

# Waveform Processing Airborne LiDAR Scanning System for High Point Density Mapping and Ultra-Wide Area Mapping

**NEW**

## RIEGL VQ-1260<sup>®</sup>

- **high pulse repetition rates of up to 2.2 MHz**
- **up to 1.47 million measurements per second on the ground**
- **best point distribution for optimum target resolution**
- **excellent atmospheric clutter suppression**
- **multiple target capability**
- **online waveform processing and full waveform data recording**
- **on-board graphical user interface for easy access to primary scanner parameters**
- **integrated inertial measurement unit and GNSS receiver**
- **prepared for the integration of up to two high resolution RGB/NIR cameras**
- **optimized for interfacing with typical hatches and stabilized platforms**
- **deteachable handgrips for facilitated handling**

The VQ-1260 is one of RIEGL's latest high-end airborne laser scanning systems, which sets a new standard for a wide field of applications – from high-point density wide area mapping to ultra-high resolution city mapping or corridor mapping.

The unique design features pulse repetition rates from 2.2 MHz, resulting in a regular point spacing and an almost constant point density distribution on the ground. The system features large measurement distances of up to 2300 m at maximum PRR, and 5400 m at minimum PRR, for a target reflectance of 20 %, which results in an unmatched high efficiency of e.g. up to 580 km<sup>2</sup>/h at 150 knots flying speed for an average of 4 points per square meter.

A newly designed optical frontend significantly minimizes for near-range echoes due to atmospheric clutter, resulting in clean point clouds. Online-Waveform processing and full-waveform processing capabilities are a matter of course for this class of equipment.

Scan data and camera images are stored on removable hard disks that can be accessed directly on the device, eliminating the need for an external data recorder.

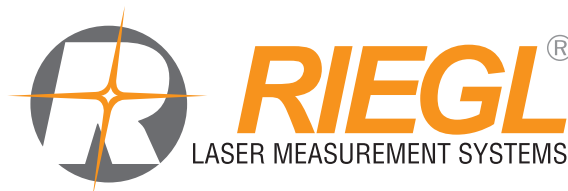
A high-performance IMU/GNSS unit and one or two optional high-resolution RGB/NIR cameras are seamlessly integrated in the compact and user-friendly designed housing. The standardized mounting flange fits typical hatches or gyro-stabilized leveling mounts for maintaining optimum point distribution.

### **Applications:**

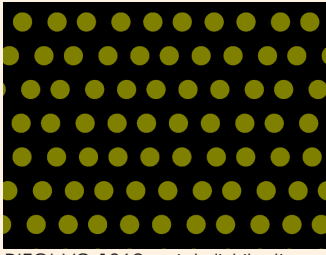
- *Ultra Wide Area / High Altitude Mapping*
- *Ultra-High Point Density Mapping*
- *Mapping of Complex Urban Environments*
- *Glacier & Snowfield Mapping*
- *City Modeling*
- *Mapping of Lakesides & River Banks*
- *Agriculture & Forestry*
- *Corridor Mapping*



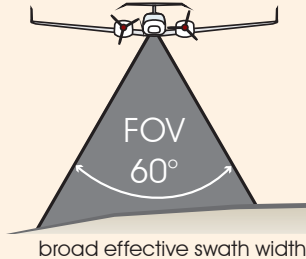
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[www.riegl.com](http://www.riegl.com)



## RIEGL VQ®-1260 Dense Scan Pattern and Wide Effective Swath Width



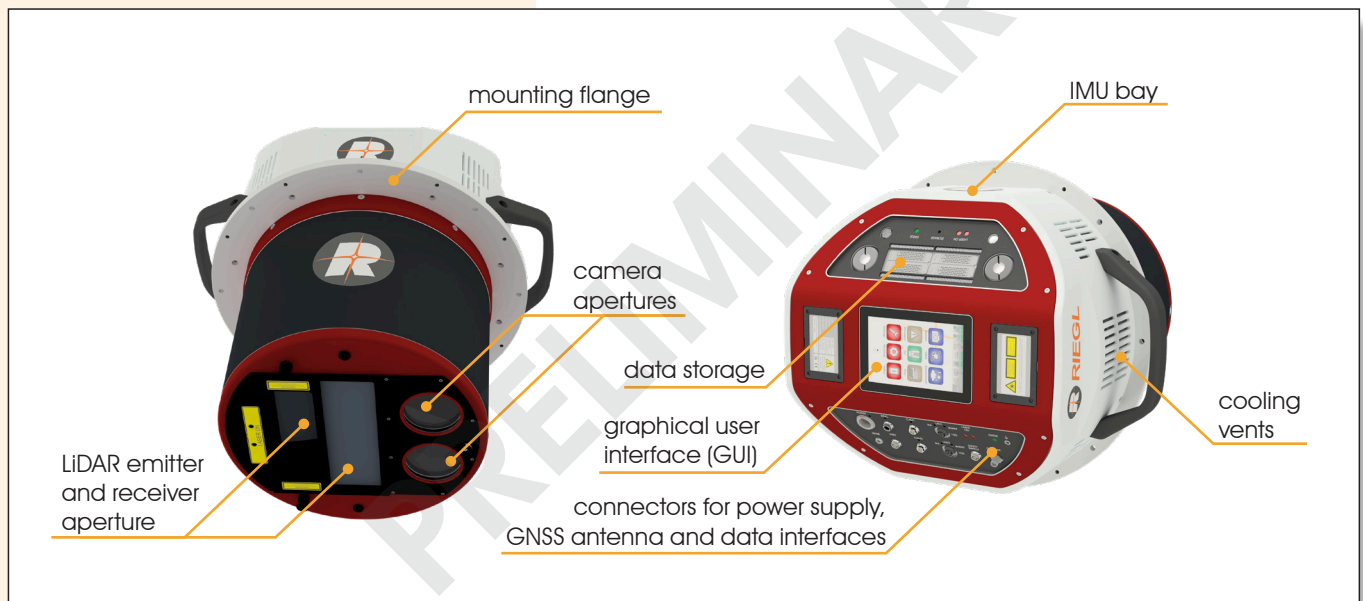
RIEGL VQ-1260 point distribution

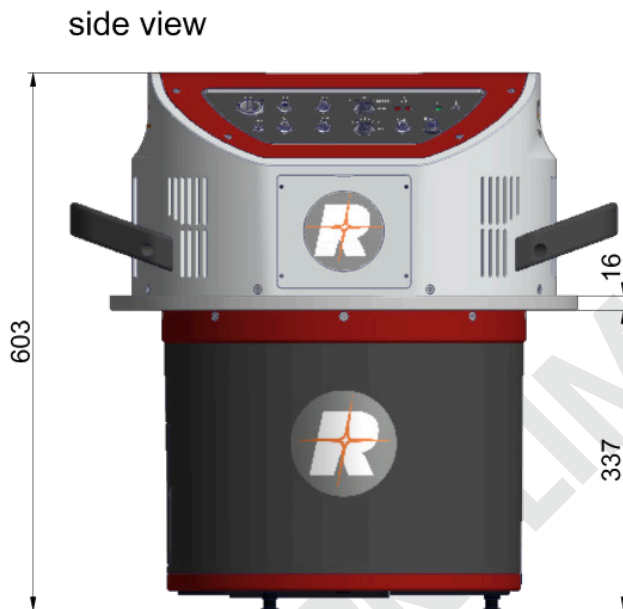
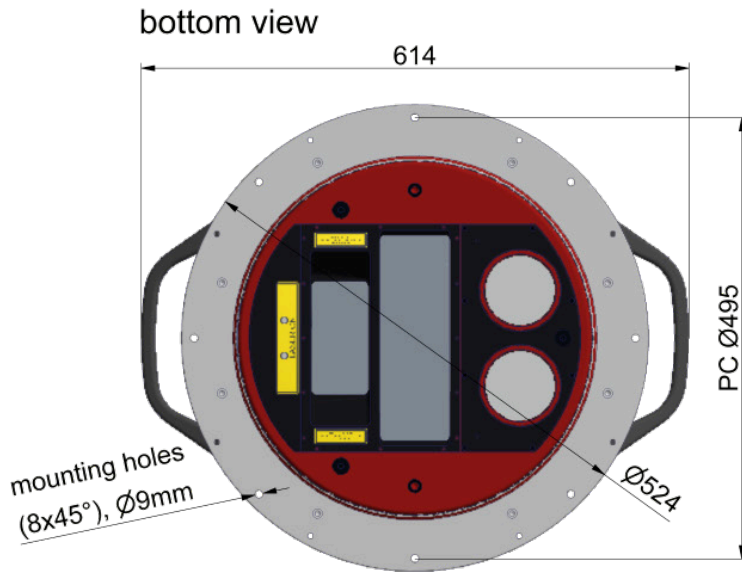


The RIEGL VQ-1260 scanning mechanism – based on a continuously rotating polygon mirror wheel – delivers straight parallel scan lines resulting in a regular point pattern on the ground. With equal spatial sampling frequency along and across track, object extents are well defined and even small objects may be detected. The instrument is perfectly suited for applications where a superior point pattern on target surfaces is required.

The wide field of view and the multiple-time-around measurement capability of the RIEGL VQ-1260 make the instrument perfectly suited for wide area mapping applications. The instrument has been designed for utmost efficiency in collecting data by enabling scanning operations from high altitudes at high laser pulse repetition rates simultaneously, reducing the necessary flight time to a minimum.

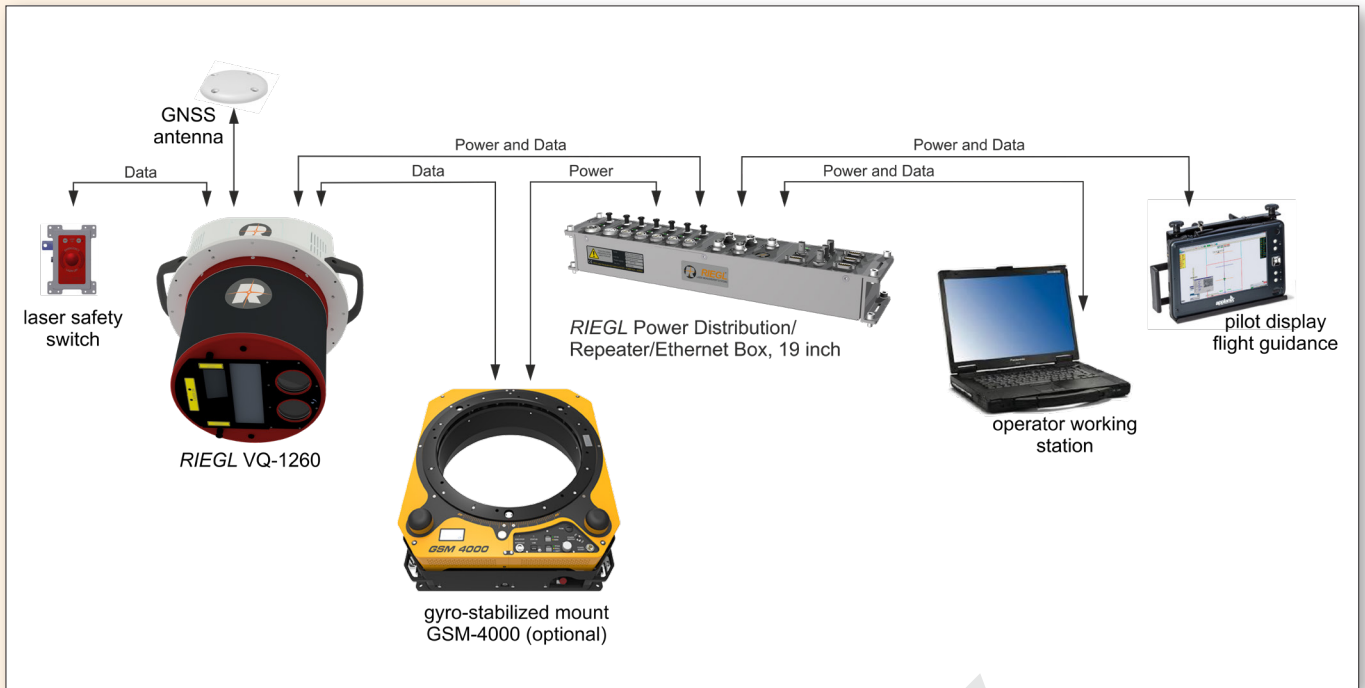
## RIEGL VQ-1260 Elements of Function and Operation





dimensions in mm

## RIEGL VQ-1260 System Components



A minimum number of system components and external cabling is required for an easy and quick installation in aircrafts.

## RIEGL VQ-1260 Installation Examples



RIEGL VQ-1260 installed in the nose pod of fixed-wing aircraft DA42 MPP

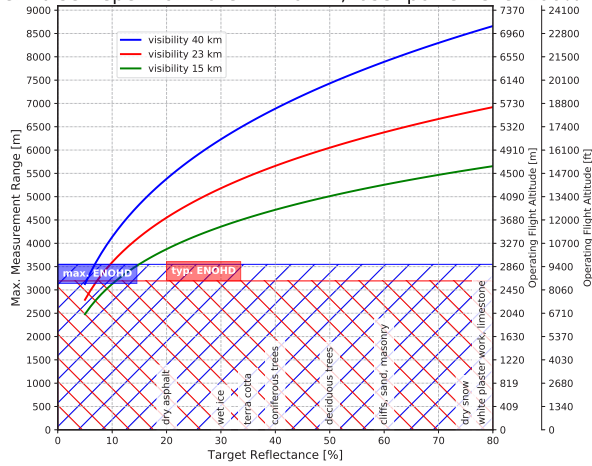


RIEGL VQ-1260 installed on GSM-4000 gyro-stabilized platform to be used in a helicopter or fixed-wing aircraft

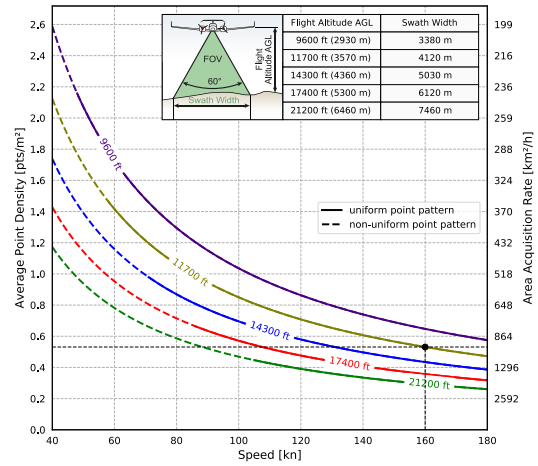


# Measurement Range & Point Density RIEGL VQ-1260

Laser Pulse Repetition Rate = 270kHz, laser power level 100%

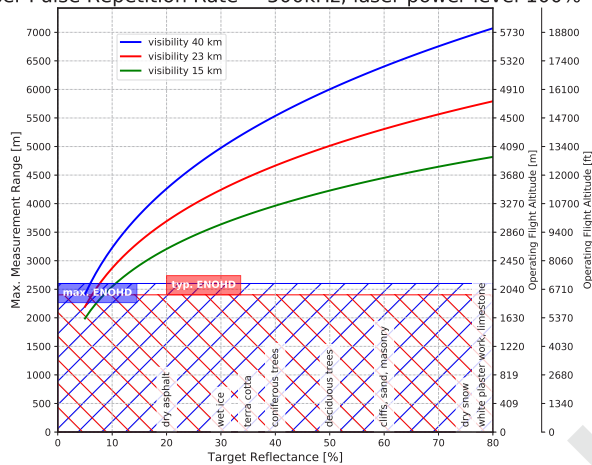


**Example:** VQ-1260 at 270,000 pulses/sec, laser power level 100%  
altitude 11,700 ft AGL, speed 160 kn

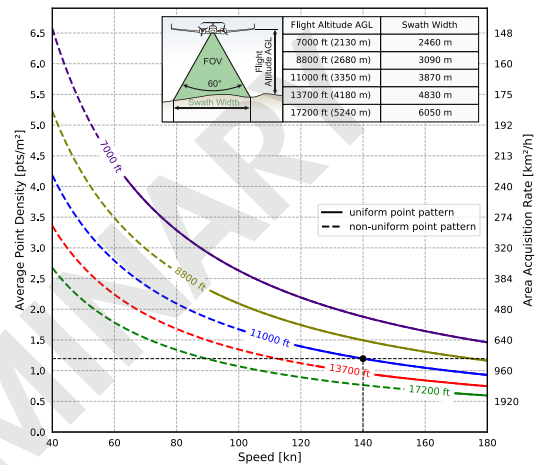


**Results:** point density ~ 0.6 pts/m<sup>2</sup>  
area acquisition rate ~ 976 km<sup>2</sup>/h

Laser Pulse Repetition Rate = 500kHz, laser power level 100%

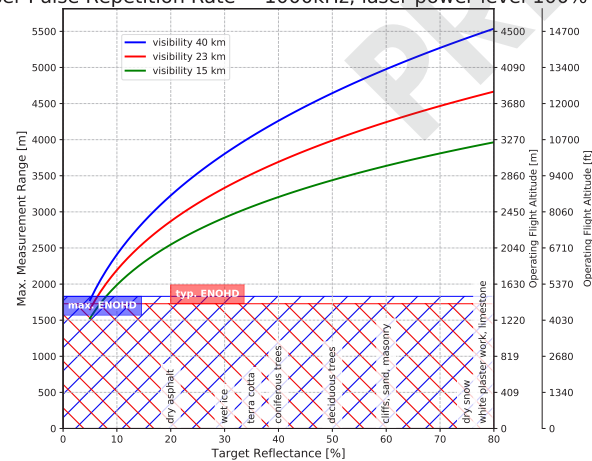


**Example:** VQ-1260 at 500,000 pulses/sec, laser power level 100%  
altitude 11,000 ft AGL, speed 140 kn

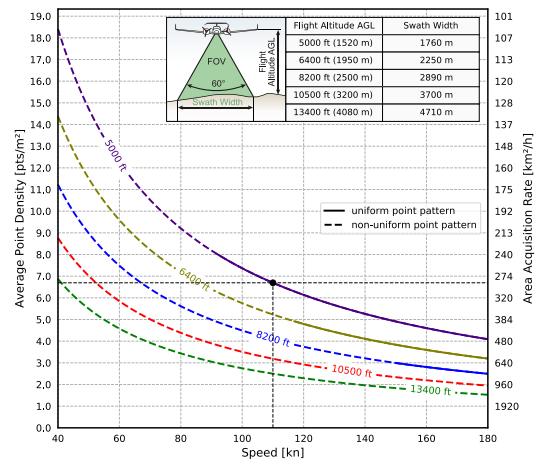


**Results:** point density ~ 1.2 pts/m<sup>2</sup>  
area acquisition rate ~ 803 km<sup>2</sup>/h

Laser Pulse Repetition Rate = 1000kHz, laser power level 100%



**Example:** VQ-1260 at 1,000,000 pulses/sec, laser power level 100%  
altitude 5,000 ft AGL, speed 110 kn



**Results:** point density ~ 6.7 pts/m<sup>2</sup>  
area acquisition rate ~ 287 km<sup>2</sup>/h

**The following conditions are assumed for the Operating Flight Altitude AGL**

- ambiguity resolved by multiple-time-around (MTA) processing
- target size ≥ laser footprint
- effective FOV 58°
- average ambient brightness
- roll angle up to ±5°

**Assumptions for calculation of the Area Acquisition Rate**

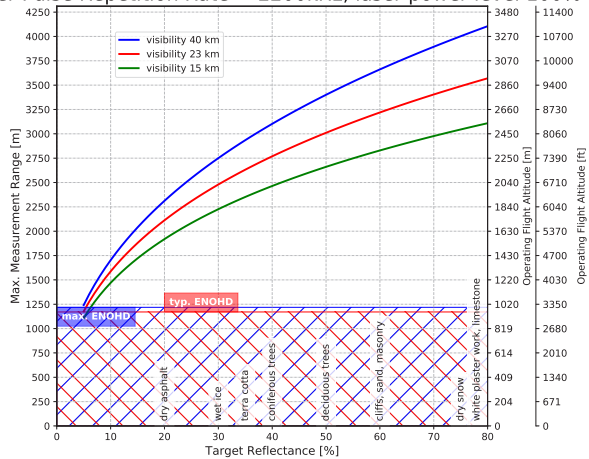
- 20% overlap of neighboring flight strips. This overlap covers a roll angle of ±5° or a reduction of flight altitude AGL of 20%.

**Typical ENOHD**

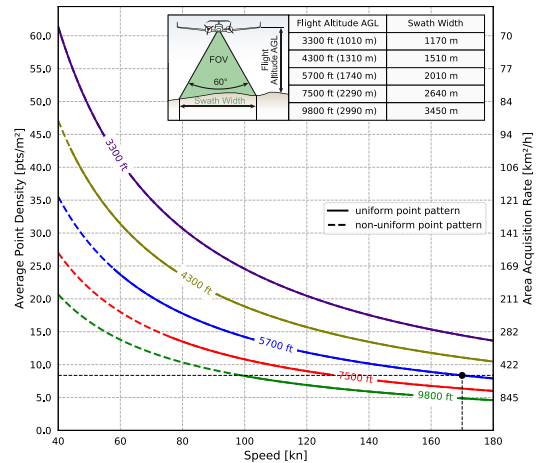
- Calculated under assumption of an angular step width of 0.012° and an aircraft speed higher than 10kn.

# Measurement Range & Point Density RIEGL VQ-1260

Laser Pulse Repetition Rate = 2200kHz, laser power level 100%

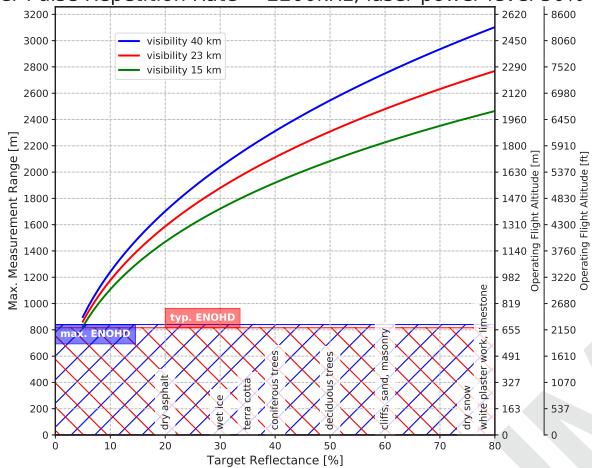


**Example:** VQ-1260 at 2,200,000 pulses/sec, laser power level 100%  
altitude 5,700 ft AGL, speed 170 kn

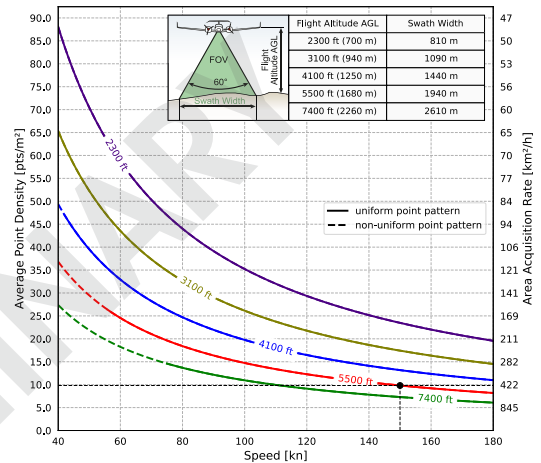


**Results:** point density ~ 8.4 pts/m<sup>2</sup>  
area acquisition rate ~ 505 km<sup>2</sup>/h

Laser Pulse Repetition Rate = 2200kHz, laser power level 50%

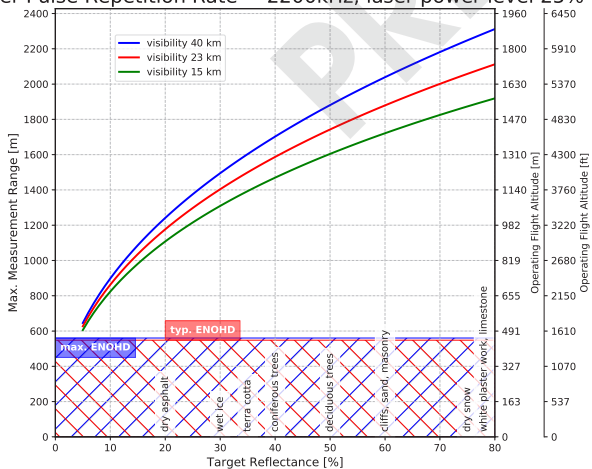


**Example:** VQ-1260 at 2,200,000 pulses/sec, laser power level 50%  
altitude 5,500 ft AGL, speed 150 kn

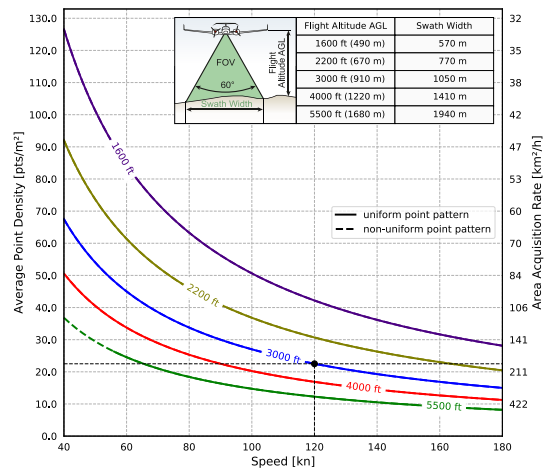


**Results:** point density ~ 9.8 pts/m<sup>2</sup>  
area acquisition rate ~ 430 km<sup>2</sup>/h

Laser Pulse Repetition Rate = 2200kHz, laser power level 25%



**Example:** VQ-1260 at 2,200,000 pulses/sec, laser power level 25%  
altitude 3,000 ft AGL, speed 120 kn



**Results:** point density ~ 23 pts/m<sup>2</sup>  
area acquisition rate ~ 188 km<sup>2</sup>/h

**The following conditions are assumed for the Operating Flight Altitude AGL**

- ambiguity resolved by multiple-time-around (MTA) processing
- target size ≥ laser footprint
- effective FOV 58°
- average ambient brightness
- roll angle up to ±5°

**Assumptions for calculation of the Area Acquisition Rate**

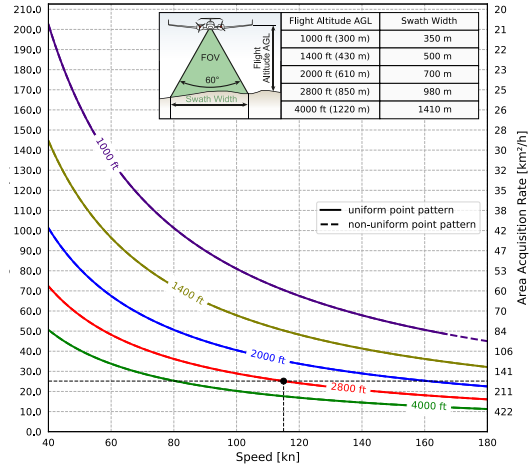
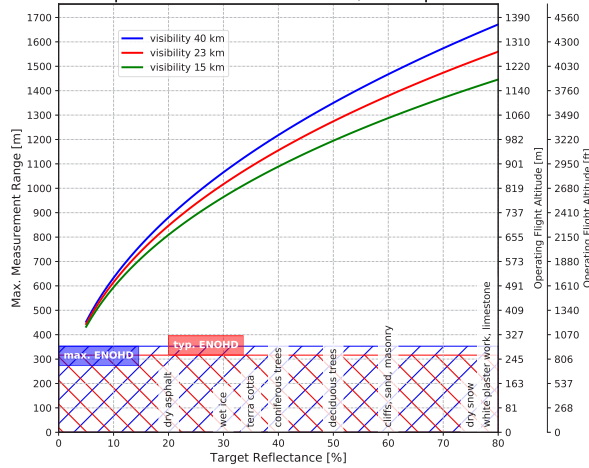
- 20% overlap of neighboring flight strips. This overlap covers a roll angle of ±5° or a reduction of flight altitude AGL of 20%.

**Typical ENOHD**

- Calculated under assumption of an angular step width of 0.012° and an aircraft speed higher than 10kn.

# Measurement Range & Point Density RIEGL VQ-1260

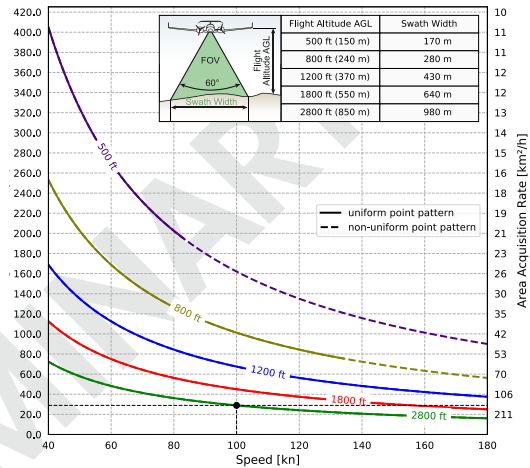
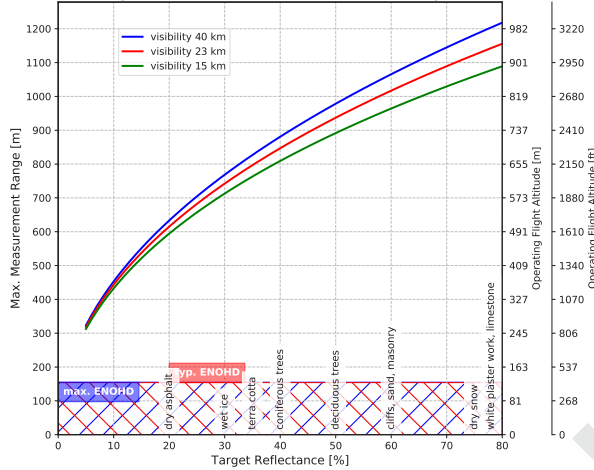
Laser Pulse Repetition Rate = 2200kHz, laser power level 12%



**Example:** VQ-1260 at 2,200,000 pulses/sec, laser power level 12%  
altitude 2,800 ft AGL, speed 115 kn

**Results:** point density ~ 25 pts/m<sup>2</sup>  
area acquisition rate ~ 168 km<sup>2</sup>/h

Laser Pulse Repetition Rate = 2200kHz, laser power level 6%



**Example:** VQ-1260 at 2,200,000 pulses/sec, laser power level 6%  
altitude 2,800 ft AGL, speed 100 kn

**Results:** point density ~ 29 pts/m<sup>2</sup>  
area acquisition rate ~ 146 km<sup>2</sup>/h

**The following conditions are assumed for the Operating Flight Altitude AGL**

- ambiguity resolved by multiple-time-around (MTA) processing
- target size ≥ laser footprint
- effective FOV 58°
- average ambient brightness
- roll angle up to ±5°

**Assumptions for calculation of the Area Acquisition Rate**

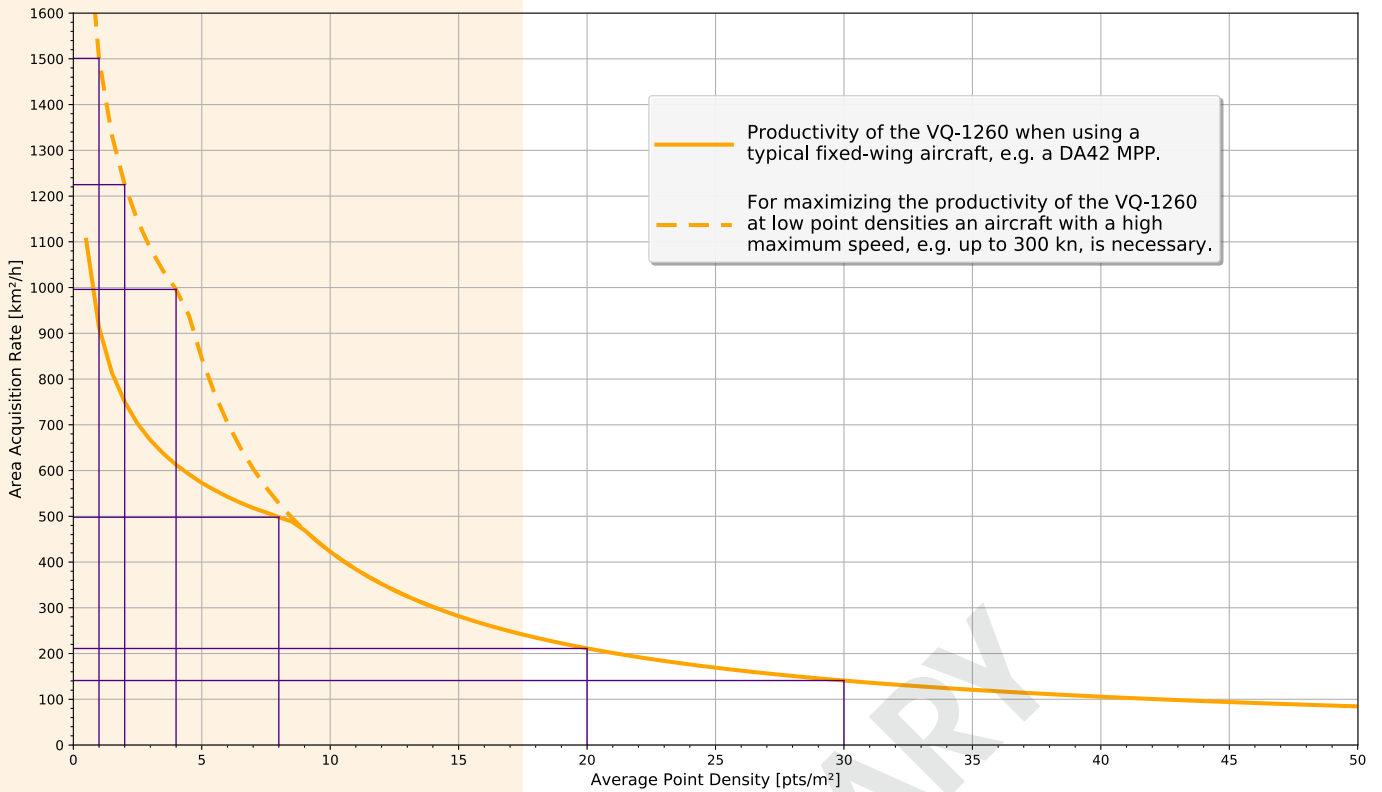
- 20% overlap of neighboring flight strips. This overlap covers a roll angle of ±5° or a reduction of flight altitude AGL of 20%.

**Typical ENOHD**

- Calculated under assumption of an angular step width of 0.012° and an aircraft speed higher than 10kn.

# RIEGL VQ-1260 Productivity

The RIEGL VQ-1260 Waveform Processing Airborne LiDAR Mapping System offers highest productivity.



## Examples <sup>1)</sup>

Average Point Density	1 pts/m <sup>2</sup>	2 pts/m <sup>2</sup>	4 pts/m <sup>2</sup>	8 pts/m <sup>2</sup>	20 pts/m <sup>2</sup>	30 pts/m <sup>2</sup>
Flight Altitude	9590 ft 2920 m	7830 ft 2390 m	6370 ft 1940 m	6370 ft 1940 m	2720 ft 830 m	2420 ft 740 m
Ground Speed	300 kn	300 kn	300 kn	150 kn	150 kn	110 kn
Swath Width	3380 m	2760 m	2240 m	2240 m	960 m	850 m
Productivity	1501 km <sup>2</sup> /h	1225 km <sup>2</sup> /h	996 km <sup>2</sup> /h	498 km <sup>2</sup> /h	211 km <sup>2</sup> /h	141 km <sup>2</sup> /h
eff. Measurement Rate <sup>2)</sup>	521,000 meas./sec	851,000 meas./sec	1,383,000 meas./sec	1,381,000 meas./sec	1,468,000 meas./sec	1,468,000 meas./sec
Camera GSD <sup>3)4)</sup>	220 mm	180 mm	146 mm	90 mm	63 mm	56 mm
Camera Trigger Intervall <sup>4)</sup>	5.7 sec	4.6 sec	3.8 sec	4.6 sec	3.2 sec	2.9 sec

1) calculated for 20% target reflectivity and 20% stripe overlap

2) The target detection rate is equal to the measurement rate for terrains offering only one target per laser pulse but may be much higher for vegetated areas.

3) Ground Sampling Distance

4) Calculated for a 150 MPixel CMOS camera with a FOV of 56.2° x 43.7° and 60% image overlap in flight direction (endlap).





# Technical Data RIEGL VQ-1260 (continued)

## Data Interfaces

Configuration  
Scan Data Output  
Synchronization

LAN 10/100/1000/2500/5000/10000 MBit/s  
LAN 10/100/1000/2500/5000/10000 MBit/s  
Serial RS-232 interface, TTL input for 1 pps synchronization pulse, accepts different data formats for GNSS-time information  
2 connectors with power, RS-232, pps, trigger, exposure  
U.2 SSD, up to 15.36 TByte

Camera Interface  
Removable Storage Device

## General Technical Data

Power Supply / Power Consumption

20 - 32 V DC / typ. 350 W  
max. 600 W, depending on integrated optional components  
Ø 524 mm x 603 mm (without flange mounted carrying handles)  
approx. 60 kg without any camera but including a typical IMU/GNSS unit  
approx. 65 kg with optional components

Main Dimensions (flange diameter x height)  
Weight

Protection Class  
Max. Flight Altitude operating / not operating  
Temperature Range operation / storage

IP54  
18500 ft (5600 m) above MSL<sup>1)</sup> / 18500 ft (5600 m) above MSL  
-5°C up to +35°C / -10°C up to +50°C

## Recommended IMU/GNSS System <sup>2) 3)</sup>

IMU Accuracy <sup>4)</sup>  
Roll, Pitch  
Heading  
IMU Sampling Rate  
Position Accuracy (typ.)

0.0025°  
0.005°  
200 Hz  
0.05 m - 0.1 m

## Optional Components VQ-1260

### Primary Camera

Sensor Resolution  
Sensor Dimensions (diagonal)  
Focal Length of Camera Lens  
Field of View (FOV)  
Data Storage

RGB  
e.g. 150 MPixel CMOS  
66.7 mm (medium format)  
50 mm  
approx. 54.6° x 42.3°  
removable Harddisk

1) Mean Sea Level

2) The recommended IMU is listed neither in the European Export Control List (i.e. Annex 1 of Regulation (EU) No. 2021/821 nor in the Canadian Export Control List. Detailed information on certain cases will be provided on request.

3) The RIEGL VQ-1260 Laser Scanning system supports different IMU/GNSS Systems, details on request.

4) One sigma values, no GNSS outages, post-processed with base station data



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