

Long Range & High Accuracy 3D Terrestrial Laser Scanner

# LMS-Z420i

The terrestrial laser scanner system **RIEGL® LMS-Z420i** consists of a high performance long-range 3D scanner, the accompanying operating and processing software **RISCAN PRO**, and a calibrated and accurately orientated and mounted high-resolution digital camera.

The system provides data which lends 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 highly demanding environmental conditions, providing a unique and unrivalled combination of a 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.

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



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## 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, allowing easy wireless data transmission*  
*Operable with 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 the XML file format*  
*Object VIEW / INSPECTOR for intelligent data viewing and feature extraction*  
*Straightforward Global Registration*  
*Interfacing to Post Processing Software*



### **Camera (optional)**

provides high resolution calibrated color images

### **NIKON D700 / NIKON D300(s) / NIKON D200:**

*D300(s): 12.3 Megapixel*  
*D700: 12.1 Megapixel, Nikon FX format*  
*D200: 10.2 Megapixel*  
*USB interface*

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

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

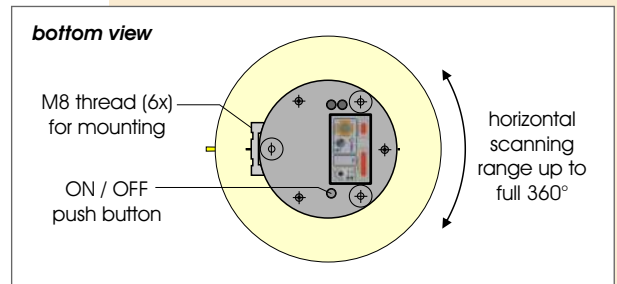
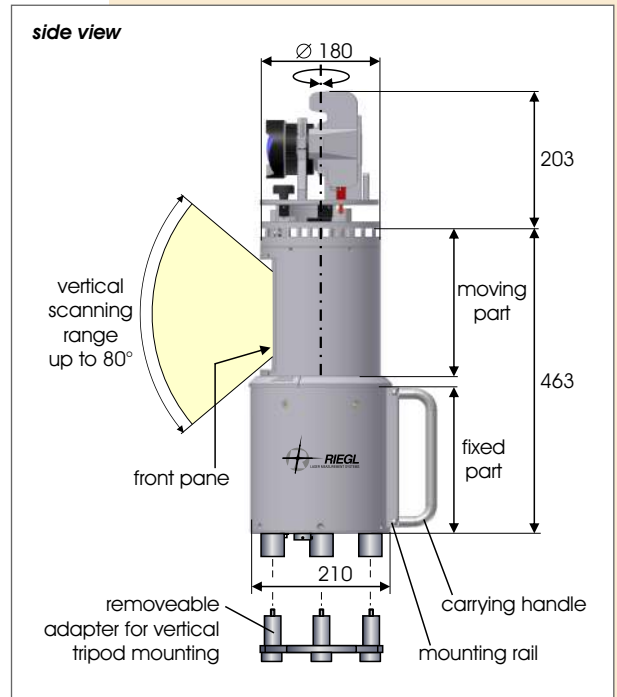
# Principle of Scanner Operation & Dimensional Drawings

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

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

Scandata: RANGE, ANGLE, SIGNAL AMPLITUDE, and optional TIMESTAMP are transmitted to a laptop via TCP/IP Ethernet Interface. Camera data is fed into the same laptop via USB/firewire interface.

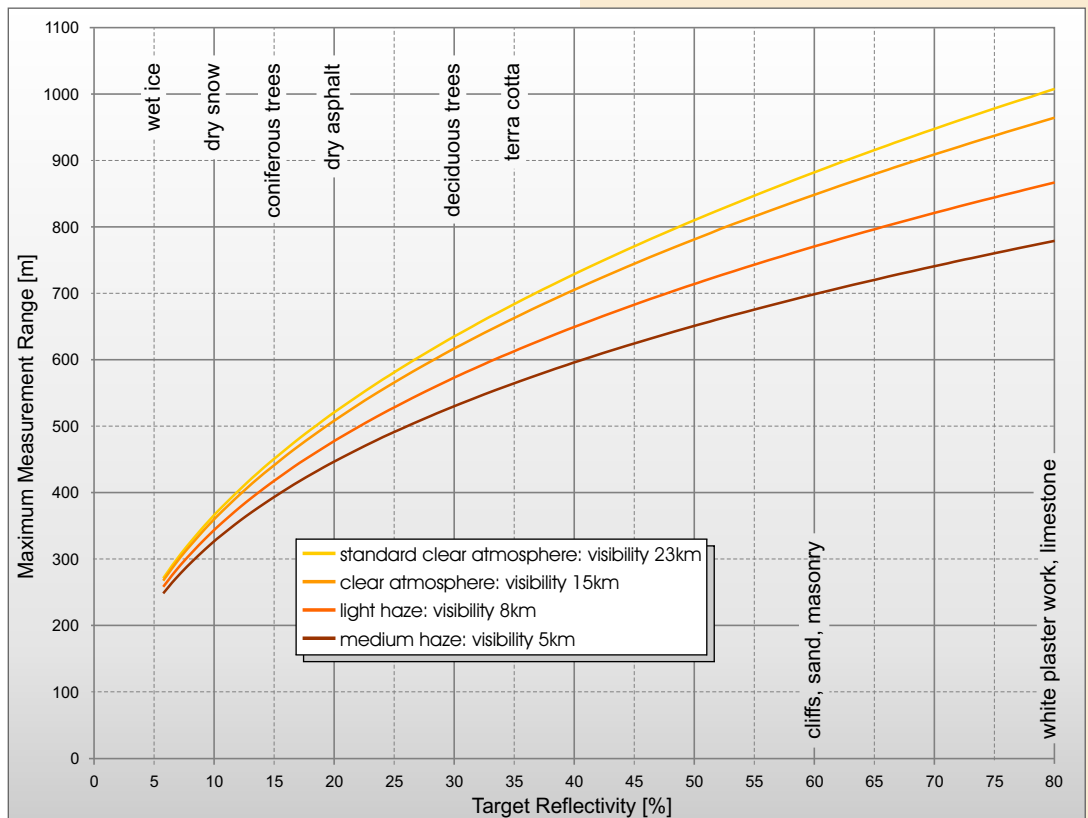
The RiSCAN PRO software allows the operator to perform a large number of tasks including sensor configuration, data acquisition, data visualization, data manipulation, and data archiving. RiSCAN PRO runs on the platforms Windows XP Professional, Windows VISTA Professional, and Windows 7 Professional.



## Maximum Measurement Range *RIEGL* LMS-Z420i

**The following conditions are assumed:**

Flat target larger than footprint of laser beam, perpendicular angle of incidence, average brightness

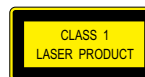


# Technical Data 3D Scanner Hardware *RIEGL* LMS-Z420i

## Laser Product Classification

Class 1 Laser Product according to IEC60825-1:2007

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 June 24, 2007.



## Rangefinder Performance<sup>1)</sup>

Max. Measurement Range<sup>2)</sup>

for natural targets, 80 %

for natural targets, 10 %

Minimum Range

Accuracy<sup>3) 5)</sup>

Repeatability<sup>4) 5)</sup>

Measurement Rate

Laser Wavelength

Beam Divergence<sup>6)</sup>

up to 1000 m

up to 350 m

2 m

10 mm

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

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

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

near infrared

0.25 mrad

1) First, Last, or Alternating Target Mode selectable from scan line to scan line.

2) Typical values under average conditions. Maximum range is specified for flat targets with size in excess of the laser beam diameter and near perpendicular angle of incidence of the laser beam, atmospheric visibility in excess of 23 km. In bright sunlight the operational range is considerably shorter than under an overcast sky.

3) Accuracy is the degree of conformity of a measured quantity to its actual (true) value.

4) Precision, also called reproducibility or repeatability, is the degree to which further measurements show the same result.

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

6) 0.25 mrad correspond to 25 mm increase of beamwidth per 100 m of range.

## Scanner Performance

Vertical (Line) Scan

Scan Angle Range

Scanning Mechanism

Scan Speed

Angular Stepwidth<sup>7)</sup>

between consecutive laser shots

Angle Measurement Resolution

0° to 80°

rotating / oscillating mirror

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

0.004° 0.2°

0.002°

Horizontal (Frame) Scan

Scan Angle Range

Scanning Mechanism

Scan Speed<sup>8)</sup>

Angular Stepwidth<sup>7)</sup>

between consecutive scan lines

Angle Measurement Resolution

0° to 360°

rotating optical head

0.01°/sec to 15°/sec

0.004° 0.75°

0.0025°

Inclination Sensors

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

Internal Sync Timer

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

7) Selectable via Ethernet Interface or RS232.

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

## General Technical Data

Interfaces: for configuration & data output

for configuration

for data output

Power Supply Input Voltage

Power Consumption

Current Consumption @ 12 V DC

@ 24 V DC

Main Dimensions

Weight

Temperature Range

Protection Class

TCP/IP Ethernet, 10/100 MBit/sec

RS 232, 19.2 kBd

ECP standard (enhanced capability port) parallel

12 - 28 V DC

typ. 78 W max. 94 W

typ. 6.5 A max. 7.8 A

typ. 3.25 A max. 3.9 A

463 mm x 210 mm (length x diameter)

16 kg

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

IP64, dust and splash-proof



**RIEGL**<sup>®</sup>  
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