

RIEGL VZ-400[®]

- *very high speed data acquisition*
- *wide field-of-view, controllable while scanning*
- *high-accuracy, high-precision ranging based on echo digitization and online waveform processing*
- *multiple target capability*
- *superior measurement capability in adverse atmospheric conditions*
- *high-precision mounting pads for optional digital camera*
- *integrated inclination sensors and laser plummet*
- *integrated GPS receiver with antenna*
- *various interfaces (LAN, WLAN, USB 2.0)*
- *internal data storage capability*

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*

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

visit our website
www.riegl.com



RIEGL[®]
LASER MEASUREMENT SYSTEMS

System Configuration



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°
(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



WLAN antenna

Carrying handles

High-resolution color TFT display

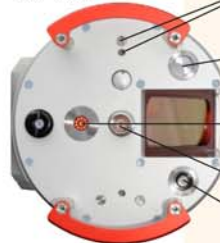
Key pad for instrument control

Connectors for power supply and LAN interface 10/100 MBit/sec, power off/on button

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
- connector for optional add-on battery

TOP VIEW



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

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

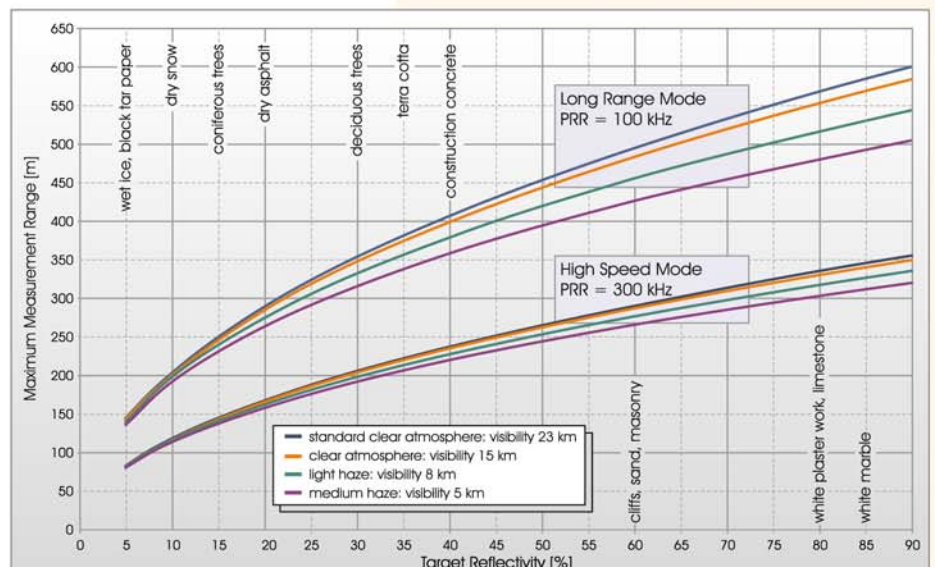


LAN 10/100/1000 MBit/sec, for rapid download of scan data

Max. Measurement Range

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 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.

CLASS 1
LASER PRODUCT

Range Performance¹⁾

	Long Range Mode	High Speed Mode
Laser PRR (Peak) ²⁾	100 kHz	300 kHz
Effective Measurement Rate ²⁾	42 000 meas./sec	122 000 meas./sec
Max. Measurement Range ³⁾ for natural targets $\rho \geq 90\%$ for natural targets $\rho \geq 20\%$	600 m 280 m	350 m 160 m
Max. Number of Targets per Pulse	practically unlimited ⁴⁾	
Accuracy ^{5) 7)}	5 mm	
Precision ^{6) 7)}	3 mm	

Minimum Range
Laser Wavelength
Beam Divergence⁸⁾

1.5 m
near infrared
0.35 mrad

1) with online waveform processing

2) rounded values

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

4) details on request

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

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

7) One sigma @ 100 m range under *RIEGL* test conditions.

8) 0.35 mrad correspond to 35 mm increase of beamwidth per 100 m of range.

Scan Performance

Scan Angle Range
Scanning Mechanism
Scan Speed
Angular Stepwidth $\Delta \theta$ (vertical), $\Delta \phi$ (horizontal)

Angle Measurement Resolution

Inclination Sensors
GPS receiver
Compass
Internal Sync Timer
Scan Sync (optional)

Vertical (Line) Scan
total 100° (+60° / -40°)
rotating multi-facet mirror
3 lines/sec to 120 lines/sec
 $0.0024^\circ \leq \Delta \theta \leq 0.288^\circ$ ⁹⁾
between consecutive laser shots
better 0.0005° (1.8 arcsec)

Horizontal (Frame) Scan
max. 360°
rotating head
0°/sec to 60°/sec¹⁰⁾
 $0.0024^\circ \leq \Delta \phi \leq 0.5^\circ$ ⁹⁾
between consecutive scan lines
better 0.0005° (1.8 arcsec)

integrated, for vertical scanner setup position, details see page 2

integrated, L1 antenna

optional, for vertical scanner setup position, details see page 2

integrated real-time synchronized time stamping of scan data
scanner rotation synchronization

9) selectable

10) frame scan can be disabled, providing 2D operation

General Technical Data

Power Supply Input Voltage
Power Consumption
External Power Supply

Main Dimensions
Weight
Humidity
Protection Class
Temperature Range
Storage
Operation
Low Temperature Operation

11 - 32 V DC
typ. 65 W (max. 80 W)
up to three independent external power sources can be connected
for uninterrupted operation
ø 180 mm x 308 mm (diameter x length)
approx. 9.6 kg
max. 80 % non condensing @ +31°C
IP 64 (dust and splash-proof)

-10°C to +50°C

0°C to +40°: 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



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