The RIEGL VZ-1000 V-Line® 3D Terrestrial Laser Scanner provides high speed, non-contact data acquisition using a narrow infrared laser beam and a fast scanning mechanism. High-accuracy laser ranging is based upon RIEGL’s unique echo digitization and online waveform processing, which enables superior measurement performance even during adverse environmental conditions and provides multiple return capability.

The RIEGL VZ-1000 is a very compact and lightweight surveying instrument, mountable in any orientation and able to perform in limited space conditions.

**Modes of Operation**
- stand-alone data acquisition without the need of a computer
- basic configuration and control via the built-in user interface
- remote operation via RiSCAN PRO on a notebook, connected either via LAN interface or integrated WLAN
- well-documented command interface for smooth integration into mobile laser scanning systems
- interfacing to post processing software

**User Interfaces**
- integrated Human-Machine Interface (HMI) for stand-alone operation without a computer
- high-resolution 3.5” TFT color display, 320 x 240 pixel, scratch resistant glass with anti-reflection coating and multi-lingual menu
- water and dirt resistant key pad with large buttons for instrument control
- speaker for audible status and operation communications

- Topography & Mining
- As-Built Surveying
- Architecture & Facade Measurement
- Archaeology & Cultural Heritage Documentation
- City Modelling
- Civil Engineering
- Forestry
- Research
High-Resolution and Accurate 3D Measurements

The 3D Laser Scanner **RIEGL VZ-1000** provides a measurement range of more than 1,400 m, 5 mm repeatability and an efficient measurement rate up to 122,000 measurements/sec. The fully portable, rugged and robust instrument offers a wide field of view of 100° vertical and 360° horizontal, and uses an invisible laser beam for eye safe operation in Laser Class 1.

**Camera Option**

A high-precision mount enables the integration of an optional DSLR camera. The camera can be easily integrated into the mount by means of two screws. Precise position and orientation of the camera is enabled by three supporting points. Power supply and a USB 2.0 interface are provided via the scanner directly.

The combination of scanner, software, and camera results in photorealistic 3D data, exact identification of details, position and distance measurements, as well as a depiction of any virtual point of view.

**Waveform Data Output Option**

The digitized echo signals, also known as waveform data, acquired by the **RIEGL VZ-1000** are the basis for waveform analysis. This data is provided by the optionally available waveform data output and accessible via the associated **RIEGL** software library RiWAVELib for investigations and research on multi target situations based on the digital waveform data samples of the target echoes.

**Supported Registration Methods**

- **Direct Geo-Referencing**
  - integrated GPS receiver (L1) connected
  - external high-end RTK GNSS receiver connected
  - integrated compass, accuracy typ. 1° (one sigma value, available for vertical scanner setup position)
  - on-board inclination sensors (tilt range ±10°, accuracy typ. ±0.008°)

- **GNSS Traversing**
  - GNSS position (RTK or autonomous)
  - on-board inclination sensors
  - automatic acquisition of well known remote target (reflector)

- **Free Stationing**
  - fast fine scanning of reflectors for precise determination of scanner position using control points

- **Backsighting**
  - setup on well known point
  - on board inclination sensors
  - precise fine scanning of well known remote target (reflector)
Operating Elements and Connectors

**Communication and Interfaces**
- LAN port 10/100/1000 MBit/sec within rotating head
- LAN port 10/100 MBit/sec within base
- Integrated WLAN interface with rod antenna
- USB 2.0 for external storage devices (USB flash drives, external HDD)
- USB 2.0 for connecting the optional digital camera
- Connector for GPS antenna
- Two ports for external power supply
- Connector for external GPS synchronization pulse (1PPS)
- Connector for external GNSS receiver
- Two ports for external power supply
- Connector for optional add-on battery

**Scan Data Storage**
- Internal 32 GBytes flash memory (2 GBytes reserved for the operating system)
- External storage devices (USB flash drives or external hard drives) via USB 2.0 interface

**Max. Measurement Range**

The following conditions are assumed:
- Flat target larger than footprint of laser beam, perpendicular angle of incidence, average brightness

![Graph showing maximum measurement range vs. target reflectance and frequency]
Technical Data 3D Scanner Hardware RIEGL VZ®-1000

Laser Product Classification

Class 1 Laser Product according to IEC 60825-1:2014

Range Performance

<table>
<thead>
<tr>
<th>Laser Pulse Repetition Rate PRR (peak)</th>
<th>70 kHz</th>
<th>100 kHz</th>
<th>150 kHz</th>
<th>300 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective Measurement Rate (meas./sec)</td>
<td>29,000</td>
<td>42,000</td>
<td>62,000</td>
<td>122,000</td>
</tr>
<tr>
<td>Max. Measurement Range for natural targets $p \geq 90%$</td>
<td>1,400 m</td>
<td>1,200 m</td>
<td>950 m</td>
<td>450 m</td>
</tr>
<tr>
<td>for natural targets $p \geq 20%$</td>
<td>700 m</td>
<td>600 m</td>
<td>500 m</td>
<td>350 m</td>
</tr>
<tr>
<td>Max. Number of Targets per Pulse</td>
<td>practically unlimited (^5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy (^8) (^\text{a,b})</td>
<td>8 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precision (^8) (^\text{a,b})</td>
<td>5 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Minimum Range

- Laser Wavelength: near infrared
- Beam Divergence \(^9\)

2.5 m

Scan Performance

- Scan Angle Range
- Scanning Mechanism: rotating multi-facet mirror
- Scan Speed: 3 lines/sec to 120 lines/sec
- Angular Stepwidth $\Delta \theta$ (vertical), $\Delta \varphi$ (horizontal)
- Angle Measurement Resolution:
  - Vertical (Line) Scan:
    - total 100° (+60° / -40°)
    - $0.0024^\circ \leq \Delta \theta \leq 0.288^\circ$
  - Horizontal (Frame) Scan:
    - max. 360°
    - $0.0024^\circ \leq \Delta \varphi \leq 0.5^\circ$
  - between consecutive laser shots:
    - better 0.0005° (1.8 arcsec)
  - between consecutive scan lines:
    - better 0.0005° (1.8 arcsec)
  - integrated, for vertical scanner setup position, details see page 2
  - integrated, L1 antenna
  - integrated, real-time synchronized time stamping of scan data
  - scanner rotation synchronization

- Inclination Sensors: integrated, for vertical scanner setup position, details see page 2
- GPS receiver: integrated, L1 antenna
- Compass: integrated, for vertical scanner setup position, details see page 2
- Internal Sync Timer: integrated, real-time synchronized time stamping of scan data
- Scan Sync (optional)

General Technical Data

- Power Supply Input Voltage: 11 - 32 V DC
- Power Consumption: Scanning, typ. 75 W (max. 90 W)
- External Power Supply: up to three independent external power sources can be connected for uninterrupted operation
- Main Dimensions: Ø 200 mm x 308 mm (diameter x length)
- Weight: approx. 9.8 kg
- Humidity: max. 80% non condensing @ +31°C
- Protection Class: IP 64 (dust and splash-proof)
- Temperature Range:
  - Storage: -10°C to +50°C
  - Operation: 0°C to +40°C standard operation
  - -20°C: continuous scanning operation if instrument is powered on while internal temperature is at or above 0°C and still air
  - -40°C: scanning operation for about 20 minutes if instrument is powered on while internal temperature is at or above 15°C and still air

- Insulating the scanner with appropriate material will enable operation at even lower temperatures.

RIEGL Laser Measurement Systems GmbH
Stiegenburgstraße 48
3080 Horn, Austria
Phone: +43 2982 4211 | Fax: +43 2982 4210
office@riegl.com | www.riegl.com

RIEGL USA Inc.
Cifradlo, Florida | info@rieglusa.com | www.rieglusa.com
RIEGL Japan Ltd.
Tokyo, Japan | info@riegljapan.co.jp | www.riegljapan.co.jp
RIEGL China Ltd.
Beijing, China | info@riegl.cn | www.riegl.cn

www.riegl.com

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