

# Technical Data RIEGL LMS-Q680i-S

## Laser Product Classification

## Class 3B Laser Product according to IEC60825-1:2007

The following clause applies for instruments delivered into the United States: Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

The instrument must be used only in combination with the appropriate laser safety box.

as a function of PRR and target reflectivity



## Range Measurement Performance

Laser Pulse Repetition Rate PRR	100 kHz	200 kHz	300 kHz	400 kHz
Max. Measuring Range <sup>1) 3)</sup>				
natural targets $\rho \geq 20\%$	1800 m	1350 m	1150 m	1000 m
natural targets $\rho \geq 60\%$	2800 m	2200 m	1850 m	1650 m
Max. Operating Flight Altitude AGL <sup>2) 3)</sup>	1450 m 4700 ft	1100 m 3600 ft	950 m 3100 ft	800 m 2600 ft
NOHD <sup>4)</sup>	95 m	65 m	50 m	42 m
eNOHD <sup>5)</sup>	720 m	500 m	390 m	330 m

1) The following conditions are assumed:  
• target is larger than the footprint of the laser beam • average ambient brightness • visibility 23 km • moderate scan speed  
• perpendicular angle of incidence • ambiguity to be resolved by proper flight planning and multiple-time-around processing  
2) Reflectivity  $\rho \geq 20\%$ , max. scan angle  $60^\circ$ , additional roll angle  $\pm 5^\circ$ , MTA zone transitions not considered  
3) In bright sunlight the operational range may be considerably shorter and the operational flight altitude may be considerably lower than under an overcast sky.  
4) Nominal Ocular Hazard Distance, based upon MPE according to IEC60825-1:2007, viewing a single scan line  
5) Extended Nominal Ocular Hazard Distance, based upon MPE according to IEC60825-1:2007, viewing a single scan line

## Minimum Range<sup>6)</sup>

## Accuracy<sup>7) 8)</sup>

## Precision<sup>7) 9)</sup>

## Laser Pulse Repetition Rate<sup>10)</sup>

## Effective Measurement Rate

## Laser Wavelength

## Laser Beam Divergence<sup>11)</sup>

## Number of Targets per Pulse

50 m  
20 mm  
20 mm  
up to 400 kHz  
up to 266 kHz @  $60^\circ$  scan angle  
near infrared  
approx. 0.3 mrad  
digitized waveform processing: unlimited<sup>12)</sup>  
monitoring data output: first pulse

## Scanner Performance

## Scanning Mechanism

## Scan Pattern

## Scan Angle Range

## Scan Speed

## Angular Step Width $\Delta \vartheta$ <sup>10)</sup>

between consecutive laser shots

## Angle Measurement Resolution

## Scan Sync

rotating polygon mirror  
parallel scan lines  
 $\pm 30^\circ = 60^\circ$  total  
10 - 200 lines/sec<sup>13)</sup>  
 $\Delta \vartheta \geq 0.006^\circ$   
  
0.001°  
Option for synchronizing scan lines to external time signal

6) Limitation for range measurement capability, does not consider laser safety!

7) Standard deviation one sigma @ 250 m range under RIEGL test conditions.

8) Accuracy is the degree of conformity of a measured quantity to its actual (true) value.

9) Precision, also called reproducibility or repeatability, is the degree to which further measurements show the same result.

10) User selectable

11) Measured at the  $1/e^2$  points. 0.30 mrad corresponds to an increase of 30 cm of beam diameter per 1000 m distance.

12) Practically limited only by the maximum data rate allowed for the RIEGL Data Recorder

13) Minimum scan speed increasing to 27 lines/sec @ 400 000 Hz laser pulse repetition rate

## Intensity Measurement

For each echo signal, high-resolution 16-bit intensity information is provided which can be used for target discrimination and/or identification/classification.

## Data Interfaces

## Configuration

## Monitoring Data Output

## Digitized Data Output

## GPS-System

TCP/IP Ethernet (10/100 MBit), RS232 (19.2 Kbd)  
TCP/IP Ethernet (10/100 MBit)  
High speed serial data link to RIEGL Data Recorder  
Serial RS232 interface, TTL input for 1pps synchronization pulse, accepts different data formats for GPS-time information

## General Technical Data

## Power Supply

## Current Consumption

## Main Dimensions (L x W x H)

## Weight

## Protection Class

## Max. Flight Altitude (operating)

## Max. Flight Altitude (not operating)

## Temperature Range

## Mounting of IMU-Sensor

18 - 32 V DC  
approx. 7A @ 24 VDC  
480 x 212 x 229 mm  
approx. 17.5 kg  
IP54  
16 500 ft (5 000 m) above MSL  
18 000 ft (5 500 m) above MSL  
0°C up to +40°C (operation) / -10°C up to +50°C (storage)  
Steel thread inserts on both sides of the laser scanner, rigidly connected to the inner structure of the scanning mechanism



**RIEGL**<sup>®</sup>  
LASER MEASUREMENT SYSTEMS

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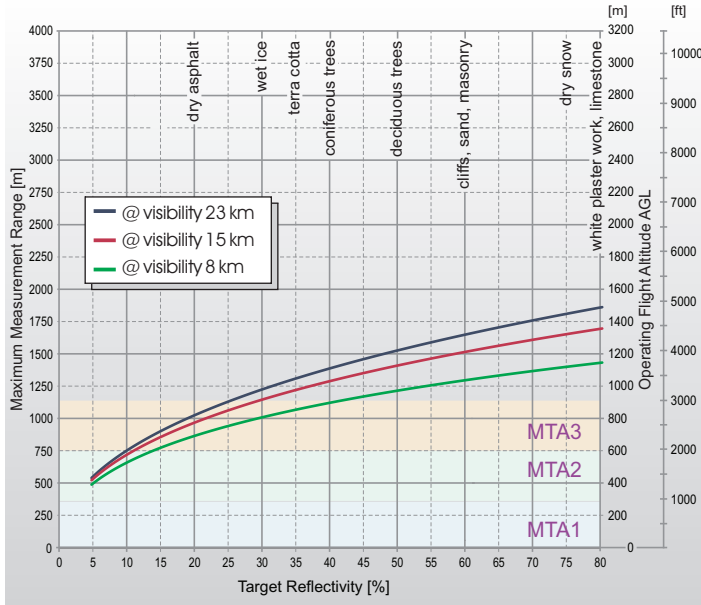
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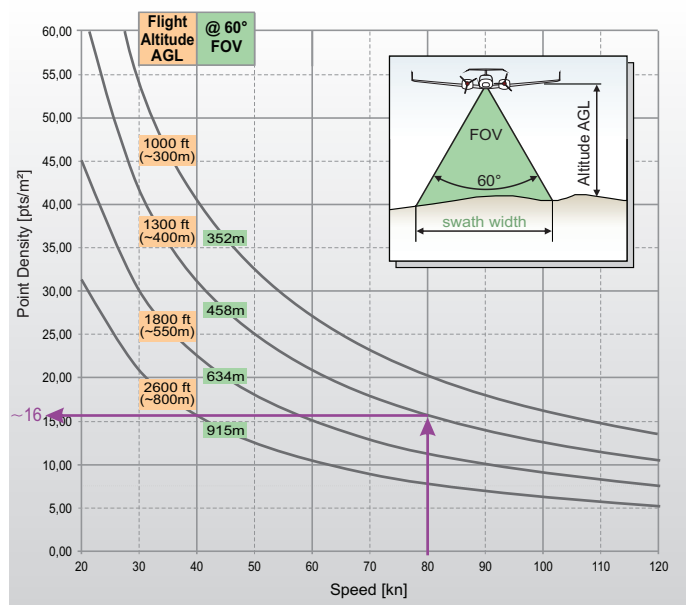
[www.riegl.com](http://www.riegl.com)

# Maximum Measurement Range & Point Density for RIEGL LMS-Q680i-S

PRR = 400 kHz

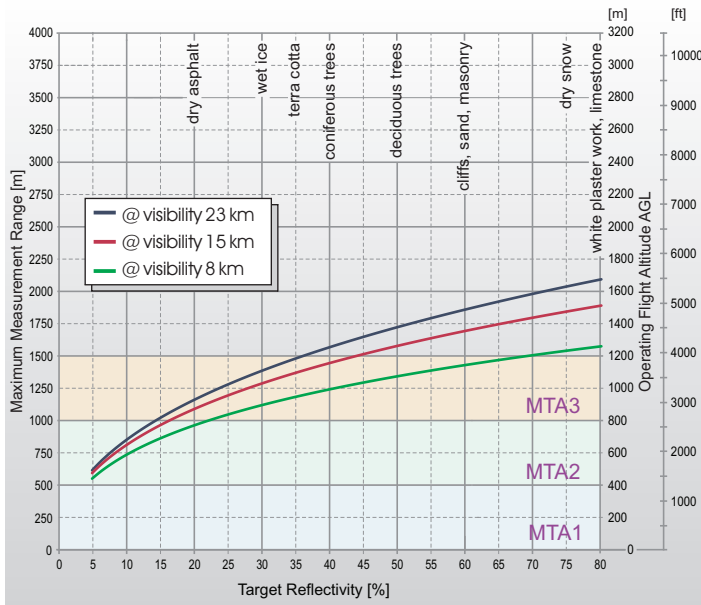


PRR = 400 kHz

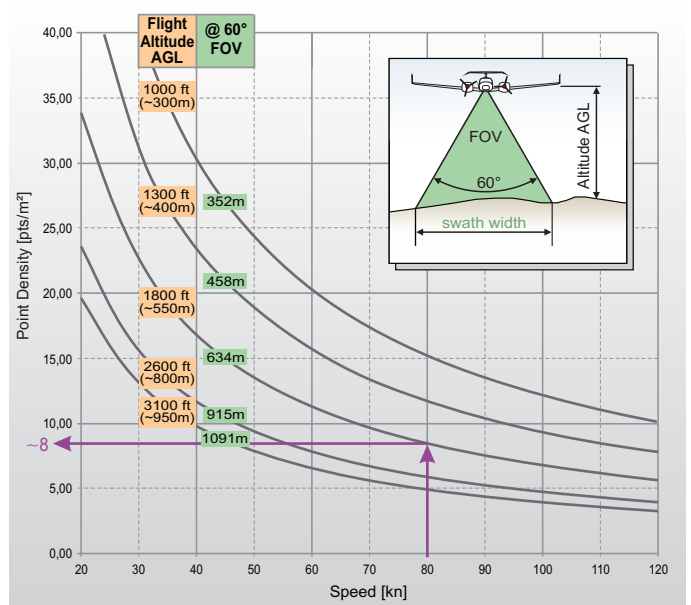


Example: Q680i-S at 400,000 pulses/second  
Altitude = 1300ft AGL, Speed = 80 kn  
Resulting Point Density ~ 16 pts/m<sup>2</sup>

PRR = 300 kHz



PRR = 300 kHz



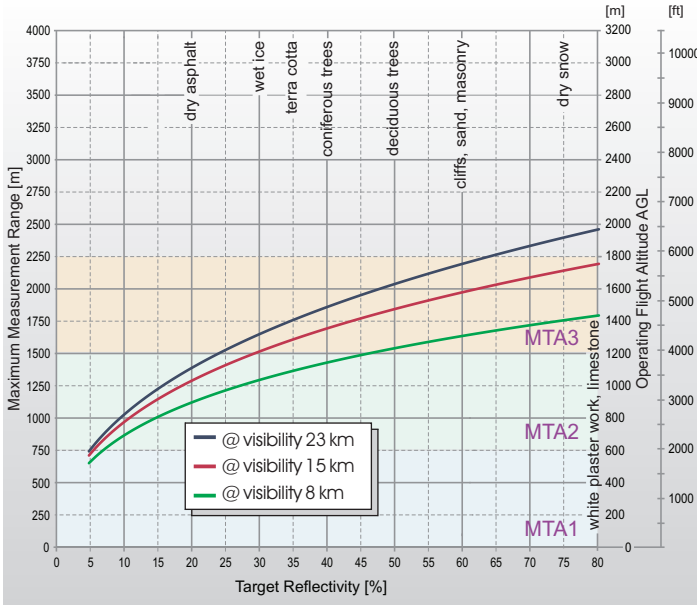
Example: Q680i-S at 300,000 pulses/second  
Altitude = 1800ft AGL, Speed = 80 kn  
Resulting Point Density ~ 8 pts/m<sup>2</sup>

**The following conditions are assumed for the Operating Flight Altitude AGL**

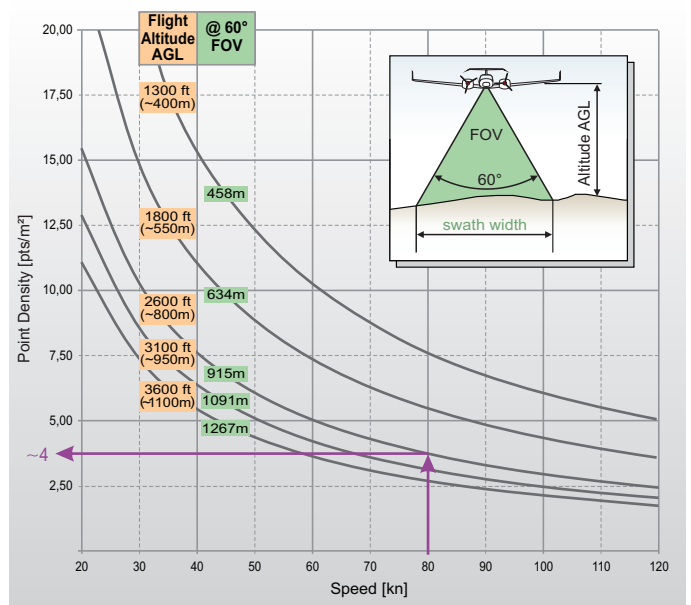
- ambiguity resolved by multiple-time-around (MTA) processing & flight planning
- target size ≥ laser footprint
- scan angle 60°
- average ambient brightness
- roll angle +/-5°

# Maximum Measurement Range & Point Density for RIEGL LMS-Q680i-S

PRR = 200 kHz

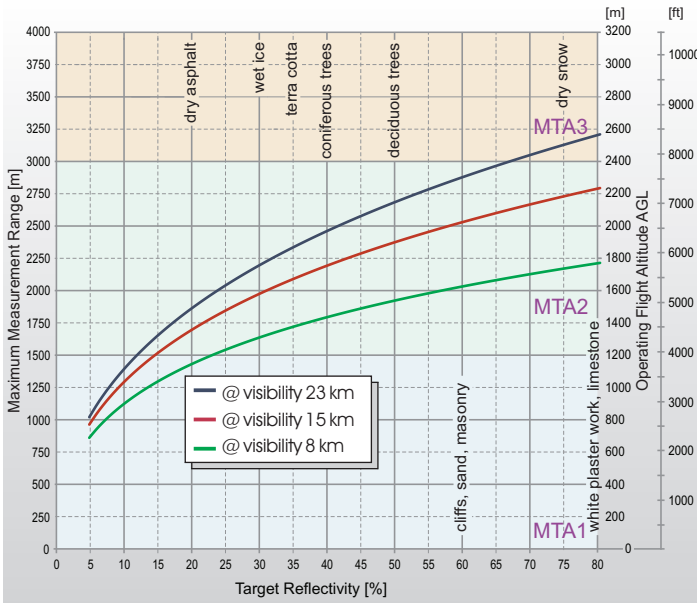


PRR = 200 kHz

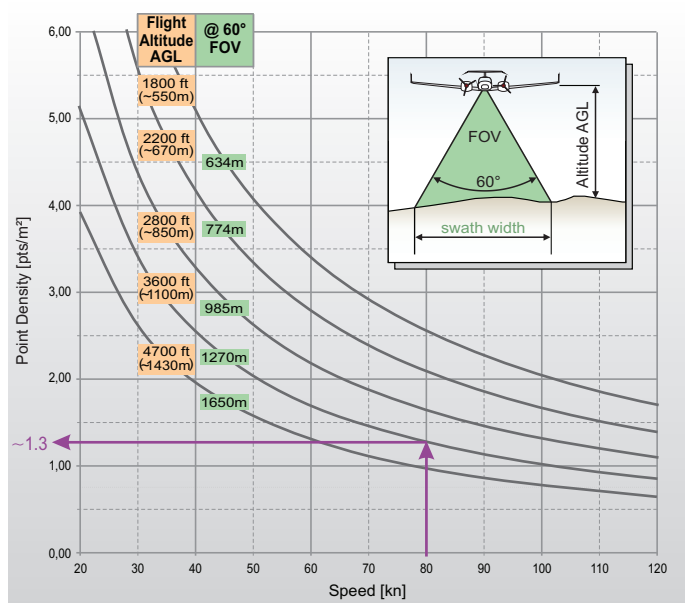


Example: Q680i-S at 200,000 pulses/second  
Altitude = 2600ft AGL, Speed = 80 kn  
Resulting Point Density ~ 4 pts/m<sup>2</sup>

PRR = 100 kHz



PRR = 100 kHz



Example: Q680i-S at 80,000 pulses/second  
Altitude = 3600ft AGL, Speed = 80 kn  
Resulting Point Density ~ 1.3 pts/m<sup>2</sup>

## The following conditions are assumed for the Operating Flight Altitude AGL

- ambiguity resolved by multiple-time-around (MTA) processing & flight planning
- target size ≥ laser footprint
- scan angle 60°
- average ambient brightness
- roll angle +/-5°