This 3D VZ-Line Laser Scanner offers superior and unrivaled long range measurement performance up to 4,000 m reflectorless while still maintaining completely eye safe operation (Laser Class 1).

RIEGL’s unique V-Line technology is based on echo digitization and online waveform processing and is the key to enabling such extreme long range measurements. The VZ-4000 operates even in poor visibility and demanding multi target situations caused by dust, haze, rain, snow, etc. which are frequently found in difficult environments such as mining sites.

Modes of Operation:

• stand-alone operation with integrated graphical user interface via 7” touchscreen
• remote control via VNC Viewer with any standard tablet PC or mobile device via WiFi
• remote operation with RiSCAN PRO on a notebook via LAN or WiFi connection
• customized operation by third party tools / applications based on RIEGL’s well documented interfaces and scanner libraries (e.g., RiVLib).

Typical applications include

• Topography & Mining
• Long Range Monitoring
• Civil Engineering
• Archaeology
Extremely Long Range Performance
The High-Speed, High-Resolution 3D Laser Scanner RIEGL VZ-4000 offers an extremely long range of more than 4,000 m and a wide field of view of 60° vertical and 360° horizontal. It uses an invisible laser beam for eye safe operation in Laser Class 1.

The high accuracy and reliability of range measurement performance is based on RIEGL’s unique V-Line technology of echo digitization and online waveform processing. Extreme long range measurements can be achieved even with poor visibility and demanding multi target situations caused by dust, haze, rain, snow, etc.

Built-in Camera
A built-in calibrated 5-Megapixel camera capturing images deflected by the laser mirror enables coverage of the entire field of view with an appropriate number of high resolution images automatically stitched together to create a high resolution panorama image. This panorama image, in combination with precise 3D measurements produced by the VZ-4000, enables the creation of photorealistic virtual models for geological and geotechnical investigations, avalanche research, geomorphology, and other geological features.

Waveform Data Output Option
The digitized echo signals, also known as waveform data, acquired by the RIEGL VZ-4000 are the basis for waveform analysis. This data is provided via the optionally available waveform data output and accessible with 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.

Compatible Software Packages
The RIEGL VZ-4000 is compatible with the RIEGL software package RiSCAN PRO for terrestrial laser scanning, RIEGL’s interface library RiVLib, as well as the workflow-optimizing software packages, e.g., RiMINING. The optional software plugin RiMTA TLS provides automatic assignment of the scan data to the correct MTA zone in multiple time around situations.

Supported Registration Methods

**Direct Geo-Referencing**
- integrated GPS receiver (L1) connected
- external high-end RTK GNSS receiver connected
- integrated compass, accuracy typically 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)
**Communication and Interfaces**

- built in LAN port 10/100/1000 MBit/sec within base
- integrated WLAN interface with high-gain antenna
- USB 2.0 for connecting an external digital camera
- connector for GPS antenna
- two external power supply ports
- connector for external GPS synchronization pulse (1PPS)
- connector for external GNSS receiver

**Scan Data Storage**

- internal 1 TB SSD (Solid State Disc) (2 GByte reserved for the operating system)
- external storage devices (USB flash drives or external hard drives) via USB 2.0 interface
The following conditions are assumed:

- flat target larger than footprint of the laser beam
- perpendicular angle of incidence
- average brightness
- ambiguity resolved by post processing with RiMTA TLS

MTA zones:

- **MTA 1**: no ambiguity / 1 pulse „in the air”
- **MTA 2**: 2 pulses „in the air”
- **MTA 3**: 3 pulses „in the air”
- **MTA 4**: 4 pulses „in the air”
User-Friendly and Efficient Operation and Acquisition Workflow

Operation is easy with the integrated graphical user interface via 7” touchscreen, or by remote control of the scanner via VNC Viewer with any tablet PC or mobile device via WiFi connection. Highly efficient scan data acquisition and global registration is supported by on-board inclination sensors, integrated L1 GPS receiver, an interface for a high-end external GNSS receiver on top of the scanner, a digital compass and built-in SSD data storage media. With a visual project overview of acquired scan data, it is possible to ensure complete data coverage or check the progress of a project as it is acquired. The system provides a number of useful features that help to increase the overall user experience. One of these features is the ability to schedule scans to be acquired fully automatically on a regularly defined time interval which is useful for capturing 4D (3D time-lapse) datasets without direct user supervision of the system.

Power Supply

- intelligent power supply management, up to three independent external power sources can be connected simultaneously for uninterrupted operation
- reliable under- and over voltage protection
- wide external voltage supply range 11-32 V DC
- power consumption typ. 75 W (max. 90 W)
- LED indicators for power status

Camera Capabilities

Advanced Camera Support Capability

The VZ-Line of scanners has been updated with advanced camera support capability. Utilizing a specialized interface and a universal mount system, RIEGL is able to provide support for a wide variety of industrial cameras in standalone operation. This development enables the VZ-4000 to directly control, operate and acquire images from RGB, Thermal, Industrial and a number of other camera systems and types without complex cabling, connections or the need of an external laptop. With simplified mount integrations, it is now possible to acquire advanced images from state-of-the-art camera technologies simply using RIEGL Terrestrial Laser Scanners.
Technical Data RIEGL VZ®-4000

Laser Product Classification

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

The following clause applies for instruments delivered into the United States:

Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed.3., as described in Laser Notice No. 56, dated May 8, 2019.

Range Measurement Performance

Measuring Principle

time of flight measurement, echo signal digitization, online full waveform analysis, multiple-time-around processing, full waveform export capability (optional)

Mode of operation

<table>
<thead>
<tr>
<th>Laser Pulse Repetition Rate PRR (peak) 2)</th>
<th>30 kHz</th>
<th>50 kHz</th>
<th>150 kHz</th>
<th>300 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective Measurement Rate (meas./sec) 2)</td>
<td>23,000</td>
<td>37,000</td>
<td>113,000</td>
<td>222,000</td>
</tr>
<tr>
<td>Max. Measurement Range 3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>natural targets p ≥ 90 %</td>
<td>4,000 m</td>
<td>4,000 m</td>
<td>2,700 m</td>
<td>2,000 m</td>
</tr>
<tr>
<td>natural targets p ≥ 20 %</td>
<td>2,300 m</td>
<td>2,300 m</td>
<td>1,450 m</td>
<td>1,000 m</td>
</tr>
<tr>
<td>Max. Number of Targets per Pulse 5)</td>
<td>15</td>
<td>15</td>
<td>10</td>
<td>9</td>
</tr>
</tbody>
</table>

Accuracy 6) 8) 15 mm

Precision 7) 8) 10 mm

Minimum Range near infrared

Laser Wavelength near infrared

Laser Beam Divergence 9) 0.15 mrad

Laser Beam Footprint (Gaussian Beam Definition) 18 mm @ exit, 75 mm @ 500 m, 150 mm @ 1000 m, 300 mm @ 2000 m

Scanner Performance

Scanning Mechanism

Field of View (selectable)

Scan Speed (selectable)

Angular Step Width Δ θ (vertical), Δ ϕ (horizontal)

Angle Measurement Resolution

Inclination Sensors

GPS Receiver

Compass

Laser Plummet

Internal Sync Timer

Scan Sync (optional)

Waveform Data Output (optional)

Vertical (Line) Scan

lightweight mirror

rotating / oscillating

total 60° (+30° / -30°)

100°/sec to 14400°/sec (+ 20 rotations/sec), full FOV

0.002° ≤ Δ θ ≤ 0.280° 11) between consecutive laser shots

better than 0.0005° (1.8 arcsec) integrated, for vertical scanner setup position, details see page 2

integrated, L1, with antenna

integrated, for real-time synchronized time stamping of scan data

scanning rotation synchronization providing digitized echo signal information for specific target echoes

Horizontal (Frame) Scan

rotating head

max. 360° standard 2,300 m 2,300 m 1,450 m 1,000 m

meas./sec to 60°/sec 10)

0.002° ≤ Δ ϕ ≤ 3° 11) between consecutive scan lines

better than 0.0005° (1.8 arcsec)

General Technical Data

Power Supply Input Voltage / Power Consumption

External Power Supply 11) -32 V DC / typ. 75 W (max. 90 W)

up to 3 independent external power sources can be connected simultaneously for uninterrupted operation

248 x 226 x 450 mm (length x width x height), approx. 14.5 kg

max. 80 % non condensing @ +31°C / IP64, dust-proof and splash-proof

-10°C up to +50°C / 0°C up 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 achieves its maximum.

Integrated Digital Camera

field of view 7.2°x5.5° (v x h)

resolution 2560 x 1920 pixels (5 Mpixel)

Display

7" WVGA (800 x 480) color capacitive touchscreen, full operation control for stand alone usage

Technical Data