The V-Line® 3D Terrestrial Laser Scanner RIEGL VZ-400 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 allows achieving superior measurement capability even under adverse atmospheric conditions and the evaluation of multiple target echoes.

The line scanning mechanism is based upon a fast rotating multi-facet polygonal mirror, which provides fully linear, unidirectional and parallel scan lines. The RIEGL VZ-400 is a very compact and lightweight surveying instrument, mountable in any orientation and even under limited space conditions.

**Modes of Operation**
- stand-alone data acquisition without the need of a notebook, basic configuration and commanding 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 computer
- high-resolution 3,5" TFT color display, 320 x 240 pixel, scratch resistant cover glass with anti-reflection coating and multi-lingual menu
- water and dirt resistant key pad with large buttons for instrument control
- loudspeaker for audible signaling of messages by voice

**Applications**
- As-Built Surveying
- Architecture & Facade Measurement
- Archaeology & Cultural Heritage Documentation
- City Modelling
- Tunnel Surveying
- Civil Engineering
Scanner Hardware RIEGL VZ-400
allows high-speed, high resolution and accurate 3D measurements

- Range up to 600 m @ Laser Class 1
- Repeatability 3 mm
- Measurement rate up to 122,000 measurements/sec
- Field of View up to 100° x 360°
- LAN/WLAN data interface, easily allowing wireless data transmission
- Operated by any standard PC or Notebook or cable less
- 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

Digital Camera (optional)
provides high resolution calibrated color images

- NIKON D700, NIKON D300(s)
  - D700: 12.1 Megapixel, Nikon FX format
  - D300(s): 12.3 Megapixel
  - USB interface

Mounting device with digital camera can be easily fixed by means of two knurled head screws. Precise position and orientation is provided by three supporting points. Power supply and USB 2.0 interface is provided by the scanner directly.

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
- Online position and distance measurements
- Online setting of any virtual point of view

Global Scan Position Registration

Stand-alone Registration
- integrated GPS receiver (L1)
- integrated biaxial inclination sensors (tilt range \(\pm 10^\circ\), accuracy typ. \(\pm 0.008^\circ\))
- integrated compass, accuracy typ. \(1^\circ\) (one sigma value, available for vertical scanner setup position)
- RiSCAN PRO Processing and Multistation Adjustment Module (MSA)

Registration via control points
- precise and fast fine scanning of retro-reflectors
- RiSCAN PRO Processing

Totalstation-like-Registration
- setup above well known point (integrated laser plummet)
- integrated inclination sensors
- precise fine scanning of well known remote target (reflector)
- RiSCAN PRO Processing Backsighting function
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

Scan Data Storage
- internal 32 GByte flash memory (1 GByte reserved for the operating system)
- external storage devices (USB flash drives or external hard drives) via USB 2.0 interface

Add-on rechargeable battery
- optional add-on rechargeable battery pack (high power, high capacity NiMH cells)
- compact disc design, short-circuit-proof and protected connection pins
- rechargeable during standard scan operation via external power supply
- integrated micro-controller based charging electronics
- easily pluggable to base of the laser scanner by central locking screw
- DC voltage source (11-32 V DC) sufficient for recharging

External 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. 65 W
- LED indicators for power status

Power Supply

- Mounting points (3x) and mounting threads inserts (2x) for digital camera
- Connector for external GNSS receiver (optional)
- USB and DC power connector for digital camera
- Connector for GPS antenna (internal receiver)
- Connector for WLAN antenna
- USB 2.0 slot for external memory devices
- LAN 10/100/1000 MBit/sec, for rapid download of scan data
Technical Data 3D Scanner Hardware RIEGL VZ®-400

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.

Physical Data

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

Protection class IP64 (dust and splash-proof)

Weight approx. 9.6 kg

Range Performance

<table>
<thead>
<tr>
<th>Laser PRR (Peak)</th>
<th>Long Range Mode</th>
<th>High Speed Mode</th>
</tr>
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<tbody>
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<td>600 m</td>
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<td>280 m</td>
<td>160 m</td>
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Effective Measurement Rate

- For natural targets \( \rho \geq 90\% \): 42,000 meas./sec
- For natural targets \( \rho \geq 20\% \): 122,000 meas./sec

Max. Number of Targets per Pulse: Practically unlimited

Accuracy: 5 mm

Precision: 3 mm

Scan Performance

Scan Angle Range
- Total 100° (+60° / -40°)
- Max. 360°

Scanning Mechanism
- Rotating multi-facet mirror
- Rotating head

Scan Speed
- 3 lines/sec to 120 lines/sec

Angular Stepwidth \( \Delta \theta \) (vertical), \( \Delta \phi \) (horizontal)
- \( \Delta \theta \leq 0.288° \)
- \( \Delta \phi \leq 0.5° \)

Angle Measurement Resolution
- Better than 0.0005° (1.8 arcsec)

Inclination Sensors
- Integrated

GPS receiver, Compass

Internal Sync Timer (optional)

Scan Sync (optional)

Max. Measurement Range

The following conditions are assumed:
- Flat target larger than footprint of laser beam
- Perpendicular angle of incidence
- Average brightness

Minimum Range: 1.5 m

Laser Wavelength: Near infrared

Beam Divergence: 0.3 mrad

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