The RIEGL miniVUX-1UAV is an extremely lightweight airborne laser scanner, designed specifically for integration with UAS/UAV/RPAS.

The small and sophisticated design of the stable aluminum housing offers various integration possibilities with platforms that offer restricted space or payload capabilities. The 360° field of view allows complete acquisition of the environment.

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

The RIEGL miniVUX-1UAV 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. As a further special feature, the wavelength is optimized for the measurement of snowy and icy terrain.

In addition to the stand-alone version of the miniVUX-1UAV, RIEGL also offers fully-integrated solutions.

Typical applications include:
- Agriculture & Forestry
- Glacier and Snowfield Mapping
- Archeology and Cultural Heritage Documentation
- Construction-Site Monitoring
- Landslide Monitoring
Maximum Measurement Range vs. Target Reflectance **RIEGL miniVUX®-1UAV**

![Graph showing Maximum Measurement Range vs. Target Reflectance](image)

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

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

Please contact sales@riegl.com to get more detailed information.

**RIEGL miniVUX-SYS System Integration Options**

Besides of the stand-alone miniVUX-1UAV LiDAR engine, **RIEGL** offers also system solutions, combining the miniVUX-1UAV with IMU/GNSS systems of different performance and of different form factors as well as optional RGB camera systems. Additionally, a special add-on to the miniVUX-SYS allows for straightforward integration with your multi-rotor UAV, e.g. a DJI Matrice M600.

**RIEGL miniVUX-1UAV with APX-15 UAV**

- IMU/GNSS unit integrated with LiDAR engine
- total weight approx. 2 kg
- interfaces for up to 2 cameras
- suited for integration into fixed-wing UAVs

**RIEGL miniVUX-1UAV with APX-20 UAV**

- higher-grade IMU/GNSS unit partly integrated with LiDAR engine
- total weight approx. 2.5 kg
- interfaces for up to 2 cameras
- suited for integration into all types of UAVs

**RIEGL Integration Kit 600**

- add-on to the miniVUX-SYS coming with shock-absorbing mounting-kit, power supply module and cabling
- total weight approx. 0.7 kg (without sensor and camera)
- suited for integration into multi-rotor UAVs

Please contact sales@riegl.com to get more detailed information.

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1) See technical details in the corresponding Applanix datasheet

**Example:** miniVUX-1UAV at 100,000 pulses/second, range to target = 100 m, speed = 4 m/s

**Resulting Point Density** ~ 40 pts/m²
**RIEGL miniVUX®-1UAV LiDAR Sensor**
equipped with APX-15 UAV

**RIEGL miniVUX®-1UAV LiDAR Sensor**
equipped with APX-20 UAV

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**RIEGL miniVUX®-1UAV Camera Options**

- **RIEGL miniVUX-1UAV LiDAR Sensor equipped with APX-15 UAV**
  - with two Sony Alpha 6000 cameras (oblique mount)
  - with Nadir-looking camera e.g. Sony Alpha 6000 camera or Sony Alpha 7R III

- **RIEGL miniVUX-1UAV LiDAR Sensor equipped with APX-20 UAV**
  - with two Sony Alpha 6000 cameras (oblique mount)
  - with Nadir-looking camera e.g. Sony Alpha 6000 camera or Sony Alpha 7R III

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1) See technical details in the corresponding Applanix datasheet

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*Dimensional Drawings RIEGL miniVUX®-1UAV Stand-Alone*
Technical Data RIEGL miniVUX-1UAV

Laser Product Classification

Class 1 Laser Product according to IEC 60825-1:2014

The following clause applies for instruments delivered into the United States:\nComplies 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

Measuring Principle

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

<table>
<thead>
<tr>
<th>Laser Pulse Repetition Rate PRR 1)</th>
<th>100 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Measuring Range 2)</td>
<td></td>
</tr>
<tr>
<td>natural targets ρ ≥ 20 %</td>
<td>170 m</td>
</tr>
<tr>
<td>natural targets ρ ≥ 60 %</td>
<td>290 m</td>
</tr>
<tr>
<td>natural targets ρ ≥ 80 %</td>
<td>330 m</td>
</tr>
<tr>
<td>Typ. Operating Flight Altitude AGL 3)</td>
<td></td>
</tr>
<tr>
<td>natural targets ρ ≥ 20 %</td>
<td>100 m (330 ft)</td>
</tr>
<tr>
<td>natural targets ρ ≥ 60 %</td>
<td>160 m (525 ft)</td>
</tr>
<tr>
<td>Max. Number of Targets per Pulse 4)</td>
<td>5</td>
</tr>
</tbody>
</table>

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) Flat terrain assumed, scan angle ±45° FOV
4) If more than one target is hit, the total laser transmitter power is split and, accordingly, the achievable range is reduced.

Minimum Range

<table>
<thead>
<tr>
<th>Accuracy 5) (7)</th>
<th>3 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precision 6)</td>
<td>15 mm</td>
</tr>
<tr>
<td>Laser Pulse Repetition Rate 1)</td>
<td>10 mm</td>
</tr>
<tr>
<td>Max. Effective Measurement Rate 1)</td>
<td>100 kHz</td>
</tr>
<tr>
<td>Echo Signal Intensity</td>
<td>100 000 meas./sec. (@ 100 kHz PRR &amp; 360° FOV)</td>
</tr>
<tr>
<td>Laser Wavelength</td>
<td>for each echo signal, high-resolution 16 bit intensity information is provided near infrared</td>
</tr>
<tr>
<td>Laser Beam Divergence 8)</td>
<td>1.6 x 0.5 mrad</td>
</tr>
<tr>
<td>Laser Beam Footprint</td>
<td>160 mm x 50 mm @ 100 m</td>
</tr>
</tbody>
</table>

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) 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: rotating mirror
Field of View: up to 360°
Angular Step Width Δ ϕ (selectable) between consecutive laser shots: 0.036° ≤ Δ ϕ ≤ 0.36°
Angle Measurement Resolution: 0.001°

Interfaces

Configuration, Scan Data Output & Communication with External Devices
2 x LAN 10/100/1000 Mbit/sec
WLAN IEEE 802.11 a/b/g/n
Serial RS-232 Interface for data string with GNSS-time information, TTL input for 1PPS synchronization pulse.
Power Output 10 V DC, max 4.5 W 9)
2 x TTL input/output 10), 1 x Remote on/off
2 x GNSS RS-232 Tx & PPS, Power, Trigger, Exposure 10)
for SDHC/SDXC memory card 32 GByte (can be upgraded to 64 GByte)

General Technical Data

Power Supply Input Voltage / Consumption: 11 - 34 V DC / typ. 18 W @ 100 scans/sec
Main Dimensions (L x W x H): 243 x 111 x 85 mm / approx. 1.6 kg
without Cooling Fan
243 x 99 x 85 mm / approx. 1.55 kg
Humidity: max. 80 % non condensing @ 31°C
Protection Class: IP64, dust and splash-proof
Temperature Range 11)
-10°C up to +40°C (operation) / -20°C up to +50°C (storage)

10) 1x externally available with standard interface box
11) Continuous operation at ambient temperature of ≥ 30°C (≥ 86°F) requires a minimum amount of air flow at approximate 3 m/s. For applications where a 3 m/s air flow along the cooling fins cannot be guaranteed, the cooling fan has to be used.

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This data sheet is compiled with care. However, errors cannot be fully excluded and alterations might be necessary.

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