High Speed 2D Laser Scanner with Online Waveform Processing

# RIEGL VQ®-450

- *very high laser pulse repetition rate (PRR) up to 550 kHz*
- *very high scan speed up to 200 scans/sec.*
- *very long range up to 800 m*
- *high-accuracy ranging*
- *multiple target capability - unlimited number of targets*
- *compact, rugged and lightweight design*
- *electrical interfaces for GPS data string and Sync Pulse (1PPS)*
- *mechanical interface for IMU mounting*
- *integrated LAN-TCP/IP interface*

**The V-Line® "Full Circle" laser scanner *RIEGL* VQ-450 is a very high speed, non-contact profile measuring system using a narrow infrared laser beam and a fast line scanning mechanism, enabling full 360 degree beam deflection without any gaps.**

High-performance pulsed laser ranging, based on *RIEGL*'s well-proven echo signal digitization technology with subsequent online waveform processing results in superior measurement capabilities even under adverse atmospheric conditions and in excellent multiple target echo discrimination.

The *RIEGL* VQ-450 is a compact and lightweight scanner, mountable in any orientation and even under limited space conditions on land based vehicles, tunnel measuring devices, watercrafts, etc. The instrument needs only one power supply and provides line scan data via the integrated LAN-TCP/IP interface. The binary data stream can easily be decoded by user-designed software making use of the available software library RiVLib.


**The *RIEGL* VQ-450 is optimally suited for**

- ***Long Range, High Speed, High Accuracy Mobile Mapping Applications***

visit our website www.riegl.com

RIEGL®
LASER MEASUREMENT SYSTEMS

# Technical Data *RIEGL* VQ®-450

| | |
|---|---|
| Laser Product Classification | Class 1 Laser Product according to IEC60825-1:2007<br>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. |


## Range Measurement Performance

Measuring Principle

- time of flight measurement
- echo signal digitization
- online waveform processing

| Effective Measurement Rate [1] | 150 kHz | 200 kHz | 300 kHz | 380 kHz | 550 kHz | 550 kHz [2] |
|---|---|---|---|---|---|---|
| Max. Measurement Range [3] | | | | | | |
| natural targets ρ ≥ 10 % | 300 m | 260 m | 200 m | 180 m | 140 m | 70 m |
| natural targets ρ ≥ 80 % | 800 m | 700 m [4] | 450 m [4] | 330 m [4] | 220 m [4] | 200 m |
| Max. Number of Targets per Pulse | practically unlimited (details on request) | | | | | |

1) Rounded values.
2) Reduced laser power for avoiding of ambiguous echo range readings.
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 overcast sky.
4) Limited by PRR.

| | |
|---|---|
| Minimum Range | 1.5 m |
| Accuracy [5] [7] | 8 mm |
| Precision [6] [7] | 5 mm |
| Laser Pulse Repetition Rate (PRR) [1] [8] | up to 550 kHz |
| **Max. Effective Measurement Rate** [1] | **up to 550 000 measurements/sec**<br>(@ 550 kHz PRR & 360° FOV) |
| Echo Signal Intensity | for each echo signal, high-resolution 16 bit intensity information is provided |
| Laser Wavelength | near infrared |
| Laser Beam Divergence | 0.3 mrad |
| Laser Beam Footprint (Gaussian Beam Definition) | 7 mm @ exit aperture<br>17 mm @ 50 m<br>32 mm @ 100 m |

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 @ 50 m range under *RIEGL* test conditions.
8) User selectable.

## Scanner Performance

| | |
|---|---|
| Scanning Mechanism | rotating mirror |
| Field of View (selectable) | up to 360° „full circle", without gaps |
| **Scan Speed** (selectable) | **up to 200 scans/sec** |
| Angular Step Width $\Delta\ \varphi$ (selectable)<br>between consecutive laser shots | $0.001° \leq \Delta\ \varphi \leq 0.48°$ |
| Angle Measurement Resolution | 0.001° |
| Internal Sync Timer | for real-time synchronized time stamping of scan data |
| Scan Sync (optional) | scanner rotation synchronization |

## Data Interfaces

| | |
|---|---|
| Configuration | LAN 10/100/1000 Mbit/sec |
| Scan Data Output | LAN 10/100/1000 Mbit/sec |
| GPS-System | Serial RS232 interface for data string with GPS-time information,<br>TTL input for 1 PPS synchronization pulse |

## Mechanical Interfaces

| | |
|---|---|
| Mounting of Laser Scanner | 6x dia 11 mm mounting slots |
| Mounting of IMU Sensor | 3x M6 thread inserts, depth 8 mm at bottom |

## General Technical Data

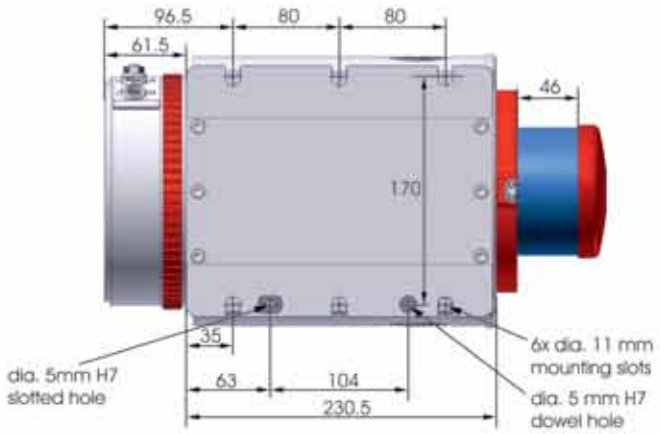
| | |
|---|---|
| Power Supply Input Voltage | 18 - 32 V DC |
| Current Consumption | typ. 55 W @ 10 scans/s, typ. 135 W @ 200 scans/s, max. 180 W [9] |
| Main Dimensions (L x W x H) | 377 x 205.5 mm x 218 mm |
| Weight | approx. 12.5 kg (without protective cap) |
| Humidity | max. 80 % non condensing @ +31°C |
| Protection Class | IP64, dust and splash-proof |
| Temperature Range | -10°C up to +40°C (operation) / -20°C up to +50°C (storage) |

9) At the maximum scanning rate of 200 scans/sec and ambient temperature < +10°C.

**Note:** In Germany and in the U.S.A. only, use of the VQ-450 for other applications than Mobile Mapping and Tunnel Profile Measurement is not permitted.

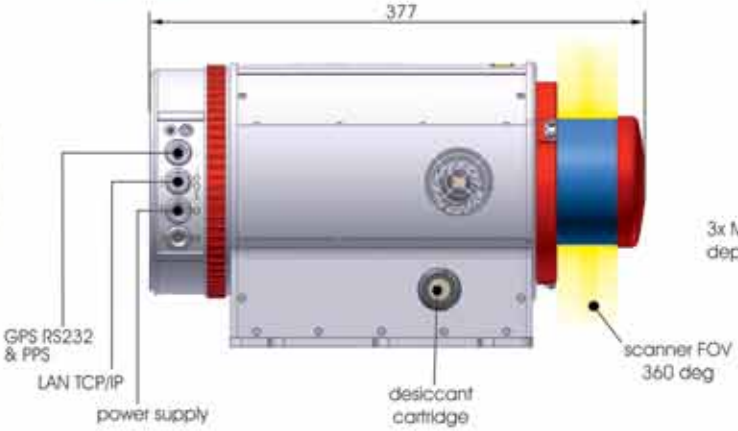
**rear view**

all dimensions in mm

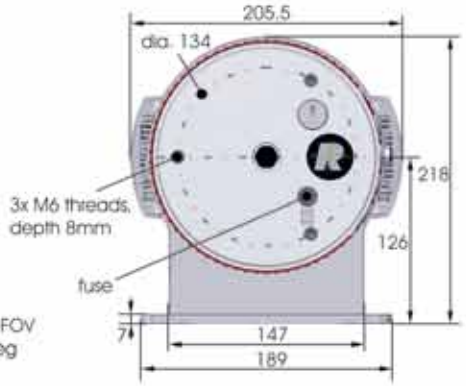



**top view**


**side view**

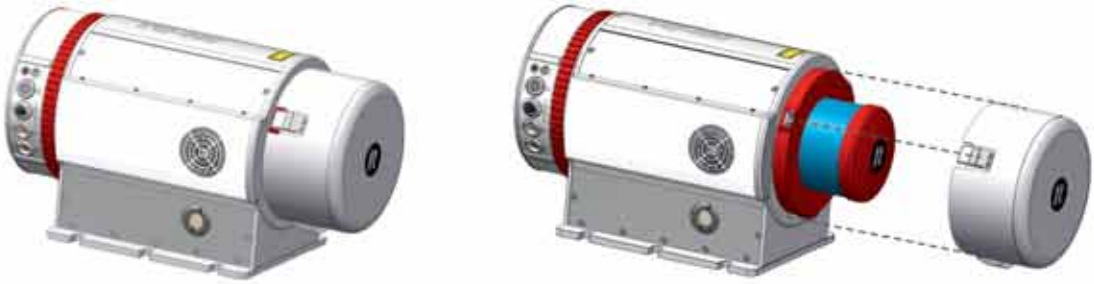



**bottom view**




**front view**


**Protective Cap:**



When not in operation, a protective cap is to be attached to shield the high precision optical front end from mechanical damage and soiling.

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