

**NEW**

# RIEGL miniVUX-SYS<sup>®</sup>

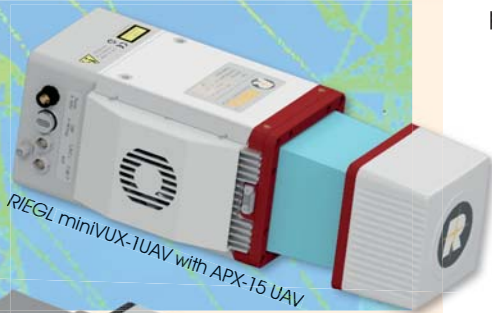
- complete miniaturized & lightweight UAV-based LiDAR system integrating a RIEGL miniVUX-1UAV LiDAR sensor
- different IMU/GNSS options available
- various mounting options for highly flexible installation
- prepared for remote control via low-bandwidth data link
- prepared for interfacing with optional RGB cameras

The **RIEGL miniVUX-SYS** is a complete laser scanning system of low weight and compact size for flexible use in UAV-based applications on a variety of UAV/UAS/RPAS.

The system comprises a **RIEGL miniVUX-1UAV** LiDAR engine, an IMU/GNSS system (three different versions available), a dedicated control unit (only applicable for AP20 solution) and an optional RGB camera system.

The measurement performance of the miniVUX-1UAV in combination with the Inertial Measurement Unit and the associated GNSS receiver results in survey-grade measurement accuracy.

The miniVUX-SYS is delivered with the necessary software tools for processing and geo-referencing of the acquired scan data, and processing of the IMU/GNSS data.



RIEGL miniVUX-1UAV with APX-15 UAV



RIEGL miniVUX-1UAV with APX-20



RIEGL miniVUX-1UAV with AP20 and control unit

#### Typical applications include

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

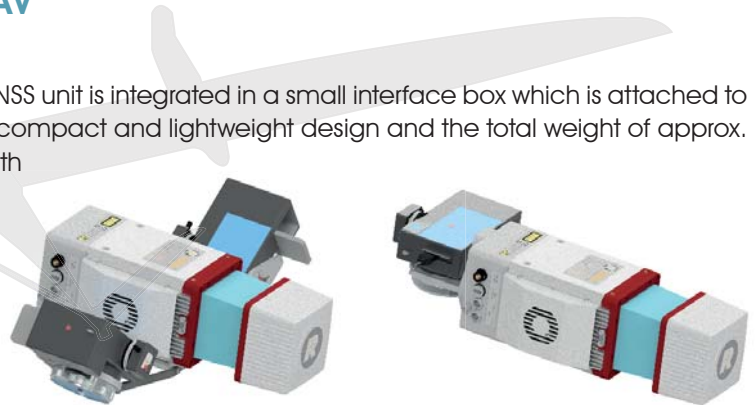
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### RIEGL miniVUX®-SYS with APX-15 UAV (e.g. for fixed-wing UAVs)

For this miniVUX-SYS solution, the APX-15 UAV<sup>1)</sup> IMU/GNSS unit is integrated in a small interface box which is attached to the rear part of the miniVUX-1UAV sensor. Due to its compact and lightweight design and the total weight of approx. 2 kg (without camera(s)), the RIEGL miniVUX-SYS with APX-15 UAV is very well suited for an integration with UAV platforms offering limited/restricted weight and space conditions.

Optionally, a single or a dual RGB camera system is available.



with two SONY alpha 6000 cameras

with one SONY alpha 6000 camera

### RIEGL miniVUX®-SYS with APX-20 (e.g. for fixed-wing, single-rotor or multi-rotor UAVs)

For this miniVUX-SYS solution, the new, higher-grade APX-20<sup>1)</sup> IMU/GNSS system is used. The miniVUX-1UAV sensor is equipped with a specifically designed interface box accommodating the GNSS board stack as well as the camera trigger electronics. The IMU sensor is tightly coupled with the LiDAR sensor.

With its weight of approx. 2.5 kg (without cameras) the RIEGL miniVUX-SYS with APX-20 is universally applicable for an integration with more or less all types of UAVs that are capable of carrying this payload weight.

Optionally, a dual RGB camera system is available.



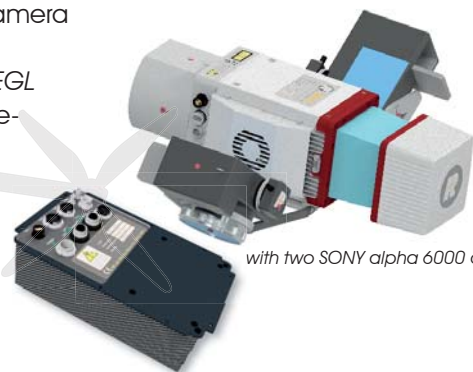
with two SONY alpha 6000 cameras

### RIEGL miniVUX®-SYS with AP20 and Control Unit (e.g. for multi-rotor or single-rotor UAVs)

For this miniVUX-SYS solution, the higher-grade AP20<sup>1)</sup> IMU/GNSS system is used. The miniVUX-1UAV sensor is equipped with the „standard“ interface box and the AP20 IMU sensor is tightly coupled with the LiDAR sensor. The separate control unit accommodates the GNSS board stack as well as the camera trigger electronics.

The total weight of this system is 3.6 kg (without camera(s)). The RIEGL miniVUX-SYS with AP20 and Control Unit is fully prepared for an integration with the RiCOPTER and also suited for an integration with other multi-rotor or single-rotor UAVs with higher payload-lifting capabilities.

Optionally, a dual RGB camera system is available. The system is prepared for interfacing with up to 4 cameras in total.



with two SONY alpha 6000 cameras

<sup>1)</sup> See technical details in the corresponding Applanix data sheet

### Integration-Package<sup>2)</sup> for selected multi-rotor UAV types

The Integration-Package is an add-on to the miniVUX-SYS for its integration with your multi-rotor UAV. The package comes with an appropriate, shock absorbing mounting-kit, power supply module, and necessary cabling for quick and straight forward integration.

<sup>2)</sup> The Integration-Package is only available for selected multi-rotor UAV types; more detailed information on request.

## Scanner Performance

*RIEGL* miniVUX-1UAV Sensor

(for details refer to the corresponding data sheet)

Typ. Operating Flight Altitude AGL <sup>1) 2)</sup>	80 m (260 ft)
Maximum Range <sup>3)</sup>	250 m
Minimum Range	3 m
Accuracy / Precision	15 mm / 10 mm
Laser Pulse Repetition Rate	up to 100 kHz
Max. Effective Measurement Rate	up to 100,000 meas./sec.
Field of View (selectable) <sup>4)</sup>	up to 360°
Max. Scan Speed	100 scans/sec
Max. Number of Targets per Pulse <sup>5)</sup>	5

1) Rounded values

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

3) Maximum range is specified for natural targets  $\rho \geq 60\%$ .

4) Note limitations when integrated in kinematic systems.

5) If more than one target is hit, the total laser transmitter power is split and, accordingly, the achievable range is reduced.

## IMU & GNSS

	Applanix APX-15 UAV <sup>6)</sup>	Applanix APX-20 <sup>6)</sup>	Applanix AP20 <sup>6)</sup>
IMU Accuracy			
Roll, Pitch	0.025°	0.015°	0.015°
Heading	0.08°	0.035°	0.035°
IMU Sampling Rate	200 Hz	200 Hz	200 Hz
Position Accuracy (typ.)			
horizontal	< 0.05 m	< 0.05 m	< 0.05 m
vertical	< 0.1 m	< 0.1 m	< 0.1 m

6) See technical details at the corresponding Applanix datasheet.

## Interfaces

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

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>7)</sup>

General IO & Control

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

Camera Interface

2 x USB 2.0, Trigger, Exposure <sup>7)</sup>

Memory Card Holder

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

Serial Interface to External Devices

SPI (Serial Peripheral Interface) <sup>8)</sup>

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

8) 1 x externally available with standard interface box

## General Technical Data

Power Supply Input Voltage / Consumption

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

*RIEGL* miniVUX-1UAV Sensor

Main Dimensions (L x W x H) / Weight  
with Cooling Fan  
without Cooling Fan

242 x 110 x 85 mm / approx. 1.6 kg  
242 x 99 x 85 mm / approx. 1.55 kg

*RIEGL* miniVUX-SYS

Main Dimensions (L x W x H) / Weight

miniVUX-1UAV with APX-15 UAV  
miniVUX-1UAV with APX-20  
miniVUX-1UAV with AP20 and Control Unit

264 x 110 x 85 mm / approx. 2.0 kg  
352 x 110 x 85 mm / approx. 2.5 kg  
308 x 110 x 85 mm / approx. 3.6 kg

Integration Package

approx. 0.7 kg

Camera(s)

depending on selected camera type

Humidity

max. 80 % non condensing @ 31°C

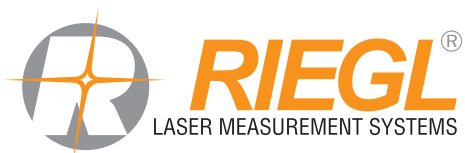
Protection Class

IP64, dust and splash-proof

Temperature Range <sup>9)</sup>

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

9) Continuous operation at ambient temperature of  $\geq 30^\circ\text{C}$  ( $\geq 86^\circ\text{F}$ ) 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.



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