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## RANGER-UAV<sup>22</sup> LITE

The **RANGER-UAV<sup>22</sup> LITE** adds high pulse rate measurement capability to a scanner that excels at measurement accuracy. Ideal for completing UAS missions with the highest degree of data quality, this member of the RANGER lineup is vehicle flexible and is an excellent choice to suit many roles. High density UAS missions, detailed mobile mapping projects, and even low altitude piloted aircraft surveys can all be conducted.

### FEATURES

- A 360° scanner FOV creates a payload designed for flexible mounting options
- Class leading 10 mm range measurement accuracy
- Integrated camera options for an outstanding all-in-one remote sensing payload

### PAYLOAD

\* Without Accessories

|                       |                           |
|-----------------------|---------------------------|
| OVERALL DIMENSIONS*   | 23.5 x 18.0 x 18.7 cm     |
| OPERATING VOLTAGE     | 14 - 28 VDC               |
| POWER CONSUMPTION*    | 75 W typical              |
| OPERATING TEMPERATURE | 0° - 40° C / 32° - 104° F |
| WEIGHT*               | 4.15 kg / 9.15 lbs        |

### LiDAR SENSOR

Source: RIEGL Laser Measurement Systems

|                            |                                       |
|----------------------------|---------------------------------------|
| LASER WAVELENGTH           | 1550 nm                               |
| RANGE MIN                  | 1.5 m at ≥1 MHz PRR                   |
| RANGE MAX                  | 755 m at 20% reflectivity, 50 kHz PRR |
| PULSE REPETITION FREQUENCY | Up to 1200 kHz                        |
| SCAN SPEED                 | 10 - 200 lines/second                 |
| MAX RETURN COUNT           | 15                                    |
| BEAM COUNT                 | 1 facet rotating mirror               |
| BEAM DIVERGENCE            | 0.35 mrad @ 1/e                       |
| HORIZONTAL FIELD OF VIEW   | 360°                                  |
| LASER ACCURACY             | 10 mm One sigma @ 150 m               |
| LASER SAFETY               | CLASS 1                               |

### NAVIGATION SYSTEM

|                                  |   |
|----------------------------------|---|
| CONSTELLATION SUPPORT            | GPS + GLONASS + BEIDOU + GALILEO          |
| SUPPORT ALIGNMENT                | Static, Kinematic, Dual-Antenna           |
| OPERATION MODES                  | Real-time, Post-Processed                 |
| ACCURACY POSITION                | 1 cm + 1 ppm GNSS baseline RMS horizontal |
| ACCURACY ATTITUDE <sup>(5)</sup> |   |
| ROLL, PITCH                      | 0.002° RMS                                |
| HEADING                          | 0.007° RMS                                |

### QUICK SPECS

#### ABSOLUTE ACCURACY <sup>(1)(2)(3)</sup>

1.5 - 3.0 cm RMSEz @ 120 m

#### INTRASWATH PRECISION <sup>(1)(2)(4)</sup>

2.0 cm RMSDz @ 120 m

#### EXAMPLE ACQUISITIONS:

##### UAV

- » 100 m AGL, 10 m/s, 90° FOV, 1200 kHz
- » Swath Width = 200 m
- » Avg. Density = 150 points/m<sup>2</sup>
- » Collection Rate = -7 km<sup>2</sup>/hr

##### HELICOPTER

- » 180 m AGL, 50 knots, 90° FOV, 400 kHz
- » Swath Width = 360 m
- » Avg. Density = 11 points/m<sup>2</sup>
- » Collection Rate = -33 km<sup>2</sup>/hr

### APPLICATIONS

- UTILITIES MAPPING
- OIL & GAS SURVEYING
- RAILWAY TRACK MAPPING
- CONSTRUCTION SITE SURVEYING
- GENERAL MAPPING

(1) Approximate values based on PLS test methods described at <https://docs.phoenixlidar.com/accuracy-standards-and-quantification>.

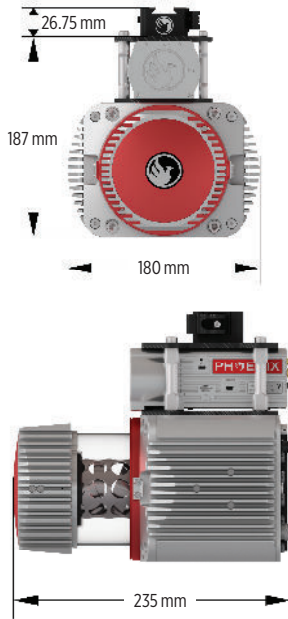
(2) Using a 90° max downward field of view.

(3) Expected RMSEz when following the PLS recommended acquisition & processing workflow and ASPRS check point guidelines.

(4) Flat surfaces with >20% reflectivity at the laser's wavelength.

(5) Estimated post-processed accuracy with IMU-30.

# RANGER-UAV<sup>22</sup> LITE DIMENSIONS



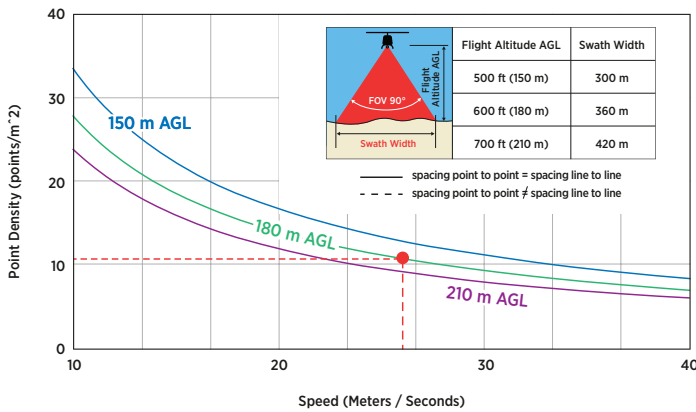
# MEASUREMENT PERFORMANCE

| Laser Pulse Repetition Rate PRR <sup>1) 5)</sup>          | 50 kHz             | 100 kHz            | 200 kHz            | 400 kHz            | 800 kHz           | 1200 kHz          |
|---|--------------------|--------------------|--------------------|--------------------|-------------------|-------------------|
| <b>Max. Measuring Range<sup>3) 4)</sup></b>               |                    |                    |                    |                    |                   |                   |
| natural targets $\rho \geq 20\%$<br>(e.g. Dry roads)      | 755 m              | 545 m              | 390 m              | 280 m              | 200 m             | 160 m             |
| natural targets $\rho \geq 60\%$<br>(e.g. Sand)           | 1250 m             | 910 m              | 660 m              | 480 m              | 340 m             | 280 m             |
| natural targets $\rho \geq 80\%$<br>(e.g. Limestone)      | 1415 m             | 1040 m             | 755 m              | 550 m              | 390 m             | 320 m             |
| <b>Max. Operating Flight Altitude AGL<sup>2) 5)</sup></b> |                    |                    |                    |                    |                   |                   |
| @ $\rho \geq 20\%$  | 490 m<br>(1590 ft) | 350 m<br>(1150 ft) | 250 m<br>(820 ft)  | 180 m<br>(590 ft)  | 130 m<br>(420 ft) | 100 m<br>(340 ft) |
| @ $\rho \geq 60\%$  | 800 m<br>(2640 ft) | 580 m<br>(1920 ft) | 420 m<br>(1390 ft) | 310 m<br>(1010 ft) | 220 m<br>(720 ft) | 180 m<br>(590 ft) |

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.  
 5) Flat terrain assumed, scan angle +/- 45°.  
 6) If more than one target is hit, the total laser transmitter power is split and, accordingly, the achievable range is reduced.

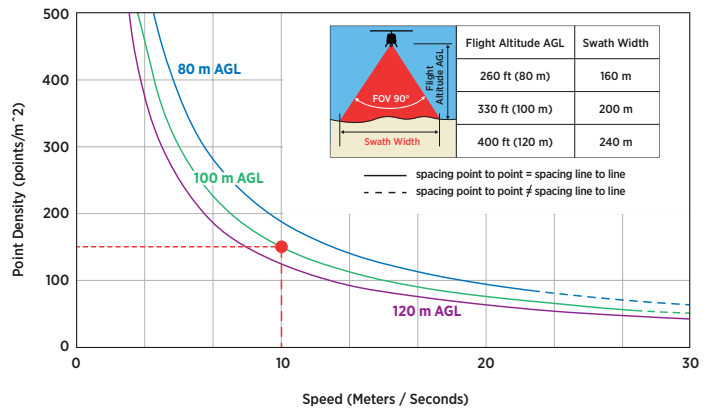
## RANGE & POINT DENSITY EXAMPLES

### PRR = 400 kHz



|                |  |                |   |
|----------------|--|----------------|---|
| <b>EXAMPLE</b> | <b>RANGER-UAV<sup>22</sup> LITE</b> at 400 kHz, 90°<br>Field of View, Flying Height AGL = 180 m,<br>Flying Speed = 50 knots (26 m/s) | <b>RESULTS</b> | <b>11 points/m<sup>2</sup> density</b><br><b>~ 33 km<sup>2</sup>/hr collection rate</b> |
|----------------|--|----------------|---|

### PRR = 1200 kHz



|                |  |                |   |
|----------------|--|----------------|---|
| <b>EXAMPLE</b> | <b>RANGER-UAV<sup>22</sup> LITE</b> at 1200 kHz, 90°<br>Field of View, Flying Height AGL = 100 m,<br>Flying Speed = 10 m/s | <b>RESULTS</b> | <b>150 points/m<sup>2</sup> density</b><br><b>~ 7 km<sup>2</sup>/hr collection rate</b> |
|----------------|--|----------------|---|

## RANGER-UAV<sup>22</sup> CAMERA OPTIONS



PhaseOne iXM-100



61MP A7R4-Lite



360° Mobile Camera



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## QUICK SPECS

### ABSOLUTE ACCURACY

1.5 - 3.0 cm RMSEz @ 120 m Range <sup>(1)(2)(4)</sup>

### PP ATTITUDE HEADING RMS ERROR

0.022° / 0.006° IMU options

### WEIGHT

4.15 kg / 9.15 lbs

### LASER RANGE

1,000 m @ 20% reflectivity, 50 kHz

### SCAN RATE

1,500 kHz pulse rate up to 15 returns

# RANGER-LR<sup>22</sup> LITE

The **RANGER-LR<sup>22</sup> LITE** is the new lighter Long Range system configuration of our RANGER Series. Designed for the most demanding mapping applications, the **RANGER-LR<sup>22</sup> LITE** is the ultimate combination of high density, long range LiDAR with a powerful 1,550 nm laser and up to 15 returns that penetrate dense vegetation at high speeds and altitudes in large scan regions. This system is available UAV, manned aircraft, mobile, VTOL and backpack configurations.

## FEATURES

- High versatility payload designed with flexible mounting options
- Survey-grade (cm-level) accuracy with outstanding range capabilities for high altitude and high speed missions
- Imaging Upgrades: High-Res RGB, Thermal, Hyperspectral, and Panoramic cameras.

## PLATFORM

\* Without Accessories

|                       |                           |
|-----------------------|---------------------------|
| OVERALL DIMENSIONS*   | 23.5 x 18.0 x 18.7 cm     |
| OPERATING VOLTAGE     | 14 - 28 VDC               |
| POWER CONSUMPTION*    | 75 W typical              |
| OPERATING TEMPERATURE | 0° - 40° C / 32° - 104° F |
| WEIGHT*               | 4.15 kg / 9.15 lbs        |

## LiDAR SENSOR

|                                |   |
|--------------------------------|---|
| LASER PROPERTIES               | 1550 nm Class 1 (eye safe)              |
| RANGE MIN                      | 1.5 m at 1 MHz PRR                      |
| RANGE MAX                      | 1,000 m at 20% reflectivity, 50 kHz PRR |
| MAX EFFECTIVE MEASUREMENT RATE | 1,500 kHz                               |
| HORIZONTAL FIELD OF VIEW       | 360°                                    |
| ACCURACY                       | 15 mm one Sigma @ 150 m                 |
| SENSOR CLASSIFICATION          | IP64                                    |
| WEIGHT                         | 3.5 kg w/o fan                          |
| POWER CONSUMPTION              | 65 W typical                            |

## APPLICATIONS



OIL & GAS SURVEYING



UTILITIES MAPPING



RAILWAY TRACK MAPPING



AGRICULTURE AND FORESTRY MONITORING



CONSTRUCTION SITE SURVEYING



OPEN PIT MINING OPERATIONS



GENERAL MAPPING

## NAVIGATION SYSTEM

|                               |                                     |
|-------------------------------|-------------------------------------|
| CONSTELLATION SUPPORT         | GPS + GLONASS + BEIDOU + GALILEO    |
| SUPPORT ALIGNMENT             | Static, Kinematic, Dual-Antenna     |
| OPERATION MODES               | Real-time, Post-processing optional |
| ACCURACY POSITION             | 1 cm + 1 ppm RMS horizontal         |
| PP ATTITUDE HEADING RMS ERROR | 0.022° to 0.006° IMU options        |

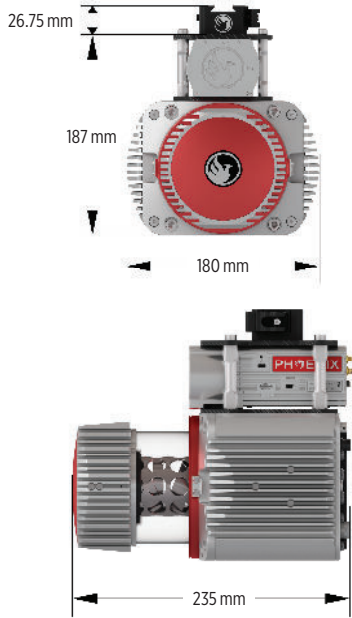
(1) Approximate values based on PLS test condition.

(2) Using a 90° downward field of view.

(3) Range of elevation values on flat surfaces with >20% reflectivity at the laser's wavelength.

(4) Expected RMSEz when following the PLS recommended acquisition & processing workflow and ASPRS check point guidelines.

## RANGER-LR<sup>22</sup> LITE DIMENSIONS



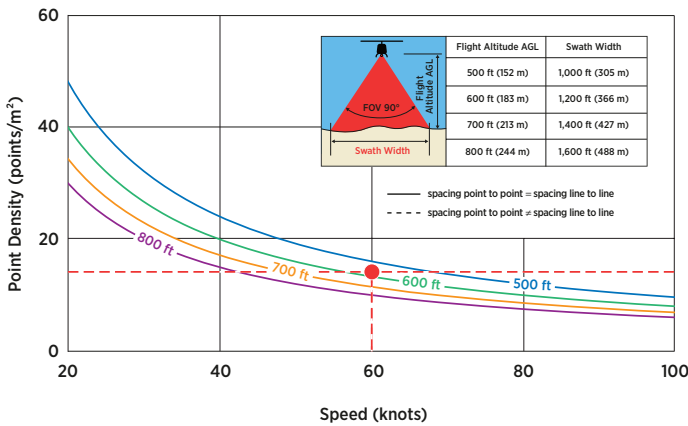
## RANGE-LR<sup>22</sup> LITE MEASUREMENT PERFORMANCE

| Laser Pulse Repetition Rate PRR <sup>1) 5)</sup>  | 50 kHz             | 200 kHz            | 400 kHz           | 600 kHz           | 800 kHz           | 1200 kHz          | 1500 kHz          |
|---|--------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Max. Measuring Range <sup>3) 4)</sup><br>natural targets $\rho \geq 20\%$<br>natural targets $\rho \geq 60\%$<br>natural targets $\rho \geq 80\%$ | 1000 m             | 600 m              | 435 m             | 355 m             | 310 m             | 255 m             | 230 m             |
|   | 1630 m             | 1000 m             | 730 m             | 600 m             | 525 m             | 435m              | 390 m             |
|   | 1845 m             | 1140 m             | 830 m             | 690 m             | 600 m             | 500 m             | 445 m             |
| Max. Operating Flight Altitude AGL <sup>2) 5)</sup><br>@ $\rho \geq 20\%$<br>@ $\rho \geq 60\%$   | 640 m<br>(2110 ft) | 390 m<br>(1270 ft) | 280 m<br>(920 ft) | 230 m<br>(750 ft) | 200 m<br>(650 ft) | 160 m<br>(540 ft) | 150 m<br>(490 ft) |
|   | 1050 m             | 640 m              | 470 m             | 390 m             | 340 m             | 280 m             | 250 m             |
|   | (3440 ft)          | (2110 ft)          | (1540 ft)         | (1270 ft)         | (1100 ft)         | (920 ft)          | (820 ft)          |
| Max. Number of Targets per Pulse <sup>6)</sup>  | 15                 | 15                 | 15                | 15                | 11                | 7                 | 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.
- 5) Flat terrain assumed, scan angle  $\pm 45^\circ$  FOV.
- 6) If more than one target is hit, the total laser transmitter power is split and, accordingly, the achievable range is reduced.

## MAX MEASUREMENT RANGE & POINT DENSITY RANGER-LR<sup>22</sup> LITE

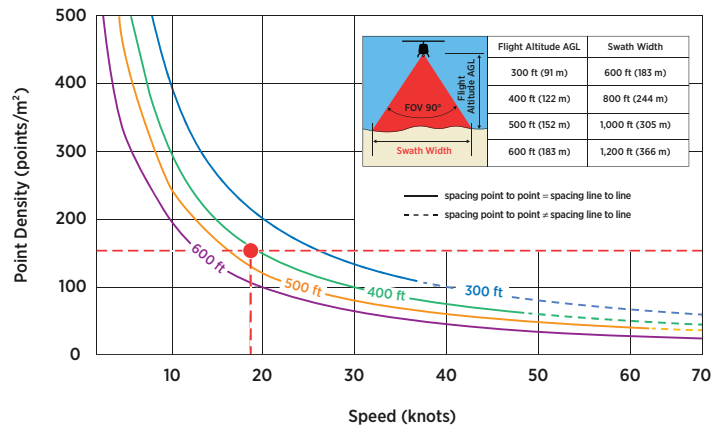
### PRR = 600 kHz



EXAMPLE RANGER-LR<sup>22</sup> LITE at 600 k pulses/sec  
Range to target = 150 m, speed 60 kn

RESULTING POINT DENSITY **16 pts/m<sup>2</sup>**

### PRR = 1500 kHz



EXAMPLE Ranger-LR<sup>22</sup> LITE at 1,500k pulses/sec  
Flying height AGL = 122 m, speed 6 m/sec (19 knots)

RESULTING POINT DENSITY **150 pts/m<sup>2</sup>**

## RANGER-LR<sup>22</sup> CAMERA ACCESSORIES



PhaseOne iXM-100



61MP A7R4-Lite



360° Mobile Camera



EXPLORE A PHOENIX LiDAR SYSTEM FOR YOUR TEAM, CONTACT US!

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