

**NEW**

# RIEGL miniVUX<sup>®</sup>-1 UAV

- **very compact & lightweight (1.55 kg / 3.4 lbs)**
- **360° field-of-view**
- **stable aluminium housing, ready to be mounted on fixed-wing, rotary-wing, and multi-rotor UAVs**
- **RIEGL's unique echo signal digitization and online waveform processing**
- **multiple target capability – up to 5 target echoes per laser shot**
- **scan speed up to 100 scans/sec**
- **measurement rate up to 100,000 measurements/sec**
- **mechanical and electrical interface for IMU mounting**
- **exceptionally well suited to measure in snowy and icy terrains**

World Premiere at  
**INTERGEO 2016**



visit our website  
[www.riegl.com](http://www.riegl.com)

The new **RIEGL miniVUX-1 UAV** is an extremely lightweight miniaturized airborne laser scanner, designed specifically for integration with the newly emerging survey platforms within UAS/UAV/RPAS.

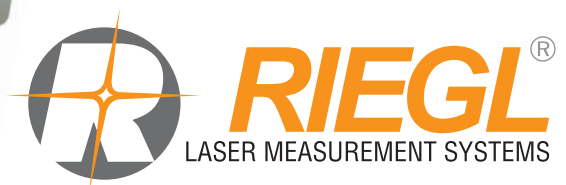
The small and sophisticated design of the stable aluminium housing enables integration with systems that have restricted space or payload weight. The 360° field of view allows complete acquisition of the environment.

An easy to remove SD storage card for data acquisition, and/or the option for streaming the scan data via LAN-TCP/IP interface, in combination with the modest power consumption of the scanner, enables simple integration possibilities with most UAS/UAV/RPAS systems.

The **RIEGL miniVUX-1 UAV** makes use of **RIEGL's** unique Waveform-LIDAR technology, allowing echo digitization and online waveform processing. Multi-target resolution is the basis for penetrating even dense foliage. Additionally the wavelength is optimized for the measurement of snowy and icy terrain.

#### Typical applications include

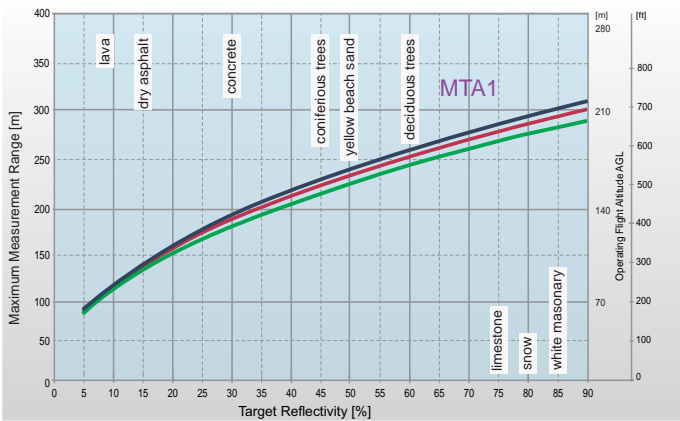
- **Agriculture & Forestry**
- **Archeology and Cultural Heritage Documentation**
- **Construction-Site Monitoring**
- **Glacier and Snowfield Mapping**
- **Landslide Monitoring**



# Maximum Measurement Range vs. Target Reflectivity *RIEGL* miniVUX®-1 UAV

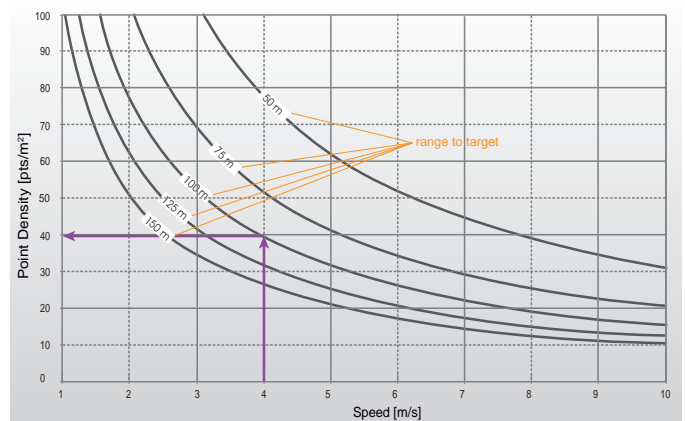
PRR = 100 kHz

PRR = 100 kHz



MTA1: no ambiguity / one transmitted pulse „in the air“

— @ visibility 23 km  
 — @ visibility 15 km  
 — @ visibility 8 km



Example: miniVUX-1 at 100,000 pulses/second  
 range to target = 100 m, speed = 4 m/s  
 Resulting Point Density ~ 40 pts/m²

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

- target size  $\geq$  laser footprint
- average ambient brightness
- operating flight altitude given at a FOV of +/-45°

## *RIEGL* miniVUX®-1 UAV Additional Equipment and Integration

### Additional Equipment for *RIEGL* miniVUX-1 UAV

#### Cooling Fan

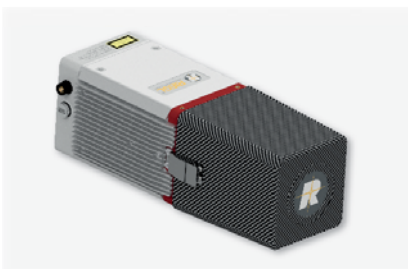


Cooling Fan

Lightweight structure with an axial fan providing forced air convection for applications where sufficient natural air flow cannot be guaranteed. Power supply is provided via integrated contact pins. The cooling fan is easy to mount by the customer and is included in the scanner's scope of delivery.

The cooling fan has to be mounted whenever the environmental conditions/temperatures require (see "temperature range" on page 4 of this datasheet).

#### Protective Cap



*RIEGL* miniVUX-1 UAV with Protective Cap

To shield the glass window of the *RIEGL* miniVUX-1 UAV from mechanical damage and soiling, a protective cap is provided to cover the upper part of the instrument during transport and storage.

### Options for *RIEGL* miniVUX-1 UAV Integration

*RIEGL* offers user-friendly, installation- and application-oriented solutions for the integration of the miniVUX-1 UAV LiDAR sensor:

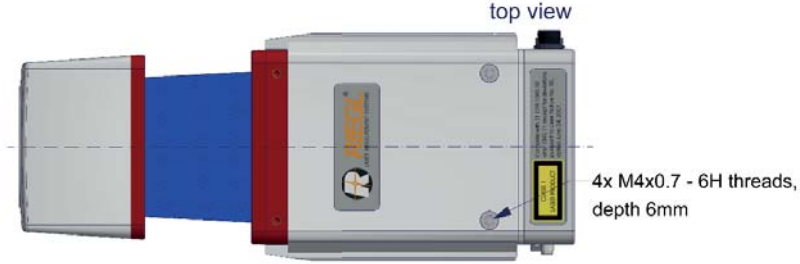
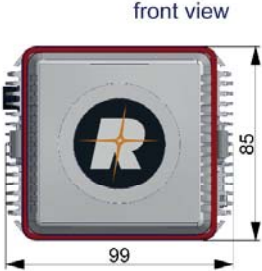
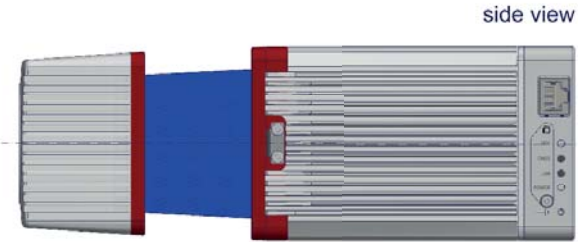
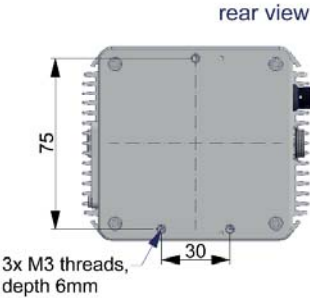
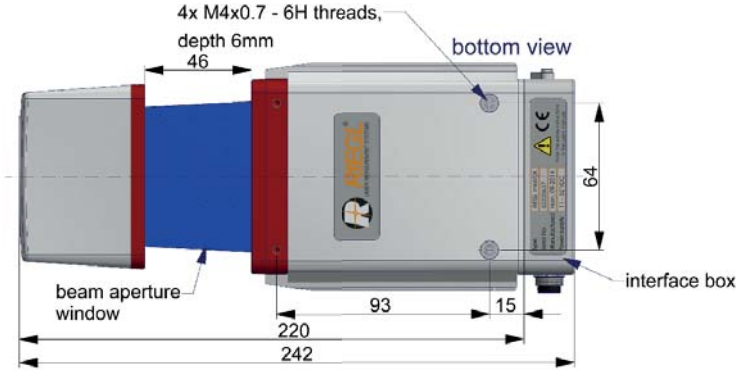
- ***RIEGL* VUX-SYS**  
 Complete airborne laser scanning system for flexible use in UAS/UAV/RPAS, helicopter, gyrocopter and ultra-light aircraft installations, comprising of the *RIEGL* miniVUX-1 UAV, an IMU/GNSS system and a dedicated control unit.
- ***RIEGL* RiCOPTER**  
 Ready to fly remotely piloted airborne laser scanning system with *RIEGL* VUX-SYS integrated

Details to be found on the relevant datasheets and infosheets.



*RIEGL* miniVUX-1 UAV with external IMU-Sensor (*RIEGL* VUX-SYS)

Dimensional Drawings *RIEGL* miniVUX®-1 UAV



all dimensions in mm

# Technical Data *RIEGL* miniVUX®-1UAV

## Laser Product Classification

Class 1 Laser Product according to IEC60825-1:2014 (Ed. 03)

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.

CLASS 1  
LASER PRODUCT

## Range Measurement Performance

### Measuring Principle

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

Laser Pulse Repetition Rate PRR <sup>1)</sup>	100 kHz
Max. Measuring Range <sup>2)</sup> natural targets $\rho \geq 20\%$ natural targets $\rho \geq 60\%$	150 m 250 m
Max. Operating Flight Altitude AGL <sup>1) 3)</sup>	100 m (330 ft)
Max. Number of Targets per Pulse	5

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) Reflectivity  $\rho \geq 20\%$ , flat terrain assumed, scan angle  $\pm 45^\circ$  FOV, additional roll angle  $\pm 5^\circ$

### Minimum Range

### Accuracy <sup>4) 6)</sup>

### Precision <sup>5) 6)</sup>

### Laser Pulse Repetition Rate <sup>1)</sup>

### Max. Effective Measurement Rate <sup>1)</sup>

### Echo Signal Intensity

### Laser Wavelength

### Laser Beam Divergence <sup>7)</sup>

### Laser Beam Footprint

3 m

15 mm

10 mm

100 kHz

up to 100 000 meas./sec. (@ 100 kHz PRR & 360° FOV)

for each echo signal, high-resolution 16 bit intensity information is provided

near infrared

1.6 x 0.5 mrad

160 mm x 50 mm @ 100 m

4) Accuracy is the degree of conformity of a measured quantity to its actual (true) value.  
5) Precision, also called reproducibility or repeatability, is the degree to which further measurements show the same result.

6) One sigma @ 50 m range under *RIEGL* test conditions.

7) Measured at 50% peak intensity, 1.6 mrad corresponds to an increase of 160 mm of beam diameter per 100 m distance..

## Scanner Performance

### Scanning Mechanism

### Field of View (selectable)

### Scan Speed (selectable)

### Angular Step Width $\Delta \theta$ (selectable) between consecutive laser shots

### Angle Measurement Resolution

rotating mirror

up to 360°

10 - 100 revolutions per second, equivalent to 10 - 100 scans/sec

$0.05^\circ \leq \Delta \theta \leq 0.5^\circ$

0.001°

## Interfaces

### Configuration, Scan Data Output & Communication with External Devices GNSS Interface

### General IO & Control

### Camera Interface

### Memory Card Holder

### Serial Interface to External Devices

2 x LAN 10/100/1000 Mbit/sec

WLAN IEEE 802.11 a/b/g/n

Serial RS232 interface for data string with GNSS-time information,

TTL input for 1PPS synchronization pulse.

Power Output 10 V DC, max 4.5 W <sup>8)</sup>

2 x TTL input/output <sup>8)</sup>, 1 x Remote on/off

2 x USB 2.0, Trigger, Exposure <sup>8)</sup>

for SDHC/SDXC memory card 32 GByte (can be upgraded to 128 GByte)

SPI (Serial Peripheral Interface) <sup>9)</sup>

8) 1 x externally available with standard interface box  
9) internally available (not available with standard interface box)

## General Technical Data

### Power Supply Input Voltage / Consumption

### Main Dimensions (L x W x H)

### without / with Cooling Fan

### Weight

### without / with Cooling Fan

### Humidity

### Protection Class

### Temperature Range <sup>10)</sup>

11 - 34 V DC / typ. 16 W @ 100 scans/sec

242 x 99 x 85 mm / 242 x 110 x 85 mm

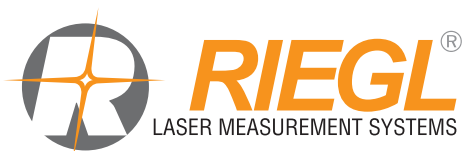
approx. 1.55 kg / approx. 1.6 kg

max. 80 % non condensing @ 31°C

IP64, dust and splash-proof

-10°C up to +40°C (operation) / -20°C up to +50°C (storage)

10) Continuous operation requires forced air convection. For applications where sufficient natural air flow alongside the cooling fins cannot be guaranteed an additional Cooling Fan (cooling fan with corresponding air deflector) has to be used.



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