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-series LiDAR sensor, an IMU/GNSS system (different versions available), and an optional camera system.

The measurement performance of RIEGL's UAV LiDAR sensors 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.

Typical applications include:
- Agriculture & Forestry
- Glacier and Snowfield Mapping
- Archeology and Cultural Heritage Documentation
- Construction-Site Monitoring
- Landslide Monitoring
**RIEGL miniVUX®-SYS with APX-15 UAV**

(e.g. for fixed-wing UAVs)

For this miniVUX-SYS solution, the APX-15 UAV\(^1\) IMU/GNSS unit is integrated in a small interface box which is attached to the rear part of the LiDAR sensor. Due to its compact and lightweight design and the total weight of approx. 2 kg (depending on scanner type, 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.

**RIEGL miniVUX-3UAV / RIEGL miniVUX-1UAV 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 A7R III or Sony A7R IV
(integration of other 3rd party cameras possible\(^2\))

**RIEGL miniVUX®-SYS with APX-20 UAV (IMU82/IMU90)**

(e.g. for fixed-wing, single-rotor or multi-rotor UAVs)

For this miniVUX-SYS solution, the higher-grade APX-20 UAV\(^1\) IMU/GNSS system is used. The LiDAR 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. 2.3 - 2.5 kg (depending on scanner type and IMU, without camera(s)), the RIEGL miniVUX-SYS with APX-20 UAV is universally applicable for an integration with more or less all types of UAVs that are capable of carrying this payload weight. Optionally, a single or a dual RGB camera system is available.

**RIEGL miniVUX-3UAV / RIEGL miniVUX-1UAV equipped with APX-20 UAV/IMU82**

with two Sony Alpha 6000 cameras (oblique mount)

with nadir-looking camera
e.g. Sony Alpha 6000 camera or
Sony A7R III or Sony A7R IV
(integration of other 3rd party cameras possible\(^2\))

**RIEGL miniVUX-3UAV / RIEGL miniVUX-1UAV equipped with APX-20 UAV/IMU90**

with two Sony Alpha 6000 cameras (oblique mount)

with nadir-looking camera
e.g. Sony Alpha 6000 camera or
Sony A7R III or Sony A7R IV
(integration of other 3rd party cameras possible\(^2\))

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1) See technical details in the corresponding Applanix data sheet.
2) Multispectral camera, hyperspectral camera, thermal imaging sensor – more information on request.
**RIEGL Integration Kit 600 / Integration Kit 300**

(e.g. for multi-rotor UAVs)

The RIEGL Integration Kit 600 – as well as the Integration Kit 300 – is an add-on to the miniVUX-SYS for its integration with your multi-rotor UAV, e.g. a DJI Matrice M600 or DJI Matrice M300 RTK. The package comes with an appropriate shock absorbing mounting-kit, power supply module, GNSS antenna, GNSS antenna mount, and necessary cabling for quick and straightforward integration.

**RIEGL Integration Kit 600 example (explosion drawing):**

- GNSS antenna + mount
- shock absorbers
- mounting plate
- APX-15 UAV or APX-20 UAV IMU/GNSS
- connection box or connection box „light“ (incl. connection board „light“)
- RIEGL miniVUX-3UAV or RIEGL miniVUX-1UAV
- camera option: nadir camera mount with one camera
- e.g. Sony Alpha 6000 camera or Sony A7R III or Sony A7R IV

**RIEGL miniVUX®-SYS – Processing Workflow and Scan Data Examples**

Using RIEGL’s software suites (RIPROCESS, RIUNITE) and dedicated processing workflows with specialized alignment tools like RIPRECISION conducting the whole procedure of scan data alignment fully automatically, processing time can be reduced to a minimum. RIPROCESS can interface the optimized, georeferenced point cloud in further post-processing tools via LAS or other data exchanges in various user-defined coordinate systems.

- raw laser scan data
  - GNSS/IMU trajectory
  - control objects
  - RIUNITE
  - point cloud
  - optimized pointcloud
  - optimized trajectory
  - RIPRECISION UAV
  - RIPROCESS

- power line surveying
- cut and fill volume comparison of disposal site
Technical Data RIEGL miniVUX®-SYS

Scanner Performance
RIEGL UAV LiDAR Sensors
(for details refer to the corresponding data sheet)

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1) 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.

IMU & GNSS

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IMU Accuracy
- Roll: 0.015°
- Pitch: 0.035°
- Heading: 0.035°

IMU & GNSS Interface
- 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

General IO & Control
- 2 x TTL input/output, 1 x Remote on/off, DMI (Distance Measurement Indicator)
- 2 x GNSS RS-232 Tx & PPS, Power, Trigger, Exposure
- SPI (Serial Peripheral Interface)

General Technical Data
RIEGL UAV LiDAR Sensors
(for details refer to the corresponding data sheet)

RRIEGL miniVUX-3UAV, -1UAV

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2) Selectable. Consider limitations when integrated in kinematic systems.
3) If more than one target is hit, the total laser transmitter power is split and, accordingly, the achievable range is reduced.

RRIEGL miniVUX-SYS

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4) 6) internally available (not available with standard interface box)
7) 7) 1x externally available with standard interface box

General Technical Data

RRIEGL miniVUX-3UAV, -1UAV

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General Technical Data

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

Weight (with lenses and mount):
- Dual Nadir Camera System approx. 1.3 kg
- Single Nadir Camera System approx. 1.0 kg
- Camera(s) optional:
  - approx. 0.7 kg / approx. 0.35 kg
  - technical data depending on selected camera type

Cameras:
- Single Nadir Camera System
  - approx. 1.0 kg (2x Sony Alpha 6000)
  - approx. 0.5 kg / 1.3 kg / 1.3 kg (Sony Alpha 6000/Sony A7RIII/Sony A7RIV)
- Dual Oblique Camera System
  - approx. 1.3 kg (2x Sony Alpha 6000)
- Single Nadir Camera System
  - approx. 1.0 kg (2x Sony Alpha 6000)
  - approx. 0.5 kg / 1.3 kg / 1.3 kg (Sony Alpha 6000/Sony A7RIII/Sony A7RIV)

8) 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.
9) Possibility of use depends on system configuration.