



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.



*Explosion proof:
IMAGER 5006EX*

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*



IMAGER 5006EX

Housing

Due to its pressure-resistant case, the device can be used in areas where explosive atmospheres caused by gases, vapours or mists are likely to occur.

Hard drive

The captured data is stored on the internal hard disk with at least 60GB capacity.

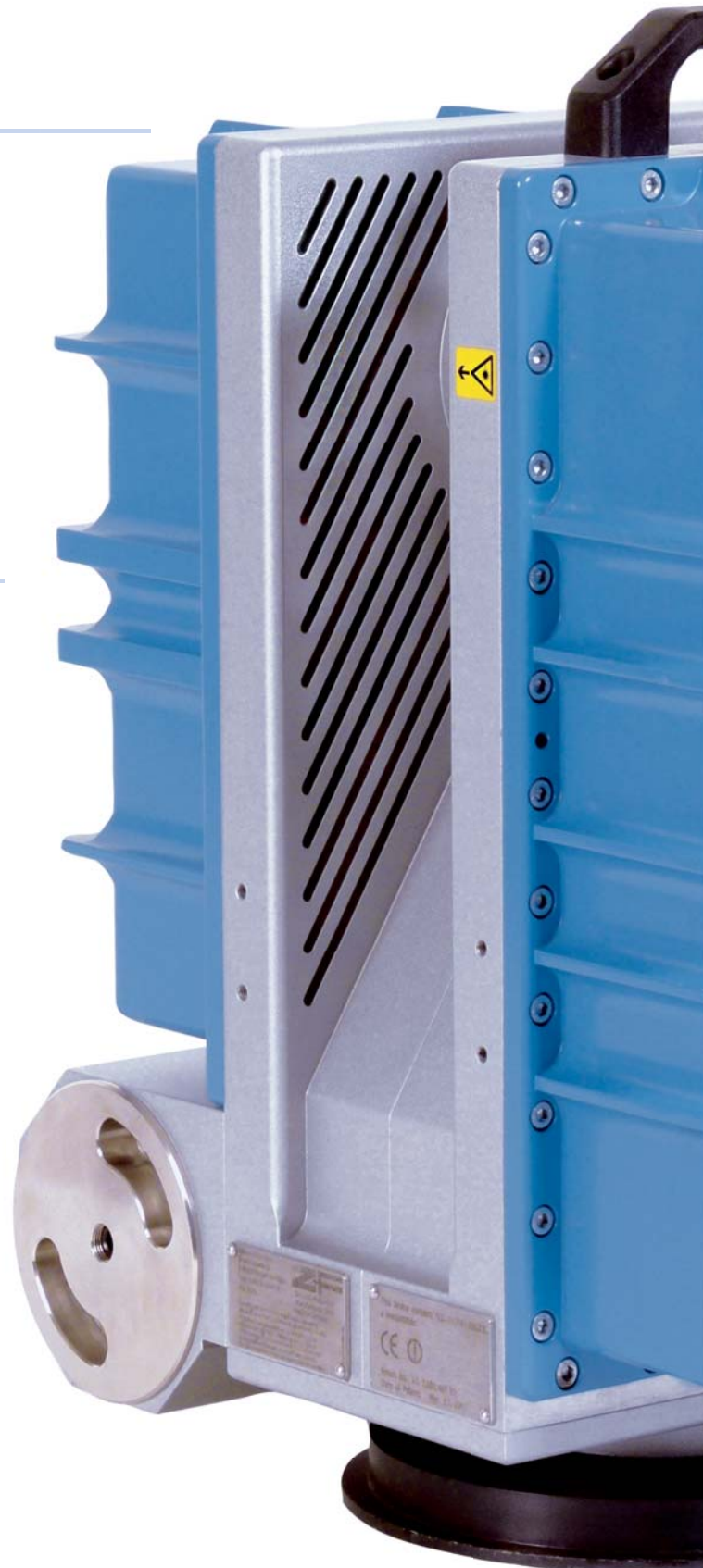
Quality

The IMAGER 5006EX is used in various applications due to the great point density and excellent accuracy. The data acquisition rate of 508,000 points per second allows very fast data capturing and project time savings.



Power supply

The scanner has a changeable internal battery pack that allows wireless scanning for 1 hour. The battery pack has been designed to allow the user to change it in an explosive environment, ATEX standards prohibit the use of external power supplies.



For more information please scan the QR-Code



Compatibility

The IMAGER 5006EX is compatible with all Z+F software products such as Z+F LaserControl. The data format is also widely supported by external software products, such as Visual Sensor Fusion (VSF), JRC 3D Reconstructor, Cyclone, Edgewise etc.

Operation

The IMAGER 5006EX can be operated via the integrated control panel. For external operation the scanner is equipped with a Wi-Fi interface. Therefore a PDA or notebook (ATEX certification needed) can be used to operate the scanner from a remote place. The Ethernet interface can be used outside the explosive environment.



Tripod/Prism

The scanner can be mounted on a special tripod available from Z+F. The tripod allows the user to level the scanner horizontally.



IMAGER 5006EX

The world's first ATEX approved 3D laser scanner.

Based on the high quality laser scanner Z+F IMAGER® 5006i, Zoller + Fröhlich GmbH and DMT GmbH & Co. KG have developed the first explosion proof 3D laser scanner. The IMAGER 5006EX pioneers surveying in underground mining and industries where explosive atmospheres occur. The IMAGER 5006EX is the world's first ATEX approved 3D laser scanner for use in mining and industrial applications under explosive conditions.

The IMAGER 5006EX is class I and class II approved according to ATEX directive 94/9/EG. The ATEX directive 94/9/EG „Equipment and protective systems intended for use in potentially explosive atmospheres“ is a European standard. The ATEX approval for this equipment is widely accepted outside the European community as well.

Class I (equipment marking: I M2 Ex d [ib] op is I)

As the first ATEX specified laser-scanner the IMAGER 5006EX can be reliably used even in harsh underground environments, throughout a wide range of mining applications. The equipment is tested and certified for ATEX equipment category 2.

Definition

1. **Equipment group I** (Mining) **category M2** (must be deenergized in the event of an explosive atmosphere)
2. **d** (flameproof enclosure)
3. **ib** (i=intrinsic safety; **ib**=application in zone 1,2)
4. **op is** (optical radiation; **op**= intrinsically optical radiation)
5. **I** (methane)

Class II (equipment marking: II 2G Ex d [ib] op is IIB T4)

The IMAGER 5006EX is approved for class II, which allows a diverse range of industrial applications. However it is important to verify the industrial environment for the appropriateness of the IMAGER 5006EX prior to use.

Definition

1. **Equipment group II** (other explosive atmospheres) **category 2G** (atmosphere G (Gas) - Zone 1)
2. **d** (flameproof enclosure)
3. **ib** (i = intrinsic safety; **ib**=application in zone 1,2)
4. **op is** (intrinsically optical radiation)
5. **IIB** (ethylene)
6. **T4** (maximum permissible surface temperature: 135°C)

The IMAGER 5006EX with its pressure-resistant case is tested for usage in category 2G. It can be used in areas (zone I and II) where explosive atmospheres, caused by gases, vapours or mists, are likely to occur.

The IMAGER 5006EX is also approved for gas group IIB. In this gas group the reference gases are ethylene, city gas and other industrial gases.

Another important specification is the temperature classification which specifies the maximum equipment surface temperature. The IMAGER 5006EX is approved for temperature class T4, where the surface temperature is allowed to reach 135°C. This is an important consideration for plant operators. The calibrated scanner can operate in temperatures of 0°C to 40°C.



Translation

EC-Type Examination Certificate

- (1)
- (2) **- Directive 94/9/EC -
Equipment and protective systems intended for use
in potentially explosive atmospheres**
- (3) **BVS 09 ATEX E 078**
- (4) **Equipment: Laser scanner type Imager 5006EX and
Power Supply type 5006EX**

[ATEX certificate](#)

Application Areas

The IMAGER 5006EX is already being used successfully for

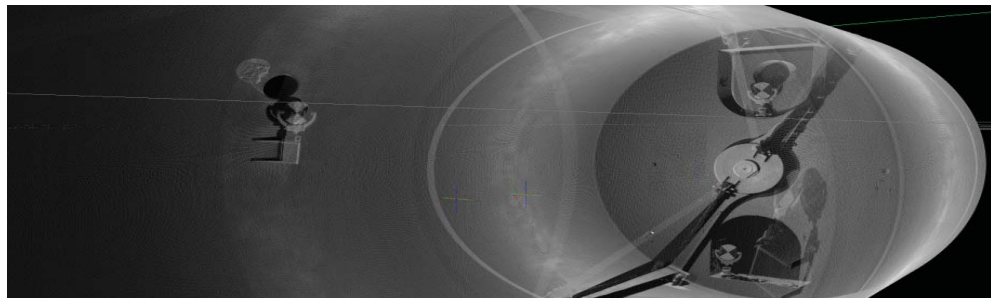
As-built documentation

3D coordinates are available in millimetre precision for future constructions and revamps, which can be used to easily derive 2D construction plans.



Deviation analysis

The 3D raw data (point clouds) can be directly compared to existing CAD models and can thus immediately detect any structural variations.



Deformation analysis

Scan data can be used to create a very detailed deformation analysis to monitor certain areas of interest over time. It is also a popular and reliable documentation tool for the preservation of evidents, e.g. accidents.



Safety and hazard analysis

Threatening dangers can be detected in time. Therefore effective protection measures can be introduced.



Technical Data

The world's first 3D Laserscanner offers a lot of advantages: the ability to swap batteries in explosive environments, a unique 'stand alone' concept to allow an easy operation and quick setup of the instrument, direct control of the scanner via an integrated control panel and display and wireless operation via W-LAN.



Lasersystem			
Laser safety class	3R (ISO EN 60825-1)		
Beam divergence	0.22 mrad		
Beam diameter	3 mm circular (1 m Ddistance)		
Ambiguity interval	79 m		
Min. range	0.4 m		
Resolution range	0.1 mm		
Data aquisition rate	≤ 508,000 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 (0°C to 40°C)	negligible due to internal reference		

Deflection Unit	
System vertical	rotating mirror
System horizontal	rotating device
Field of view vertical	310°
Field of viewhorizontal	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 for 360°
Resolutions		
„preview“	1,250	25 sec..
„middle“	5,000	1:40 min
„high“	10,000	3:22 min
„super high“	20,000	6:44 min
„ultra high“	40,000	26:40 min
„max. resolutions for selections“	100,000	---



IMAGER 5006EX

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

Power supply	
Input voltage	18V DC (scanner)
Power consumption	65 W max.
Battery life time	1.h typ. (changeable battery pack)

Ambient conditions	
Calibrated temperature	0°C to +40°C
Storage temperature	-20°C to +50°C
Illumination	all conditions from complete darkness to bright daylight
Humidity; Dust/air humidity	non-condensing
Protection class	IP 53
Explosion protection	ATEX 94/9/EG, class I and II
Target reflectivity	no retro-reflectors

Dimensions and weights	
Scanner: (w x d x h) weight	250 x 395 x 414 mm 30.6 kg
Bottom of scanner to horizontal axis	343 mm
Tripod: Height Diameter Weight	approx. 800 - 1,400 mm approx. 2,800 mm 12 kg

1. detailed explanation on demand – please contact info@zf-laser.com
2. data acquisition rate: 127,000 pxl/sec





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

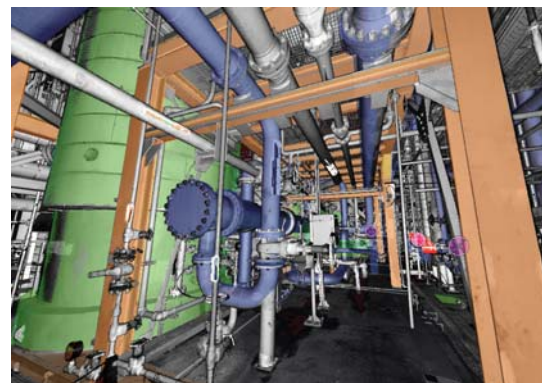
Bring laser scan data into any number of leading CAD packages. Create a database containing an unlimited number of high resolution scans using Infinite Core™ technology. Automatically detect clashes between a CAD design and as-built laser scan data.

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®.

Visit us online: www.lfm-software.com | Or call +44 161 8690450



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