The RIEGL VUX-SYS is a completely integrated laser scanning system of low weight and compact size for flexible use in kinematic applications (e.g. UAS/UAV/RPAS, helicopter, gyrocopter and ultra-light aircraft installations).

The system comprises a RIEGL VUX-1 Series LiDAR Sensor, a IMU/GNSS system and - if applicable - a dedicated control unit. The excellent measurement performance of the VUX-1 in combination with the precise inertial measurement unit and the associated GPS/GLONASS receiver results in survey-grade measurement accuracy over its full range of applications.

The VUX-SYS is specifically designed to be easily installed or exchanged by the user, alternatively either in the RIEGL VP-1 HeliCopterPod, the RiCOPTER unmanned aerial system, or in any kinematic measuring system, whatsoever.

The VUX-SYS provides interfaces for controlling up to four digital cameras. When installed in the VP-1 HeliCopterPod or the RiCOPTER UAV the VUX-SYS is complemented by up to two cameras.

The small size, low weight, and small number of interconnecting cables required account for a very short set-up time of the system.

The VUX-SYS is delivered with the necessary software tools for processing scan data as well as IMU/GNSS data. Based on the software bundle RiPROCESS and its associated software tools, scan data is geo-referenced, calibrated and exported fully automatically. RIEGL offers an optional system calibration service.

Typical applications include:
- Corridor Mapping: Power Line, Railway Track, and Pipeline Inspection
- Terrain and Canyon Mapping
- Surveying of Urban Environments
- Topography in Open-Cast Mining
- Agriculture & Forestry
- Archeology and Cultural Heritage Documentation
- Construction-Site Monitoring

**Complete Sensor System for Kinematic Laser Scanning**

**RIEGL VUX-SYS**

- complete, compact & lightweight kinematic LiDAR system
- fully integrated RIEGL VUX-1 Series LiDAR sensor
- various mounting options for highly flexible installation
- prepared for remote control via low-bandwidth data link
- fully integrated system versions with application-oriented IMU/GNSS unit
- compact control unit with various interfacing options
- operates up to 4 digital cameras

visit our website
www.riegl.com

Kinematic Laser Scanning

RIEGL® LASER MEASUREMENT SYSTEMS
### RIEGL VUX®-SYS - Integration Options

#### RIEGL VUX-1 with APX-20 UAV
- Interface for 4 optional cameras available
- **Main Dimensions**
  - VUX-1 with IMU: 314 x 180 x 125 mm
  - VUX-1 with IMU and Cooling Fan Device: 314 x 209 x 128 mm
- **Weight**
  - VUX-1 with IMU: approx. 4.2 kg
  - Cooling Fan Device: approx. 0.25 kg
  - Camera(s): depending on selected camera type

#### RIEGL VUX-1 with AP20
- With separate control unit accommodating the GNSS board stack as well as the camera trigger electronics for up to 4 optional cameras
- **Main Dimensions**
  - VUX-1 with IMU: 296 x 180 x 125 mm
  - VUX-1 with IMU and Cooling Fan Device: 296 x 209 x 128 mm
  - Control Unit: 210 x 124 x 79 mm
- **Weight**
  - VUX-1 with IMU: approx. 4.2 kg
  - Cooling Fan Device: approx. 0.25 kg
  - Control Unit: approx. 0.9 kg
  - Camera(s): depending on selected camera type

#### RIEGL VUX-1 with AP60
- With separate control unit accommodating the GNSS board stack as well as the camera trigger electronics for up to 4 optional cameras
- **Main Dimensions**
  - VUX-1 with IMU: 337 x 180 x 125 mm
  - VUX-1 with IMU and Cooling Fan Device: 337 x 209 x 128 mm
  - Control Unit: 210 x 124 x 79 mm
- **Weight**
  - VUX-1 with IMU: approx. 6.8 kg
  - Cooling Fan Device: approx. 0.25 kg
  - Control Unit: approx. 0.9 kg
  - Camera(s): depending on selected camera type

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*All dimensions in mm*
**RIEGL VUX®-SYS System Installation**

**RIEGL VUX®-SYS installed in RiCOPTER (Unmanned)**

The VUX-SYS fits the dedicated mounting bay of the RiCOPTER directly without any adaptations. The system is supplemented by two digital cameras, covering a field of view of approximately 160 degrees, whereas the VUX-SYS covers a FOV of 230°. The low weight of the VUX-SYS enables the RiCOPTER to operate up to half an hour at a gross weight of 25 kg.

**RIEGL VUX®-SYS installed in VP-1 (Airborne)**

The VUX-SYS fits the small and lightweight RIEGL VP-1 HeliCopterPod, to be mounted on standard hard points and typical camera mounts of manned helicopters. Quick release adapter brackets and a minimum of external cabling (i.e., power supply, LAN, GPS antenna) allow quick system installation and removal.

**RIEGL VUX®-SYS installed in VMQ (Mobile)**

Fully integrated into the measuring head of the system, the VUX-SYS is the core part of the RIEGL VMQ Single Scanner Mobile Mapping System. Together with the universal VMQ roof mount the system can be easily mounted on a great variety of vehicles. One single external VMQ main cable minimizes the efforts of the set-up time. The swivel plate allows the operator to achieve different point cloud patterns according to the project requirements.

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**RIEGL VUX-SYS for RiCOPTER**

**System Components:**

- RIEGL VUX-1UAV or RIEGL VUX-1LR LiDAR sensor
- IMU/GNSS unit (Applanix AP20 or APX-20 UAV)
- GNSS antenna
- control unit 1)
- camera(s) optional (2x e.g. Sony Alpha 6000)
- connecting cables

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**RIEGL VUX-SYS for VP-1**

**System Components:**

- RIEGL VUX-1UAV or RIEGL VUX-1LR LiDAR sensor
- IMU/GNSS unit (Applanix AP20, APX-20 UAV or AP60)
- GNSS antenna
- control unit 1)
- digital camera(s) (1x Nikon D810, or 1x Phase One iXU, or 2x Sony Alpha 6000)
- connecting cables

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**RIEGL VUX-SYS for VMQ**

**System Components:**

- RIEGL VUX-1HA LiDAR sensor (preferred) or RIEGL VUX-1UAV sensor (possible)
- IMU/GNSS unit (Applanix AP20 or AP60)
- GNSS antenna
- control unit 1)
- up to 4 digital camera(s) (e.g., FLIR Ladybug® 5+, Nikon D810, 5 MPix industrial camera)
- connecting cables

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1) for use with AP20 and AP60
RIEGL VUX®-SYS Technical Data

Scanner Performance (for details refer to the corresponding RIEGL data sheets)

RIEGL VUX-1 Series Sensor

<table>
<thead>
<tr>
<th>Sensor</th>
<th>VUX-1LR</th>
<th>VUX-1UAV</th>
<th>VUX-1HA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Range</td>
<td>1,350 m</td>
<td>920 m</td>
<td>420 m</td>
</tr>
<tr>
<td>Minimum Range</td>
<td>5 m</td>
<td>3 m</td>
<td>5 m</td>
</tr>
<tr>
<td>Accuracy / Precision</td>
<td>5 mm / 10 mm</td>
<td>10 mm / 5 mm</td>
<td>5 mm / 3 mm</td>
</tr>
<tr>
<td>Laser Pulse Repetition Rate</td>
<td>up to 820 kHz</td>
<td>up to 550 kHz</td>
<td>up to 1000 kHz</td>
</tr>
<tr>
<td>Max. Effective Measurement Rate</td>
<td>up to 750,000 meas./sec.</td>
<td>up to 500,000 meas./sec.</td>
<td>up to 1,000,000 meas./sec.</td>
</tr>
<tr>
<td>Field of View (selectable)</td>
<td>up to 330°</td>
<td>up to 330°</td>
<td>up to 360°</td>
</tr>
<tr>
<td>Max. Scan Speed</td>
<td>200 scans/sec</td>
<td>200 scans/sec</td>
<td>250 scans/sec</td>
</tr>
</tbody>
</table>

| 1) Not recommended to be seen as a first choice for ALS and UAV applications because of its lower range capability. |

Data Interfaces

- Configuration
- Scan Data Output
- GNSS Interface
- Camera

IMU & GNSS

- IMU Accuracy:
  - Roll, Pitch: ±0.015°
  - Heading: ±0.035°
- IMU Sampling Rate: 200 Hz
- Position Accuracy (typ.):
  - Horizontal: < 0.05 m
  - Vertical: < 0.1 m

| 5) See technical details at the according Applanix datasheet |
| 6) Values are given for airborne applications |
| 7) Heading for mobile applications: ±0.005° |

General Technical Data

- Power Supply Input Voltage: 11 - 34 V DC
- Power Consumption: typ. 95 W
- Humidity: max. 80 % non condensing @ 31°C
- Temperature Range: -10°C up to +40°C (operation) / -20°C up to +50°C (storage)

RIEGL VUX®-SYS UAV Platform Integration

RICOPTER with VUX-SYS components:

- RIEGL VUX-1UAV
- APX-20 UAV
- Sony Alpha 7R III
- Flir Tau 2 thermal camera

1) Maximum range is specified for natural targets Δ ≥ 60%.
2) Maximum range is specified for natural targets Δ ≥ 80%.
3) Note limitations when integrated in kinematic systems.
4) IMU Accuracy

Applanix AP20 ⁵  
- Roll, Pitch: ±0.015°
- Heading: ±0.035°
- IMU Sampling Rate: 200 Hz
- Position Accuracy (typ.):
  - Horizontal: < 0.05 m
  - Vertical: < 0.1 m

Applanix APX-20 UAV ⁵  
- Roll, Pitch: ±0.035°
- IMU Sampling Rate: 200 Hz
- Position Accuracy (typ.):
  - Horizontal: < 0.05 m
  - Vertical: < 0.1 m

Applanix AP60 ⁵  
- Roll, Pitch: ±0.005°
- IMU Sampling Rate: 200 Hz
- Position Accuracy (typ.):
  - Horizontal: < 0.05 m
  - Vertical: < 0.1 m

5) See technical details at the according Applanix datasheet
6) Heading for mobile applications: ±0.005°