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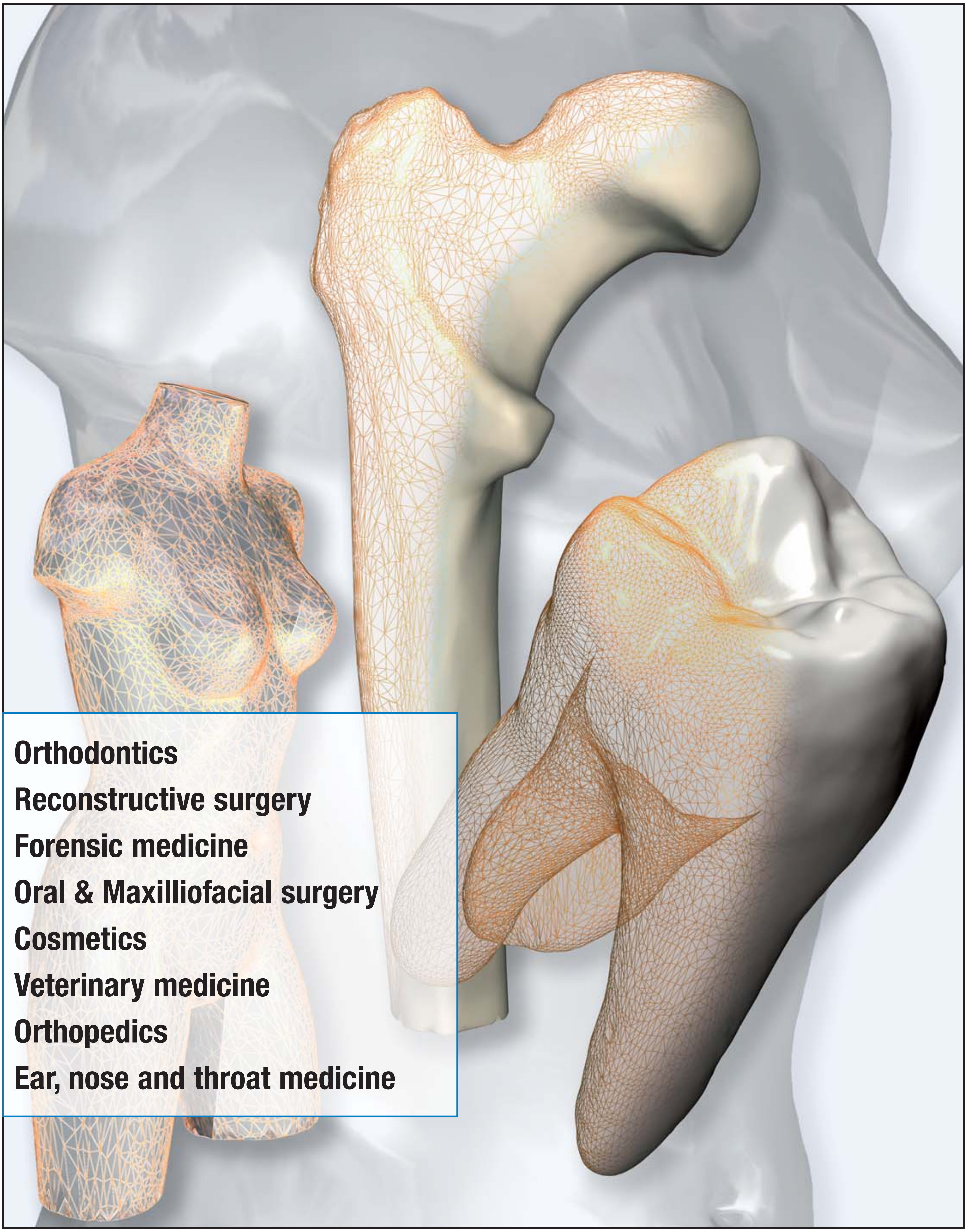
3D Digitizing

KONICA MINOLTA 3D Laserscanner

Applications in medical science



- Orthodontics
- Reconstructive surgery
- Forensic medicine
- Oral & Maxilliofacial surgery
- Cosmetics
- Veterinary medicine
- Orthopedics
- Ear, nose and throat medicine

3D Digitizing
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We are pleased to present this brochure introducing the Konica Minolta Non-Contact 3D Digitizer as the ideal scanning tool for applications in medical sciences.

Actively engaged in 3D imaging technology internationally since 1997, Konica Minolta works in close partnership with leading universities, research institutes and software partners. This global acitivity puts the company in an ideal position to offer successful product solutions for a wide range of 3D applications. The design and manufacture of 3D imaging systems is a logical next step in the development of Konica Minolta´s core strengths based on its expertise in color- and light-measurement technology.

The 3D product range is comprised of hardware and complementary processing software for a wide range of applications where both the shape and the color are to be analysed.
Konica Minolta non-contact 3D Digitizers are used in the industrial sector (reverse engineering, rapid prototyping), in restoration and conservation of art objects and cultural heritage materials (three-dimensional documentation and archiving, virtual museums and non-contact molding replication) and in web design and animation (3D character animation for film and cartoons).
Many medical researchers and practitioners have derived a variety of useful research applications and diagnostics in the medical sector.

In the field of 3D measurement in medical science there are numerous applications. For example, the scanning method is used in orthodontics to measure, reproduce and archive teeth and to fabricate appliances and plan treatments.

The VI-3D Digitizer is used in forensic medicine to digitize and archive corpses for criminological purposes such as analysing evidence and determining the likely sequence of events. Another application is in reconstructive surgery in which faces, breasts or entire bodies are scanned for surgical planning and prosthetic design.
Breast cancer treatment via radiation therapy is improved by use of a correct 3D model for creation of the compensating mask. Another typical application is the comparison of pre- and postoperative 3D models with the aim to optimize symmetry and volume.

Specific reasons to use the versatile Konica Minolta 3D Digitizers in medical sciences:

Fast	– with up to 0.3 seconds per scan, there is no inconvenience to patients
Accurate	– with up to ± 0.10 mm accuracy it accomodates even the most demanding requirements for pre and post surgical measurement
Color-mapping	– captures 3D shape and color with only one scan
Portable	– with only 11 kg easy to carry
Flexible	– no calibration required prior to scanning
Stand-alone	– no computer required while measuring
Easy to Use	– operating is just as easy as photographing with a digital camera
Non-contact	– measuring without touching the patient

Konica Minolta's 3D laser technology could be the perfect solution for you too.

3D Digitizing
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Product Information

Konica Minolta 3D laserscanner

For use in medical sciences, the non-contact 3D Digitizers combine all the advantages of a non-contact optical measurement in a single system. They are portable and compact, giving maximum mobility during patient treatment.
Konica Minolta non-contact 3D Digitizers are based on the principle of laser triangulation. Objects are scanned using a laser light stripe. The light reflecting from the object then enters the CCD camera of the VI-910. The distance to the object can be obtained by the angle of reflection of the laser, the angle of incidence of the reflected light from the object into the CCD and the fixed distance between Laser and CCD camera.

Using a CCD with a resolution of 640x480 pixels and four rotary filters (for R, G, B and 3D measurement) you can produce 3D data and color images in high quality in which every single color data pixel corresponds to a point in the 3D data.
With dimensions of some 20x40x30 cm and a weight of around 11 kg, the 3D Digitizers are handy to use, may be operated from a tripod or a desk top and do not need to be calibrated. This means you can bring the scanner to the patient instead of the patient coming to the scanner.

Konica Minolta VI-910 3D laserscanner

The VI-910 (called VIVID-910 outside of Europe) has three interchangeable lenses giving an exceptionally flexible scanning area.
A scan area from 11x8 cm at a subject distance of 60 cm up to 120x90 cm at a subject distance of 2.5 m can be covered with each scan. Measuring time in fine mode (307,000 points) can be reached in 2.5 seconds and in fast mode (76,800 points) in 0.3 seconds.
The system achieves a resolution 0.008 mm in the z coordinate.
The VI-910 can be also operated in stand-alone mode (i.e., without a host computer) by using an LCD and a compact flash memory card.
The 3D Digitizer has received ISO 9001 and ISO 14001 certification and has an FDA Laser Class 1 certification (IEC Class 2).
This means it is eye-safe, not hazardous to humans even with prolonged exposure.

Konica Minolta‘s software Polygon Editing Tool (PET)

With the Konica Minolta standard software it is then simple matter to merge several individual scans and edit and export the data. The 3D Digitizer can also be operated with a turntable allowing fast and automatic 360° acquisition of models. The object data can then be processed with a variety of third party software packages.

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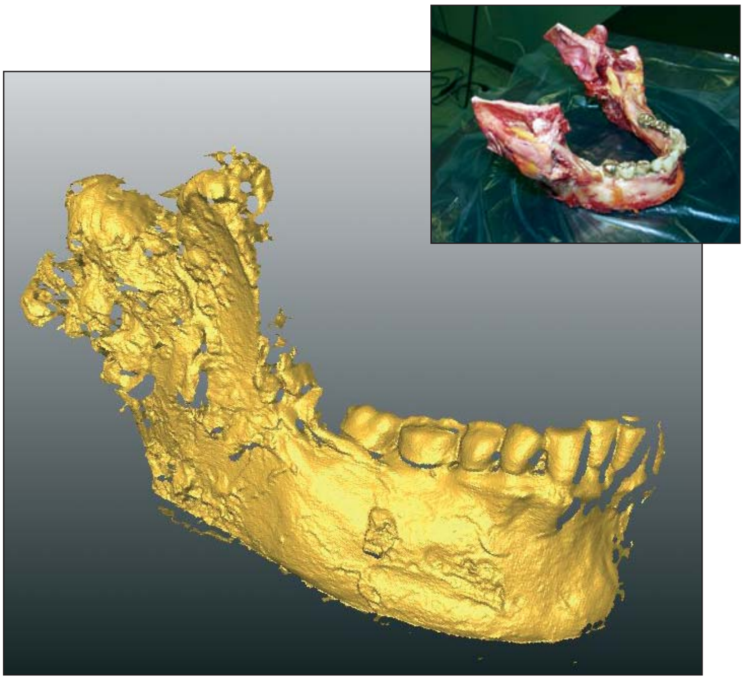
Orthodontics

3D reconstruction of a human mandible

Application areas of 3D reconstructions of human organs include pre and post operative treaments, biomechanical simulation, anatomical research, forensic medicine, anthropology, and archaeology.

Two cadaver mandibles were scanned by Dr. C. Kober, Univ. of Appl. Sc. Osnabrück, S. Adolf, Konica Minolta, Langenhagen, C. Dorow, and M. Geiger, both Dept. of Orthodontics, Univ. of Ulm.

The project was under the courtesy of Prof. Dr. H.-F. Zeilhofer and Dr. R. Sader from the Division of Cranio-Maxillofacial Surgery of the University Hospital Basel. The result is an accurate and detailed reconstruction of the human lower jaw.



3D data of a single scan of a fresh cadaver mandible.

The first measuring object was a recently-deceased mandible. In addition to computer tomography (CT) and magnetic resonance imaging (MRI), optical scanning (Konica Minolta VI-910) was performed combined with stepwise fine dissection.
This part of the project was carried out at the Dept. of Orthodontics at the Univ. of Ulm (head Prof. Dr. F. G. Sander).

“Raw” output of the VI-910 3D Digitizer. Even the surface of the bone can be recognized.

The second measuring object was a dry fully dentate human mandible. The complete acquisition of its 3D model took 12 single scans at a resolution of 220,000 points. They were registered semi-automatically, smoothed and merged to a closed model with the Konica Minolta Software PET 1.10.

Final result, mandible scan after application of the smoothing PET-tool.

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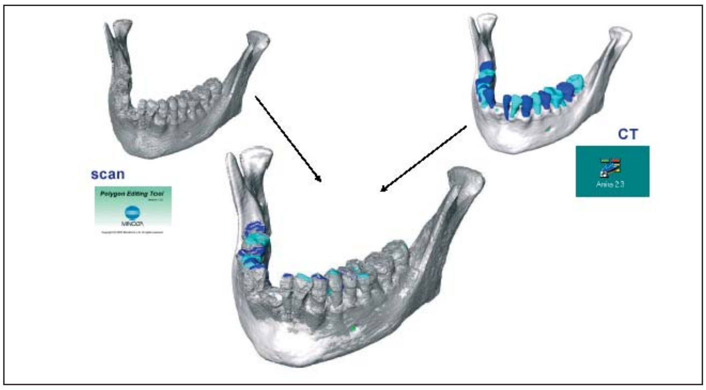
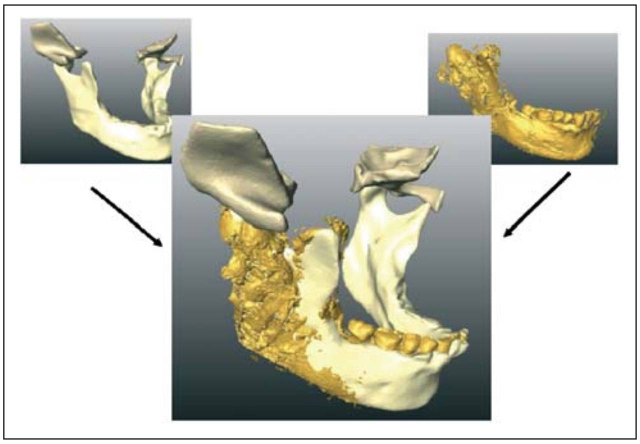
Orthodontics

Having reconstructed a complete 3D model by optical scanning the mandible was imaged using computer tomography (CT). The CT provides 3D data on the internal and external anatomy of the mandible as well as density and, to some degree, elasticity coefficients. The following part of the project was to compare the optically scanned surface with the CT surface of the mandible. There was a satisfactory spatial consistency between both the optically scanned model by the Konica Minolta VI-910 and CT model.
Finally, the two acquired 3D-models were merged to one very detailed and accurate model



Superposition of both optical scan and CT model of the dry mandible. In some instances, the optical scanned model is more precise than the CT (colored parts in the superposed model).

which led to a refined understanding of the individual anatomy. Additional analysis required the acquisition of an anatomical model suitable for biting simulation. The utility of the VI-910 was most apparent in the acqisition of the cortical shell which is very thin and not easily measured by a CT. The VI-910 allows exact and detailed scanning of the shape of this complex cortical shell which is on the anterior side of the alveolar process, on the proximal surfaces, on the interproximal spaces and on the crowns. In this way the tooth/bone interface could be acquired and analysed which is important for the research of the biting simulation.



Superposition of CT-reconstruction and optical scan of the cadaver mandible. Due to the incomplete dentition, metal bridges and crowns caused serious artifacts and voids in the CT image which were eliminated by the superposition of both data sets. At the mandibular ramus, left-overs of soft tissue can be recognized by the optical scan, especially the musculus masseter.

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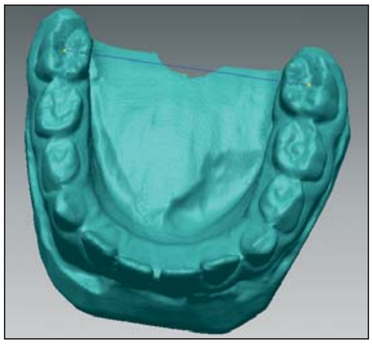
Orthodontic model analysis

A very efficient application in orthodontics is digitizing impressions. With the existing manual 2D measuring method there are a finite number of reference points from which to take precise measurements. For an exact diagnosis it is necessary to use 3D based analyse method for orthodontic models.
3D Analysis and treatment planning tools simulate an estimated result before treatment and facilitates measurements during and after treatment, for example to measure the length discrepancies or take symmetry diagnosis.
Moreover, the digitized impressions can be archived and easily reproduced if required based on the 3D data sets.



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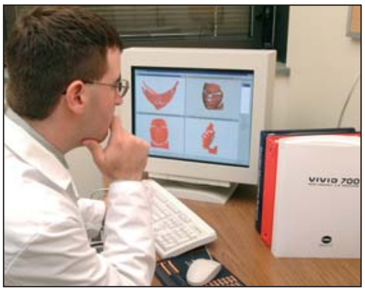
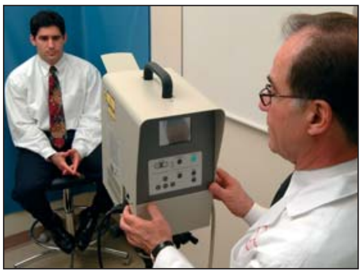
Orthodontics

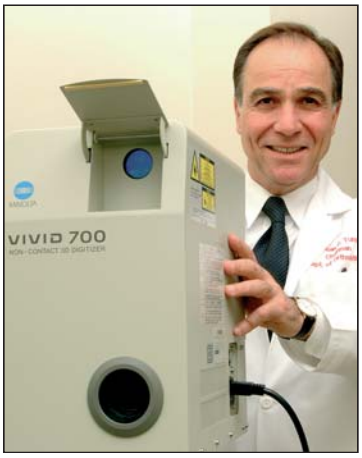
Simulating patient's treatment

The world of orthodontics is getting a "virtual" facelift. Dr. Orhan C. Tuncay, Professor and chairman of the Department of Orthodontics and Division of Pediatric Dentistry of Temple University School of Dentistry in Philadelphia, PA, has developed a technique and procedure using 3-D graphics and animation to plan a patient's treatment.



Orthodontics is the branch of dentistry that specializes in the diagnosis, prevention and treatment of dental and facial irregularities.
The ultimate goal of orthodontic treatment is to correct or rearrange these dental and facial irregularities to function in harmony.
Jaw and mouth motion must function with smile movements, and all - the face, mouth and smile - must be esthetically pleasing.





A problem plaguing the orthodontic world for years is the fact that treatment affects three dimensions, yet the most popular tool for diagnosis, x-ray, photography, and the like, is only two-dimensional. While 3D imaging systems such as MRI and CT scanners are used widely in hospitals, they are not accurate enough for orthodontic treatment and are too cost-prohibitive for in-office use. And while some in the field of orthodontics are using optic 3D image capture, optical 3D images may suffer from optical distortions, thus lacking the accuracy required in most orthodontic treatments. "There was a real need for precise and accurate malocclusion animation," says Tuncay. "And that's what we have developed – the first ever animation of the human face using 3D laser generated images. It's the only such system in the world."

Tuncay's procedure, now called 3-D CIMAS, three-dimensional Craniofacial Imaging and Motion Animation System, allows both the patient and clinician to see exactly the proposed orthodontic treatment and the outcome of that treatment before work is ever begun. Tuncay's 3-D CIMAS uses a Konica Minolta VI-700 3D Non-Contact Digitizer which is intrinsically-safe Class 1 (eye safe at any distance) and captures both 3D surface geometry and color texture data. The procedure uses Minolta scanning/registration and texture mapping software included with the VI-700 3D Digitizer.

"Orthodontics is an elective treatment," explains Tuncay. "It's not life threatening. Quality of life is very important to a patient. And perceived quality of life is much higher if a patient is well informed before treatment begins. If a patient knows what they are getting, and the outcome - what they will look like after treatment – they're more satisfied. There are no surprises. We make our mistakes on a computer screen, never on a patient."
"We will continue to perfect our system here at Temple," explains Tuncay. "We have a study currently underway involving 100 patients to help develop standards for using the new system and technique. Who knows, in the future, maybe there will be Orthodontic centers for 3D image processing. The 3D images will be worked up into a movie that's then e-mailed to a doctor to perform the treatment."

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Reconstructive Surgery

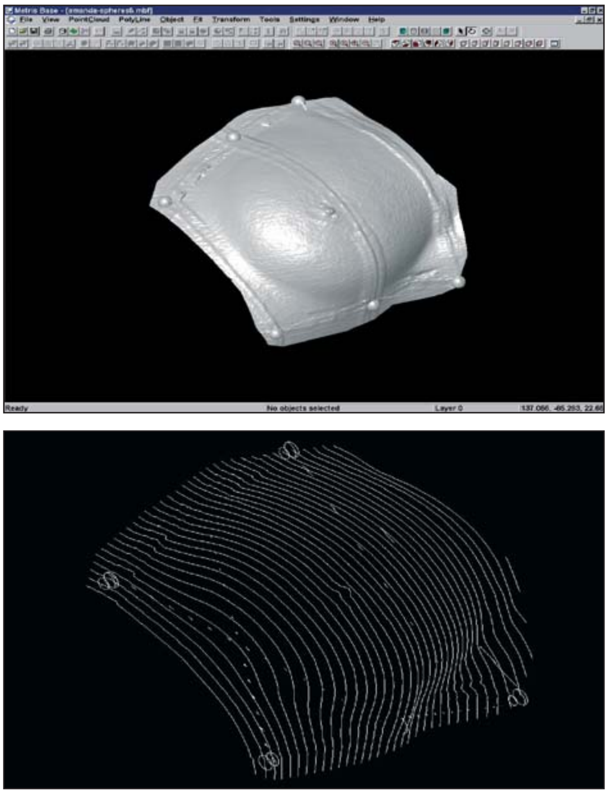
Breast Cancer Treatment

In the planning of radiation treatment for breast cancer it is important to have a detailed knowledge of the patient outline in order to correctly calculate the dose distribution that can be expected within the patient.

The information of the patient outline is obtained from an extensive Computer Tomography (CT) scan of the patient. CT data provides the best level of detail because both external patient shape and Internal anatomical information is collected. In some cases however, it is not practical for either economical or physical reasons to use CT scans.

Scanning a breast to reduce the calculated maximum dose of the irradiation.

For instance, for breast irradiation the normal patient position is an upright posture. According to the patient's breast which is deformed when lying horizontally in the CT scanner the acquired 3D data does not suit to the irradiation treatment and its dose distribution.


A digital breast in
shaded view (above) and in slices (below).

Assumed that the patient fits into the bore of the CT scanner the limited resources of expensive CT scanners for such a large patient population is also significant.

These limitations can be overcome by employing the Konica Minolta 3D laser scanning method. Addenbrooke's Hospital in Cambridge, England measured a breast in the treatment position with the Konica Minolta VI-3D Digitizer. The scan merely takes 0.6 seconds, and since there is no patient contact, the tissue is not deformed.

The acquired 3D data gives a set of outlines that can be used in conjunction with the radiotherapy system. This technique enables the treatment teams to evaluate the true three dimensional dose distribution with the irradiation of patients. The result showed that the dose distribution was significantly reduced.
Calculated maximum doses for the volunteer were reduced from 113% to 106%.

Konica Minolta's 3D laser technique has no radiation overhead associated with it and is proving to be a quick, accurate and cost affective tool.

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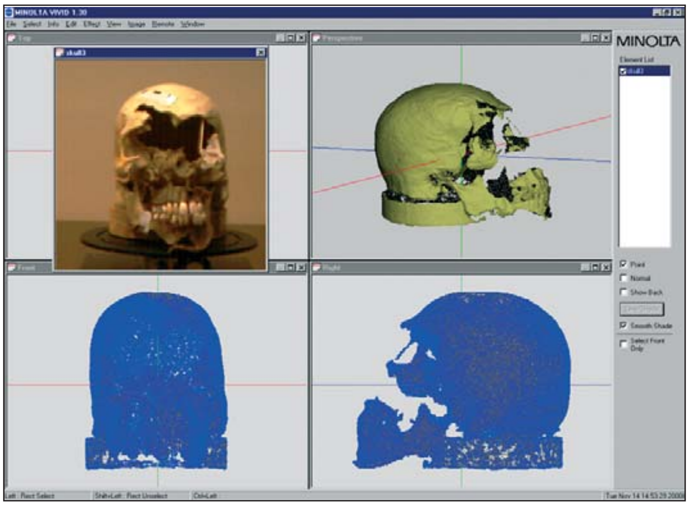
Forensic Medicine

Three-dimensional crime scene investigation

An imprecise inspection of the crime scene can negatively affect the outcome of trials and tribunals. Temporal evidence can be lost forever.
Prof. Dr. Miguel C. Botella López, Director of the Laboratory of Anthropology of the University of Granada applies three-dimensional Crime Scene Investigation.

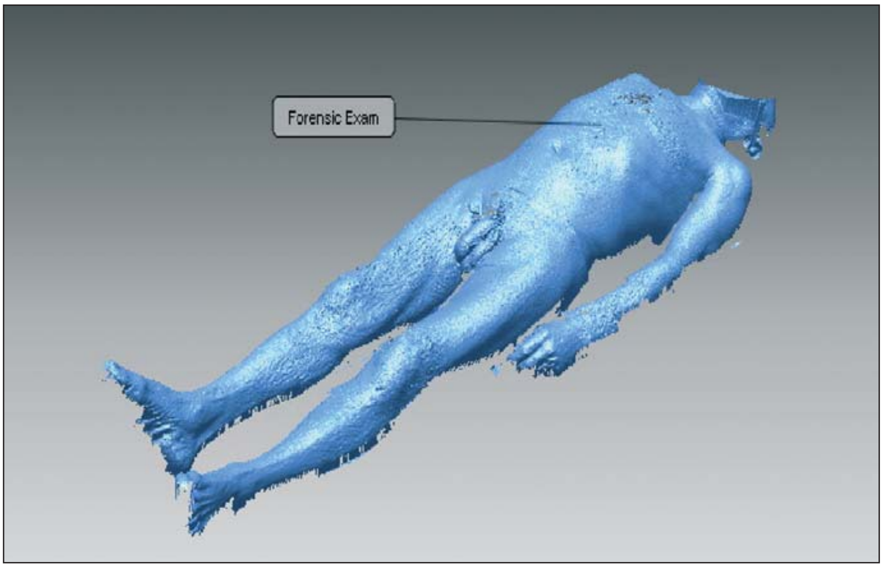
With the introduction of Konica Minolta VI-910 3D Digitizer highly-accurate accurated 3D models are provided for a detailed reconstruction of a crime scene.



3D model of a skull.

A new dimension is opened for investigators

Modern 3D data representation techniques allow them to reconstruct the original crime scene three-dimensionally. Adding 3D animation techniques investigators are able to show suspicious persons and even their alleged actions at the scene.



An archived digital 3D model of a dead body.

If investigators own some film of the scene where they had doubts about the recognition of something suspicious in particular they could scan those in 3D and simulate the same scene with highly accurate 3D animation videos. Investigators could overlap either scenes, original camera and simulated flying camera, and compare both using photorealistic corresponding real models. The possibility of travelling around the scene helps the jurors to envision the crime and to make better judgement about actual events.

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Forensic Medicine

The possibilities in criminal investigation of the new developments in forensic anthropology allow the human identification from any type of human remain being with a high reliability. In addition the conservation of such evidence as well as any physical evidence can be obtained and archived as synthetic images on scale 1/1 and with real textures and colors with the Konica Minolta VI-910 3D Digitizer.

3D acquisition of a face in addition to the information of criminals for criminological purposes.

A further great benefit of capturing evidence digitally is the fact that it allows the images to travel through the network in real time. The uncomplicated and fast creation of a 3D model by the VI-910 makes it possible to ask different professionals around the world to collaborate about a particular evidence on line. The police investigations, the review by the police as well as inquisitions in court will undergo substantial changes from these technological innovations.

Arrangement of scanning objects on a Konica Minolta rotating stage.

The picture shows anthropologists placing a dried bone and a skull on a rotating stage in preparation for 3D scanning.

Using the Konica Minolta rotating stage the scan process is automated. Scans from different angles are easily merged to one complete 3D model by using the PET Software.

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Oral & Maxilliofacial Surgery

Face reconstruction after severe burn injury

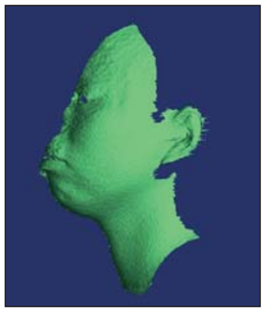
A 14-year-old patient at the Dept. of Plastic Surgery, Klinikum rechts der Isar of the TU Munich had suffered with an accident resulting in a fourth-degree burn of her middle face with a complete destruction of the outer nose, the right eye, the soft parts of the forehead, the middle and right area of the face, leading to massive bone defects. For reconstructing the face of the patient a surgical treatment became necessary.

Concerning the surgery planning the surface of the soft parts of the involved structures were acquired by means of computer tomography and additional optical 3D laser scanning with the Konica Minolta VI-910.

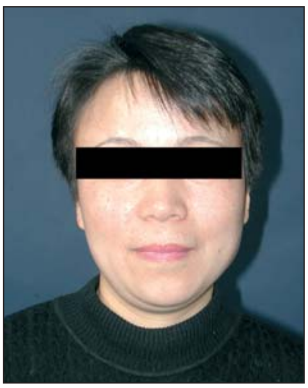
Frontview with color (above)

Frontview in shaded view (below)

Front view of the 3D model of the patient



Having analyzed and edited the 3D data sets with the software Rapidform® (INUS Technology) und 3Shape® (Aps. Denmark) a virtual model of the face was created, displaying the appearance of the patient before the accident.



The ideal virtual model was created by mirroring the intact facial areas in the 3D data set and the combination with the 3D data set of the patient and the patient’s mother.

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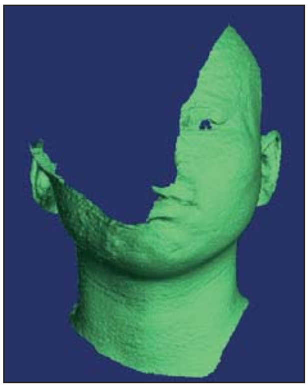
Oral & Maxilliofacial Surgery

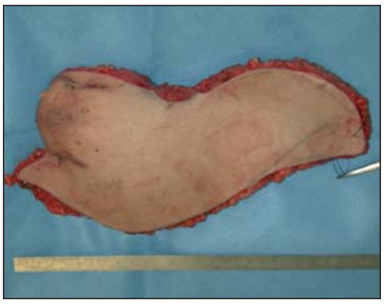



The rough procedures to create the missing parts for visualisation. The first image shows the healthy 3D information of the scanned patient. The second image is the ideal virtual model with the extracted missing 3D data on the right. The last image demonstrates the patient with the stereolithograph model of the tissue defect.

As a result of the superposition of the virtual constructed 3D model with the 3D model of a patient's face the defect of the substance can be calculated and the difference of the volume can be displayed graphically. Aditionally, a physical model was created using stereolithography for visualizing purposes, a contribution of the rapid prototyping group from the Center of Advanced European Study and Research (caesar) in Bonn.

With the help of the software the graphical model can be evaluated and measured. The length of the nose cartilage can be calculated and furthermore the necessary size of the flap for the new nose can be determined by projecting the reconstructed 3D model to the plan. The entire flap can be preformed and cut out from the ventral area.





Single operation steps: The marked flap on the ventral area, the preformed nose and the harvested abdominal flap (from left).


In summary, it can be said that the reconstruction of complex defects in facial areas already benefit from the new technical possibilities to scan and display different three-dimensional structures in the current stadium.", says Dr. L. Kovacs from the Dept. of Plastic Surgery of the Klinikum rechts der Isar. „The methods available facilitate the accurate acquisition of three-dimensional surfaces, volumes, etc. for surgery planning."

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Cosmetics

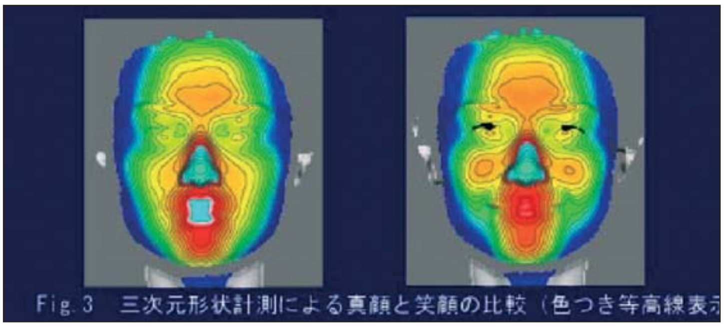
3D shape measurement of Human face

A cosmetics manufacturer, POLA (Kanagawa, Japan) is using Konica Minolta's VI-700, non-contact 3D Digitizer, to research human facial expression. POLA's theory is that analyzing the smiling face is more captivating than other facial expressions. As a result, POLA is analyzing the shape of a smiling face to determine which type of make up best accentuates facial contours.

Comparison between a sober face and a smiling face by 2D.

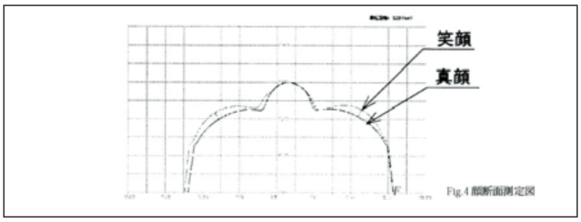
To substanciate its position, POLA uses the easy-to-operate VI-700 3D Digitizer to capture both smiling and unsmiling faces. The VI-700 scans an object very quickly (0.6 seconds) with an eye-safe laser beam. A complete 360° image of the face can be viewed on a computer monitor as a color picture, in polygonal mesh, or grey shading.

Comparison between a sober face and a smiling face by contour maps.



Colored contour maps of 3D image of normal face and smiling face.

With the software that is built into the VI-700, POLA can easily modify, model, or scale the face, and then import the final image into a variety of off the shelf software packages. POLA uses „3D Rugle" to compare the 3D shapes of an unsmiling face to a smiling face. There are obvious differences between the shapes of each cheek; the cheeks of a smiling face are more projected than those of the unsmiling face by as 2 to 5 mm (Fig.4).



POLA concludes that a smiling face's cheeks are different from an unsmiling face, and the smiling face conveys more positive human qualities. Indeed over 90% of the people POLA interviewed agrees with these findings. This analysis is based on the assumption that the shapes of mouth, nose and cheeks were the same. As the result of these findings, POLA is researching makeup methods to create a product that will simulate the radiance of a smiling face.

The data in this article were provided by POLA.
Reference: The 4th Japan Academy of Facial Studies. 3D Rugle is a trademark of Medic Engineering.

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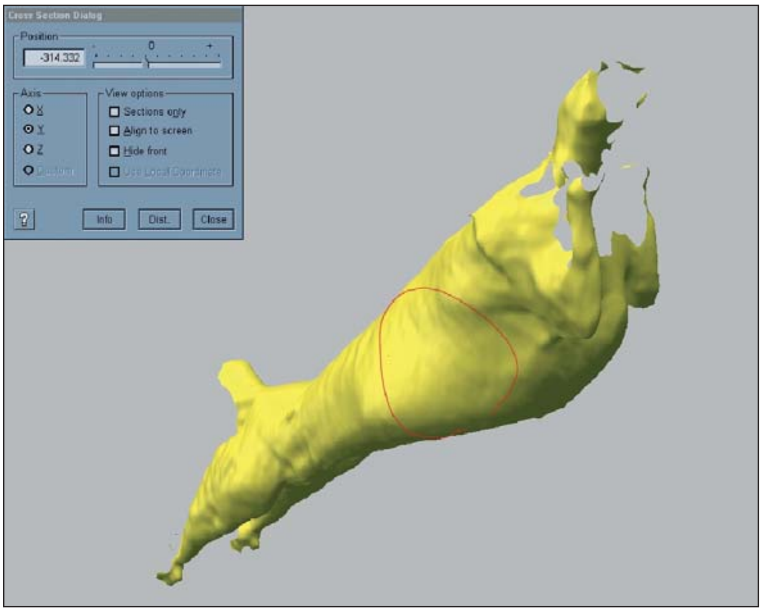
Veterinary medicine

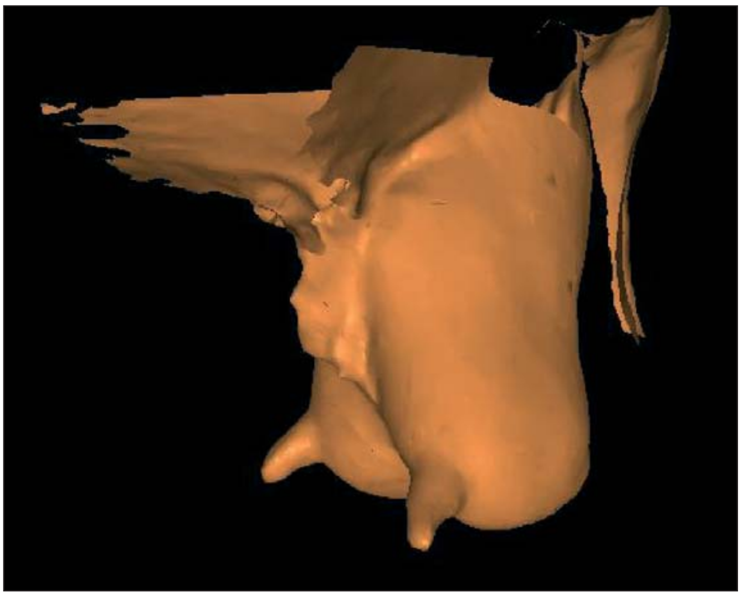
Optical scanning in agriculture

The Institute Nationale de la Recherche Agronomique (INRA), France captured in digital form single slaughter cattle.
Because of the short scanning time of the Konica Minolta VI-910 3D Digitizer a relatively small effort is necessary to digitize i.e. butchered cows one by one in a few minutes shoving them on an iron rod.
Besides the 3D shape of the object INRA captured in parallel the color of the meat with only one scan. In this way, the analysis of the meat becomes facilitated in terms of the evaluation of the proportion of fat/meat as well as the quality of the meat.
This enables estimating the necessary change of the admixture of the fortage.
Using the VI-910 cattle-breeding can be controlled through these analyzes.



A 3D model of a butchered cow with an additional circumferential measurement.

The individual shapes of the udders of cows or goats make the attaching of milking machines with standardized forms uncomfortable to the animals. INRA selected the goat with the best naturally formed udder and digitzed the udder with the VI-910.



Shaded view of the 3D model of a goat's udder.

Due to the captured 3D data it is possible to produce an optimal fitting part of milking machines to the shape of the udder to make it more comfortable to the animals and furthermore for analyzing the udder's volume.

The fast scanning mode of the 3D Laserscanner enables as well the difficult application with unsettled animals.

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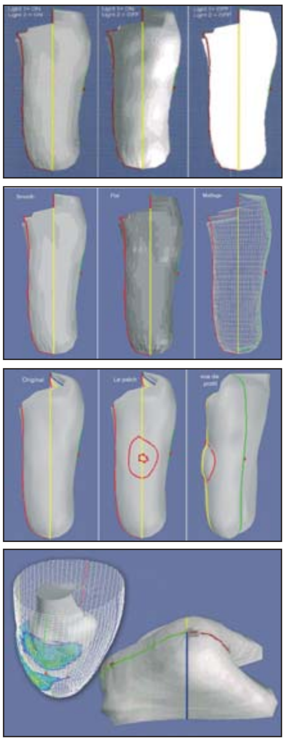
Orthopedics

Prostheses - Improved fitting and patient comfort

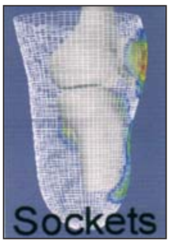
The company Mignard SARL, France, specializes in the development of software and hardware technologies primarily related to fitting artificial limbs and medical braces. Mignard SARL use their own proprietary medical software which integrates the Konica Minolta VI-700 3D Digitizer into a complete 3D digital process chain. This includes capturing, processing and using 3D data for prostheses production by CNC-milling.



Difficulties arise when applying the traditional plaster method to obtain data from burn patients. Applying and removing of the plaster is a painful and slow procedure.
The Konica Minolta VI-700 adopts a non-contact approach which is faster and offers more comfort and thus can be used for patients with open wounds“, says Jean-Christoph Mignard, owner and manager of Mignard SARL.

The surface data of the patient’s body generated by CAT scanners tend to be unreliable as the body shape changes when lying in the bore of the CAT scanner. By using the VI-3D Digitizer Mignard SARL could reduce the average production and fitting time per patient from three days down to a half a day, and this even with increasing the accuracy of prostheses.

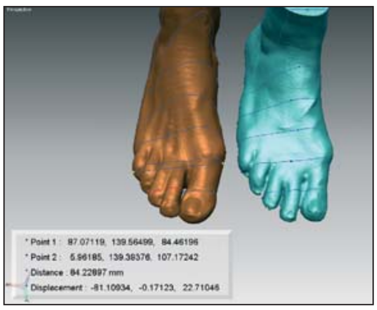
The VI-700 3D Digitizer can be applied even in a hospital environment. The VI-700 does not generate a magnetic field and requires just a power source. The scanning speed, memory card, LC Display and touch panel allow convenient on-site data acquisition and storage for a variety of prosthetics.



The Mignard proprietary software „Sockets“ allows reshaping the output data of the VI-700 by manipulating the 3D shape of the soft tissue with respect to the patient’s bone structure. After the necessary corrective measures have been taken, the milling module is launched. Hard-foam is the preferable milling material due to its relatively low cost and speed of milling. By applying these techniques any part of the human body can be acquired and successfully treated.

Individual adjustment of shoes

Concerning the adjustment of shoes an optimized 3D model can be created on the basis of the 3D models of the feet. A CNC milling machine is able to produce a physical master of the optimized 3D model which will be used to produce the actual shoe. Another option is an orthotic foot bed which can be milled with the 3D data set of the optimized 3D model as well.



3D Digitizing

KONICA MINOLTA 3D Laserscanner

Ear, nose and throat medicine

Integrated hearing aids

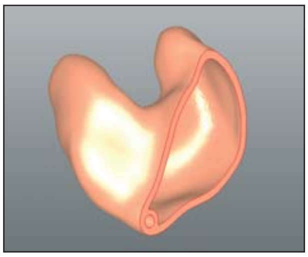
The Siemens Hearing Instruments company is the largest manufacturer of integrated hearing aids and has developed an optimized manufacturing process using the Konica Minolta Sailor III ear impression scanner. The 3D data of the Sailor III is used for producing individually customized hearing aids that fit and perform better, and are more comfortable to wear.

A silicone ear impression on the rotating stage.

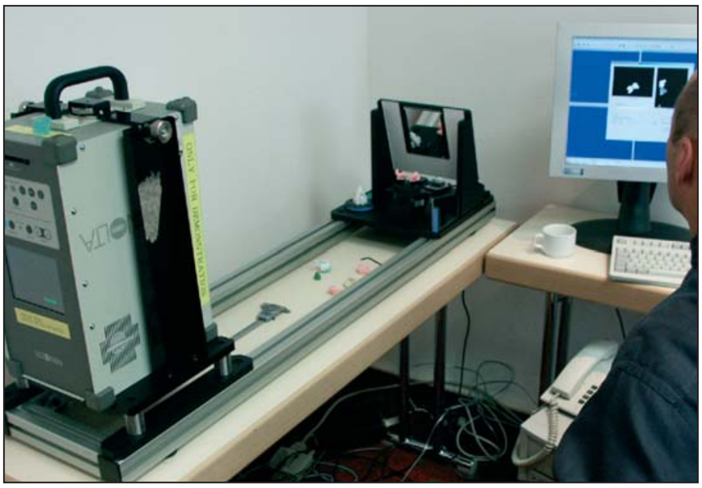
One scan only takes 50 seconds.

In contrast to conventional hearing aids, the electronics contained in integrated hearing aids are not placed behind the ear but inside of the auditory canal. These ITE (in the ear) devices are heavily customized to fit each individual patient. Siemens developed a manufacturing process that combines laser scanning and Rapid Prototyping to create a unique shell for each patient. The benefit is more comfortable hearing aids that fit more preciely in the patient's ear.

Manufacturing integrated hearing aids starts with making a silicone impression of the patient's ear in the same way conventional hearing aids are made. The difference is that a 3-D digital model of this impression is made by scanning the impression's shape using the Konica Minolta Sailor III. The scanning system is a special device, developed to scan ear impressions, and was made possible by Konica Minolta's versatile VI-technology. In only 50 seconds the surface of an ear impression can be scanned and replicated in the computer with an accuracy of ± 0,10mm.



A digital CAD model of a hearing aid shell.



Siemens uses a proprietary CAD system to modify and optimize the hearing aid shell on the basis of the virtual model. Since the patient data is stored digitally, there is no problem reproducing a lost or damaged hearing aid. The next step is to produce the hearing aid shell.

Siemens sends the redesigned 3D data set of the virtual hearing aid shell to a selective-laser-sintering machine, a type of 3-D printer that produces the custom shell.

The electronics are installed and the assembly finished for delivery to the dispensing clinician. The Sailor III is easy to operate, normal operation requirse the operator to identify the impression (i.e. serial number input), to place the impression and to click the scan button. The result is a better fit for improved hearing and improved patient satisfaction.

Konica Minolta 3D Laserscanner

VI-910

- **non-contact**
- **portable**
- **no calibration**

KONICA MINOLTA

Specifications

Type
Non–contact 3D laserscanner

Method
Triangulation light block method

Auto Fokus
Image surface AF (contrast method)
active AF

Optical system
Three interchangeable lenses:
telephoto (f = 25 mm), medium (f =14 mm)
wide–angle (f = 8 mm)

Object distance
0.6 m to 2.5 m

Scannable range (XY) / depending on dist.
min 111 mm x 83 mm
max 1196 mm x 897 mm

Geometrical precision (typical for Z)
+/– 0.008 mm (FINE)

Measured data per scan
307,000 Punkte (FINE)
76,800 Punkte (FAST)

Scanning time
0.3 s (FAST) / 2.5 s (FINE) / 0.5 s (Color)

Ambient light
< 500 lux

Memory card
Compact Flash Memory Card (128 MB)

Interface
Fast SCSI

Laser
Class 1 (FDA)
Class 2 (IEC 60825–1), 'Eye safe'

Color-LCD
5.7 inch color TFT LCD
(320 x 240 pixels)

File sizes
1.6 MB (FAST) bis 3.6 MB (FINE)

Output formats
3D: Konica Minolta Format & STL, DXF, OBJ, ASCII, VRML (export formats for 3D polygon editing software (standard accessory))
Texture: RGB, 24–bit color depth

Dimensions
213 mm x 413 mm x 271 mm (WxHxD)

Weight
approx. 11 kg

Operating environment
10° to 40°C, RH < 65% / (no condensation)

Storage environment
–10° to +50°C, RH < 85% / (no condensation)

Konica Minolta's innovative 3D laser digitizing technology could be the perfect solution for you too.
We would be pleased to supply further information and look forward to hearing from you.

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The essentials of imaging

Specifications and details subject to change without notice.