Zoller+Fröhlich

50 YEARS

How we build reality

Z+F IMAGER® 5010C

Zoller + Fröhlich

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.

The first compact device: Z+F IMAGER 5003

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 laserscanner worldwide.

Making visions come true

Explosion proof: IMAGER 5006EX

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 ignated 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 encouraged 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

Z+F IMAGER® 5010C

Rotating i – Cam

The camera is fully embedded within the rotor, and therefore well protected against environmental influences. In order to achieve a perfect image quality, even under difficult lighting conditions, the camera provides full HDR panoramic images of up to 80 Mpixel per scan.

Rotating mirror

The rotating mirror is completely encapsulated and extremely well protected from the environment. This makes the scanner ideal for outdoor use. With a maximum rotation speed of 3,000 rev/min and a maximum scan rate of 1 million pixel/sec, it is possible to do complete panorama scans at a high resolution within extremely short time.

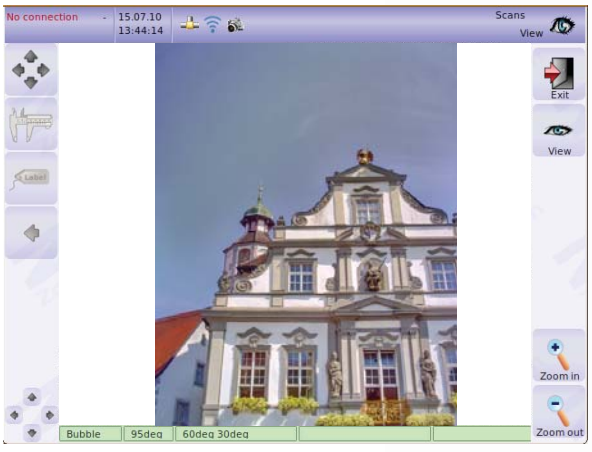
Integrated control panel

Due to the high-resolution colour display with integrated touch screen the scanner can be operated intuitively. The operating manual is available in the scanner menue.

In addition, simple measurement and navigation functions can be conducted in order to guarantee quality assurance already on-site.

High resolution colour display

It enables the user to display the data in various views immediately after scanning.



For more information
scan the QR-Code

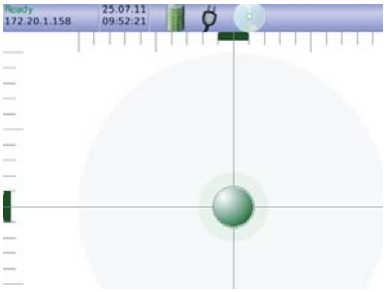
USB ports
The scanner has two USB ports for 32 GB flash drives which are integrated into sealed closure casings. This allows external data storage on removable devices. An external hard drive can also be connected to one of the USB ports.

LEMO connections
In combination with the USB ports, the external LEMO connections are used for controlling accessories. Furthermore, external sensors like a GPS receiver can be connected. The submitted time stamps can be used to synchronize the scan data precisely and be fed into the scan data stream. Digital time-stamp output signals are available as well.

Connections for power supply and data download
These connections are located in the lower scanner part.

Ethernet/W-LAN interface
The integrated W-LAN interface allows to command the scanner using a standard web-browser (Internet Explorer, Mozilla Firefox, etc.) via the IP address.

Laser plummet
With the laser plummet, the instrument can be accurately positioned above a known physical coordinate.



Dual-axis compensator
The built-in dual-axis compensator helps to improve the registration and supports geodetic measurement techniques, as free positioning. The dual-axis compensator is also used as a bubble level for horizontal set-up of the scanner.

Z+F IMAGER® 5010C

The colourful way to scan: colourfast, high dynamic and flexible.

The Z+F IMAGER 5010C sets new standards for 3D laser scanning. The IMAGER 5010C is a high-end product deriving from the evolution of the most reliable phase-shift technology.
The IMAGER 5010C is outstanding for its incredible speed and simple operation interface allowing extreme efficiency.

Laser class 1
The IMAGER 5010C with a wavelength of 1.5 µm complies to laser class 1 (EN 60825-1) thus the laser beam is rated harmless.

Range 187 metres
Due to the wavelength and the approved ranging system, the device operates within a maximum range of 187 m. This long range is unique for phase techology laserscanners and a new field of applications.

High-speed
1 million pixel/second
With a maximum measurement rate of 1,016,027 pixel/sec the IMAGER 5010C is one of the fastest 3D laser scanner in the world.

Resolution/Quality
Four different quality levels can be combined with seven resolution sets at the extremely high measurement rate. Depending on the application or objective, the optimum configuration can be chosen. In this way, it is possible to keep a high density resolution even at great distances.

320° x 360° field-of-view
The extended 320° x 360° field-of-view yields maximum coverage.

Light and compact
The IMAGER 5010C is very light – 9.8 kg. Another big advantage is its compact size – 170 x 286 x 395 mm (w x d x h).

Intuitive operating concept
The touch screen display, with an intuitive menu system offers the user a great deal of information and useful features, that are easy and clear to use because of the intuitive operating concept.

Quick-scan feature
The quick-scan button only needs to be pressed twice to start the pre-defined standard scan. The entire start phase takes only a few seconds.

100% stand-alone
The stand-alone principle has been improved. The scan data can be stored on two removable USB flash drives and on an internal flash card. The colour display allows visual control of the scan with zoom and basic measuring functions.

High quality data
The IMAGER 5010C distinguishes through highest precision in angle and distance measurement. The low noise level conserves highest quality of data even on difficult surfaces and long ranges. The typical high accuracy within millimeters can be achieved even at the highest data capture rates.

Encapsulated mirror
The laser beam is reflected by a rotating mirror which can reach a speed of up to 50 rev/sec. This mirror is enclosed in a patented body with protective glass. A high degree of quality, robustness and durability is guaranteed.

Completely integrated color camera
A very low-noise color CMOS camera has been installed in the rotor. The lens and camera type have been carefully selected to produce low noise and high-quality images in any lightning environment. Sophisticated post-processing algorithms yield HDR colour images for perfect colour even under the most dificult lighting conditions.

Accessories

For more information
scan the GR-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 battery charger
- 1 Ethernet cable
- 1 power cable
- 1 extension cable
- 1 license of Z+F LaserControl software

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 5010C.

PaperTarget

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

Z+F ProfiTarget

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.

Z+F AutoTarget

Whichever target is used, the software automatically recognizes the target centre to an accuracy of less than 1/10 of a pixel. In addition, it is possible to include tachymetry data for georeferencing, and also to increase accuracy of registration through bundle adjustment.

The aluminium tripod is very light and easy to handle. Because of its 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.

Aluminium tripod

Detailed descriptions about numerous additional accessories are available at:
www.zf-laser.com or directly at the help menu of your IMAGER 5010.

Technical Data

Compact high-speed phase-based laser scanner with great precision, range and spherical field of view. Unique stand-alone concept with integrated battery and color display with touch screen. Built-in dual-axis compensator and laser plummet.

Laser system			
Laser class	1		
Beam divergence	< 0.3 mrad		
Beam diameter	approx. 3.5 mm (at 0.1 m distance)		
Range	187.3 m (unambiguity interval)		
Minimum distance	0.3 m		
Resolution range	0.1 mm		
Data acquisition rate	Max. 1.016 million pixel/sec.		
Linearity error [1]	≤ 1 mm		
Range noise	black 14 %	grey 37 %	white 80 %
Range noise, 10 m [1 2]	0.4 mm rms	0.3 mm rms	0.2 mm rms
Range noise, 25 m [1 2]	0.6mm rms	0.4 mm rms	0.3 mm rms
Range noise, 50 m [1 2]	2.2 mm rms	0.8 mm rms	0.5 mm rms
Range noise, 100 m [1 2 3]	10 mm rms	3.3 mm rms	1.6 mm rms
Temperature drift	negligible		

Deflection unit	
Vertical system	completely encapsulated rotating mirror
Horizontal system	device rotates about its vertical axis
Vertical field of view	320°
Horizontal field of view	360°
Vertical resolution	0.0004°
Horizontal resolution	0.0002°
Vertical accuracy [1]	0.007° rms
Horizontal accuracy [1]	0.007° rms
Rotation speed	max. 50 rps (3,000 rpm)

Deflection unit					
		Scan duration			
Angle resolution	pixel/360° horizontal & vertical	less quality [6]	normal quality [6]	high quality [6]	premium quality [6]
“preview“ [4]	1,250	---	0:26 min	---	---
“low“	2,500	0:26 min	0:52 min	1:44 min	---
“middle“	5,000	0:52 min	1:44 min	3:22 min	6:44 min
“high“	10,000	1:44 min	3:22 min	6:44 min	13:28 min
“super high“	20,000	3:28 min	6:44 min	13:28 min	26:56 min
“ultra high“ [5]	40,000	---	13:28 min	26:56 min	53:20 min
“extremely high“ [5]	100,000	---	81:00 min	162:00 min	---

Z+F IMAGER® 5010C

Miscellaneous	
Dual-axis compensator	resolution: 0.001° measurement range: +/- 0.5° accuracy: < 0.007° selectable on/off
Laser plummet	laser class: 2 accuracy of plummet: 0.5 mm/1m laser point diameter: < 1.5 mm at 1.5 m
Levelling display	electronic level in onboard display and LRC
Communication	1GB Ethernet/W-LAN
Data storage	internal 64 GB flash card, 2 x 32 GB USB external flash drive
Data transmission	Ethernet or USB 2.0
Integrated control panel	touch screen with colour display
Interfaces	2 x USB, LEMO 9-pin und LEMO 7-pin connections for and external sensors like GPS, odometer, etc.

Power supply	
Input voltage	24 V DC (scanner) ; 100 – 240 V AC (power unit)
Power consumption	< 65 W (on average)
Operating time	> 3 h (internal battery)

Ambient conditions	
Operating temperature	-10 °C … +45 °C
Storage temperature	-20 °C … +50 °C
Lighting conditions	operational in all conditions, from sunlight to darkness
Humidity	non-condensing
Protection class	IP 53

Dimensions and weights	
Scanner Dimensions (w x d x h) Weight	 170 x 286 x 395 mm 9.8 kg
Battery Dimensions (w x d x h) Weight	 170 x 88 x 61 mm 1.2 kg
AC power unit Dimensions Weight	 35 x 67 x 167 mm 0.54 kg

HDR camera	
focus area	1 m - ∞
panorama compilation	
image count for panorama	42
recording time (depend on the environment exposure)	ca. 3:30 min.
panorama resolution	ca. 80 MPixel

1. Detailed explanation on request – please contact info@zf-laser.com
2. Data rate 127,000 pixel/sec (equivalent to "high resolution / high quality" scan), 1 Sigma range noise, unfiltered raw data, in high power mode
3. Not tested durch production
4. Resolution not recommended for exact measurements, only for positioning higher resolution scan selections!
5. Only recommended for scan selections because of the enormous amount of data
6. Doubling ("less quality") or halving ("high quality") the data rate (pixel/sec) theoretically increases the range noise on each pixel by 40% ("less quality") or decreases it by 40% ("high quality"), compared to "normal quality". Depending on the roughness of the surveyed surface, in the field this difference might result less, especially when scanning objects with a bright surface at short distances, e.g. indoors.

High precision and flexibility

Town hall Wangen im Allgäu in 3D view

The new Z+F IMAGER 5010C is highly precise, reliable and flexible. These improvements can be appreciated in your daily work.

The technical specifications of the IMAGER 5010C set new standards in the field of 3D laser scanning. Its enormous scanning speed, extended range of 187 m and low weight make it the perfect choice for countless applications.

Meeting laser class 1 requirements, the IMAGER 5010C can be used without restriction in almost any environment. This makes the scanner an interesting option from heritage even to busy environment applications.

Due to the laser scanner's low weight and unique stand-alone concept, it can also be employed in areas difficult to access like industrial plants or forests.
Having the protection class IP 53 means that the device is protected against splash water and dust.

The extremely fast scanner makes it possible to work efficiently on-site. Scans can be completed in very short time, depending on the requirements.

At the scene of an accident, for example, all the relevant data can be gathered very quickly without interrupting the work of the police or rescue teams. Downtimes of production plants can similarly be reduced to a minimum.

The IMAGER 5010C can also take colour images without any set-up times.

photo-realistic colored scan with the i-Cam of the townhall Wangen

integrated Z+F i-Cam

Zoller + Fröhlich is known for its outstanding laser scanners worldwide. It has always been our goal to acquire data as fast as possible with a maximum of data-quality and a minimum of user effort.

These objectives have guided the development of the Z+F IMAGER 5010C. The integrated camera works very well in all environments. One focus is to always provide realistic panoramas. To make the operation as user friendly as possible, the Z+F i-Cam is fully integrated into the Z+F IMAGER 5010C.

High Dynamic Range technique (HDR)
At each position, several images with different exposure times are taken (called bracketing). The HDR image is generated from an exposure series, and therefore more lifelike than a single recorded image with only one exposure time.

Scanning process
While scanning the user only selects the Z+F i-Cam. No further adjustments have to be made.

Generating color-scans
The generation of color scans is realized within our software Z+F LaserControl. A special HDR method has been developed for the Z+F i-Cam. This method yields a high dynamic-range-image directly from the input images.

To colorize one panoramic laserscan, 42 HDR images are generated and stitched to a complete HDR panorama. HDR image processing and colour mapping to laserscans are performed fully automatically for the entire project in batch processing.

photo-realistic forest image with i-Cam

Applications

3D point cloud of a burnt restaurant

Insurance

The high resolution allow the Z+F IMAGER 5010C to “freeze” scenes rapidly for later analysis and in extraordinary quality. In this case, the data serves mainly for preserving evidence and documenting damage. This leads to great time savings for accident reconstruction and many other insurance purposes.

BubbleView® in LFM

Industry

Z+F IMAGER 5010C 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. The scanner can also operate in a temperature range of -10 °C to +45 °C.

Cave paintings in Wadi Sura

Archaeology

The Z+F IMAGER 5010C is the perfect choice on archaeological sites. Large areas can be mapped with only one or two scans, resulting in detailed three-dimensional true-scale models. The integrated i-Cam can be used to capture colour information. Compared to conventional methods, much time can be saved. Unrivaled levels of precision can be achieved.

For more informations und applications
scan the QR-Code

Cultural heritage

The Z+F IMAGER 5010C 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 integrated Z+F i-Cam enables the whole point cloud to be coloured, which gives a photorealistic impression of a scan with a high level of detail.

photo-realistic scan of a old bridge with the HDR Cam

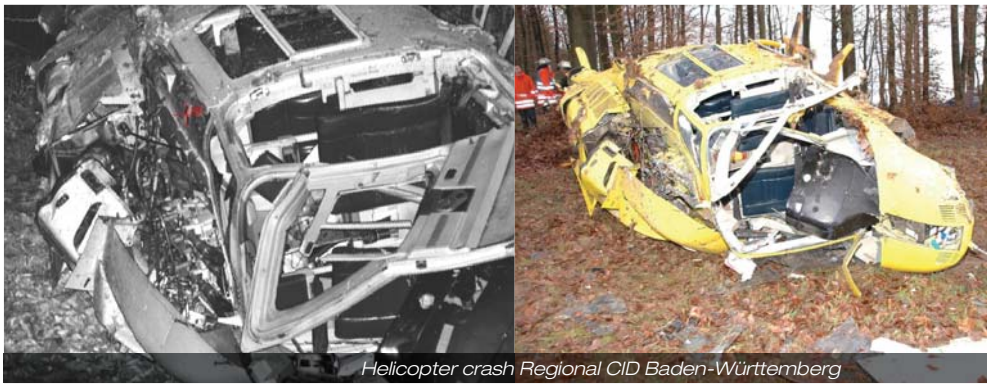
Architecture

The 3D phase based laser scanner Z+F IMAGER 5010C enables a detailed condition and damage assessment of the current status of a building or complex structure and its surroundings. From the 3D data it is easy to create 2D floor plans or views of the object to plan building or conversion projects.

colored scan with the integrated HDR Cam

Forensic science

The decisive advantage of the IMAGER in forensics is the immense speed. The crime scene can be documented holistically without interfering with the running investigation. The high resolution enables to capture even inconspicuous details being preserved as evidence.



Helicopter crash Regional CID Baden-Württemberg

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.

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 callibration, 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.

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.

Z+F LaserControl **Professional PLUS** provides extended functions for registration, additional data visualisation and project managment 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 managment.

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

Forensics
The forensics modul 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 stanard formats OSF, PTG and ASTM-E57 can also be used for export.

LFM
Value Added Reseller

LFM Software

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.

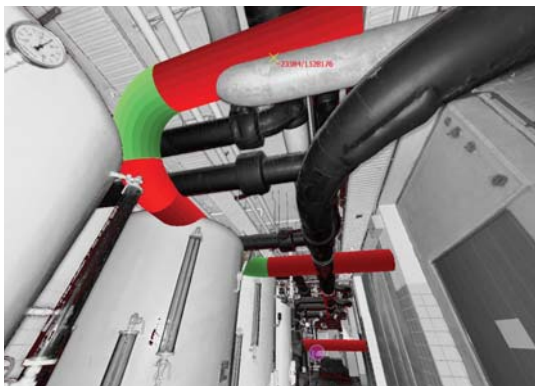
The LFM Suite

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

Head office – Germany

Zoller + Fröhlich GmbH
Simoniusstrasse 22
88239 Wangen im Allgäu
Germany

Phone: +49 7522 9308-0
Fax: +49 7522 9308-252

www.zf-laser.com
info@zf-laser.com

Office Bochum

Zoller + Fröhlich GmbH
Bürokomplex WS2
Ferdinandstrasse 17
44789 Bochum
Germany

Phone: +49 234 2987 99-0
Fax: +49 234 2987 99-29

www.zf-laser.com
bochum@zf-laser.com

Subsidiary – UK

ZF UK Laser Ltd.
9 Avocado Court
Commerce Way
Trafford Park
Manchester M17 1HW
United Kingdom

Phone: +44 161 8717 050
Fax: +44 161 3125 063

www.zf-uk.com
info@zf-uk.com

Subsidiary – USA

Z+F USA, Inc.
700 Old Pond Road
Suite 606
Bridgeville, PA 15017
USA

Phone: +1 412 2578 575
Fax: +1 412 2578 576

www.zf-usa.com
info@zf-usa.com

02/2013 | www.machwerbung.de