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, an IMU/GNSS system and 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 helicopter pod, the RIEGL RiCOPTER unmanned aerial system, or in any kinematic measuring system, whatsoever.

The VUX-SYS is complemented within the VP-1 by one single high resolution digital camera, and in the RiCOPTER by two lightweight consumer-grade digital cameras. It is prepared to handle up to 4 independent cameras in other installations.

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
**RIEGL VUX®-SYS installed in RiCOPTER**

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. The low weight of the VUX-SYS enables the RiCOPTER to operate up to half an hour at a gross weight of 25kg.

**RIEGL VUX-SYS for RiCOPTER**

System Components:
- **RIEGL VUX-1UAV or RIEGL VUX-1LR** LiDAR sensor
- **IMU/GNSS unit** (Applanix AP20)
- **GNSS antenna**
- **control unit**
- **2 cameras** (SONY alpha 6000)
- **connecting cables**

**RIEGL VUX®-SYS - Block Diagram Remote Control Setup**

Accounting for the integration in unmanned remotely piloted systems, a dedicated TTL interface for receiving and emitting Pulse-Width Modulated (PWM) signals enables full control as well as system status feedback. Based on a predefined set of commands and associated pulse widths, the system can be controlled easily via a standard remote-control radio channel of low bandwidth.

It is possible to adjust the data rate of scan data for streaming monitoring data even in real-time via suitable radio channels of sufficient bandwidth.
The VUX-SYS fits the small and lightweight RIEGL VP-1 pod, 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 VP-1**

The VUX-SYS contains a LAN interface for direct control from an operator’s working station running RIACQUIRE. RIACQUIRE is fully compatible with the VUX-SYS and enables full control over the laser scanner, the IMU/GNSS system, and optionally up to 4 digital cameras.

Scan data and image data can be directly stored on the particular sensor’s internal storage, or can be directly stored on an optional data recorder DR1560 or on a laptop.

The control unit contains trigger and event marker interfaces for each camera. Precise time stamps of the camera’s release-events are stored in the raw scan data stream enabling combination of point cloud data and imagery in subsequent data processing.

**RIEGL VP-1**

**System Components:**
- RIEGL VUX-1LR LiDAR sensor
- IMU/GNSS unit (Applanix AP20)
- GNSS antenna
- control unit
- digital camera (Nikon D810 or Phase One iXU150)
- connecting cables

**RIEGL VP-1**

**Technical Data:**
- quick installation & removal using the existing mounts (e.g. AirFILM Camera System);
- mounting and operation at end user’s responsibility
- total weight approx. 19 kg
- area exposed to wind 0.114 m²

**RIEGL VUX®-SYS - Block Diagram Conventional Control Setup**
RIEGL VUX®-SYS Mechanical Drawings

Control Unit

RIEGL VUX-1 with IMU

RIEGL VUX-1 with IMU and Cooling Fan Device

Camera:

GNSS antenna:

all dimensions in mm

RIEGL VUX®-SYS Mechanical Drawings

RIEGL VUX-1 with IMU

RIEGL VUX-1 with IMU and Cooling Fan Device

Camera:

GNSS antenna:

all dimensions in mm

Technical Data RIEGL VUX®-SYS

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

RIEGL VUX-1 Series Sensor

<table>
<thead>
<tr>
<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>
</tr>
<tr>
<td>Minimum Range</td>
<td>5 m</td>
<td>3 m</td>
</tr>
<tr>
<td>Accuracy / Precision</td>
<td>15 mm / 10 mm</td>
<td>10 mm / 5 mm</td>
</tr>
<tr>
<td>Laser Pulse Repetition Rate</td>
<td>up to 750 kHz</td>
<td>up to 550 kHz</td>
</tr>
<tr>
<td>Field of View (selectable) 4)</td>
<td>up to 330°</td>
<td>up to 330°</td>
</tr>
<tr>
<td>Max. Scan Speed</td>
<td>200 scans/sec</td>
<td>200 scans/sec</td>
</tr>
</tbody>
</table>

1) Not recommended to be seen as a first choice for UAV applications because of its lower range capability.
2) Maximum range is specified for natural targets ∆ ≥ 60%.
3) Maximum range is specified for natural targets ∆ ≥ 80%.
4) Note limitations when integrated in kinematic systems.

Data Interfaces

Configuration
Scan Data Output
GNSS Interface

Data Sheet, RIEGL VUX-SYS, 2016-04-18

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