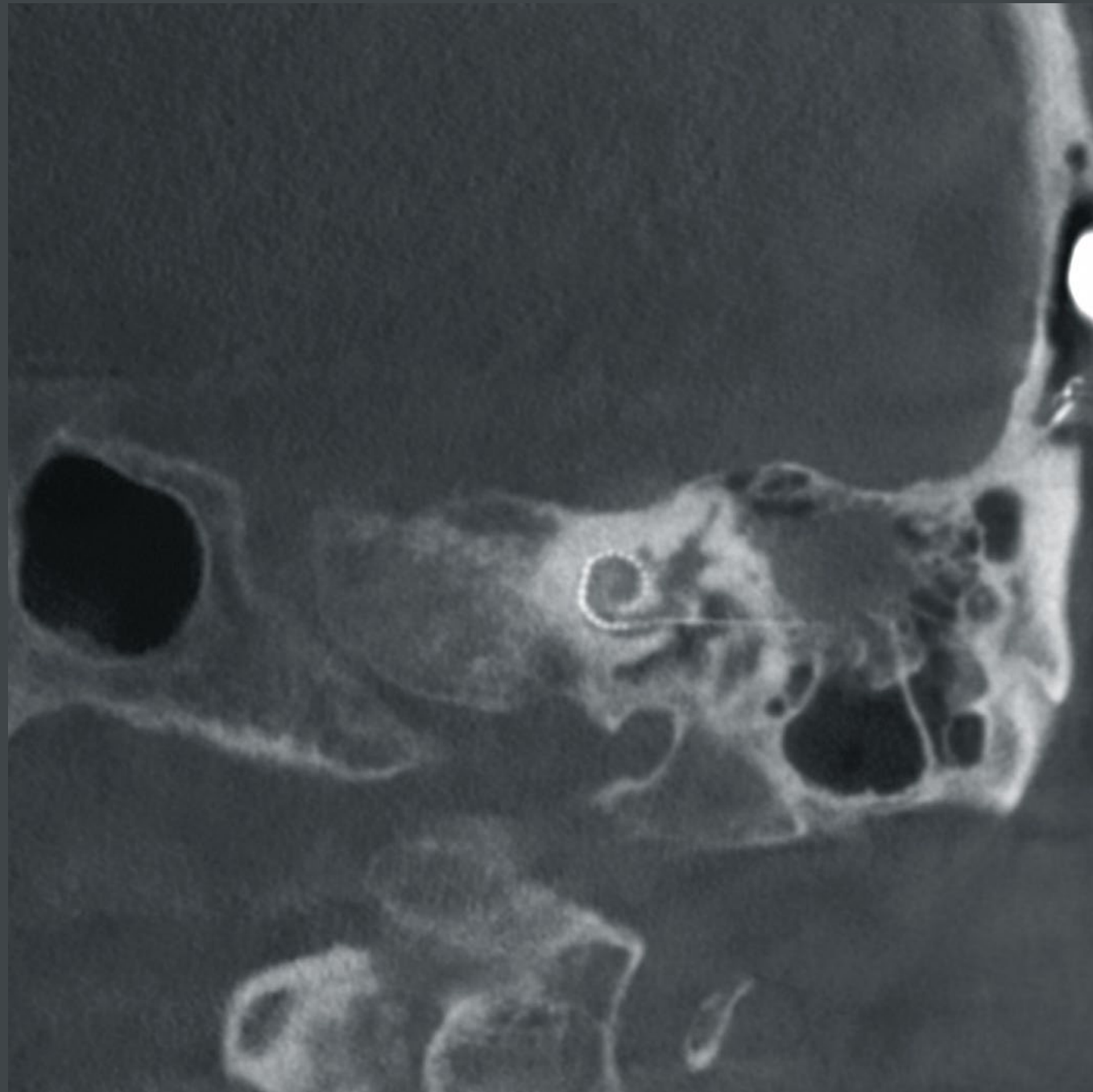
3D reconstruction of stent placement (abdominal aortic aneurism)



Coronal view of tibia fracture (volume size 10 cm x 10 cm x 10 cm)



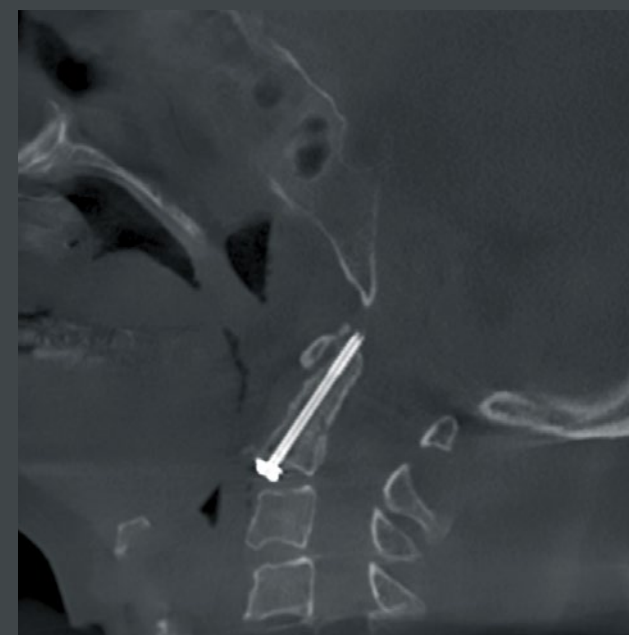
Kyphoplasty surgery – high resolution imaging with  $512^3$  voxel



Cochlear implant (width of electrode: 0.3 mm)



Combined arthrodesis of tibiotalar and subtalar joints



Cervical spine – Standard mode



Cervical spine – Low Dose mode

“We have seen significant dose savings in comparison to CT examinations in clinical applications like the cervical spine. With the Low Dose mode I can achieve even less dose. And what’s more: the image quality remains as exceptional as usual.”

**PROF. DR. JOSTEN, UNIVERSITY HOSPITAL LEIPZIG, LEIPZIG, GERMANY**



## 03/ Master your quality outcome with image-guided surgery and workflow wizards

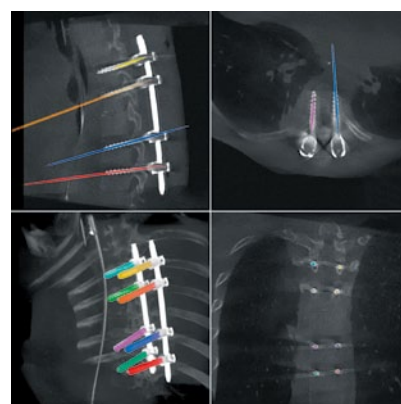
Designed to help surgeons meet their quality demands quickly and efficiently, the Ziehm Vision RFD 3D redefines daily clinical OR routines with image-guided surgery and workflow wizards. The Ziehm Vision RFD 3D builds confidence by enhancing intraoperative control and by pulling the postoperative CT scan forward to the OR. This translates into better patient outcomes and unprecedented usability for massive efficiency gains.

### → Precise and time saving

Our 3D C-arms are significantly smaller than fixed C-arms and around 60% lighter than mobile CTs. Thus, the Ziehm Vision RFD 3D can be easily positioned during all kinds of procedures. The surgeon can operate the C-arm entirely from the sterile field: Due to the motorization of all 4 axes combined with the Position Control Center or the Remote Vision Center, the C-arm can be moved into the exact position desired. The operator can easily save and recall up to 3 positions, for example switching between AP, lateral, and oblique positions saving time and increasing precision.

### → Color-coded differentiation of screws

Especially designed for orthopedic use, Enhanced Screw Visualization offers corresponding color-coding on all axes and in volume rendering – saving valuable OR time as a result. The introduction of color to our comprehensive set of software functions improves daily communication in the OR. Enhanced Screw Visualization, Enhanced Vessel Visualization as well as color in our intuitive Anatomical Marking Tool boost fast, efficient and secure decision-making and help to ease daily workflows.



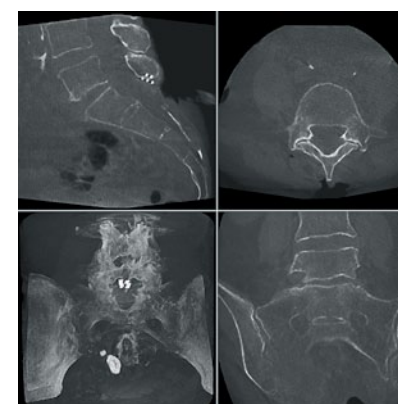
Enhanced Screw Visualization

### → Patient safety

Patient safety is top priority. The Ziehm Vision RFD 3D is configured with Distance Control – an assistance system supporting non-contact collision protection. In the patient's proximity, the motorized movement is slowed down. The movement stops immediately before entering a defined safety zone.

### → Image-guided surgery

The proven Ziehm NaviPort interface connects the mobile 3D C-arms of Ziehm Imaging to the navigation and robotic guidance systems of leading providers. The high-resolution 3D data set is transferred seamlessly from the C-arm via the the Ziehm NaviPort to the navigation or robotic guidance system. Image data aligns automatically with the patient's anatomy and eliminates the need to register the 3D data record. The navigation system guides the surgeon in real time while surgical instruments are depicted on the screen. Robot-assisted surgery, on the other hand, offers guidance for the precise positioning of surgical instruments in line with a pre-defined plan. The fusion of 3D imaging and image-guided capabilities allows for less invasive approaches and reduces the need for revision surgeries and postoperative CT scans, and leads to a boost in decision-making confidence within the OR.<sup>4,5,6</sup>



Ziehm Vision RFD 3D

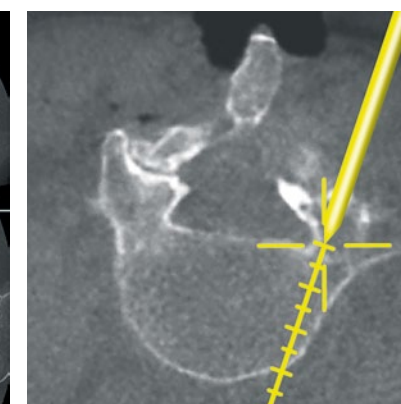


Image-guided navigation

“The Ziehm RFD 3D and the Brainlab navigation has shown to be an ideal combination for our daily spine and trauma cases. It allows switching seamlessly between intraoperative navigation, CT-like 3D imaging and excellent 2D fluoroscopy with a 31 cm x 31 cm field of view.”

**DR. SIMON WEIDERT, UNIVERSITY  
HOSPITAL MUNICH, MUNICH, GERMANY**

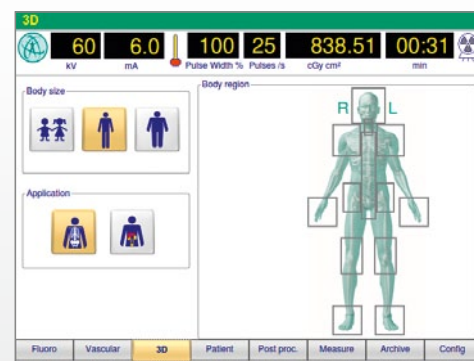


### → Accelerating your clinical procedures

The Ziehm Vision RFD 3D enhances daily OR routine. With the wizard-guided workflow and the intuitive user interface, the system will easily lead through imaging procedures and help to save valuable OR time. The Ziehm Vision RFD 3D performs a complete 3D scan in less than three minutes, which translates into reduced surgery time for clinical work.

approx.

**2**  
min.



PREPARATION

The workflow wizards assist in setting up the scan and guiding to the right anatomical program with the ideal dose settings. After positioning the 3D C-arm, and performing a collision check in a period of approximately 2 minutes, the system is ready to scan.

**48**  
sec.



180° SCAN FOR  
COMPLETE 3D INFORMATION

The refined motorization of the system and the intelligent combination of linear and rotating movements allow for 180 degrees of scanned information in only 48 seconds.

**8**  
sec.



RECONSTRUCTION AND  
DISPLAY OF 3D DATASET

Our iterative reconstruction techniques – most commonly seen in CT imaging – create crystal-clear images in only 8 seconds (standard volume). Even with the highest resolution of 512<sup>3</sup> voxel, the system needs only 18 seconds of reconstruction time.

→ Ziehm Usability Concept

Heavy case loads and a large number of different users call for OR equipment with a highly standardized and ergonomic design. Ziehm Imaging supports this need with the unique Ziehm Usability Concept<sup>7</sup>. Seamlessly integrated workflows offer unmatched levels of usability – anytime, anyplace.

As the innovation and technology leader, Ziehm Imaging has developed the sophisticated, yet intuitive Ziehm Usability Concept that combines a unique and finely tuned set of hardware features with seamlessly integrated software functionalities. In a challenging clinical environment, the entire concept is geared toward increasing ease of use in daily tasks. It improves process efficiency and ensures standardized quality levels in the OR for optimized patient outcomes.



**COLOR-CODED SCALES AND HANDLES** to ensure clear communication in the OR



**WIRELESS DUAL-PLUS FOOTSWITCH** to control all imaging functionalities without any disturbing cables



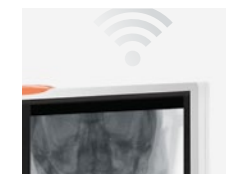
**MOST COMPACT FOOTPRINT WITH 0.8 M<sup>2</sup>** to fit in even the smallest treatment scenarios



**ZIEHM NETPORT** with WLAN enables easy integration into IT networks



**UP TO 165° OF ORBITAL MOVEMENT** to support easier patient coverage



**WIRELESS VIDEO** transmitting live X-ray images to external monitors



**ZIEHM VISION CENTER** featuring an intuitive touchscreen user interface



**CONTROL MODULES** for a fast and flexible setup in the sterile field



**SMARTEYE** enabling users to keep track of orientation and object position



**VERSATILE VIEWING OPTIONS** to offer maximum flexibility in the OR



**ANATOMICAL MARKING TOOL** to easily apply markings and labels to fluoroscopic images – now enhanced with color

## 04/Reduce exposure significantly with benchmark dose settings and hardware improvements

The Ziehm Vision RFD 3D is designed to meet growing demand among surgeons and their staff for minimized dose exposure without compromising on image quality. Optimal filtration and advanced anatomical programs deliver on these demands, making this device perfect for dose-sensitive applications.

### → Best image quality. Minimized dose.

The comprehensive concept consists of a broad, clinically proven application portfolio to address daily challenges of low dose and high image quality. With significant dose savings, Ziehm Imaging sets the benchmark in user-friendly adjustments of dose exposure. SmartDose<sup>3</sup> helps display even the smallest details of complex anatomical areas and reduce dose with intelligent pulse regulation and optimized anatomical programs. Furthermore, dedicated SmartDose functions significantly reduce exposure in pediatric surgery<sup>8</sup>.

### → Beam Filtration for reduced skin entrance dose

Our feature-rich SmartDose concept comes with the groundbreaking Beam Filtration<sup>1</sup> technology. Dose reduction techniques for an optimized X-ray spectrum support our enhanced CMOS imaging chain. Beam Filtration enables an exceptional reduction in the skin entrance dose for Ziehm Imaging flat-detector systems in comparison to systems with conventional filtration technology.



**SmartDose**  
Best image quality. Minimized dose.

- 
**LASER POSITIONING DEVICE**  
integrated in flat-panel or I.I. and generator housing for accurate and dose-free positioning of C-arm
- 
**REDUCTION OF PULSE FREQUENCY**  
manually or fully automatically to lower the accumulated dose
- 
**OBJECT DETECTED DOSE CONTROL (ODDC)**  
to automatically analyze the area of interest and minimize dose while optimizing image quality
- 
**ANATOMICAL PROGRAMS**  
with automatic optimization of dose and image quality for best results
- 
**HIGH-SPEED ADR**  
for intelligent, fast regulation of pulse rate to lower the dose level
- 
**ZAIP ALGORITHM AND FILTERS**  
to display fast-moving objects like guide wires and even the smallest vessels in razor-sharp image quality
- 
**LOW DOSE MODE**  
in all anatomical programs for particularly dose-sensitive procedures, e.g. in pediatrics
- 
**PREMAG**  
for exposure-free magnification of X-ray images
- 
**AUTOMATIC ADJUSTMENT**  
for large patients – with no additional increase in dose
- 
**REMOVABLE GRID**  
to reduce dose in pediatric and other dose-sensitive procedures
- 
**VIRTUAL COLLIMATORS**  
for exposure-free positioning of collimators
- 
**BEAM FILTRATION**  
for reduced skin entrance dose without compromising on image quality





FEATURES	ZIEHM VISION FD VARIO 3D	ZIEHM VISION RFD 3D
Imaging technology	a-Si, 20 cm x 20 cm	a-Si, 30 cm x 30 cm CMOS, 31 cm x 31 cm
Power generator	2kW, pulsed monoblock generator	25kW, pulsed monoblock generator
Motorization	3 axes	4 axes
Scanned information	135°	180°
3D volume size	12.8 cm x 12.8 cm x 12.8 cm; 256 <sup>3</sup> /512 <sup>3</sup> voxel	16 cm x 16 cm x 16 cm; 320 <sup>3</sup> /512 <sup>3</sup> voxel Further options: 10 cm x 10 cm x 10 cm; 320 <sup>3</sup> /512 <sup>3</sup> voxel 19.8 cm x 19.6 cm x 18.0 cm; 320 <sup>3</sup> /512 <sup>3</sup> voxel
Open navigation interface	Brainlab, Stryker, Medtronic	Brainlab, Stryker, Scopis, Globus Medical, Zimmer Biomet
<b>CLINICAL APPLICATIONS</b>		
Spine	••	•••
Lower extremities	•	•••
Upper extremities	••	•••
Pelvis	•	•••
Shoulder	••	•••
Maxillofacial/ENT	•	•••
Interventional/Hybrid	–	•••
Brachytherapy	•	•••

available ■ | not available – | good • | very good •• | ideal •••



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8. Shanghai (China)
9. Guangzhou (China)
10. Singapore (Singapore)
11. Midrand (South Africa)
12. São Paulo (Brazil)
13. Orlando, FL (USA)
14. Scottsdale, AZ, Orthoscan (USA)

## MAXIMIZE YOUR UPTIME



**Make sure to get the best service for your daily business.**

Rely on Ziehm Imaging for flexible and fast service to stay on the cutting edge of technology. Tailored service packages, remote service and individual upgrade paths keep you competitive in your daily hospital routine.

<sup>1</sup> The technology Beam Filtration reduces dose exposure for Ziehm Imaging flat-detector systems in comparison with conventional filtration techniques. Data on File. Results may vary.

<sup>2</sup> CMOSline represents a system configuration that is based on a Ziehm Imaging CMOS flat-panel detector.

<sup>3</sup> The SmartDose Concept includes a variety of hard- and software features. Due to regulatory reasons the availability of each feature may vary. Please contact your local Ziehm Imaging sales representative for detailed information.

<sup>4</sup> Recum von, J. et al., Unfallchirurg 2012, 115:196-201, Die intraoperative 3D-C-Bogen-Anwendung. State of the art

<sup>5</sup> Richter et. al., Cervical pedicle screws: conventional versus computer-assisted placement of cannulated screws. Spine (PhilaPa 1976). 2005 Oct 15;30(20):2280-7

<sup>6</sup> Gebhard et al., Does computer assisted spine surgery reduce intraoperative radiation doses? Spine (PhilaPa1976). 2006 Aug 1;31(17)

<sup>7</sup> The Usability Concept includes a variety of hard- and software features. Due to regulatory reasons the availability of each feature may vary. Please contact your local Ziehm Imaging sales representative for detailed information.

<sup>8</sup> Gosch D. et al. "Influence of grid and ODDC on radiation exposure and image quality using mobile C-arms – First results," RöFo, 09/07

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