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 straight-forward 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 system solutions.

Typical applications include:
- Agriculture & Forestry
- Glacier and Snowfield Mapping
- Archeology and Cultural Heritage Documentation
- Construction-Site Monitoring
- Landslide Monitoring

Visit our website
www.riegl.com
Maximum Measurement Range vs. Target Reflectance RIEGL miniVUX®-1UAV

![Graph showing measurement range vs. target reflectance](image)

**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 straight forward integration with your multi-rotor UAV, e.g. a DJI Matrice M600 / M300 RTK.

**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 / 300**
- add-on to the miniVUX-SYS coming with shock-absorbing mounting-kit, power supply module and cabling
- total weight approx. 0.7 kg / 0.35 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

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**Operating Flight Altitude AGL given for the following conditions:**
- FOV of +/-45°, target size ≥ laser footprint, average ambient brightness

**Example:** miniVUX-1UAV at 100,000 pulses/second, speed = 4 m/s, range to target = 100 m, resulting point density ~ 40 pts/m²
**RIEGL miniVUX®-1UAV LiDAR Sensor equipped with APX-15 UAV**

1) See technical details in the corresponding Applanix data sheet.

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

2) Multispectral camera, hyperspectral camera, thermal imaging sensor – more information on request.
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: 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.

Range Measurement Performance

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

<table>
<thead>
<tr>
<th>Laser Pulse Repetition Rate PRR</th>
<th>100 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Measuring Range</td>
<td>100 kHz</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</td>
<td>100 m (330 ft)</td>
</tr>
<tr>
<td>natural targets ρ ≥ 20 %</td>
<td>160 m (525 ft)</td>
</tr>
<tr>
<td>natural targets ρ ≥ 60 %</td>
<td></td>
</tr>
<tr>
<td>Max. Number of Targets per Pulse</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.
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.

Minimum Range

3 m

Accuracy

15 mm

Precision

10 mm

Laser Pulse Repetition Rate

100 kHz

Max. Effective Measurement Rate

1 000 000 meas./sec. (@ 100 kHz PRR & 360° FOV)

Echo Signal Intensity

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

Laser Wavelength

1.6 x 0.5 mrad

Laser Beam Divergence

160 mm x 50 mm @ 100 m

Laser Beam Footprint

Scanner Performance

Scanning Mechanism

rotating mirror

Field of View (selectable)

up to 360°

Scan Speed (selectable)

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

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.

General IO & Control

2 x TTL input/output, 1 x Remote on/off

Camera Interface

2 x GNSS RS-232 Tx & PPS, Power, Trigger, Exposure

Memory Card Slot

for SDHC/SDXC memory card 32 GByte (can be upgraded to 64 GByte)

9) internally available (not available with standard interface box)

10) 1x externally available with standard interface box

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) / Weight

without Cooling Fan

243 x 111 x 85 mm / approx. 1.6 kg

with 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

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

Temperature Range

11) Continuous operation at ambient temperature of ≥ 30°C (≥ 86°F) requires a minimum amount of air flow at approx. 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.

RIEGL Laser Measurement Systems GmbH
Horn, Austria
Phone: +43 2982 4211 | www.riegl.com

RIEGL USA Inc.
Winter Garden, Florida, USA
Phone: +1 407 248 9927 | www.rieglusa.com

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