



How we build reality



Zoller + Fröhlich GmbH was founded in Wangen in 1963. Initially the company concentrated on the design and implementation of individual control systems for the automobile and engineering industry.

The construction of the company's own switch cabinet was the reason behind the invention of ferrules with plastic sleeves to simplify the wiring of control systems. Due to a constant process of development and innovation, the first machines for the manufacturing of crimp contacts and cable assembly were designed. Because of the complexity of these machines great attention is given to their operation. Ergonomic handling by human operators who ensure a smooth production by permanent control. To achieve this, simulation studies and several specific operator simulations were carried out to create

an ergonomic design optimizing the manual working processes and environment. Today Zoller + Fröhlich stands for innovation and quality in the electrical engineering world far beyond the borders of Europe.

Apart from these areas, the development and production of sensor systems with personalised CAD software solutions for 3D environment modeling represent a new cornerstone to secure the company's viability in the future.

Already in the 90's, Zoller + Fröhlich began exploring Laser measurement technology and was awarded to the Dr. Rudolf Eberle prize, "Innovations in Baden-Württemberg" in December 1998.

In the early 90s, the first laser system for measuring rail track and tunnels was developed and followed by the first "visual 3D laser measurement system for assessing the condition of objects" in 1996. By launching the IMAGER 5003 in 2002, Zoller + Fröhlich stepped into the Laserscanner market with the first compact device produced in series with a range of 53.5 m and a maximum data capture rate of 500,000 pixel/sec.

In 2006, the success story of the IMAGER series was continued with the Z+F IMAGER 5006. Thanks to its integrated control panel, a powerful internal PC, hard disk and internal battery, the IMAGER 5006 was the first stand-alone 3D laser-scanner worldwide.



The first compact device: Z+F IMAGER 5003

Making visions come true

Upgrades to the 5006i and 5006h versions followed in 2008 and in 2010. With a data acquisition rate of 1,016,027 pixel/sec, the Z+F IMAGER 5006h is the fastest 3D laser measuring device in the world.

Apart from the Z+F IMAGER for 3D laser scanning, other devices were developed as well. The Z+F PROFILER, a 2D laser measuring device for kinematic applications use, appeared on the market in 2002. These instruments are designed for the use on mobile platforms such as railway or road vehicles. The development stages of the PROFILER are identical to those of the Z+F IMAGER.

In 2009 the IMAGER 5006EX was presented. Based on the IMAGER 5006, it was the first explosion proof 3D laser scanner worldwide. Due to its ATEX classification, this device could be used in environments where explosive gases, dust, aerosols are present which can be ignited by electric or mechanical devices. Zoller + Fröhlich scanners come equipped with many accessories. In addition, numerous innovative solutions are offered to increase efficiency of individual applications.

For data evaluation and data processing, Zoller + Fröhlich provides numerous solutions. The software package Z+F LaserControl is designed for high accurate pre-processing obtaining top data quality and is equipped with tools for point cloud processing.

Visionary ideas combined with down-to-earth expertise are the cornerstones of our success. Zoller + Fröhlich has always encoura-



ged innovative thinking to create future-oriented products, reflected by the numerous patents and prizes awarded to the company.

The relationship to costumers and partners is most important for Zoller + Fröhlich. Users worldwide appreciate our personal service and technical support. Today Zoller + Fröhlich is one of the leading enterprises in the field of contact-free laser measuring technology. Thanks to years of practise and countless concluded projects, we built a wealth of experience and success. At present, Zoller + Fröhlich is represented in 40 different countries with branches in England and USA, and many sales co-operations throughout the world. The success of Zoller + Fröhlich can be attributed to first-class service and personal advice.



*In operation in Angkor Wat:
Z+F IMAGER 5006i*



*Explosion proof:
IMAGER 5006EX*

Z+F IMAGER® 5006h

Configuration

Maximum mobility is guaranteed with the Z+F IMAGER 5006h. The scanner follows a 'stand-alone' concept featuring an integrated control panel, a changeable and rechargeable battery, an internal hard disk and W-LAN access. Connections for USB-drives are also provided, as well as for an additional power supply and Ethernet. The instrument also includes an electronic tilt sensor, to detect movements during a scan.

Power supply

- 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).

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® 5006.
- The IMAGER 5006h perfectly communicates with the Z+F software products such as LaserControl.
- The laser scan data is compatible with a wide range of software products such as Visual Sensor Fusion® (VSF), JRC 3D Reconstructor®, LFM, Geomagic etc.



Rotating mirror for 310° vertical scanning





For more information please scan the QR-Code



Handling

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

- The laserscanner can be operated via an integrated keyboard-display combination. The captured data is stored on the internal hard disk.

- For external operation, the IMAGER 5006h is equipped with W-LAN and Ethernet-interface. A mobile device or Notebook/PC can therefore be used to operate the scanner from a distance if required.

- The user can control the IMAGER 5006h by 'scan over IP' via a browser.



USB-interface



Keypad/Display

Quality

- The IMAGER 5006h can now be used in more applications than ever before due to an extended point density and an ambiguity range of 79 m.

- The scanner provides highly accurate data.

- The data is captured at high speed. The acquisition rate of the IMAGER 5006h is at top performance 1.016 million pixel/sec.

- The laserscanner includes a minimum of 60GB storage capacity. This provides sufficient disk space to allow very intensive scanning over several days.

- Data transfer to a Notebook/PC is possible via W-LAN or Ethernet connection.

- Data transfer to an external hard drive is possible via the USB connection.



Changeable battery pack



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



Application Areas



Fort Konstantin

Cultural heritage

The Z+F IMAGER sets an impressive record in this field because of its contact-free, and above all rapid measuring ability. This reduces costs tremendously in comparison to traditional measurement systems. The optional M-Cam enables the whole point

cloud to be coloured, which gives a photorealistic impression of a scan with a high level of detail. The low noise level means that despite long distances, a very high data quality and scan resolution can be achieved and even small details can be captured.



3D point cloud of a burnt restaurant

Insurance

The enormous scan rate and high-resolution allow the Z+F IMAGER to “freeze” scenes rapidly for later analysis and in extraordinary quality. In this case, the data serves mainly for preserving evidence and documenting damage. Using the Z+F

LaserControl software, the scenes can be visualized afterwards. This leads to great time savings for accident reconstruction, checking plausibility where manipulation is suspected and many other insurance purposes.

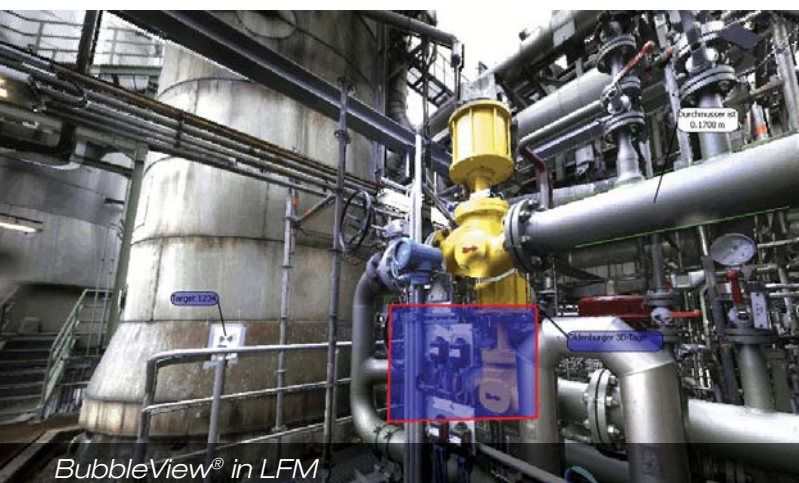


Helicopter crash Regional CID Baden-Württemberg

Forensic science

The decisive advantage of the Z+F IMAGER in forensics is the immense speed. The crime scene can be documented holistically without interfering with the running investigation.

The optional M-Cam provides colour information in order to create a photorealistic image of the scene. The high resolution enables to capture even inconspicuous details being preserved as evidence.



BubbleView® in LFM

Industry

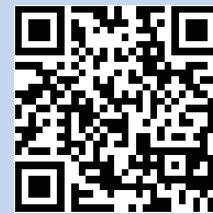
Z+F IMAGER's extreme speed reduces downtimes of industrial plants to a minimum. The high level of detail facilitates modeling of extraordinary accuracy. This enables a subsequent comparison between the revamp design and the

as-built site. Another advantage is its ability to operate in a temperature range of -10 °C to +45 °C.



Accessories

For more information please scan the QR-Code



The hard case ensures the safe storage of the accessories

Every Z+F laser scanner is delivered with an accessory case that includes the following items:

- 1 extra battery pack
- 1 charger cradle
- 1 battery charger
- 1 Ethernet cable
- 1 power cable
- 1 extension cable

For the registration of several scans in one project, there are various target types available.

The typical PaperTargets can also be employed with the IMAGER 5006h.



PaperTarget



Z+F ProfiTarget



Z+F AutoTarget

The Z+F ProfiTargets can be rotated two-axially around the target centre for perfect alignment to the scanner position.

The Z+F AutoTargets offer the fastest way of registration since they are automatically recognized in the scan by the software. Numbering also takes place automatically with the integrated code ring.

Whichever target is used, the software automatically recognizes the target centre to an accuracy of less than one pixel.

In addition, it is possible to include tachymetry data for georeferencing, and also to increase accuracy of registration through bundle adjustment.

The M-Cam, an industrial colour camera with a resolution of five

megapixels, takes pictures in order to colour the point clouds (360° x 320°). It can be easily mounted onto the scanner, and is connected via two USB cables and a LEMO cable. The camera and its power supply are controlled by the scanner.

The pictures are automatically associated and saved with the respective scan. The camera calibration specifications are included in the bundle.

The aluminium tripod is very light and easy to handle. Because of its high stability it is suited for various applications. The quick-release clamps make it very easy to adjust the height and to quickly assemble and dismantle it. A dolly ensures maximum mobility.

Detailed descriptions about numerous additional accessories are available at www.zf-laser.com.



The M-Cam can be mounted effortlessly



Aluminium tripod

Technical Data

The imaging 3D laser measurement systems are applicable in the fields of digital planning of factories, industrial plants, architecture, protection of historic monuments, landscape and virtual reality. They are based upon the Z+F spot Laser Measurement System LARA.



Lasersystem			
Laser safety class	3R (ISO EN 60825-1)		
Beam divergence	0.22 mrad		
Beam diameter	3 mm circular (1 m distance)		
Ambiguity interval	79 m		
Min. range	0.4 m		
Resolution range	0.1 mm		
Data acquisition rate	≤ 1,016,027 pixel/sec		
Linearity error up to 50 m ¹	≤ 1 mm		
Range noise	black 10 %	grey 20 %	white 100 %
Range noise, 10 m ^{1 2}	1.2 mm rms	0.7 mm rms	0.4 mm rms
Range noise, 25 m ^{1 2}	2.6 mm rms	1.5 mm rms	0.7 mm rms
Range noise, 50 m ^{1 2}	6.8 mm rms	3.5 mm rms	1.8 mm rms
Temperature drift (-10°C to -45°C)	negligible due to internal reference		



Deflection Unit	
System vertical	rotating mirror
System horizontal	rotating device
Field of view vertical	310°
Field of view horizontal	360°
Resolution vertical	0.0018°
Resolution horizontal	0.0018°
Accuracy vertical ¹	0.007° rms
Accuracy horizontal ¹	0.007° rms
Scanning speed	≤ 50 r/s (3,000 r/min) max.

Resolution	Pixel/360° horizontal & vertical	Scanning time		
		low quality	normal quality	high quality ⁵
Resolutions		50 rps	25 rps	12,5 rps
„preview“ ³	1,250	13 sec.	25 sec.	50 sec.
„middle“	5,000	50 sec.	1:40 min.	3:20 min.
„high“	10,000	1:41 min.	3:22 min.	6:44 min.
„super high“	20,000	3:22 min.	6:44 min.	13:28 min.
„ultra high“ ⁴	40.000	-	13:38 min.	26:36 min.

Z+F IMAGER[®] 5006h

General	
Tilt measurement	Resolution: 1/1,000° Accuracy (zero point): 1/500°
Communication	Ethernet/W-LAN
Data storage	internal HDD (60 GB)
Integrated operation panel	> Keypad: 6 Buttons ; > Display: 4 Lines
Data interface	Ethernet/USB 2.0

Power supply	
Input voltage	24V DC (scanner)/90-260V AC (power unit)
Power consumption	65 W max.
Battery life time	2.5 h typ. (changeable battery pack) 4 h (external battery (TRAPP - 15 - 24))

Ambient conditions	
Calibrated temperature	-10 °C to +45 °C
Storage temperature	-20 °C to 50 °C
Illumination	all conditions from darkness to daylight
Humidity; Dust/air humidity	non-condensing
Target reflectivity	no retro-reflectors

Dimensions and weights	
Scanner: (w x d x h)	286 x 190 x 412 mm
Weight	14 kg
Bottom of scanner to horizontal axis	242 mm
Tripod:	
Height	approx. 800 - 1,400 mm
Diameter	approx. 1,200 mm
Weight	9 kg

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. not recommended for exact measurements, should only be used as an overview
4. only recommended for selection scans, as the data will be too large for further post processing.
Resolution of 100,000 pxl/360° for selections
5. Doubling (“less quality”) and halving (“high quality”) of the data rate (pixels / sec), increases the range noise on each pixel theoretically by 40% (“less 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.





LaserControl Software

Z+F LaserControl provides all necessary tools to manage your scan jobs efficiently. It is a unique software solution with complete workflow from data capturing to delivery. Three different software packages are available for getting the ideal solution according to your needs.



Elements

Z+F LaserControl **Elements** is the freedom to view and browse your point cloud data without any cost. Besides checking the accuracy status of the device calibration, basic measurement functions are implemented. Furthermore it is the key to access and operate all Z+F products of the entire Z+F IMAGER and Z+F PROFILER family.



Professional

Z+F LaserControl **Professional** is the standard solution for common use with every laserscanner of the IMAGER and PROFILER series. A suite of filters allow differentiated preprocessing of scan data and are the key to a highly accurate registration. By adding colour information with the included color module the scan data is ready for post-processing through a wide range of export formats. Naturally all LaserControl Element features are included. In addition the Kinematic function gives extended usability for profiling applications.



Professional PLUS

Z+F LaserControl **Professional PLUS** provides extended functions for registration, additional data visualisation and project management tools. Both Cloud-to-Cloud and Plane-to-Plane registration decrease the need for targets dramatically. Saving time in the field and in the office are striking benefits of these future orientated registration tools. Furthermore fly throughs can be generated, simulated and saved. Your static imagery can be rectified and printed to scale. The relocation of misplaced data with the mirror filter is the right tool to bring your point clouds to perfection. Finally the linktool offers you best usability for project management.

Color

An ideal starting point for visualising objects is obtained by combining 3D data with digital photography. The documentary value of the colour data is important for many applications. The colour images are projected onto the point clouds and provide a photographic impression of the object in 3D.

Forensics

The forensics module is a client-specific product design that also equates the high requirements from the German police. Using 3D data enables investigators to visualise the crime scene and adjust the storyline.

Import/Export

A great variety of import and export formats are supported by LaserControl. As well as many ASCII-based exchange formats, the new binary standard formats OSF, PTG and ASTM-E57 can also be used for export.

LFM is hardware and software vendor neutral. It accepts data from all 3D laser scanners and exports to 3D integrated plant design systems CAD and Review platforms.

Whether you are a service provider looking for fast database generation, an owner operator looking for an effective asset management tool, or a designer working on the latest process plant for a major oil and gas multinational company, the use of LFM Software brings business benefits to brownfield and as-built documentation projects.

LFM software users can benefit from an open system without compatibility restriction. LFM aims to be neutral on both ends: neutral with respect to capture devices and neutral with respect to CAD and modelling technologies. Surveyors and service providers can use LFM to create any number of CAD deliverables. Engineering companies and Owners/Operators can work with LFM laser scan data in CAD packages from Autodesk, AVEVA, Bentley, Intergraph or VR Context.

LFM is compatible with the latest IMAGER generation and also accepts 3D laser scan data from previous generations and other hardware systems. This has cost saving implications for LFM customers. If the hardware system changes, the software solution does not, avoiding expensive switching costs.

Z+F GmbH is a LFM Value Added Reseller. LFM is a powerful 3D laser scanning software package, which is relevant throughout the laser data and asset lifecycle.

The LFM Suite

LFM Register

LFM Register™ allows users to take raw data from individual 3D laser scanning positions and bring them together into a fully co-ordinated framework faster and more efficiently than any other package.

LFM Server

Bring laser scan data into any number of leading CAD packages. Create a database containing an unlimited number of high resolution scans using Infinite Core™ technology. Automatically detect clashes between a CAD design and as-built laser scan data.

LFM NetView

LFM NetView provides users with comprehensive and easy-to-use tools to help projects collaboration even when multiple users are in different part of the world.

LFM Modeller

Rapidly produce 3D CAD models from as-built laser scan data with only a few clicks, and export their intelligent 3D model creations into a wide range of target CAD systems.



LFM is driven by the BubbleView®. Make annotations and measurements, create 3D models and view clashes in the BubbleView®.



Z+F
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50 YEARS

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