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

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VZ®-4000 Key Features and Components

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)
Operating Elements and Connectors RIEGL VZ®-4000

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 80 GByte 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

All dimensions in mm.
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 class 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, 2017

**Range Measurement Performance 1)**

Measuring Principle

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

double pulse ranging

**Mode of operation**

- **Laser Pulse Repetition Rate PRR (peak)**: 30 kHz, 50 kHz, 150 kHz, 300 kHz
- **Effective Measurement Rate (meas./sec)**: 23,000, 37,000, 113,000, 222,000
- **Max. Measurement Range (natural targets)**: 4,000 m, 4,000 m (4), 2,700 m (4), 2,000 m (4)
- **Max. Number of Targets per Pulse**: 15

**Accuracy 4) 6)**

15 mm

**Precision 7)**

10 mm

**Minimum Range**

5 m

**Laser Wavelength**

near infrared

**Laser Beam Divergence 9)**

0.15 mrad

**Laser Product Classification**

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

**Laser Beam Footprint (Gaussian Beam Definition)**

18 mm @ exit, 75 mm @ 500 m, 150 mm @ 1000 m, 300 mm @ 2000 m

**Temperature Range**

-20°C: continuous scanning operation if instrument is powered on

**Storage / Operation**

-10°C up to +50°C / 0°C up to +40°C (standard operation)

**Humidity / Protection Class**

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

**Scan Speed (selectable)**

100°/sec to 14,400°/sec (÷ 20 rotations/sec), full FOV 0°/sec to 60°/sec

**Field of View (selectable)**

total 60° (+30° / -30°) max. 360° rotating / oscillating

**Scanning Mechanism**

lightweight mirror rotating head

**Display**

Resolution 2560 x 1920 pixels (5 Mpixel)

**Integrated Digital Camera**

Integrated Digital Camera

**Power Supply Input Voltage / Power Consumption**

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

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

**Main Dimensions / Weight**

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

**Humidity / Protection Class**

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

**Temperature Range**

-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

**Field of View**

7.2°x5.5° (v x h)

**Scanned Data Output (optional)**

Vertical (Line) Scan

lightweight mirror rotating / oscillating

- total 60° (+30° / -30°)
- 100°/sec to 14,400°/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
- between consecutive scan lines
- better than 0.0005° (1.8 arcsec)
- integrated, for real-time synchronized time stamping of scan data
- scanner rotation synchronization
- providing digitized echo signal information for specific target echoes

10) Frame scan can be disabled, providing 2D scanner operation.

11) Selectable.

**GPS Receiver**

- For vertical scanner setup position, details see page 2

**Inclination Sensors**

- For vertical scanner setup position, details see page 2

**Angle Measurement Resolution**

- better than 0.0005° (1.8 arcsec)

**Angular Step Width**

- between consecutive laser shots
- better than 0.0005° (1.8 arcsec)

**Measuring Principle**

- time of flight measurement, echo signal digitization,