

**NEW**

# RIEGL VUX<sup>®</sup>-3HA

## DISCOVER NEW HORIZONS in mobile laser scanning!

- very high measurement rate up to 3,000,000 meas./sec
- very high scan speed up to 400 scans/sec
- survey-grade performance:  
3 mm accuracy  
2 mm precision
- 360° field of view  
for unrestricted data acquisition
- regular point pattern,  
perfectly parallel scan lines
- cutting edge RIEGL technology:
  - echo signal digitization
  - online waveform processing
  - multiple-time-around processing
  - multi-target capability
  - calibrated amplitude
  - range independent reflectance
- compact (212x209x125 mm),  
lightweight (3.2 kg), and rugged
- userfriendly mounting
- mechanical and electrical  
interface for external IMU sensor
- electrical interfaces for GNSS data  
string and sync pulse (1PPS)
- LAN-TCP/IP interface
- internal 2 TByte solid state drive (SSD)  
for data storage

The RIEGL VUX-3HA high-precision laser scanner offers a 360° coverage of extremely dense point cloud data. A pulse repetition rate of up to 3 MHz combined with an increased line speed of up to 400 scans/second enables the detection of minute details in close-range applications such as scanning road surfaces and the detection of even thin structures such as steel cable constructions, power lines, and vegetation details at longer distances. Even at higher platform speeds, the point density requirements of projects are easily met, increasing efficiency in a wide variety of mapping tasks.

High performance pulsed laser ranging, based on RIEGL's well-proven echo signal digitization technology with subsequent online waveform processing results in superior measurement capabilities even under adverse atmospheric conditions and in excellent multiple target echo discrimination. Scan data is provided with additional point attributes, e.g. range-independent reflectance and calibrated amplitude. While calibrated amplitude values visualize the objects scanned depending on the distance, range-independent reflectance values visualize them regardless of distance but depending on surface properties. Such information can be used for classification and further AI-based processing. RIEGL's software package RiPROCESS and the associated software tools and apps enable full utilization of the highly informative data available with each individual measurement point.

### Typical MLS applications include

#### ROAD:

- Transportation Infrastructure Mapping
- Road Surface Measurement
- HD Mapping for Autonomous Vehicles
- City Modeling
- GIS Mapping and Asset Management
- As-Built Surveying

#### RAIL:

- Rapid and Safe Data Capture with Minimal Disruption to Network Schedules
- Track and Infrastructure Monitoring
- Clash Detection Simulation and Clearance Analysis



visit our website  
[www.riegl.com](http://www.riegl.com)



## Laser Product Classification

Class 1 Laser Product  
according to IEC 60825-1:2014

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.



## Range Measurement Performance

### Measuring Principle

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

Laser Pulse Repetition Rate PRR <sup>1) 2)</sup>	300 kHz	1000 kHz	1800 kHz	3000 kHz
Max. Measuring Range <sup>3) 4)</sup> natural targets $\rho \geq 10\%$ natural targets $\rho \geq 80\%$	180 m 500 m	100 m 280 m	90 m 250 m	70 m 200 m
Max. Number of Targets per Pulse <sup>5)</sup>	31	15	8	5

- 1) Rounded values.  
2) Setting of intermediate PRR values possible.  
3) 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.  
4) Ambiguity to be resolved by post-processing with RIUNITE software.  
5) If more than one target is hit, the total laser transmitter power is split and, accordingly, the achievable range is reduced.

## Minimum Range

Accuracy <sup>6) 8)</sup>

Precision <sup>7) 8)</sup>

Laser Pulse Repetition Rate <sup>1) 9)</sup>

Max. Effective Measurement Rate <sup>1)</sup>

Echo Signal Intensity

Laser Wavelength

Laser Beam Divergence

Laser Beam Footprint (Gaussian Beam Definition)

1 m  
3 mm  
2 mm  
300 kHz to 3000 kHz  
up to 3 000 000 meas./sec. (@ 3000 kHz PRR & 360° FOV)  
for each echo signal, high-resolution 16 bit intensity information is provided  
near infrared  
typ. 0.35 mrad @  $1/e^{10}$ , typ. 0.5 mrad @  $1/e^2$  <sup>11)</sup>  
4.5 mm @ exit, 5 mm @ 5 m, 6.6 mm @ 10 m,  
13 mm @ 25 m, 25 mm @ 50 m, 50 mm @ 100 m

- 6) Accuracy is the degree of conformity of a measured quantity to its actual (true) value.  
7) Precision, also called reproducibility or repeatability, is the degree to which further measurements show the same result.  
8) One sigma @ 16 m range under RIEGL test conditions.  
9) User selectable, setting of intermediate PRR values possible.

- 10) Measured at the  $1/e$  points. 0.35 mrad corresponds to an increase of 35 mm of beam diameter per 100 m distance.  
11) Measured at the  $1/e^2$  points. 0.50 mrad corresponds to an increase of 50 mm of beam diameter per 100 m distance.

## Scanner Performance

Scanning Mechanism <sup>12)</sup>

Field of View (selectable)

Scan Speed (selectable) <sup>12)</sup>

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

between consecutive laser shots

Angle Measurement Resolution

Internal Sync Timer

Scan Sync (optional)

rotating mirror  
360° „full circle“  
10 - 400 revolutions per second, equivalent to 10 - 400 scans/sec  
 $0.0012^\circ \leq \Delta \vartheta \leq 0.48^\circ$   
  
0.001°  
for real-time synchronized time stamping of scan data  
scanner rotation synchronization

- 12) The rotation noise may vary from device to device and depends strongly on the rotation speed. A louder rotation noise in a device compared to other devices is usually no indication of a malfunction, does not qualify for a rectification, nor does it constitute a warranty case. The max. noise is less than 70 dB(A) at 1 m distance.

## Data Interfaces

Configuration

Scan Data Output

GNSS Interface

Internal Data Storage

External Camera

LAN 10/100/1000 Mbit/sec  
LAN 10/100/1000 Mbit/sec  
Serial RS-232 interface for data string with GNSS-time information,  
TTL input for 1PPS synchronization pulse  
2 TByte SSD  
TTL input/output

## General Technical Data

Power Supply Input Voltage

Power Consumption <sup>13)</sup>

Main Dimensions <sup>13)</sup>

Weight <sup>13)</sup>

Humidity

Protection Class

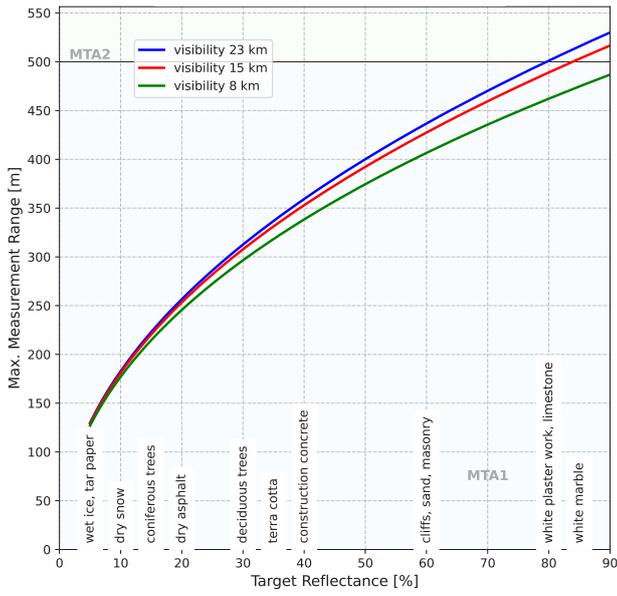
Temperature Range

11 - 34 V DC  
typ. 48 W @ 25 °C  
typ. 65 W @ low temperatures  
212 x 209 x 125 mm  
approx. 3.2 kg  
max. 80 % non condensing @ 31 °C  
IP66<sup>14)</sup>, IP67<sup>15)</sup>  
-20 °C <sup>16)</sup> up to +40 °C (operation) / -20 °C up to +50 °C (storage)

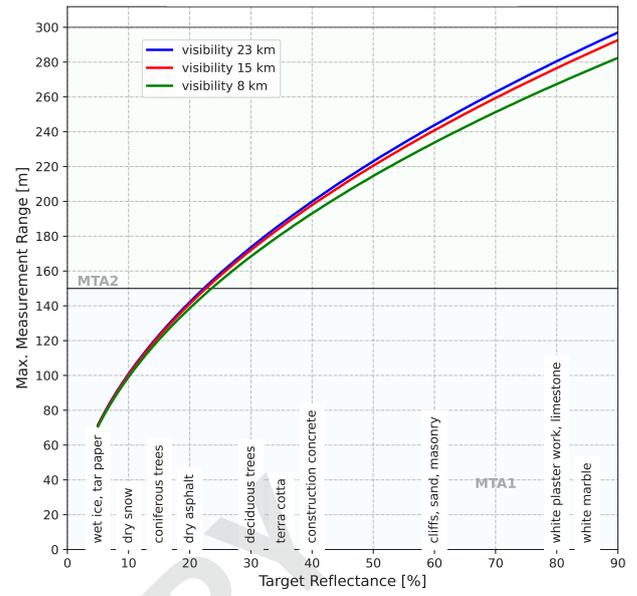
- 13) without external IMU/GNSS  
14) dust-tight, protected against powerful waterjets  
15) dust-tight, protected against temporary immersion in water

- 16) Requires that the scanner is powered up at or above -10 °C ambient temperature and held in continuous scanning operation. Insulating the scanner with appropriate material will enable operation at even lower temperatures.

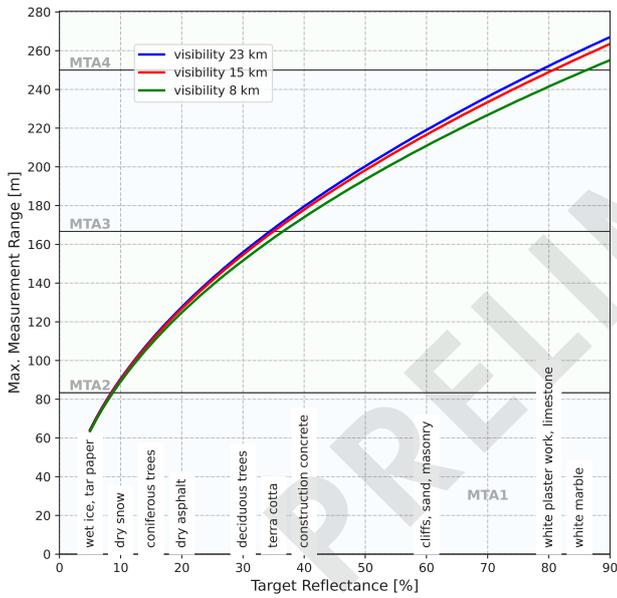
Laser PRR = 300 kHz



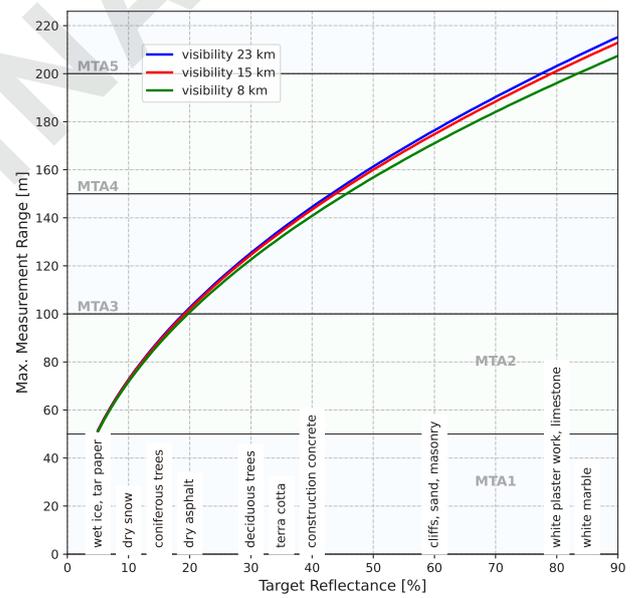
Laser PRR = 1000 kHz



Laser PRR = 1800 kHz



Laser PRR = 3000 kHz



# RIEGL VUX®-3HA Features

## Protective Cap

To shield the glass tube of the RIEGL VUX-3HA from mechanical damage and soiling, a protective cap is provided to cover the upper part of the instrument during transport and storage.

## Compact, Rugged Housing

The housing with its industrial-grade fans is IP66 and IP67 rated. Several mounting points ensure easy installation in various mounting positions.

## Active Dehumidification

The integrated active drying units ensure reliable air dehumidification inside the RIEGL VUX-3HA during operation.

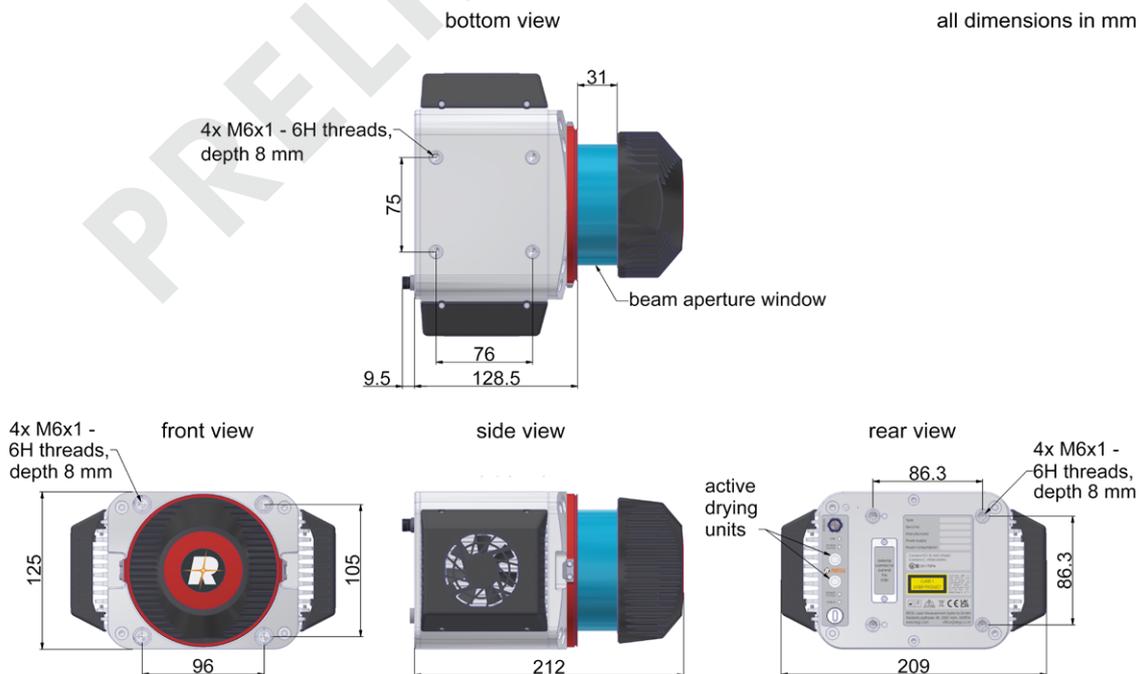
## Optional External IMU-Sensor

## Options for RIEGL VUX-3HA Integration

RIEGL offers user-friendly hardware and software interfaces for straight forward integration of the RIEGL VUX-3HA LiDAR sensor into kinematic systems.



# Dimensional Drawings RIEGL VUX®-3HA



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

RIEGL Japan Ltd.  
 RIEGL China Ltd.  
 RIEGL Australia Pty Ltd.  
 RIEGL Canada Inc.  
 RIEGL UK Ltd.

RIEGL Asia Pacific Ltd.  
 RIEGL South America SpA  
 RIEGL Deutschland Vertriebsgesellschaft mbH  
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