

RIEGL VUX[®]-100²⁵

- **laser pulse repetition rate up to 1,500 kHz**
- **measurement rate up to 1,333,333 meas./sec**
- **scan speed up to 200 lines/second**
- **operating flight altitude up to 360 m / 1,200 ft @ 60% target reflectivity**
- **Field of View up to 160°**
- **compact & lightweight (2.2 kg / 4.9 lbs)**
- **cutting edge RIEGL technology providing:**
 - **echo signal digitization**
 - **multiple target capability**
 - **online waveform processing**
 - **multiple-time-around processing**
- **easily mountable to unmanned platforms (UAVs) and small manned aircraft**
- **mechanical and electrical interface for IMU/GNSS integration**
- **RIEGL RiLOC IMU/GNSS system solutions available**
- **interfaces for up to 2 external cameras**
- **scan data storage on internal SSD Memory**
- **removeable CFAST[®] memory card**

The *RIEGL VUX-100²⁵* is a lightweight and versatile airborne laser scanner offering a wide field of view of 160 degrees and an extremely high pulse repetition rate of up to 1,500 kHz.

The key features – especially the extra large field of view – provide an extra wide area coverage, which is especially of advantage for applications like mapping of complex terrain and narrow canyons.

The scanner provides an internal data storage capacity of 2 TByte and a removeable CFAST card. Interfaces for up to two optional external cameras and for integration of an external IMU/GNSS system are available. Additionally, the *RIEGL VUX-100²⁵* can be equipped with one of *RIEGL*'s RiLOC IMU/GNSS system solutions.

The sophisticated design of the *RIEGL VUX-100²⁵* allows smooth integration on UAS/UAV/RPAS, small manned aeroplanes (like gyrocopters), but also on helicopters. It is offered as stand-alone UAV LiDAR sensor and also in various fully-integrated UAV-based laser scanning system configurations with appropriate IMU/GNSS system and optional cameras. This allows the scanner to perfectly meet all the specific requirements of the customers' applications.

Typical applications include

- **Corridor Mapping:
Power Line, Railway Track and Pipeline Inspection**
- **Topography in Open-Cast Mining**
- **Surveying of Urban Environments**
- **Archeology and Cultural Heritage Documentation**
- **Agriculture & Forestry**

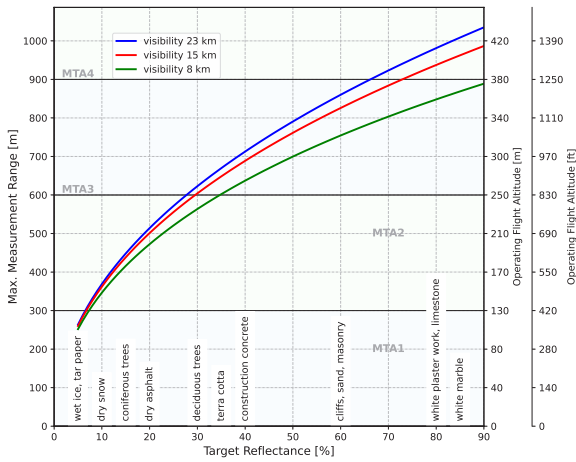


visit our website
www.riegl.com

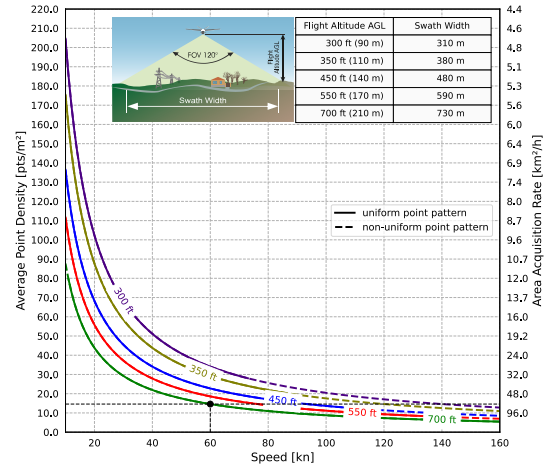


Maximum Measurement Range & Point Density *RIEGL VUX®-100*²⁵

PRR = 500 kHz

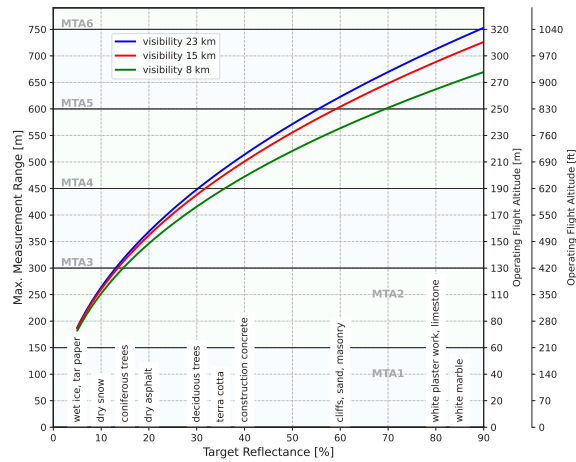


Operating Flight Altitude AGL given for the following conditions:
FOV 120°, ambiguity resolved by multiple-time-around (MTA) processing,
average ambient brightness, target size $\geq$ laser footprint, roll angle $\pm 5^\circ$

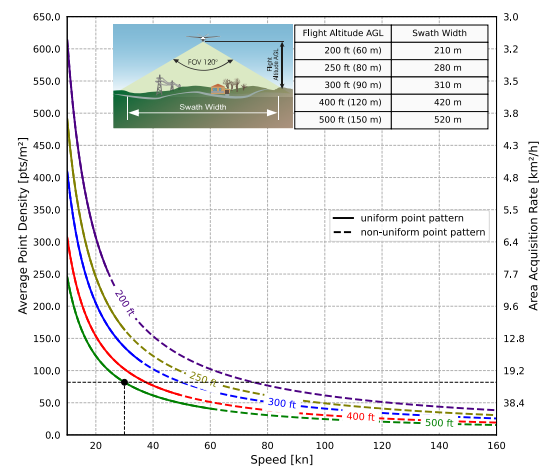


Example: VUX-100²⁵ at 500,000 pulses/sec, laser power level 100%
Altitude = 700 ft AGL, Speed 60 kn, resulting point density ~ 14.6 pts/m²

PRR = 1000 kHz

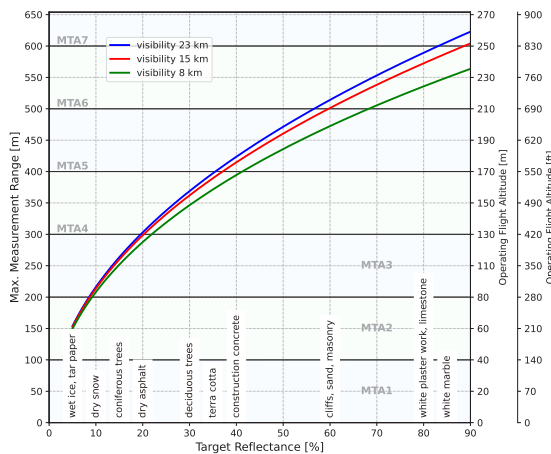


Operating Flight Altitude AGL given for the following conditions:
FOV 120°, ambiguity resolved by multiple-time-around (MTA) processing,
average ambient brightness, target size $\geq$ laser footprint, roll angle $\pm 5^\circ$

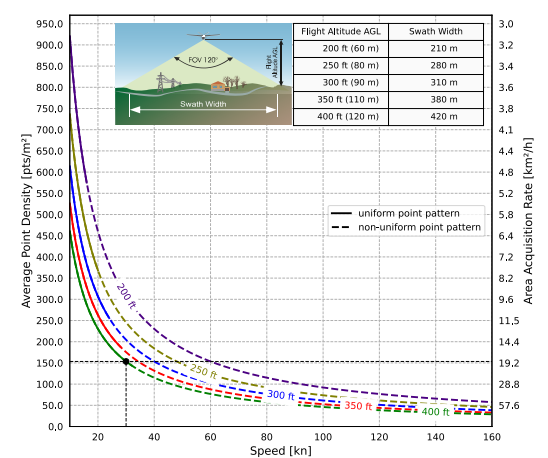


Example: VUX-100²⁵ at 1,000,000 pulses/sec, laser power level 100%
Altitude = 500 ft AGL, Speed 30 kn, resulting point density ~ 81.8 pts/m²

PRR = 1500 kHz

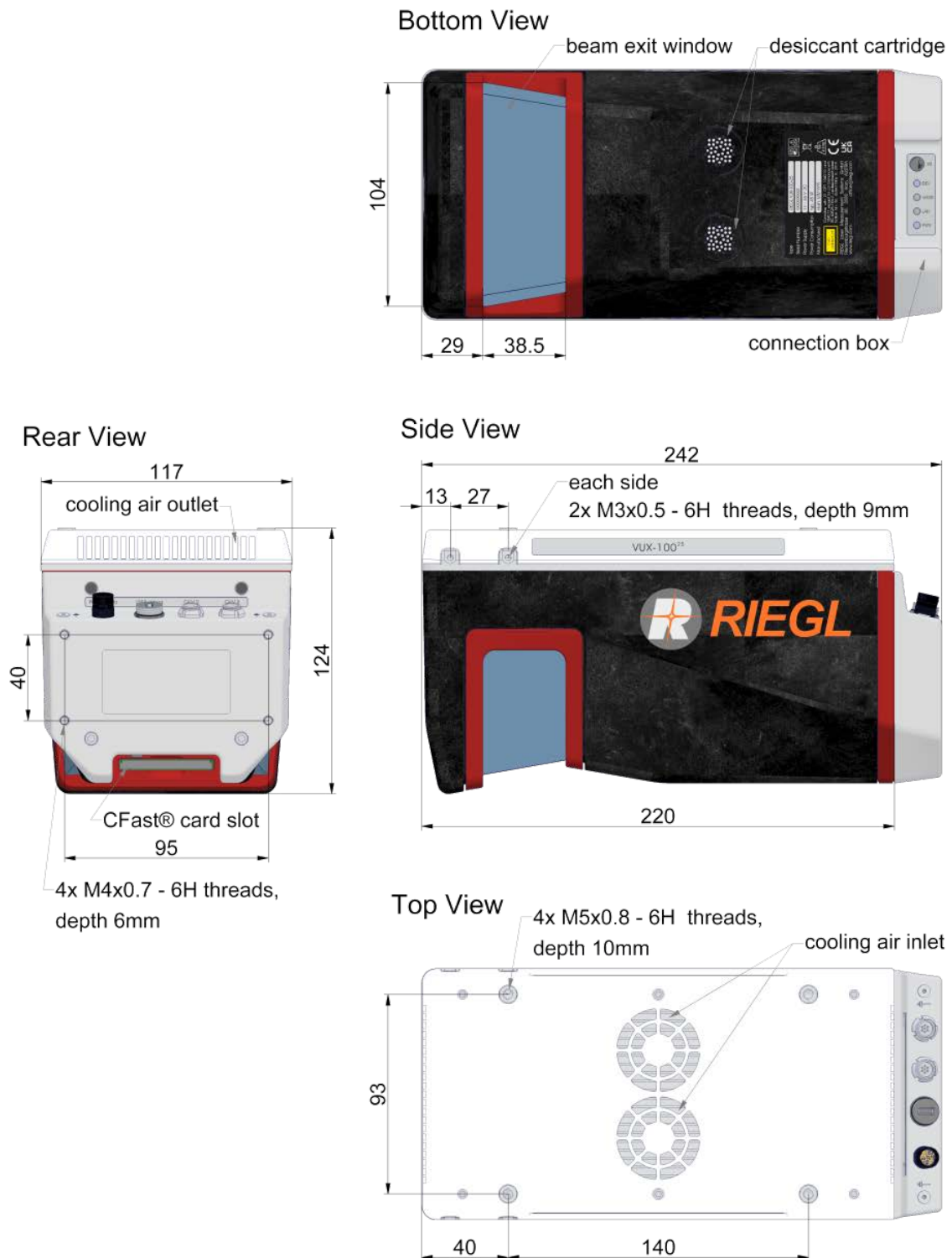


Operating Flight Altitude AGL given for the following conditions:
FOV 120°, ambiguity resolved by multiple-time-around (MTA) processing,
average ambient brightness, target size $\geq$ laser footprint, roll angle $\pm 5^\circ$



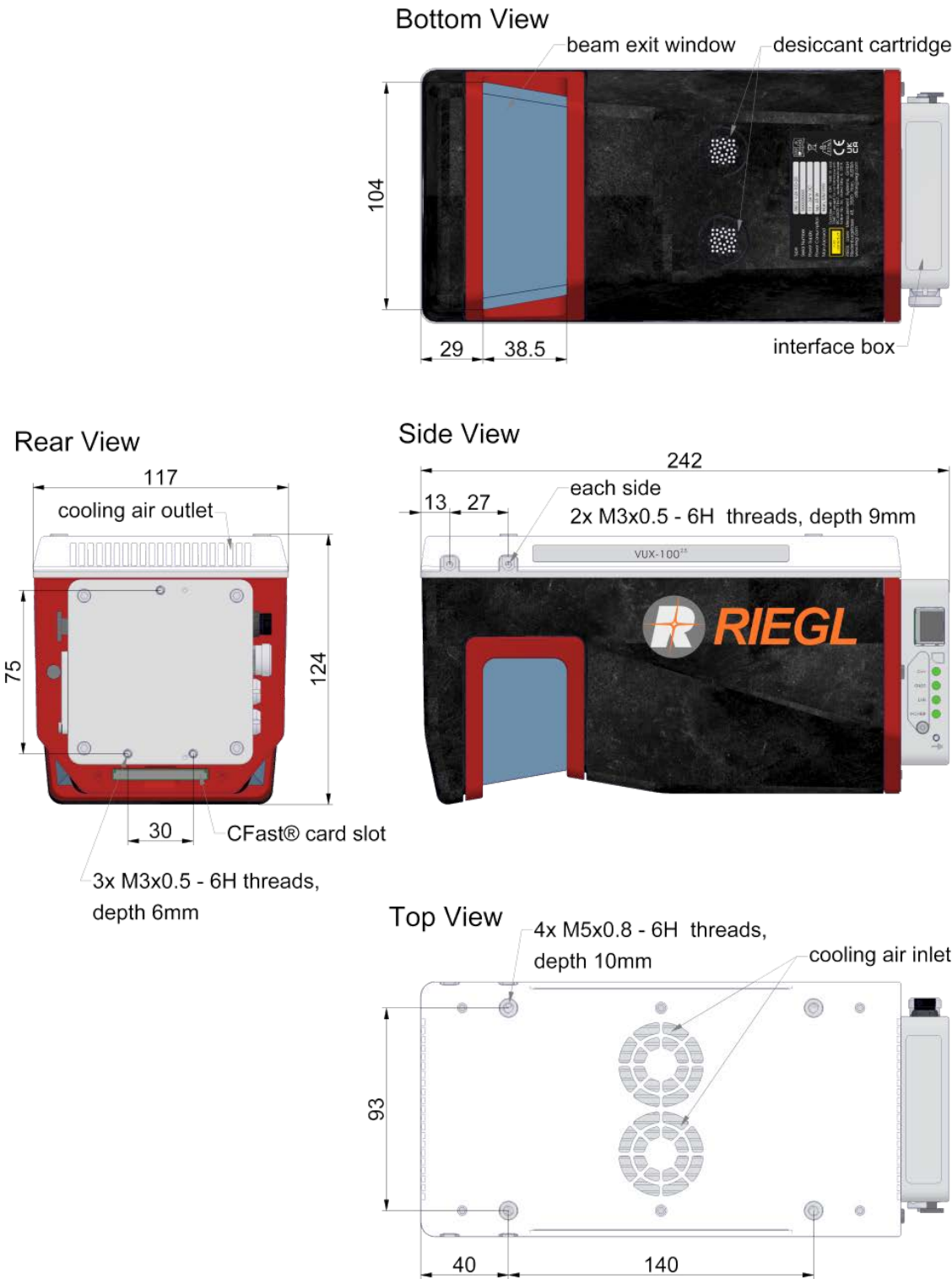
Example: VUX-100²⁵ at 1,500,000 pulses/sec, laser power level 100%
Altitude = 400 ft AGL, Speed 30 kn, resulting point density ~ 153.4 pts/m²

**RIEGL VUX-100²⁵ UAV LiDAR Sensor
with Connection Box**



all dimensions in mm

***RIEGL VUX-100*²⁵ UAV LiDAR Sensor
with Interface Box**



all dimensions in mm

Laser Product Classification

Class 1 Laser Product according to IEC60825-1:2014
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.

**CLASS 1
LASER PRODUCT**

Range Measurement Performance

Measuring Principle

time of flight measurement, echo signal digitization, multiple target capability, online waveform processing, multiple-time-around-processing

Laser Pulse Repetition Rate PRR ¹⁾	500 kHz	1000 kHz	1500 kHz
Max. Measuring Range ^{2) 3) 4)}			
natural targets $\rho \geq 20\%$	510 m	370 m	300 m
natural targets $\rho \geq 60\%$	860 m	620 m	510 m
natural targets $\rho \geq 80\%$	980 m	710 m	590 m
Max. Operating Flight Altitude AGL ^{2) 5)}			
@ $\rho \geq 20\%$	220 m (700 ft)	160 m (500 ft)	130 m (400 ft)
@ $\rho \geq 60\%$	360 m (1200 ft)	260 m (850 ft)	220 m (700 ft)
Max. Number of Targets per Pulse ⁶⁾	30	14	9

1) Rounded average PRR.
2) Typical values for average conditions and average ambient brightness. In bright sunlight, the max. range is shorter than under an overcast sky.
3) The 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. Range ambiguities have to be resolved by multiple-time-around processing.
4) Within FOV $\pm 65^\circ = 130^\circ$ full measuring range performance, over 130° to 160° 90% of full measuring range performance.
5) Considering max. effective FOV 120° , additional roll angle $\pm 5^\circ$.
6) If the laser beam hits, in part, more than one target, the laser's pulse power is split accordingly. Thus the achievable range is reduced.

Minimum Range

Accuracy ^{7) 9)}

Precision ^{8) 9)}

Laser Pulse Repetition Rate ^{1) 10)}

Max. Effective Measurement Rate ¹⁾

Echo Signal Intensity

Laser Wavelength

Laser Beam Divergence

Laser Beam Footprint (Gaussian Beam Definition)

5 m

10 mm

5 mm

up to 1500 kHz

up to 1,333,333 meas./sec. (@ 1500 kHz PRR & 160° scan angle)

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

near infrared

0.4 mrad ¹¹⁾

40 mm @ 100 m, 200 mm @ 500 m, 400 mm @ 1000 m

- 7) Accuracy is the degree of conformity of a measured quantity to its actual (true) value.
8) Precision, also called reproducibility or repeatability, is the degree to which further measurements show the same result.

- 9) One sigma @ 150 m range under RIEGL test conditions.
10) User selectable.
11) Measured at the $1/e^2$ points. 0.4 mrad corresponds to an increase of 40 mm of beam diameter per 100 m distance.

Scanner Performance

Scanning Mechanism

Scan Pattern

Field of View (selectable)

Scan Speed (selectable)

Angular Step Width $\Delta \theta$ (selectable)

between consecutive laser shots

Angle Measurement Resolution

Scan Sync (optional)

rotating polygon mirror

parallel scan lines

$\pm 80^\circ = 160^\circ$ ¹²⁾

50 - 200 lines/sec

$0.006^\circ \leq \Delta \theta \leq 0.24^\circ$ ^{13) 14)}

0.001°

scanner rotation synchronization

Data Interfaces

Configuration, Scan Data Output &

Communication with External Devices

GNSS Interface

General IO & Control ¹⁵⁾

Camera Interfaces at connector panel

Camera Interfaces via multi purpose connector ¹⁷⁾

IMU Interface (optional)

2x LAN 10/100/1000 MBit/sec ^{15) 16)}

Serial RS-232 interface, TTL input for 1pps synchronisation pulse, accepts different data formats for GNSS-time information

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

2x power (max. 1.2 A), trigger, exposure, and GNSS RS-232 Tx & PPS

1x trigger and exposure

IMU data, power

General Technical Data

Power Supply Input Voltage / Consumption

Main Dimensions (L x W x H)

Weight (without IMU/GNSS system)

Humidity

Protection Class

Max. Flight Altitude (operating & not operating)

Temperature Range

11 - 34 V DC / typ. 45 W

242 mm x 117 mm x 124 mm (with interface box)

225 mm x 117 mm x 124 mm (without interface box)

approx. 2.2 kg (with interface box), approx. 2.1 kg (without interface box)

max. 80 % non condensing @ 31°C

IP64, dust and splash-proof

18 500 ft (5 600 m) above MSL (Mean Sea Level)

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

- 12) Recommend FoV is 120° over flat terrain.
13) The angular step width depends on the selected laser PRR.
14) The maximum angular step width is limited by the maximum scan rate.

- 15) 1x externally available via multi-purpose connector
16) 1x available directly on optional interface box
17) externally available via connection board (including 1x power camera)

Technical Data *RIEGL VUX®-100*²⁵ (continued)

Data Storage

Internal Data Storage
Memory Card Slot

Solid State Disc SSD, 2 TByte
for CFAST^{® 1)} industrial memory card 1TByte

IMU & GNSS (optional)

Orientation Accuracy ⁶⁾

Roll, Pitch

Heading

IMU Sampling Rate

Position Accuracy (typ.)

System Total Weight (approx.)

RIEGL RiLOC-E^{25 2)}

RIEGL RiLOC-F ³⁾ /
RIEGL RiLOC-F ^{inside 3)}

Applanix
APX-20 UAV ⁴⁾

Applanix
AP+50 ^{4) 5)}

0.010°

0.005°

0.015°

0.005°

0.025°

0.020°

0.035°

0.010°

up to 700 Hz

up to 700 Hz

200 Hz

200 Hz

0.02 - 0.04 m

0.02 - 0.03 m

0.02 - 0.05 m

0.02 - 0.05 m

2.4 kg

2.4 kg / 2.3 kg

2.8 kg

3.5 kg ⁷⁾

1) CFAST is a registered trademark of CompactFlash Association.

2) See technical details at the RiLOC-E²⁵ infosheet

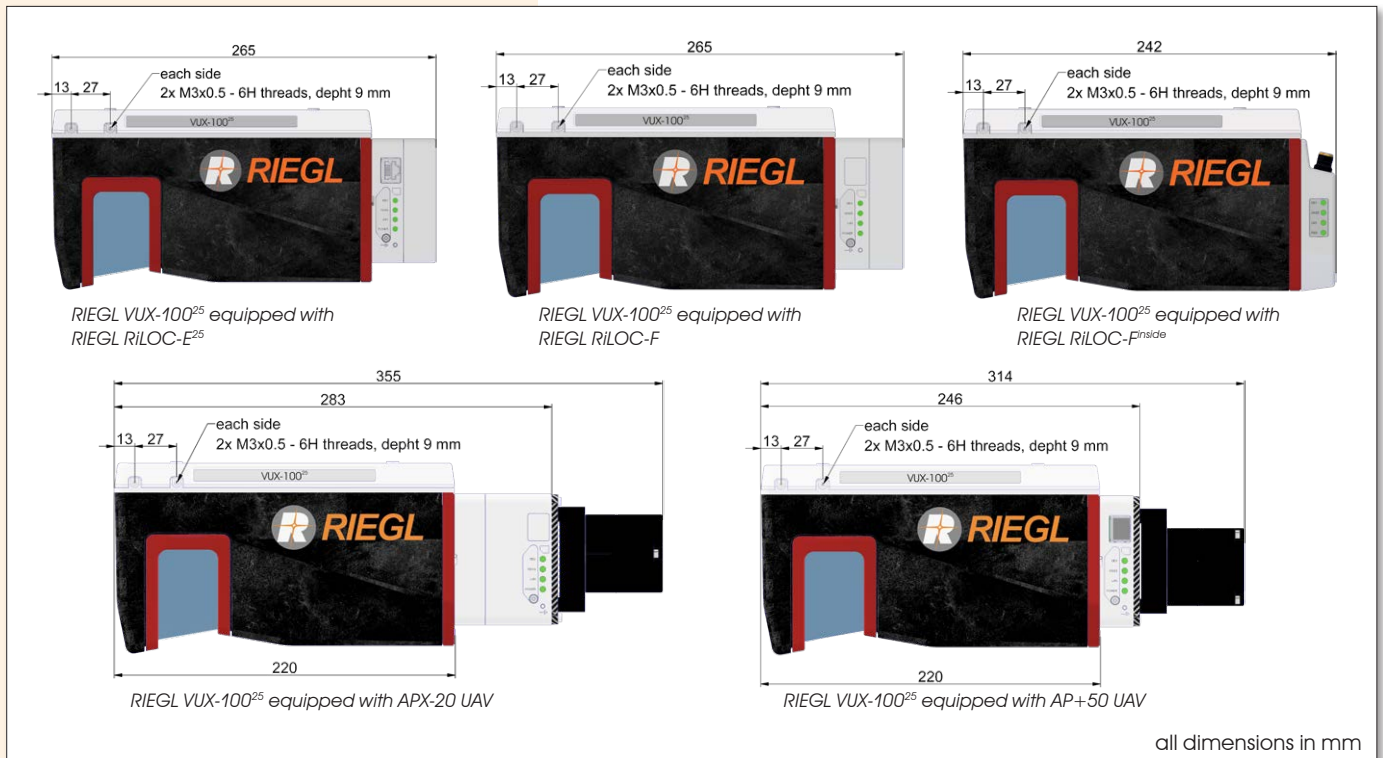
3) See technical details at the RiLOC-F/RiLOC-F^{inside} infosheet

4) See technical details at the according Applanix datasheet

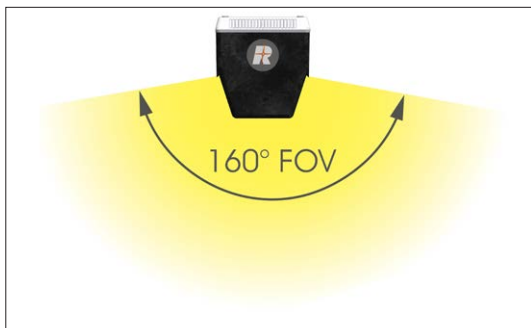
5) Use of the RiSYS-CU-23 Control Unit is mandatory

6) Accuracy specifications for post-processed data

7) Total weight includes RiSYS-CU-23 Control Unit (0.9 kg)



*RIEGL VUX®-100*²⁵ Field of View & System Integration



160° extra large FOV for wide area coverage



*RIEGL VUX-100*²⁵ LiDAR sensor
with APX-20 UAV IMU/GNSS unit fully integrated
on Acecore Zoe multirotor UAV platform



RIEGL Laser Measurement Systems GmbH, Headquarters
RIEGL USA Inc., Headquarters North America

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RIEGL China Ltd.
RIEGL Australia Pty Ltd.
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