



Z+F IMAGER® 5006h

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

Z+F IMAGER® 5006h



Wireless operation via PDA (WLAN)

In 2006 the Z+F IMAGER® 5006 was released.

It impressed due to its innovative stand alone concept, its ability to capture data at an exceptionally high resolution and its ease of use. Now in 2010, the Z+F IMAGER® 5006h maintains and builds upon the high standard of technology which lead to worldwide adoption of the highly regarded Z+F IMAGER® 3D Laser scanning series. The Z+F IMAGER® 5006h boasts an increased temperature range and an improvement in the point cloud data captured.

Configuration

Maximum mobility is guaranteed with the Z+F IMAGER® 5006h. The Z+F IMAGER® 5006h like its predecessor follows a stand alone concept featuring an integrated control panel, changeable and rechargeable battery and an internal hard disk. An USB interface is also included as are connections for network links, an additional power supply and Ethernet connection.

Power supply

The Z+F IMAGER® 5006h customer is afforded great flexibility in ease of handling with a choice of power supply options.

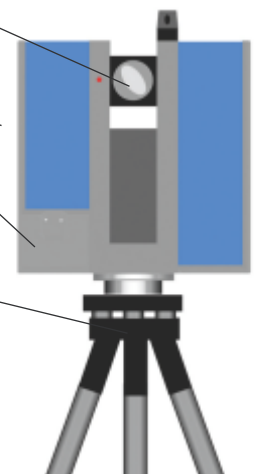
- A changeable battery pack allows wireless scanning for at least 2,5 hours. This simplifies the scanning process on site and reduces assembly time considerably.
- Where scanning time is expected to exceed the internal battery life, an external battery pack can be used. This provides the user with an additional four hours of battery life. A notebook computer may also be powered via this battery.
- Unlimited scanning time can be achieved by using a cable connection to AC power supply (90 - 260V).

Rotating mirror for 310° vertical scanning

Rotating device for 360° horizontal scanning

Changeable battery pack

Mounted onto the approved Wild/Leica tribrach system

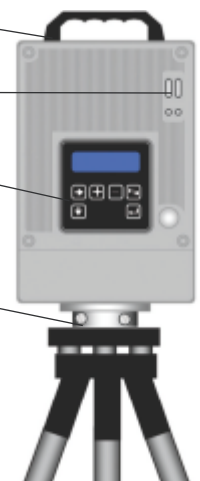


Carrying handle

USB-interface

Keypad/display combination

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



Handling

The Z+F IMAGER® 5006h has been designed with ease of handling, flexibility and intelligent control in mind.

- The Z+F IMAGER® 5006h can be operated via an integrated keyboard-display combination. The captured data is then saved on the internal hard disk.
- For external operation, the Z+F IMAGER® 5006h is equipped with WLAN and Ethernet-interface. A PDA or notebook/PC can therefore be used to operate the Z+F IMAGER® 5006h from a distance if required.
- The user can control the Z+F IMAGER® 5006h by 'Scan over IP' via the internet (this can provide operation and software updates). These options further increase the mobility of the system for its users.

Data capture/quality

- The Z+F IMAGER® 5006h can now be used in more applications than ever before due to an extended point density and an ambiguity range of 79m.
- The Z+F IMAGER® 5006h gives unrivaled accuracy for this type of system.
- The data is captured at a rapid pace. The acquisition rate of the Z+F IMAGER® 5006h is an incredible 1.016.727 points per second.
- The Z+F IMAGER® 5006h includes a minimum 60 GB storage capacity. This provides sufficient disk space to allow very intensive scanning.
- Data transfer to a notebook/PC is possible via WLAN or Ethernet connection.
- Data transfer to an external hard drive is possible via the USB connection.

Compatibility

- All accessories of the Z+F IMAGER® 5006h are compatible with the previous Z+F IMAGER® 3D laser scanners including the Z+F IMAGER® 5006h.
- The scanner can be mounted onto the standard Wild/Leica tribrach system.
- The Z+F IMAGER® 5006h is compatible with all Z+F software products such as LaserControl and Light Form Modeller (LFM).
- The laser scan data is also compatible with software products supplied by other supported external vendors such as Visual Sensor Fusion® (VSF), JRC 3D Reconstructor® etc.



USB 2.0-interface

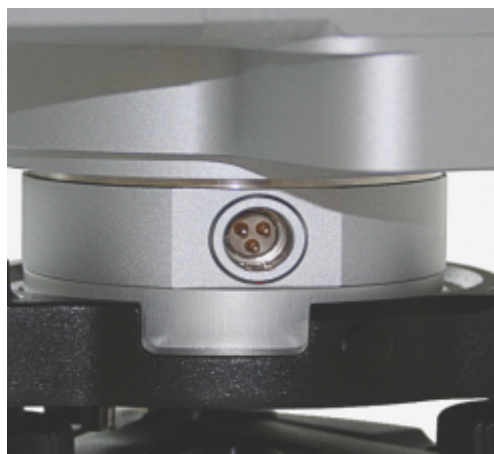


fig. left: Connection for the external power supply and the data download (Ethernet)



fig. right: Keypad and display

Digital site planning



Precise working is very important in this area. All details of existing plant environments and installations can be captured three-dimensionally with the Z+F IMAGER® 5006h.

Such accurate data forms a vital part of an asset management strategy as it enables Owner/Operators to better understand their asset. The as-built data also informs the design process when modifying or upgrading an existing capacity.

Clash checks can be performed allowing the user to automatically and reliably find interferences between existing conditions (laser data) and proposed changes.

The ability to upgrade and design an existing capacity from the safety of the office ensures minimum disruption to production. Significant cost savings can be achieved as standstill periods are reduced or avoided.



Factory site as 3D model – generated from scanner data

The Z+F IMAGER® 5006h is perfectly suited to the Process Power and Marine markets due to the vast amount of highly accurate, high resolution data that is captured, its ease of handling, portability and speed.

With LFM software, the data is taken from the field, through registration and viewing to the designers or operators desktop. At this stage an infinite number of measurements can be made, the user can generate 2D floor plans and elevation drawings. Furthermore semi-automated 3D models of the as-built plant or installation can be generated.

■ Areas of application:

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

Architecture & preservation of historical buildings



When the Z+F IMAGER® 5006h was developed, an incredible amount of care and attention was taken to ensure that the finished product achieved the highest levels of accuracy and resolution that are so important in this field.

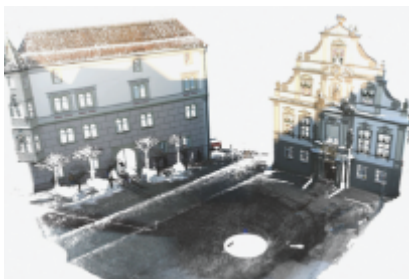
The outcome of this development process is a 3D Laser scanner that offers so far unachievable possibilities in data capture. A minimum range of 0,4 m ensures that even the finest details can be captured with the Z+F IMAGER® 5006h.

3D models generated from the laser data can be provided with textures and integrated into virtual-reality software packages making it possible to “walk” inside rooms and buildings even before they are built.

Additional benefits provided by the Z+F IMAGER® 5006h include the ability to capture color data. The demand for this is increasing due to the importance of matching the data set to the captured scan scene. This demand can be met by combining the technology in the Z+F IMAGER® 5006h with the Z+F M-CAM.

■ Areas of application:

- Castles
- Churches
- Museums
- Other buildings for documentation



Colormapping – 3D point cloud with RGB color information



Colormapping – 2D view with RGB color information



Colormapping – BubbleView with RGB color information

Accident documentation & infrastructure



■ Accident Documentation

Use of a very fast but nevertheless precise measurement system is very important when documenting or reconstructing accidents. Even the finest of details can be captured by the Z+F IMAGER® 5006h for example vehicles deformations or brake marks.

By capturing an accident in 3D the sequence of events can be more easily analysed and understood.

The Z+F IMAGER® 5006h can be used outdoor in almost any weather condition, making it perfectly suited to this application.

■ Areas of application:

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



Laserscanning in infrastructure facility

■ Infrastructure

Very precise 3D measurements can be made with the Z+F IMAGER® 5006h, even from moving platforms. The 3D laser scanner can be mounted onto a vehicle and measurements can be made of tunnels, railways or streets (Profiler Mode).



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

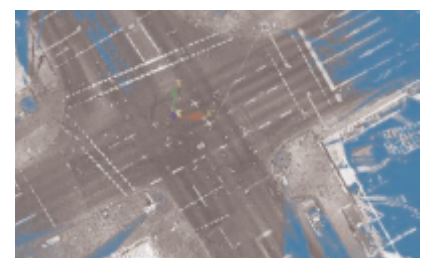


fig. bottom: Orthophoto view of a junction

Forensics



In the field of crime scene investigation, time is of the essence and before the investigation can begin, the crime scene should be documented. Documentation of the crime scene can be achieved rapidly and extremely efficiently with the Z+F IMAGER® 5006h. Large amounts of precise data can be captured from every corner of the crime scene and from even the most limited of areas, for example the area beneath a chair. Therefore the chance of missing important crime scene data is reduced.

Once this data is taken back to the desktop the investigator can reconstruct shot angles and simulate the course of events. Specialised software allows the criminals size to be determined facilitating the search for the guilty person(s).

The demand for colored point cloud data is very high in Forensics due to the additional information provided. Color capture can be achieved by combining the technology in the Z+F IMAGER® 5006h with the Z+F M-CAM. Approx. 28 color images are captured at the end of each scan taking approx. 3,5 minutes per scan. This color information can be automatically mapped onto the laser scan data providing the investigator with instant 'true to life' data.

■ Areas of application:

- Measuring of crime scenes
- Determination of criminals size
- Confirmation of eye witness testimony



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:	0.4 m
Resolution range:	0.1 mm
Max. data acquisition rate:	1 016 727 pixel/sec
Linearity error up to 50 m: ¹	≤1 mm
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):	2.6 mm rms
- Reflectivity 20% (dark grey):	1.5 mm rms
- Reflectivity 100% (white):	0.7 mm rms
Range noise at 50 m: ^{1 2 3}	
- Reflectivity 10% (black):	6.8 mm rms
- Reflectivity 20% (dark grey):	3.5 mm rms
- Reflectivity 100% (white):	1.8 mm rms
Range drift over temp. (-10°C to 45°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/rotating 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 (low quality ⁶) 50 rps	Scanning time (normal quality) 25 rps	Scanning time (high quality ⁶) 12,5 rps
- „preview“: ⁴	1 250	13 sec	25 sec	50 sec
- „middle“:	5 000	50 sec	1 min 40 sec	3 min 20 sec
- „high“:	10 000	1 min 41 sec	3 min 22 sec	6 min 44 sec

	Pixel/360°	Scanning time (low quality ⁶) 50 rps	Scanning time (normal quality) 25 rps	Scanning time (high quality ⁶) 12,5 rps
Resolutions:	(vertical, horizontal)			
- „super high“:	20 000	3 min 22 sec	6 min 44 sec	13 min 28 sec
- „ultra high“: ⁵	40 000		26 min 44 sec	53 min 20 sec
- Max: resolution for selections:	100 000			

Miscellaneous

Tilt sensor:	
- Resolution:	1/1 000°
- Accuracy (zero point): ⁷	1/500°
Data storage:	Internal HDD (≥ 60GB)
Data interface:	Ethernet / USB 2.0
Communication interface:	Ethernet / WLAN
Integrated operation panel:	
- Keypad:	4 Lines
- Display:	6 Buttons
Power supply:	
- Input voltage:	24V DC (scanner) 90 - 260V AC (power unit)
Power consumption:	65 W max.
Battery life time:	
- Changeable battery pack:	2.5 h
- External battery (TRAPP-15-24):	4 h
Ambient conditions:	
- Calibrated temperature:	-10°C to 45°C
- Storage temperature:	-20°C to 50°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 412 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 request – please contact info@zf-laser.com

² data-rate of 127 000 pxl / sec., 1 sigma range noise, unfiltered raw data, in high power mode

³ all values are extrapolated

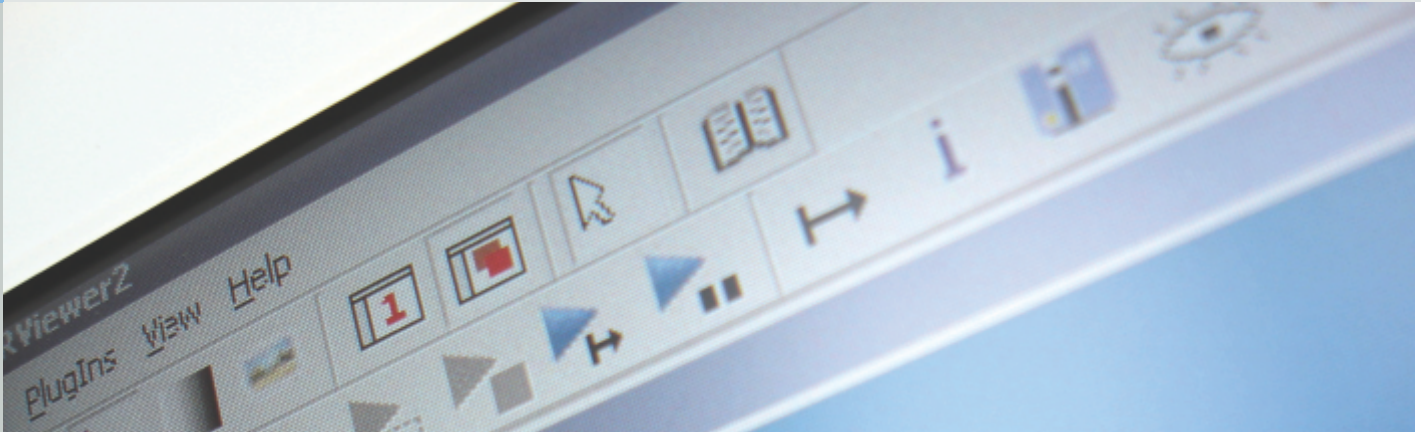
⁴ not recommended for exact measurements, should only be used as an overview

⁵ only recommended for selection scans, as the data will be too large for further post processing

⁶ Doubling (“low quality”) and halving (“high quality”) of the data rate (pixels / sec), increases the range noise on each pixel theoretically by 40% (“low quality”) or decreased it by 40% (“high quality”) in comparison the “normal quality”. Related to the roughness of the measured surface, the difference in reality can be less, especially when scanning objects with bright surfaces in short distances, e.g. indoor.

⁷ Zero can be determined by automatic alteration

Software



Z+F LaserControl

The latest version of Z+F LaserControl has been adjusted to meet the requirements of the Z+F IMAGER® 5006h. LaserControl is a proven software tool designed for control of the Z+F IMAGER® series.

Features:

- LaserControl allows the 3D laser scanner to be controlled easily and intuitively via a notebook computer or laptop.
- LaserControl allows for visualization and control of the 3D laser scanner on site, either as a high resolution 2D gray scale picture or a 3D point cloud.
- Extensive measurement facilities in both the 2D and 3D views are possible, e.g. distance measurement between any captured point or orthogonal.
- Registration is effected via marked points (targets), natural object points or suitable spheres.
- By using the Z+F M-CAM black and white points can be colored by mapping the color information into the laser scan data.

Visual Sensor Fusion® (VSF)

VSF is a software module from DelftTech B.V., a software developer and authorised service provider of Z+F products in the Netherlands.

Features:

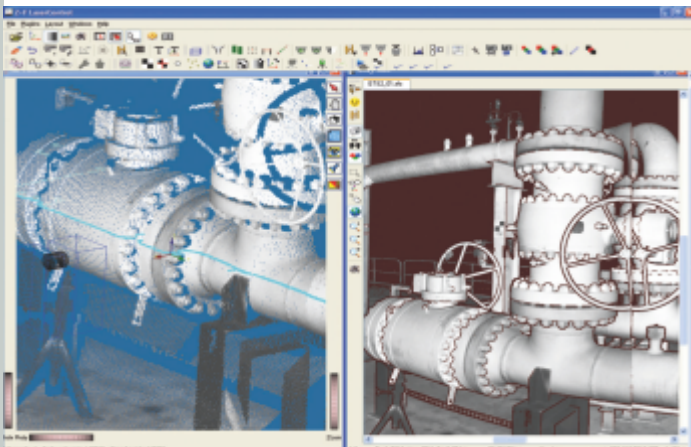
- 3D point cloud data can be linked to 2D photographs.
- The criminals size is determined by way of placing a virtual character into the point cloud.

JRC 3D Reconstructor®

JRC Reconstructor was developed by the Joint Research Center of the European Commission in Italy.

Features:

- Measuring functions
- Pre-Registration/Registration (ICP)
- Coloring of point clouds/texturing



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

Light Form Modeller (LFM) family

LFM or Light Form Modeller is the primary software product developed and marketed by Z+F. The product package comprises of complete, reliable and comprehensive solutions, all of them based on more than 10 years of experience.

LFM Modeller

LFM ViewerLite

- Powerful viewing package
- High resolution BubbleViews
- Key plans for ease of navigation
- Extensive mark up and measurement facilities

LFM Viewer

- Features all the benefits of LFM ViewerLite
- 3D solid CAD objects can be imported into LFM Viewer

LFM Register

- Target finder for Targets and spheres
- Scan registration vs. survey
- Scan to scan registration
- Inter Cloud Registration (ICR) - Registration is possible even when some targets are not visible
- "Traffic light system" indicates quality of registration

LFM Modeller

- 3D model generation
- Robust fitting algorithms
- Orthophoto generation
- BubbleView Modelling
- Several export routes
- Advanced structural standards are available

LFM Server

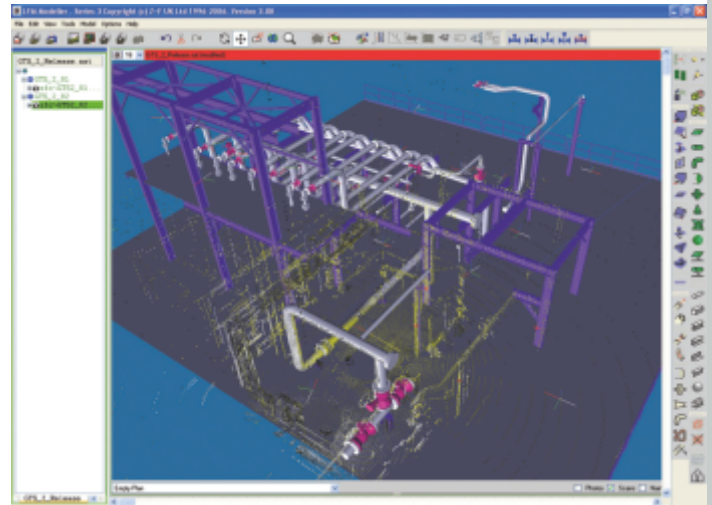
- Create and then Load multiple databases simultaneously
- A Database can be generated from an unlimited number of individual scans
- Advanced clash detection tools between as-built data
- High resolution BubbleViews
- Smart Demolition mode

Optional:

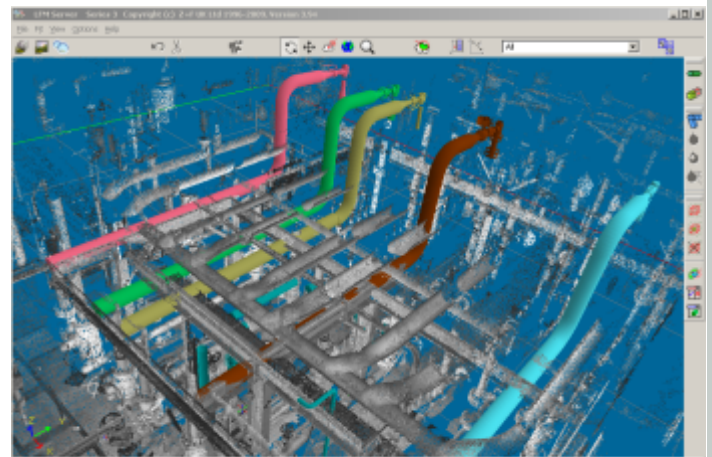
- Autodesk - AutoCAD link
- Bentley MicroStation link, AutoPlant link
- AVEVA PDMS link, Review link
- Intergraph PDS link, SmartPlant 3D link, SmartPlant Review link
- COADE CADWorx link
- VR Context Walkinside link
- Clash
- Segmentation

LFM NetView

- Remote access on LFM Server projects
- Data sharing via internet
- Communication tool
- Measurement, mark up features
- Master-Slave session



3D model in LFM Modeller – generated from scanned data



Clash detection in LFM Server



Measurements and mark ups in LFM NetView

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