



IMAGER 5006

The new way of scanning –
highly accurate, fast, reliable and flexible

IMAGER 5006



With the IMAGER 5006 Zoller+Froehlich GmbH (Z+F) pursue their successful IMAGER scanner series. Like its predecessor, the IMAGER 5003, this progressive 3D laserscanner impresses because of its quality and reliability. The first "stand alone" laserscanner worldwide not only impresses because of its changed design but also because of its many technical innovations. The newly developed IMAGER 5006 is a laser measurement system which satisfies highest customer requirements.

Configuration

Maximum mobility is guaranteed by the logical and functional construction of the IMAGER 5006. Essential components are the control panel, the changeable rechargeable battery, the internal hard disc, USB interface as well as connections for network links, additional power supply and Ethernet at the non-rotating scanner base. Furthermore the scanner is equipped with an electrical 2-axes compensator.

Power supply

Z+F set a new standard regarding flexibility and easy handling with the IMAGER 5006's power supply.

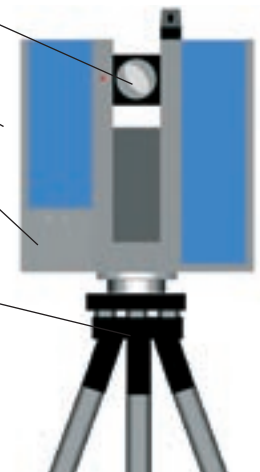
- An changeable battery back allows wireless scanning for at least 1.5 hours. This simplifies the whole scanning process on site and the assembly time is considerably shortened.
- Longer scanning processes are easily made possible by using an external battery pack (which was also used with the IMAGER 5003 – TRAPP). The battery life of TRAPP is more than four hours. The power supply for a notebook is also possible via TRAPP.
- Unlimited scanning time can be achieved by using a cable joint to AC power supply (90 - 260 V).

Rotating mirror for 310° vertical scanning

Rotating device for 360° horizontal scanning

Changeable battery pack

Mounted onto the approved Wild/Leica tribrach system



Carrying handle

USB-interface

Keypad/display combination

External power supply and Ethernet at the non-rotating scanner base



■ Handling

Flexible and intelligent control of the compact sensor is one of its main features.

- Operation of the IMAGER 5006 is effected directly by keyboard-display combination and it is fully operational in a little while. The captured data are saved on an internal hard disk.
- For an external operation, the IMAGER 5006 is equipped with a Bluetooth and Ethernet-interface, a PDA or a notebook / PC can thus be used. The user can control the IMAGER 5006 by "Scan over IP" via the Internet (operation and software updates). These options provide further mobility of the system.

■ Data capture/Quality

- The IMAGER 5006 offers an extended ambiguity range of 79 m. Because of this higher range and the extended point density the IMAGER 5006 opens up further areas of application.
- The laserscanner offers a high quality of data regarding the accuracy of angles and distances. The data capture is very fast and the results are absolutely precise (mm-area).
- The data can be stored directly on the internal hard drive, thus working without external devices is possible.
- Min. 60 GB storage capacity is sufficient for at least 2 days of intensive scanning.
- The data transfer to a notebook/PC is possible via Ethernet connection and data transfer to an external hard drive can be effected via USB.

■ Compatibility

- All accessories of the IMAGER 5006 (such as power supply, external batteries, cable joints) are compatible to the previous model IMAGER 5003.
- The mounting of the scanner is effected onto the approved Wild/Leica tribrach system.
- The measurement system is compatible to all Z+F software products such as Z+F LaserControl, Z+F Project-View, Light Form Modeller (LFM) and Visual Sensor Fusion® (VSF), JRC 3D Reconstructor®, etc.



USB 2.0-interface

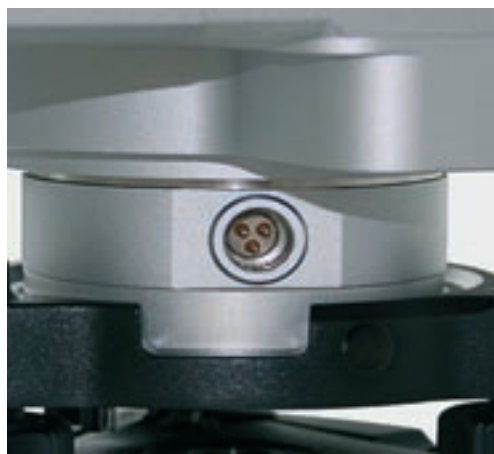


fig. left: Connection for the external power supply and the data download (Ethernet)

fig. right: Keypad and display



Digital site planning



Precise working is very important in this area. All details of existing plant environments and installations are captured three-dimensionally. Room coordinates in the millimeter area are thus available which can easily be used for the creation of 2D-construction plans, which are needed for later measurements of new plants or for reconstruction.

Moreover semi-automated 3D-models of the actual state of a plant or installation can be generated via the software LFM developed by Z+F. These 3D-models enable the

■ Application areas:

- Automotive areas
- Chemical sites
- Power plants
- Oil rigs
- Other plants



Factory site as 3D model – generated from scanner data

virtual simulation of production sequences and processes as well as the performance of collision inspections with newly planned sites or reconstructions. During the measuring of installations of plant buildings in which work is taking place simultaneously time pressure is permanently present. The aim of Z+F is not to disturb the workflow in the plant and thus to avoid bottlenecks in advance. (s. Software product - page 11)

The IMAGER 5006 impresses in this area with its ease of handling, speed and high productivity, which reduces standstill times during the capture of data to a minimum which, in the end, will lead to significant cost savings.

Architecture & protection of historical building



During the development of the IMAGER 5006 special care was taken in order to achieve the relevant exactness needed for the measuring of buildings. High resolution offers so far unachieved possibilities for the documentation of damage and statics calculation. Thanks to the very high scanning speed, a distance resolution of less than 1 mm and a measurement accuracy in the mm-area, capture of the finest structures and details is possible.

2D-plans (ground plans, front view, etc) for documentation of new buildings or reconstructions can be generated from the 3D-measurement data. The 3D-models generated from the laser data can be captured with textures and integrated into virtual-reality-applications thus making it possible to "walk" in rooms and buildings even before they are built. By using a digital camera with its colour option further attractive possibilities are offered for this area of application.

■ Application areas:

- Castles
- Churches
- Museums
- Other buildings for documentation



Colourmapping – 2D view with RGB colour information



Colourmapping – 3D point cloud with RGB colour information



Colourmapping – Bubble-View with RGB colour information

Accident documentation & infrastructure



The usage of a very fast but nevertheless precise measurement system is very important at frequented roads and traffic ways or after accidents. By capturing the accident with all details in 3D, e.g. vehicles' deformations or brake marks, the question of a possible reason for an accident or its sequence of events can more easily be analysed and answered. As the Z+F scanner is suitable for outdoor usage in almost any weather condition, the Z+F system is especially suitable for such applications.

■ Application areas:

- Railway nets
- Streets/crossroads
- Tunnels
- Drains
- Bridges
- Accident areas



Laserscanning in infrastructure facility

Thanks to the high data capturing rate very precise 3D-measuring of the surroundings is possible with the Z+F laserscanners even from moving platforms. This is very important for the measuring of tunnels, railways and streets (Profiler Mode).



fig. top:
Meshed model of a damaged car due to accident



fig. bottom:
Orthophoto view of a junction

Forensics



Fast working whilst assuring complete forensics is of extreme importance for securing sites of crime or during the prosecution of criminals. The IMAGER 5006 ensures exact data capture even from very limited areas (e.g. beneath a chair).

The responsible persons can reconstruct shot angles from the scanned data and simulate the course of events. A speciality in this area is the specific software for the determination of the criminal's size, which facilitates the search for such persons. First results such as 3D-plans, ground plans, horizontal- or vertical cuts or only views of the point clouds can already be provided on-site thanks to the fast acquirement of data via the Z+F system.

The demand for colored point clouds is very high in this area as the information content and recognition are increased significantly by using them. The Z+F package fully complies with this demand.

■ Application areas:

- Measuring of sites of crime
- Determination of delinquent's size
- Disaster areas
- Capture of dangerous areas



Crime scene documentation (2D reflectance image made by scan data)



Scanned data superimposed with photo taken by observation camera - virtual people positioned in point cloud

Technical Data

Laser measurement system

Ambiguity interval:	79 m
Min. range:	1.0 m
Resolution Range:	0.1 mm
Data acquisition rate:	≤ 500 000 Pixel/sec.
Linearity error up to 50m ¹ :	≤ 1mm
Range noise at 10 m^{1 2}:	
- Reflectivity 10% (black):	1.2 mm rms
- Reflectivity 20% (dark grey):	0.7 mm rms
- Reflectivity 100% (white):	0.4 mm rms
Range noise at 25 m^{1 2}:	
- Reflectivity 10% (black):	3.0 mm rms
- Reflectivity 20% (dark grey):	2.0 mm rms
- Reflectivity 100% (white):	1.0 mm rms
Range noise at 50 m^{1 2}:	
- Reflectivity 10% (black):	7.5 mm rms
- Reflectivity 20% (dark grey):	4.0 mm rms
- Reflectivity 100% (white):	2.5 mm rms
Range drift over temp. (0°C - 40°C):	negligible due to internal reference

Optical transceiver

Laser:	visible
Beam divergence:	0.22 mrad
Beam diameter at 1 m distance:	3 mm circular
Laser safety class:	3R (ISO EN 60825-1)

Deflection unit

System vertical/horizontal:	Rotating mirror/device
Field of view vertical/horizontal:	310°/360°
Resolution vertical/horizontal:	0.0018°/0.0018°
Accuracy vertical ¹ /horizontal ¹ :	0.007° rms/0.007° rms
Max. scanning speed vertical:	≤ 50 rps
Typ. scanning speed vertical:	25 rps

Resolution

Resolutions:	Pixel/360° (vertical, horizontal)	Scanning time
- „preview“:	1 250	25 sec
- „middle“:	5 000	1 min 40 sec
- „high“:	10 000	3 min 22 sec

Resolutions:	Pixel/360° (vertikal, horizontal)	Scanning time
- „super high“:	20 000	6 min 44 sec
- „ultra high“:	40 000	26 min 40 sec
- Max resolution for selections:	100 000	variable

Miscellaneous

Tilt measurement:	
- Resolution:	1/1 000°
- Accuracy:	1/500°
Data storage:	Interne Festplatte
Data interface:	Ethernet/USB 2.0
Communication interface:	Ethernet/Bluetooth
Integrated operation panel:	
- Keypad:	6 Buttons
- Display:	4 Lines
Power supply:	
- Input voltage:	24V DC (scanner) 90 - 260V AC (power unit)
Power consumption:	50 W
Battery life time:	
- Changeable battery pack:	1.5 h
- External battery pack:	4 h
Ambient conditions:	
- Calibrated temperature:	0°C - 40°C
- Storage temperature:	-20°C - 40°C
- Humidity:	non-condensing
- Target reflectivity:	no retro-reflectors
- Illumination:	all conditions from darkness to daylight

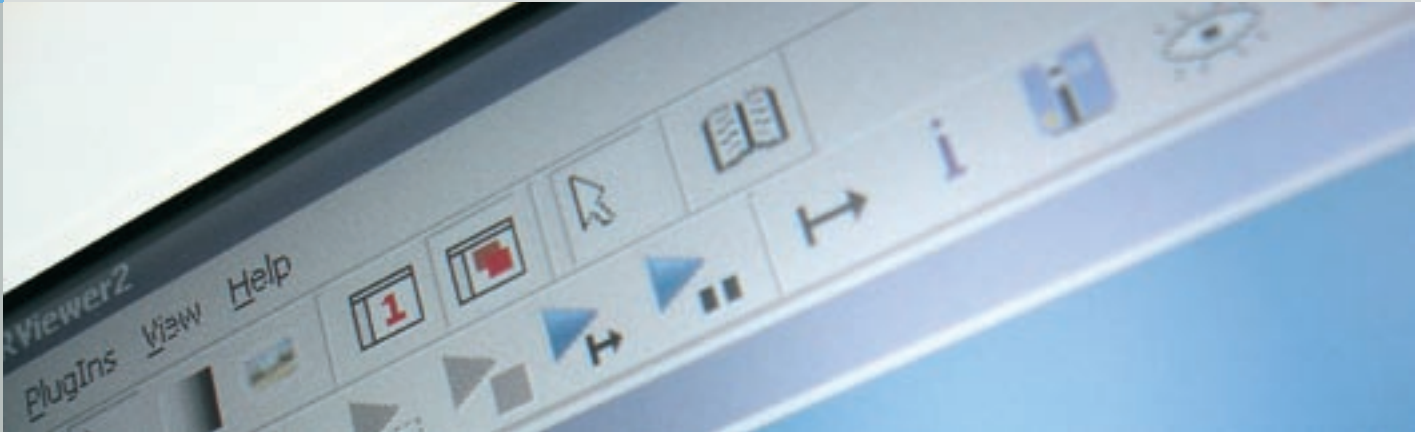
Dimensions and weights

Scanner (w x d x h)/weight:	286 mm x 190 mm x 372 mm/14 kg
Bottom of scanner to horizontal axis:	242 mm
Tripod:	
- Height/weight:	approx. 800 mm -1 400 mm/ 9 kg
- Diameter:	approx. 1 200 mm

¹ detailed explanation on demand – please contact imager5006@zflaser.com

² data acquisition rate: 127 000 pxl/sec.

Software

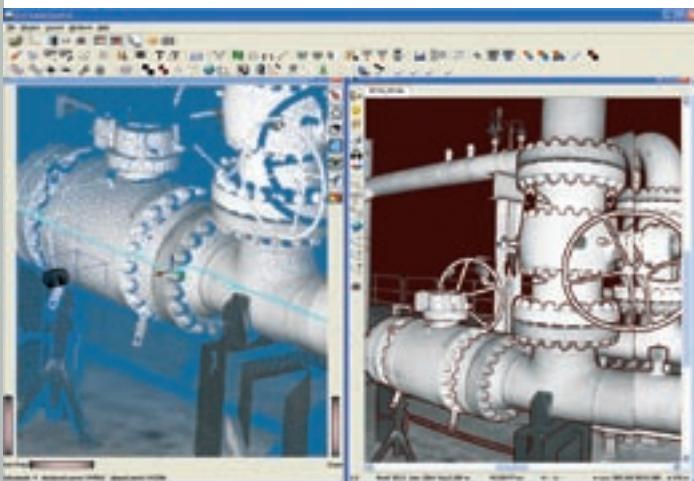


Z+F LaserControl

With the latest version of Z+F LaserControl Z+F has adjusted an already proven software tool to the requirements of the IMAGER 5006. The software offers the complete user platform for controlling the laserscanners IMAGER 5006 and IMAGER 5003.

Features:

- Easy as well as comfortable control of the laserscanner via notebook
- Visualization and control of the scan data directly after the scan, either as high-resolution 2D- grey scale picture or 3D point cloud
- The program comprises extensive measurement functions in 2D or 3D views, e.g. distance measurement between any captured point or orthogonal distance measurements
- Registration is effected via marked points (targets), natural object points or suitable spheres
- By using a digital camera measured points can be colored in real camera colors with the color mapping function



3D point cloud with a slice (left) and 2D reflectance image (right)

Z+F ProjectView

Z+F ProjectView was developed by Z+F. The server-based tool offers significant advantages for larger projects which are processed by various persons, even at different sites.

- Easy and efficient management of scans
- Scans are saved on a centralized server
- Program environment: Internet explorer
- All relevant persons have access to the scans via Intra-/Internet
- Overview is given with three main windows: 2D/3D-views, ground plan view and tree structure
- Lettering and marking function (redlining) in the scans

Visual Sensor Fusion® (VSF)

VSF is a software module from DelfiTech B.V. in the Netherlands, designed for the determination of criminals' sizes. For users in the forensics field the following new possibilities are offered:

- 3D- point clouds can be linked to 2D-photographs (e.g. from supervising monitors)
- The determination of the criminal's size can be effected via a virtual person which is positioned within the point cloud

JRC 3D Reconstructor®

The Reconstructor was developed by the Joint Research Center of the European Commission in Italy and comprises following functions:

- Measuring functions
- Pre-Registration/Registration (ICP)
- Coloring of point clouds/Texturing
- Comparison of actual state with target

Light Form Modeller (LFM) family

The software products of the LFM family offer further important tools for the user with large point clouds and data quantities. The product package comprises of complete, reliable and comprehensive solutions, all of them based on more than 10 years of experience.

LFM Modeller

LFM Lite Viewer:

- 3D and intensity view
- Floor plan navigation
- 3D point measurement
- Lettering function in the scans

LFM Viewer:

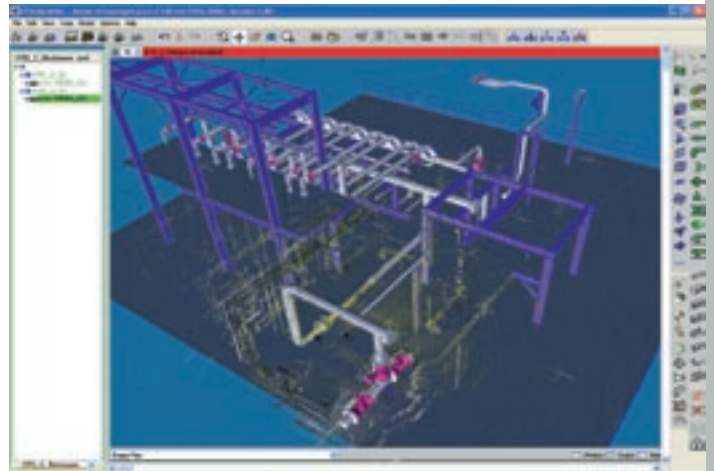
- Viewing of a LFM 3D model with pointcloud

LFM Register:

- Targetfinder for Targets and spheres
- Scan registration vs survey
- Scan to scan registration

LFM Modeller:

- 3D model generation
- Robot fitting algorithms
- Orthophoto generation



3D model in LFM Modeller – generated from scanned data

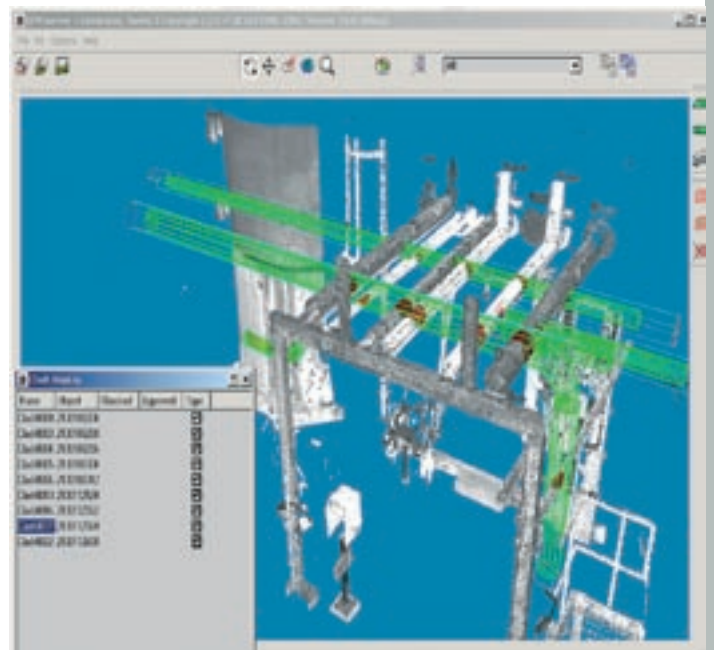
LFM Server

LFM Server:

- Database generation
- No limitation of the number of scans
- Clash detection between pointcloud and 3D-model
- Pipes
- 2D and bubble view

Optional:

- MicroStation Link
- AutoCAD Link
- PDS link, PDMS link, Smart Plant Review link



Clashdetection in LFM Server

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