



How we build reality

Zoller + Fröhlich

Zoller + Fröhlich GmbH was founded in Wangen im Allgäu 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. The human operators ensure that these run smoothly through permanent control. To achieve this, simulation studies and several specific operator simulations were carried out to create an ergonomic de-

sign 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. Laser measurement technology is an area that Zoller + Fröhlich began exploring in the 90s. In particular, the company's visual laser radar was awarded the Dr. Rudolf Eberle prize, "Innovations in Baden-Württemberg" in December 1998. Already in the early 90s, the first laser system for measuring rail track and tunnels was developed. In 1996 the first "visual 3D laser measurement system for assessing the condition of objects" followed up and then in 2002 Zoller + Fröhlich stepped in the laser scanner market by launching the Z+F IMAGER 5003, 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, powerful internal PC, hard disk and internal battery, the IMAGER 5006 was the first 3D laser measuring device where the stand-alone concept was realized 100%.



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 kinematical use, appeared on the market in 2002. These instruments are designed for the use on mobile platforms as railway or 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 explosions may occur, e.g. mines or petrochemical plants.

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 packages LFM and Z+F LaserControl are designed for great flexibility in various applications and are well 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 of open

minds to be translated into future-oriented products, reflected by the numerous patents and prizes awarded to the company.

Zoller + Fröhlich gives particular attention to customers and cooperation partners.

Customers and 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 do dispose of 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.



*Explosion proof:
IMAGER 5006EX*

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

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. This device is also available in the 2D version Z+F PROFILER 5010 for kinematical applications (see page 13).



Laser system	IMAGER and PROFILER		
Laser class	1		
Beam divergence	< 0.3 mrad (fullangle)		
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}	0.5 mm rms	0.4 mm rms	0.3 mm rms
Range noise, 25 m ^{1 2}	1.0 mm rms	0.6 mm rms	0.5 mm rms
Range noise, 50 m ^{1 2}	2.7 mm rms	1.2 mm rms	0.8 mm rms
Range noise, 100 m ^{1 2 3}	10 mm rms	3.8 mm rms	2.0 mm rms
Temperature drift	negligible		



Deflection unit	IMAGER	PROFILER
Vertical system	completely encapsulated rotating mirror	
Horizontal system	device rotates about its vertical axis	
Vertical field of view	320°	320°
Horizontal field of view	360°	---
Vertical resolution	0.0004°	0.0016°
Horizontal resolution	0.0002°	---
Vertical accuracy ¹	0.007° rms	0.007° rms
Horizontal accuracy ¹	0.007° rms	---
Rotation speed	max. 50 rps (3,000 rpm)	max. 100 rps (6,000 rpm)



Deflection unit	IMAGER	IMAGER and PROFILER				PROFILER
		Scan duration				
Angle resolution	pixel/360° horizontal & vertical	less quality ⁶	normal quality ⁶	high quality ⁶	premium quality ⁶	pixel/360° vertical
"preview" ⁴	1,250	---	0:26 min	---	---	1,280
"low"	2,500	0:26 min	0:52 min	1:44 min	---	2,560
"middle"	5,000	0:52 min	1:44 min	3:22 min	6:44 min	5,120
"high"	10,000	1:44 min	3:22 min	6:44 min	13:28 min	10,240
"super high"	20,000	3:28 min	6:44 min	13:28 min	26:56 min	20,480
"ultra high" ⁵	40,000	---	13:28 min	26:56 min	53:20 min	40,960
"extremely high" ⁵	100,000	---	81:00 min	162:00 min	---	---

Miscellaneous	IMAGER	PROFILER
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	Ethernet/W-LAN	Ethernet
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, colour display for browsing scan data and colour pictures, with measuring and navigation functions	
Interfaces	2 x USB, LEMO 9-pin und LEMO 7-pin connections for M-Cam and external sensors e.g. GPS, odometer, etc.	



Power supply	IMAGER	PROFILER
Input voltage	24 V DC (scanner) 100 – 240 V AC (power unit)	24 V DC (scanner) 100 – 240 V AC (power unit)
Power consumption	< 65 W (on average)	< 75 W (on average)
Operating time	> 2.5 h (internal battery)	unlimited



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

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



- 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) All values extrapolated
- 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.

Z+F PROFILER 5010

The Z+F PROFILER 5010 is based on the Z+F IMAGER 5010 and is the fastest 2D profiling laser measurement system in the world.

With its scan rate of 1 million points per second and maximum scan speed of 100 rev/sec, very short distances between profiles can be achieved even at high speeds. At the highest point density of 40,960 points/360°, even small objects can be captured and processed by the software.

Since the new laser measurement system complies to laser class 1, the scanner can be used in urban environments without restriction.

A hardware-assisted tried and tested pixel-by-pixel synchronization allows processing of external signal input for scan data positioning. Using the LEMO connections, GPS, displacement sensors and counters can be attached, and the external timing pulses directly fed into the digital scan data stream.

The scanner can dispatch digital synchronisation pulses through the LEMO connectors. The new 1 GBit Ethernet interface allows the scan data to be transmitted online to an external PC in case of realtime evaluation or data visualization.

The PROFILER 5010 is equipped with a colour touch screen and intuitive operating concept. By just two clicks, the PROFILER 5010 can be configured and started.



The PROFILER is also suitable for use on fast-moving mobile platforms like trains.



Mounting bracket for overhead use of the PROFILER available as accessory (see www.zf-laser.com).



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