

# RIEGL VZ<sup>®</sup>-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<sup>®</sup> 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**  
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**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.  $\pm 0.008^\circ$ )  
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*



WLAN antenna

Carrying handles

High-resolution color TFT display

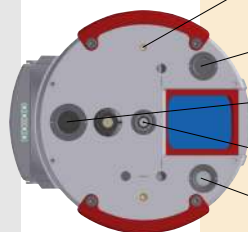
Key pad for instrument control

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

## Communication and Interfaces

LAN interface 10/100/1000 MBit/sec within rotating head  
 LAN interface 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 connectors for external power supply  
 connector for external GPS synchronization pulse (1PPS)

TOP VIEW



Mounting points for digital camera (2x)

Connector for GPS antenna (optional)

USB connector for digital camera

Connector for GPS antenna

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

## Power Supply

### 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

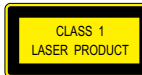


# Technical Data 3D Scanner Hardware *RIEGL VZ*<sup>®</sup>-400

## 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<sup>1)</sup>

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

## Minimum Range

1.5 m

## Laser Wavelength

near infrared

## Beam Divergence<sup>8)</sup>

0.3 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) 0.3 mrad correspond to 30 mm increase of beamwidth per 100 m of range.

## Scan Performance

Scan Angle Range

Scanning Mechanism

Scan Speed

Angular Stepwidth (vertical), (horizontal)

Angle Measurement Resolution

Inclination Sensors

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° 0.288°<sup>9)</sup>

between consecutive laser shots

better 0.0005° (1.8 arcsec)

Horizontal (Frame) Scan

max. 360°

rotating head

0°/sec to 60°/sec<sup>10)</sup>

0.0024° 0.5°<sup>9)</sup>

between consecutive scan lines

better 0.0005° (1.8 arcsec)

integrated, for vertical scanner setup position

optional, for vertical scanner setup position

integrated real-time synchronized time stamping of scan data

scanner rotation synchronization

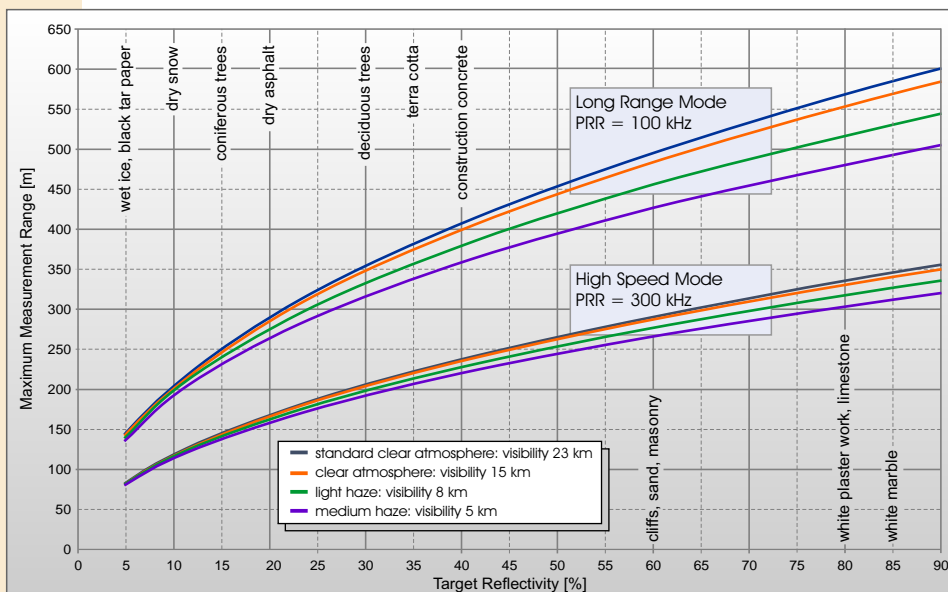
9) selectable

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

## Max. Measurement Range

The following conditions are assumed:

Flat target larger than footprint of laser beam, perpendicular angle of incidence, average brightness



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