Terrestrial Laser Scanning

RIEGL ®

RIEGL VZ®600i

## Exceeding your expectations

RIEGL VZ®600i

RIEGL`s latest generation of professional Terrestrial Laser Scanners stands for extreme versatility, high productivity, ultimate performance, and additional mobility – providing an excellent return on investment.

High Productivity

- One-Touch button operation
- *RIEGL* VZ-i Project Map App for scan project monitoring
- simultaneous scan and image data acquisition
- Real-Time On-Board automatic registration
- One-Touch Processing Wizard in RiSCAN PRO for automatic production of detailed PDF-report
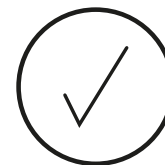
Ultimate Performance

- pulse repetition rate up to 2.2 MHz
- scan speed up to 420 lines/sec
- 30 sec scan time (6 mm resolution @ 10 m distance)
- high speed data download of up to 500 MB/sec

Extreme Versatility

- for various applications
- indoor and outdoor 3D mapping
- short and long ranges
- lightweight (approx. 6 kg / 13 lbs)
- prepared for user-specific Python apps
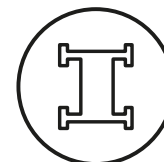
Additional Mobility

- prepared for robotic operation integration (ROS driver available)
- option for mobile mapping
- can be used with the *RIEGL* VMR Robotic Rail Scanning System
- flexible mounting platforms

RIEGL® Data Sheet

Extreme Versatility –
Key Applications

The new *RIEGL* VZ-600i is operable in a wide variety of applications, featuring reliable and robust automatic real-time on-board registration:

Key Applications
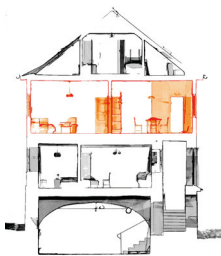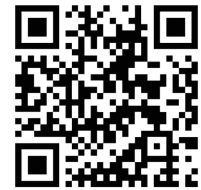
BIM (Building Information Modeling)

High speed data acquisition, verifiably precise scan data, large projects (100s of scan positions), accuracy better than 10 mm for digital twins.
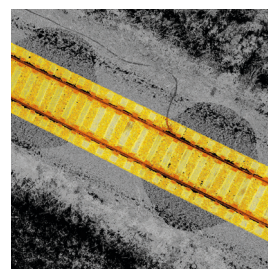
Forestry and Vegetation

ToF (Time of Flight) measurement with multi-target responses, minimize occlusion, vegetation penetration, waveform.

Public Safety and Forensics

Fast data capture to release scenes earlier, lightweight scanner for all staff, proven data for court presentation.

Railroad Surveying

Robotic operation - use of onboard sensors and ROS for fast and repeatable data acquisition, railway applications with the *RIEGL* VMR Robotic Rail Laser Scanning System

Construction

Inspection and varification for design build tilt wall/panel construction, blockouts & sleeves locations, and vertical wall plumbness. Ideal for preconstruction and large-scale ground grading and post roadway construction.
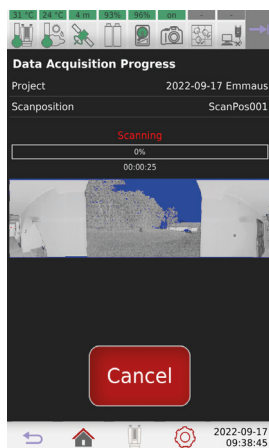
Surveying and Mapping

Precise and accurate mapping of any environment for planning, design, and traditional survey. Steamline registration to survey control with full reporting in PDF format.

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High Productivity –
Rapid Data Acquisition

Start	1 hour scanning in the field

1ˢᵗ Scan Position

RIEGL VZ-600i Screen
or VZ-i Series App

66ᵗʰ Scan Position
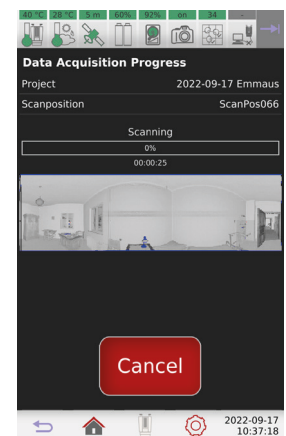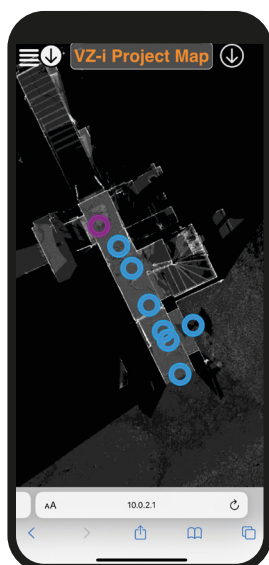
RIEGL VZ-600i Screen
or VZ-i Series App

Key Features of rapid data acquisition with the *RIEGL* VZ-600i:

- up to 60 scan positions per hour

- 6 mm resolution @ 10 m distance

- simultaneous image acquisition

- real-time on-board automatic registration, no tablet required

- no tie points necessary for robust registration

- remote control by the use of the *RIEGL* VZ-i Series App (for iOS and Android)

- monitor registration with the VZ-i Project Map App (direct from the scanner)

VZ-i Project Map App

VZ-i Project Map App

![RIEGL] **RIEGL** Data Sheet
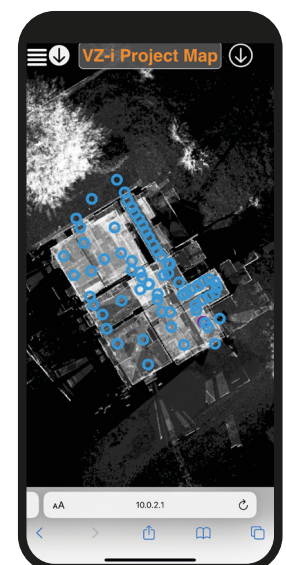
High Productivity –
Swift Data Processing

Produce end deliverables with the Data Processing Software RiSCAN PRO and its One-Touch Processing Wizard.

One-Touch Processing Wizard

① Task selection
Select the tasks to be performed

Save settings...   Load settings...   Restore default

☑	**Task 1**: Convert Scans		100% Finished: 29m
	Convert raw RXP scan data into to RDB 2 database file format	165 total, 165 succeeded	
☑	**Task 2**: Filter Scans		100% Finished: 4m 54s
	Keep one echo per laser shot. Delete points with a Pulse Shape Deviation above 15.	165 total, 165 succeeded	
☑	**Task 3**: Register Scan Positions		100% Finished: 7m 43s
	Register Scan Positions with Automatic Registration 2	164 total, 164 already registered	
☑	**Task 4**: Fine Adjust Project		100% Finished: 49m
	Adjust Scan Positions with Multi Station Adjustment 2	Succeeded	
☐	**Task 5**: Calibrate Camera Mounting		
	Calibrate Camera Mounting by using data from first 3 Scan Positions		
☐	**Task 6**: Colorize Scans from Photos		
	Colorize Scans from Photos		
☑	**Task 7**: Mark Single Source Points		100% Finished: 45m
	Mark points that are scanned from one Scan Position only with the "Single Source Point" ...	Single Source Points marked in 165 Point Clouds	
☑	**Task 8**: Mark Dynamic Objects		100% Finished: 1h 10m
	Mark points caused by dynamic objects with the "Dynamic Object Point" Point Flag	Dynamic Objects marked in 165 Point Clouds	
☑	**Task 9**: Generate Octree based Point Clouds		100% Finished: 23m
	Generate combined point clouds with the following resolutions: 0.01 m, 0.005 m). "Single...	2 total, 2 succeeded	

Select tasks: All None   Restart   Close   Status: Finished
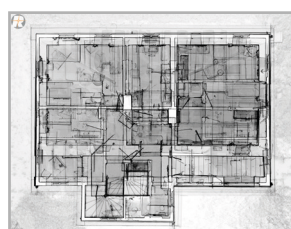☑ Create PDF Report   Runtime: 3h 53m

RiSCAN PRO – One-Touch Processing Wizard

Key Features of the Data Processing Software RiSCAN PRO:

- One-Touch Processing Wizard
- fast download from the CF-Express Card (up to 500 MB/sec)
- automatic filtering (e.g. dynamic objects, deviation, reflectance, multiple targets, etc.)
- optimization of the camera mounting calibration
- automatic colorization of the point cloud
- generation of ortho plots (e.g. GeoTIFF)
- export as RiPANO project, e57 project, LAS, etc.
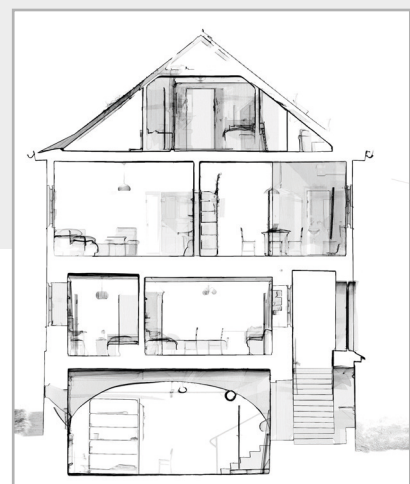- automatic generation of PDF report

PDF report

Floor plan, all floors

Floor plan, one floor

3D Point Cloud

RIEGL   Data Sheet

Key Components

Front View

beam exit window

3 internal cameras

Rear View

7 inch touch screen (1280 x 800 pixel)

single button for convenient handling

1 rechargeable battery at each side

quick mounting adapter

Optional Equipment

RTK GNSS antenna and/or external camera

With an attached RTK-GNSS antenna, the absolute positioning accuracy can be improved to 1-2 cm. The correction data is then received via WLAN.

Charger for 2 or 6 batteries

The chargers are designed for 2 or 6 batteries. They can be supplied from the 12V DC voltage of a vehicle as well as from the 110/230V AC voltage. The advantage of the 2-fold charger lies in the size and weight, that of the 6-fold charger in the possibility of continuous scanning over 24 hours (with simultaneous charging of the empty batteries).

Optional Equipment

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Accessory List
RIEGL VZ-i Series

www.riegl.com

Ultimate Performance –
Technical Data

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.	CLASS 1 LASER PRODUCT

Range Measurement Performance

Measuring Principle / Mode of Operation	time of flight measurement, echo signal digitization, online waveform processing				
Laser Pulse Repetition Rate (PRR) – (peak) [1]	**2200 kHz**	1200 kHz	600 kHz	300 kHz	100 kHz
Max. Measuring Range [2] natural targets $\rho \geq 90\ \%$ natural targets $\rho \geq 20\ \%$	**210 m** **100 m**	280 m 130 m	390 m 190 m	550 m 260 m	910 m 450 m
Minimum Range [3]	**0.5 m**	0.5 m	0.5 m	1 m	1 m
Max. Number of Targets per Pulse [4]	**5**	10	20	31	31
Ranging Accuracy [5] [7]	**5 mm**				
3D Position Accuracy [8]	**3 mm @ 50 m, 5 mm @ 100 m**				
Precision [6] [7]	**3 mm (1 mm with extended scan time)**				
Laser Wavelength	near infrared, invisible				
Laser Beam Divergence	0.35 mrad [9] / 0.25 mrad [10]				

1) Rounded values.
2) 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.
3) Minimum range specified for vertical zenith angles from 30 deg to 120 deg, resp. 90° vertical field of view.

4) If more than one target is hit, the total laser transmitter power is split and, accordingly, the achieveable range is reduced.
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) 1 sigma @ 100 m range under *RIEGL* test conditions.

8) 1-sigma value, based on target modelling, under *RIEGL* test conditions.
9) Measured at the 1/e2 points. 0.35 mrad corresponds to an increase of 35 mm of beam diameter per 100 m distance.
10) Measured at the 1/e points. 0.25 mrad corresponds to an increase of 25 mm of beam diameter per 100 m distance.

Scanner Performance

	Vertical (Line) Scan	Horizontal (Frame) Scan
Scan Angle Range	total 105° (+65° / -40°)	max. 360°
Scanning Mechanism	rotating multi-facet mirror	rotating head
Scan Speed	4 lines/sec to 420 lines/sec	0°/sec to 360°/sec [11]
Performance	**scan time less than 30 seconds for "Panorama_6mm"** (approx. 30 Mio measurements) 6 mm resolution @ 10 m distance, **up to 60 scan positions per hour** (including scan and image acquisition with real-time onboard registration)	
Angular Step Width [12] $\Delta\vartheta$ (vertical), $\Delta\varphi$ (horizontal) User defineable Resolution	$0.0007° \leq \Delta\vartheta \leq 0.75°$ between consecutive laser shots	$0.0015° \leq \Delta\varphi \leq 0.86°$ between consecutive scan lines
Angular Accuracy [13]	0.0028° (10 arcsec)	0.0028° (10 arcsec)
Angle Measurement Resolution	better 0.0007° (2.5 arcsec)	better 0.0005° (1.8 arcsec)

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

13) 1-sigma value, based on target modeling, under *RIEGL* test conditions

Scanner Performance (continued)

Orientation Sensors	integrated 3-axis accelerometer, 3-axis gyroscope, 3-axis magnetometer (compass), barometer
GNSS Receiver	integrated L1 GNSS receiver, optional external *RIEGL* GNSS RTK receiver
Waveform Data Output (optional)	providing digitized echo signal information for specific target echoes
Data Storage	integrated SSD 1 TByte, removable CF-Express card 480 GByte, automatic sync while scanning
Cloud Storage	Amazon S3, FTP-Server, Microsoft Azure
On-board Registration	automatic scan data registration as background process while scanning

Scanner Control

via Laser Scanner	7 inch touch screen, 1280 pixel x 800 pixel
via Mobile Device(WiFi)	„*RIEGL* VZi-Series"-App, available for iOS and Android
via ROS	ROS (Robot Operation System) driver available

Camera

Internal Camera	3 x 12 MPix CMOS color cameras, FOV 115° x 40° (v x h)
External Camera (optional)	e.g. detachable SONY α7R IV

General Technical Data

Internal Power Supply	**2 x Li-Ion hot-swap rechargeable batteries** 99 Wh, up to 90 minutes operating time, each <0.5 kg / 1.1 lbs each
External Power Supply	input voltage 11 - 34 V DC
Power Consumption	typ. 50 W, max. 65 W (without external devices)
Main Dimensions (width x height x depth)	173 mm x 305 mm x 184 mm
Weight	**Scanner without battery <6 kg / 13 lbs**
Humidity	max. 80 % non condensing @ +31°C
Protection Class	**IP64, dust- and splash-proof**
Temperature Range Storage / Operation Low Temperature Operation [1]	-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 -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

[1] Insulating the scanner with appropriate material will enable operation at even lower temperatures.

RIEGL® Data Sheet