RIEGL VZ-200®

- *high laser pulse repetition rate of up to 1.2 MHz*
- *high speed data acquisition with up to 550,000 measurements/sec.*
- *mounting and operation possible in any orientation*
- *high-accuracy, high precision ranging based on echo digitization, online waveform processing, and multiple-time-around processing*
- *excellent multiple target capability*
- *superior measurement capability in adverse visibility conditions*
- *orientation sensors fully integrated*
- *electrical interfaces for time synchronization of scan data*

The High Speed High Performance 3D Laser Scanner *RIEGL* VZ-200 is a rugged and fully portable sensor especially designed for the rapid acquisition of high-quality three dimensional point cloud data even under high demanding environmental conditions in industrial environments.

Due to its ingenious design the scanner can be mounted and operated in any orientation and thus optimally adapted to the requirements of the operating environment. The *RIEGL* VZ-200 provides a unique and unrivalled combination of wide field-of-view, high accuracy, and extremely fast data acquisition.

High-performance pulsed laser ranging, based on *RIEGL*'s state-of-the-art Waveform-LiDAR technology – offering echo signal digitization with subsequent online waveform analysis – results in accurate measurement capabilities with excellent multiple target echo discrimination.
As the scanner operates at extremely high laser pulse repetition rates, laser ranging by pulsed time-of-flight ranging normally will become ambiguous. By means of applying the *RIEGL* library RiMTA data provided by the VZ-200 are reliably assigned to the correct MTA zone and thus range values are given correctly. The RiMTA library is available for all major platforms and makes use of any GPU available to further speed up processing.

Scanner control and acquisition of the binary *RIEGL* raw RXP-datastream is supported by the RiVLib software library.

Typical applications include

- ***Process Automation of Stackers and Reclaimers***
- ***Measurement of Stock Piles and Bulk Material***
- ***Topography and Mining***

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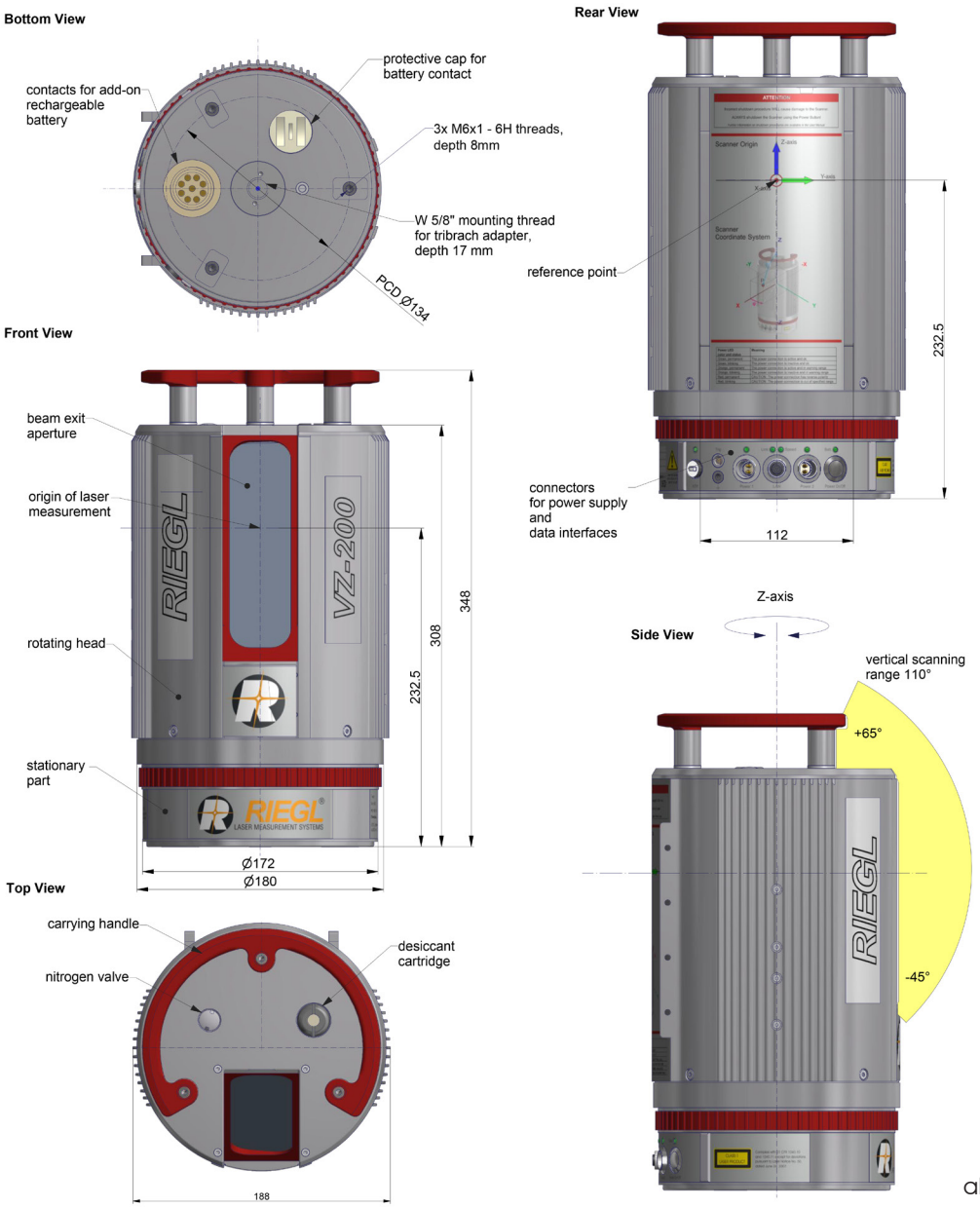
www.riegl.com

RIEGL®
LASER MEASUREMENT SYSTEMS

RIEGL VZ-200 Main Dimensions



all dimensions in mm

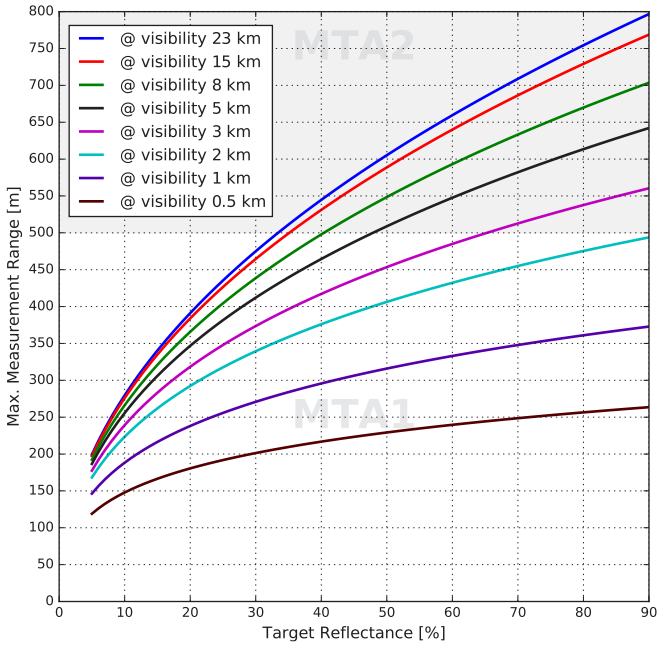
RIEGL VZ-200 Mounting

vertical (upright) mounting

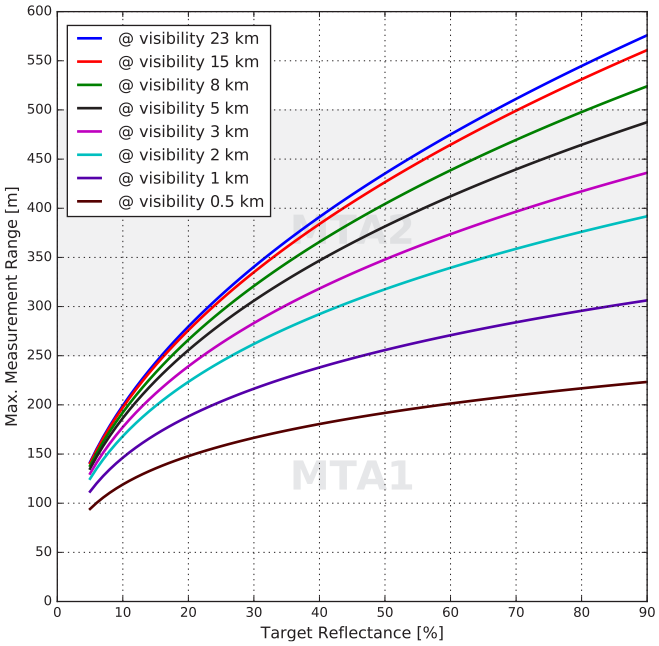
tilted mounting

upside down mounting

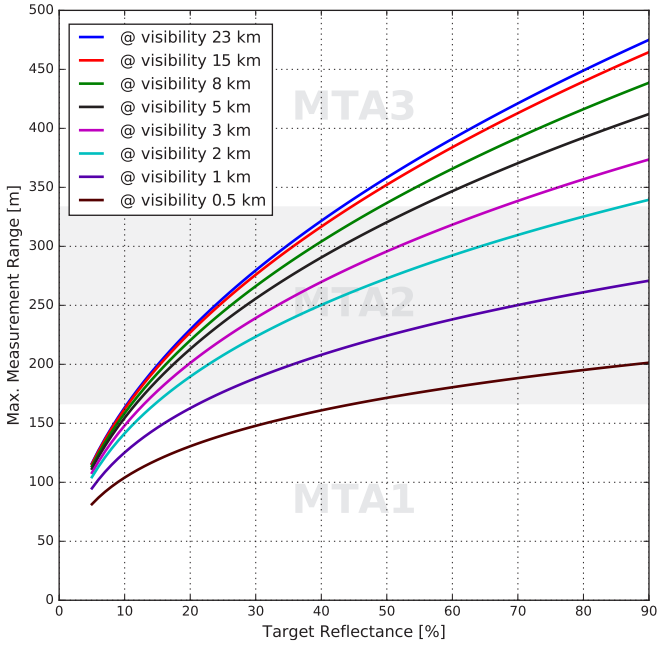
300 kHz Laser Pulse Repetition Rate



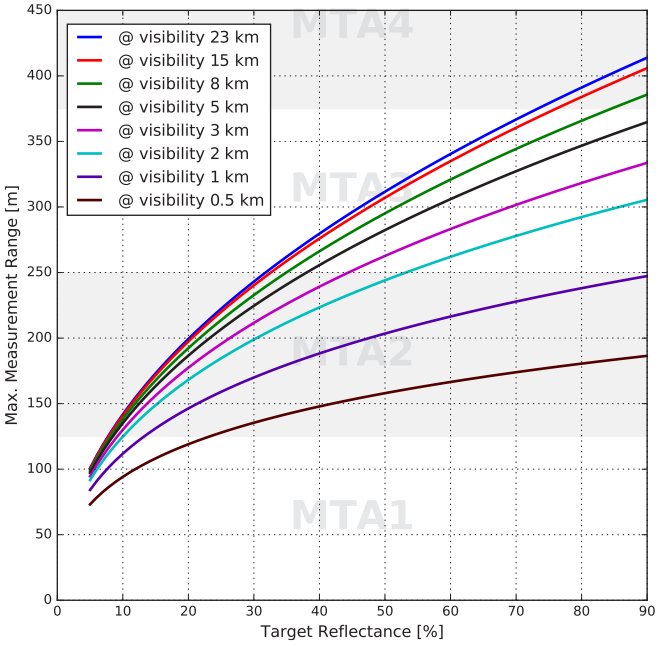
600 kHz Laser Pulse Repetition Rate



900 kHz Laser Pulse Repetition Rate



1200 kHz Laser Pulse Repetition Rate



The following conditions are assumed:

- flat target larger than the footprint of the laser beam
- perpendicular angle of incidence
- average brightness
- ambiguity resolved by post processing within RiSCAN PRO

MTA** (Multiple Time Around) **zones:

MTA 1: no ambiguity / 1 pulse „in the air"
MTA 2: 2 pulses „in the air"
MTA x: x pulses „in the air"

Technical Data *RIEGL* VZ-200

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 [1]

Measuring Principle / Mode of Operation: time of flight measurement, echo signal digitization, online waveform processing, multiple-time-around processing capability, single pulse ranging

Laser Pulse Repetition Rate PRR (peak) [2] [3]	300 kHz	600 kHz	900 kHz	1200 kHz
Effective Measurement Rate (meas./sec) [2]	137,600	275,000	412,500	550,000
Max. Measurement Range [4]				
natural targets ρ ≥ 80 %	750 m	540 m	450 m	390 m
natural targets ρ ≥ 10 %	280 m	200 m	160 m	140 m
Max. Number of Targets per Pulse [5]	15	8	5	4

Minimum Measurement Range	1.5 m
Accuracy [6] [8]	5 mm
Precision [7] [8]	3 mm
Laser Wavelength	near infrared
Laser Beam Divergence	0.35 mrad [9]

1) With online waveform processing.
2) Rounded values.
3) In order to minimize multiple-time-around issues it is crucial to carefully select the laser pulse repetition rate according to the application in question.
4) 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 overcast sky.
5) If more than one target is hit, the total laser transmitter power is split and, accordingly, the achieveable range is reduced.
6) Accuracy is the degree of conformity of a measured quantity to its actual (true) value.
7) Precision, also called reproducibility or repeatability, is the degree to which further measurements show the same result.
8) One sigma @ 100 m range under *RIEGL* test conditions.
9) Measured at the $1/e^2$ points. 0.35 mrad corresponds to an increase of 35 mm of beam diameter per 100 m distance.

Scanner Performance

	Vertical (Line) Scan	*Horizontal (Frame) Scan*
Scan Angle Range	total 110° (+65° / -45°)	max. 360°
Scanning Mechanism	rotating multi-facet mirror	rotating head
Scan Speed	3 lines/sec to 240 lines/sec	0°/sec to 150°/sec [11]
Angular Step Width [10] Δ ϑ (vertical), Δ φ (horizontal)	0.0007° ≤ Δ ϑ ≤ 0.2° between consecutive laser shots	0.0015° ≤ Δ φ ≤ 0.62° between consecutive scan lines
Angle Measurement Resolution	better 0.0007° (2.5 arcsec)	better 0.0005° (1.8 arcsec)
Internal Sync Timer	integrated, for real-time synchronized time stamping of scan data	
Scan Sync (optional)	scanner rotation synchronization for operating several scanners	

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

Inclination Sensors

for vertical scanner mounting	
Angular Tilt Range / Accuracy	vertical setup +/- 15° [12] / typically +/- 0.02 deg [12] [13]

12) The inclination measurement provides measurement values in an angular range from 0° to 360°, but the measurement accuracy is only guaranteed in the specified angular tilt range.
13) One Sigma under *RIEGL* test conditions.

Data Interfaces

Configuration	LAN 10/100/1000 Mbit/sec (TCP/IP protocol)
Scan Data Output	LAN 10/100/1000 Mbit/sec (TCP/IP protocol)
Data Storage	internal > 240 GB SSD
GNSS Interface	Serial RS-232 interface for data string with GNSS-time information, TTL input for 1 PPS synchronization pulse

General Technical Data

Power Supply Input Voltage / Consumption	18 - 34 V DC / typ. 55 W (max. 75 W)
Main Dimensions	ø 188 mm x 348 mm (diameter x height)
Weight	approx. 9.4 kg
Humidity	max. 80 % non condensing @ +31°C
Protection Class	IP64, dust- and splash-proof
Temperature Range	
Storage	-20°C up to +55°C: as a series-produced product
Low Temperature Storage	-40°C: on request based upon individual assessment
Operation	-10°C up to +45°C: standard operation
Low Temperature Operation [14]	-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

14) Insulating the scanner with appropriate material will enable operation at even lower temperatures.

RIEGL®
LASER MEASUREMENT SYSTEMS

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