Z+F IMAGER® 5010

Integrated control panel
The high-resolution colour display with integrated touch screen enable the scanner to be used intuitively. The operating manual can also be viewed directly on the scanner's display.

A simple, clear menu structure with many functions makes it efficient and fast to operate. For example, standard scans can be started with only two clicks.

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 3000 rev/min. and a maximum scan rate of 1 million pixel/sec., it is possible to take pictures at a high resolution in a short space of time.

In addition, simple measurement and navigation functions can be conducted in order to guarantee quality assurance on the spot.

High resolution graphic display
This enables the scans to be displayed immediately after scanning in various views.

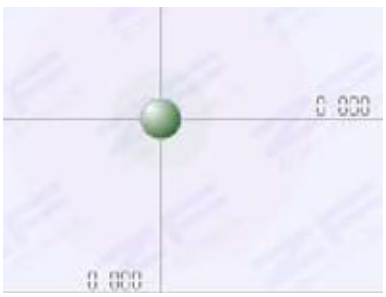
USB ports
The scanner has two USB ports for 32 GB flash drives which are integrated into sealed closure casings. This allows external data storage on removable devices. An external hard drive can also be connected to one of the USB ports.

LEMO connections
In combination with the USB ports, the external LEMO connections are used for controlling accessories like the M-Cam, for example. Furthermore, external sensors like a GPS receiver can be connected using the LEMO connection. The time stamps received can be used to synchronize the scan data precisely and be fed into the scan data stream. A digital outlet for outputting the time stamp is built-in.

Connections for power supply and data download
These connections can be found in the lower part of the scanner that does not turn.

WLAN interface
The integrated WLAN interface makes it possible to control and operate the scanner using a standard web-browser (Internet Explorer, Mozilla Firefox, etc.) and the relevant IP address.

Laser plummet
With the laser plummet, the instrument can be accurately positioned over a particular point for greater ease of use.



Dual-axis compensator
The built-in dual-axis compensator helps to improve the registration and supports geodetic measurement techniques like free positioning. The dual-axis compensator is also used as a level to align the scanner horizontally.

Z+F IMAGER® 5010

The fastest way of scanning: highly accurate, reliable and flexible

The Z+F IMAGER 5010 sets new standards in the field of 3D laser scanning. The tried and tested, extremely fast phase comparison procedure was developed further and installed in a device with the latest technology. The IMAGER 5010 has won admiration for its incredible speed and simple operation, enabling people to work efficiently and quickly.

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

187 metre range
Due to the wavelength and new measuring systems, the device can operate up to a maximum range of 187.3 m. This wide range opens up new areas of application for the scanner.

1 million points per second
With a maximum measurement rate of 1,016,027 points per second, the Z+F IMAGER 5010 is the fastest 3D laser scanner in the world.

Resolution
In combination with a very high measurement rate and seven different resolutions, four different quality levels can also be selected. Depending on the application or objective, the optimum scan configuration can be chosen. In this way, it is possible to have points very close together even at a great distance.

320° x 360° field of view
The extended 320° x 360° field of view leads to coverage of the greatest possible scan areas.

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

Intuitive operating concept
The touch screen display, with a recently developed 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.

One-touch scan button
The one-touch scan button only needs to be pressed twice to start the pre-defined standard scan quickly and efficiently. The entire start phase only takes one or two seconds.

100% stand-alone
The stand-alone principle has been improved upon even further. The scan data can be stored onto two removable USB flash drives, as well as a flash card. The color display enables the scan to be viewed with a zoom function and a simple measuring function. This means that there is no need for an external computer to be connected to check the scanned data.

High quality data
The IMAGER 5010 distinguishes itself through having a high precision of angle and distance measurement. Also the low noise level on differing surfaces even at great distances, is responsible for the highest quality of data. An accuracy to 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 speeds 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 are guaranteed.

Accessories

The stable case ensures the safe storage of the accessories

Every Z+F laser scanner comes complete 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
- 1 seat of Z+F LaserControl software

For the registration of several scans in one project there are various targets available.

Typical paper targets can also be employed with the Z+F IMAGER 5010.

paper target

The Z+F ProfiTargets can be rotated about two axes around the target centre, and so are always perfectly aligned 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 it is possible to increase accuracy of registration through bundle adjustment.

Z+F ProfiTarget

Z+F AutoTarget

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 to the scanner, and is then connected via two USB cables and the LEMO cable. The camera and power supply are then controlled by the scanner.
The pictures are automatically associated with the respective scan and saved. The calibration data necessary for the camera is of course supplied as well.

The aluminium tripod is a further accessory that is impressive because of its low weight and ease of handling. It is highly stable, making it suitable for various uses. The quick-release clamps make it very easy to adjust the height and quickly assemble and dismantle it. A dolly ensures maximum mobility.

Numerous additional accessories with detailed descriptions can be found at www.zf-laser.com or directly from the help menu of the Z+F IMAGER 5010.

The M-Cam can be mounted effortlessly

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

Laser system	IMAGER and PROFILER		
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 %	gray 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	
Scanning speed	max. 50 rev/s (3000 rev/min)	max. 100 rev/s (6000 rev/min)

Deflection unit	IMAGER	IMAGER and PROFILER				PROFILER
		Scan duration				
Angle resolution	pixel/360° horizontal & vertical	low quality[6]	normal quality[6]	high quality[6]	premium quality[6]	pixel/360° vertical
"preview"[4]	1,250	0:13 min	0:26 min	0:52 min	1:44 min	1,280
"low"	2,500	0:26 min	0:52 min	1:44 min	3:24 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	6:56 min	13:28 min	26:56 min	53:20 min	40,960
"extremely high"[5]	100,000	---	1:21 h	2:42 h	3:24 h	---

Miscellaneous	IMAGER	PROFILER
Dual-axis compensator	resolution: 0.001° measurement range: +/- 0.5° accuracy: < 0.007° choice of 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 external 32 GB USB flash drive	
Data transmission	Ethernet or USB 2.0	
Integrated operating panel	touch screen operation, colour display to view 3D laser 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 like 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, even in bright sunlight or pitch darkness
Humidity	non-condensing
Protection class	IP 53

Dimensions and weights	IMAGER	PROFILER
Scanner Dimensions (w/d/h) Weight	170 x 286 x 395 mm 9,8 kg	170 x 286 x 395 mm 9,8 kg
Battery Dimensions (w/d/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	35 x 67 x 167 mm 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 ("low quality") and halving ("high quality") the data rate (pixel/sec.) theoretically increases the range noise on each pixel by 40% ("low quality") or decreases it by 40% ("high quality") compared to "normal quality". Depending on the roughness of the surface measured, in reality this difference could be less, especially when scanning objects with a bright surface at short distances, e.g. indoors

High precision and flexibility

Wangen town hall in Allgäu in 3D view

The new Z+F IMAGER 5010 is highly precise, reliable and flexible.
The extent of these improvements can be appreciated when working day to day with the new scanner.

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

Thanks to the laser class 1, the IMAGER 5010 can be used without restriction in almost any environment. This makes the scanner an interesting option for use in areas like the preservation of historical monuments or architecture, even in busy urban environments.

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 almost insusceptible to most environmental influences.

Complex 3D model used in palaeontological research

The extremely fast scanner makes it possible to work efficiently on the spot. Scans can be completed in no time at all, 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 rescuer workers. Standstill times in production plants can similarly be reduced to a minimum.

Colorized point cloud - Warsaw University

Applications

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 colored, which gives a photorealistic view of a scan with a high degree of detail.
The low degree of measurement noise means that despite long distances, a very high data quality and scan resolution can be achieved and even the smallest of details can be recorded.

Scanning sample areas

Forestry

The unique stand-alone concept and low weight make the Z+F IMAGER the ideal surveying instrument in this field. An absence of peripheral devices enables one to work quickly and effectively, even in the most inaccessible terrain, and without getting tired. The new lightweight aluminium tripod is especially practical.

The protection class IP 53 means that the scanner is not affected by environmental influences. The low measurement noise guarantees a detailed and precise evaluation of the forest land.

Helicopter crash
Regional CID Baden-Württemberg

Forensic science

The biggest advantage here of the Z+F IMAGER is its immense speed.

The scene of a crime can be documented in its entirety without interrupting the work of the investigators.

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

Applications

Insurance

The enormous scan rate and high resolution allow the Z+F IMAGER to “freeze” scenes for later analysis in next to no time, and in unsurpassed quality. In this case, the data serves mainly for preserving evidence and documenting damage.

Using the LFM software, the scenes can then be visualized afterwards.
This leads to great savings in time when reconstructing an accident, checking plausibility where manipulation is suspected, and many other purposes in insurance.

3D point cloud of a fire in a restaurant

Industry

Z+F IMAGER’s extreme speed makes it possible to reduce standstill times in industrial plants to a minimum. The high level of detail facilitates modelling of extraordinary accuracy.

This enables a subsequent comparison between the revamp design and the as - built site. One other advantage is that the scanner can operate in a temperature range of -10° to +45°C.

Bubble view™ in LFM

Archaeology

The Z+F IMAGER is the perfect choice for archaeological work. Its high range, elegant stand-alone concept, low weight and large temperature range make this scanner the ideal measuring instrument for use all over the world.

Large areas can be mapped with only one or two scans, resulting in three-dimensional data which includes the smallest of details.
The optional M-Cam can be used to capture colour information. Compared to conventional methods, much time can be saved. Unparalleled levels of precision can be achieved.

Cave paintings in Wadi Sura

Find many more examples of applications at www.zf-laser.com