

LONG RANGE & HIGH ACCURACY 3D TERRESTRIAL LASER SCANNER SYSTEM

LMS-Z420i

The terrestrial laser scanner system *RIEGL* LMS-Z420i consists of a high performance long-range 3D scanner, associated operating and processing software RiSCAN PRO, and a calibrated and definitely orientated high-resolution digital camera.

The system provides data which lend itself to automatic or semi-automatic processing of scan data and image data to generate products such as textured triangulated surfaces or orthophotos with depth information.

The *RIEGL* LMS-Z420i is a rugged and fully portable sensor especially designed for the rapid acquisition of high-quality three dimensional images even under high demanding environmental conditions, providing a unique and unrivalled combination of wide field-of-view, high maximum range, and fast data acquisition.

A standard Windows notebook and the bundled software package RiSCAN PRO enable the user to instantly acquire high-quality 3D data in the field and provide a variety of registration, post processing and export functions.

- **Topography & Mining**
- **Architecture & Facade Measurement**
- **As-Built Surveying**
- **Archaeology & Cultural Heritage Documentation**
- **Monitoring & Civil Engineering**
- **City Modeling**



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RIEGL
LASER MEASUREMENT SYSTEMS

System Key Performance Data



Scanner Hardware **LMS-Z420i**

allows high-speed, high resolution and accurate 3D measurements

- Range up to 1000 m @ Laser Class 1
- Repeatability up to 4 mm
- Measurement rate up to 11000 pts / sec
- Field of View up to 80° x 360°
- TCP/IP data interface, easily allowing wireless data transmission
- Operated by any standard PC or Notebook
- Fully portable, rugged & robust

Software **RiSCAN PRO**

RIEGL software package for scanner operation and data processing

- Data archiving using a well-documented tree structure in XML file format
- Object VIEW / INSPECTOR for intelligent data viewing and feature extraction
- Straightforward Global Registration
- Interfacing to Post Processing Software



Camera

provides high resolution calibrated color images

NIKON D200 / NIKON D100 / NIKON D70s:

- D200: 10.2 Megapixel (3.872 x 2.592 pixel)
D100 / D70s: 6.1 Megapixel (3.008 x 2.000 pixel)
- Lens focal length: 14/20/28/35/50/85/180 mm
- USB interface, easily allowing wireless data transmission

or

CANON EOS 1Ds MARK II / CANON EOS 20D:

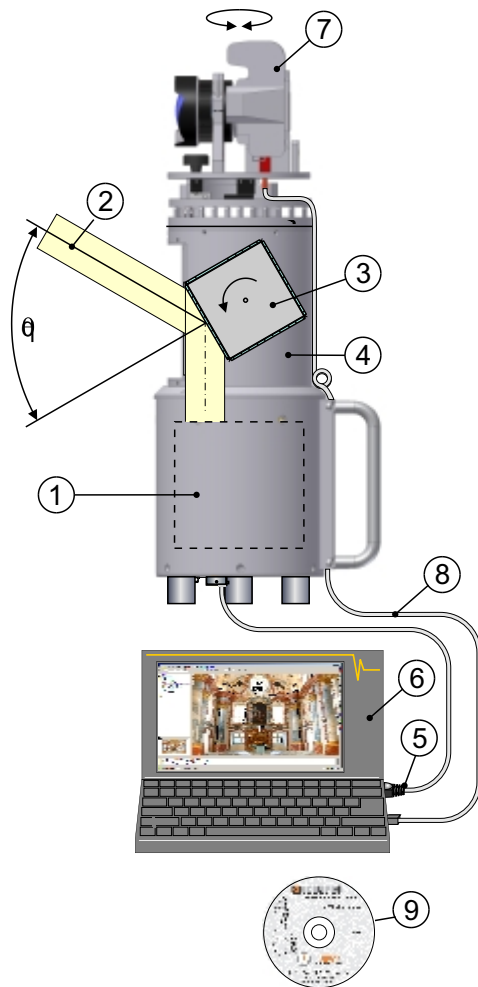
- EOS 1Ds MARK II:
16.7 Megapixel (4.992 x 3.328 pixel)
EOS 20 D: 8.2 Megapixel (3.504 x 2.336 pixel)
- Lens focal length: 20/28/35/50/85/200 mm
- EOS 1Ds MARK II: IEEE 1394 firewire interface
EOS 20 D: USB interface, easily allowing wireless data transmission



The combination of the key components Scanner, Software and Camera results in

- Automatic generation of high resolution textured meshes
- Photorealistic 3D reconstruction
- Exact identification of details
- Automatic generation of 3D orthophotos
- Online position and distance measurements
- Online setting of any virtual point of view

Principle of Scanner Operation



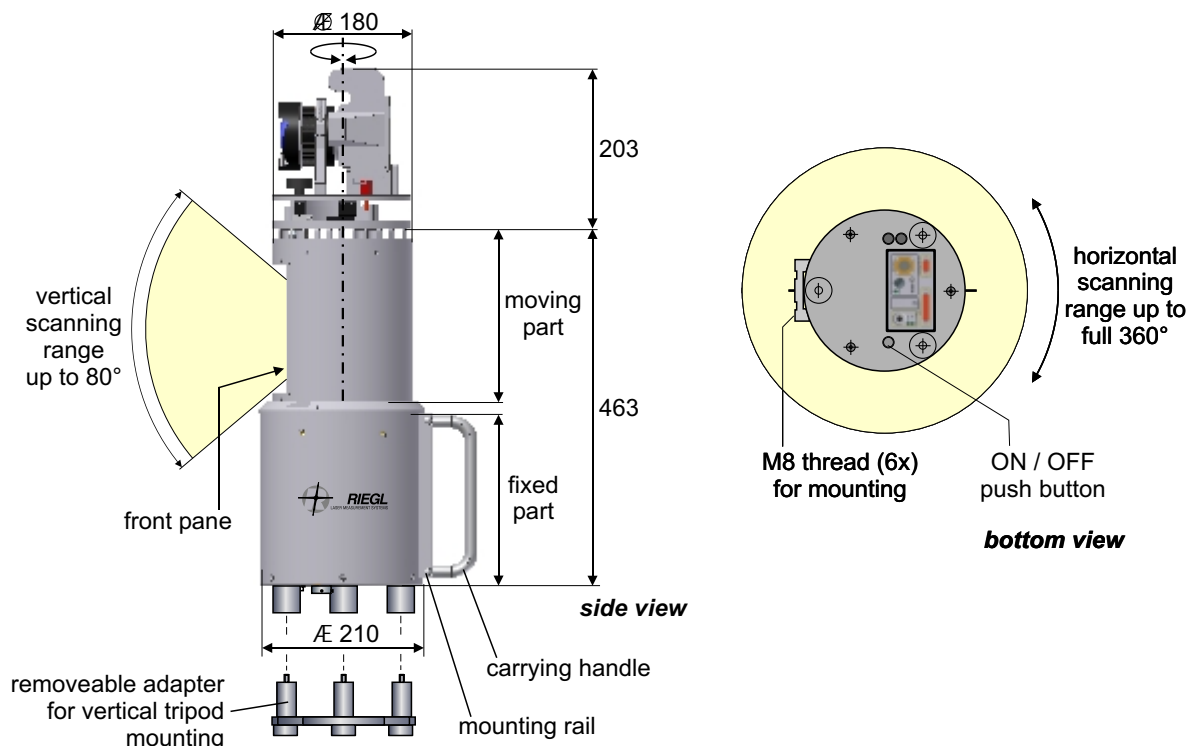
The **range finder electronics (1)** of the 3D scanner *RIEGL* LMS-Z420i is optimized in order to meet the requirements of high speed scanning (fast laser repetition rate, fast signal processing, and high speed data interface).

The *vertical deflection* ("line scan") of the **laser beam (2)** is realized by a **polygon (3)** with a number of reflective surfaces. For high scanning rates and/or a vertical scan angle q up to 80° , the polygonal mirror rotates continuously at adjustable speed. For slow scanning rates and/or small scanning angles, it is oscillating linearly up and down. The *horizontal scan* ("frame scan") is provided by rotating the complete **optical head (4)** up to 360° .

Scandata: RANGE, ANGLE, SIGNAL AMPLITUDE, and optional **TIMESTAMP** are transmitted to a **laptop (6)** via **TCP/IP Ethernet Interface (5)**. **Camera (7)** data are fed into the same laptop via **USB/firewire interface (8)**.

The **RiSCAN PRO software (9)** allows the operator to perform a large number of tasks including sensor configuration, data acquisition, data visualization, data manipulation, and data archiving. RiSCAN PRO runs on platforms WINDOWS XP or 2000 SP2.

Dimensional Drawings



Technical Data 3D Scanner Hardware *RIEGL* LMS-Z420i

Rangefinder performance ¹⁾

Eye safety class



according to IEC60825-1:1993+A1:1997+A2:2001
The following clause applies for instruments delivered into the United States:
Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant
to Laser Notice No. 50, dated July 26, 2001.

Measurement range ²⁾

for natural targets, $p \geq 80\%$

for natural targets, $p \geq 10\%$

up to 1000 m

up to 350 m

Minimum range

2 m

Accuracy ³⁾

10 mm

Repeatability ³⁾

8 mm (single shot), 4 mm (averaged)

Measurement rate

up to 11000 pts/sec @ low scanning rate (oscillating mirror)

up to 8000 pts/sec @ high scanning rate (rotating mirror)

Laser wavelength

near infrared

Beam divergence ⁴⁾

0.25 mrad

Scanner performance

Vertical (line) scan

Scanning range

0° to 80°

Scanning mechanism

rotating / oscillating mirror

Scanning rate

1 scan/sec to 20 scans/sec @ 80° scanning range

Angle stepwidth D J ⁵⁾

0.004° £ D J £ 0.2°

between consecutive laser shots

Angular resolution

0.002°

Horizontal (frame) scan

Scanning range

0° to 360°

Scanning mechanism

rotating optical head

Scanning rate ⁶⁾

0.01 °/sec to 15 °/sec

Angle stepwidth D j ⁵⁾

0.004° £ D j £ 0.75°

between consecutive scan lines

Angular resolution

0.0025°

Inclination Sensors

optional, for vertical scanner setup position
(specifications to be found in separate datasheet)

Internal Sync Timer

Option for GPS-synchronized time stamping of scan data
(specifications to be found in separate datasheet)

General technical data

Interface: for configuration & data output
for configuration
for data output

TCP/IP Ethernet, 10/100 MBit/sec
RS 232, 19.2 kBd
ECP standard (enhanced capability port) parallel

Power supply input voltage

12 - 28 V DC

Power consumption

typ. 78 W max 94 W

Current consumption @ 12 V DC

typ. 6.5 A max 7.8 A

@ 24 V DC

typ. 3.25 A max 3.9 A

Main dimensions

463 mm x 210 mm (length x diameter)

Weight

16 kg

Temperature range

0°C to +40°C (operation), -10°C to +50°C (storage)

Protection class

IP64, dust and splash-water proof

1) First, Last, or Alternating target mode selectable from scan line to scan line.

3) One sigma @ 50 m range under *RIEGL* test conditions.

2) Typical values for average conditions. Maximum range is specified for flat targets with size in excess of the laser beam diameter and near to normal incidence of the laser beam. In bright sunlight, the operational range is considerably shorter than under an overcast sky.

4) 0.25 mrad correspond to 25 mm increase of beamwidth per 100 m of range.

5) Selectable via Ethernet Interface or RS232.

6) Horizontal scan can be disabled, providing 2D-scanner operation.

Information contained herein is believed to be accurate and reliable. However, no responsibility is assumed by *RIEGL* for its use. Technical data are subject to change without notice. Data sheet, LMS-Z420i, 23/02/2007



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