routescene®
beyond the point

Technical specification for your turnkey UAV LiDAR solution

The Routescene® survey-grade 3D mapping solution is an integrated system ready for immediate use.

Literally the only extras you need are a UAV and batteries to conduct an aerial survey. It's that quick and simple.

Beyond the point...
What is included in the Routescene® solution?

This robustly engineered, turnkey solution combines workflow methodologies, software, hardware and firmware.

The hardware includes the Routescene LidarPod®. Lightweight and compact, the system is designed specifically for use on Unmanned Aerial Vehicles (UAVs). The system can also be used on vehicles, with our specially designed mounting kit, to perform ground surveys.

Proven. Reliable. Provides fast results.

What is included in our Premium UAV LiDAR solution

- 1 x Routescene LidarPod®
- 1 x Routescene Ground Station
- 1 x UAV Mounting Kit
- 1 x Routescene LidarViewer Pro software license
- 1 x QA Monitor real-time in-flight web interface
- 1 x dummy LidarPod and antennae for practice purposes
- 4 x Reflective Ground Targets complete with mini tripods
- 1 x Routescene Survey Operating Procedures
- 1 x LidarPod / LidarViewer User Manual
- One year warranty
- 1st year maintenance included (firmware and software updates)
- 1st year technical support is included when you purchase the recommended training

PLUS

- 2 x Pelican cases for transportation
- 1 x GNSS Ground Station antenna plus survey tripod
- 1 x Radio Ground Station antenna plus tripod
- 2 x GNSS UAV antennae
- 1 x Radio UAV antenna
- Cables for power, antennae and data plus spare cables
- Wifi adapter for smartphone/tablet control
- Comprehensive toolkit and tape measure

Component parts of the Routescene UAV solution

TRAINING FOR OPTIMAL RESULTS

3 day training course to cover the operation of the LidarPod and LidarViewer Pro.

Training is essential so you know how to get optimal results from your hardware and software and achieve a quicker return on your investment.

Technical support for the first year is included when you purchase training.

Revolutionizing surveying

Technical details of the Routescene LidarPod®

The Routescene LidarPod contains all you need to collect precise survey data, quality control the data in real-time and create a very dense and accurate georeferenced point cloud. The internal firmware controls the sensors, parses the raw data and transmits data samples to the Routescene Ground Station, it also manages and monitors power consumption of the LidarPod.

Weight: Complete payload of 3kg including LidarPod, GNSS antennae, cables and UAV mounting kit
Dimensions: 320 mm length x 100 mm diameter
Construction: Carbon fiber aerodynamic protective housing with IP67 rated connectors

External power

- Switchable power from UAV to Ground supply
- Supply Voltage: 12-48VDC, 56 W max, less than 28 W
- Operating temperature: -10° to +40° C

Velodyne HDL-32e

A true 3D LiDAR scanner that delivers unsurpassed resolution.

- Two discrete returns (strongest and last return) and useable in either single or dual return mode
- 32 laser sensors/ detector pairs
- Class I eye safe
- Infra-red 905 nm wavelength
- Time of flight distance measurement with intensity
- 5-20 Hz user selectable frame rate
- up to 1.4 million 3D points per second

Range: Maximum up to 100 m, recommended 80 m
Range accuracy: <20 mm
Field of View: 360° vertical and 41° horizontal
Angular separation between lasers: 1.33°
Environmental Protection: IP67

Data Storage

Onboard solid state data storage enabling 12 hours of data to be collected, plenty of capacity for a long vehicle survey.

GNSS fused Inertial Navigation System (INS)

A state of the art integrated Real-Time Kinematic (RTK) Global Navigation Satellite System (GNSS) and INS that provides accurate position, velocity, acceleration and orientation under the most demanding conditions. The dual antenna RTK GNSS solution ensures that we can achieve the highest accuracy possible for the lowest weight. This sensor combines a multi channel GNSS receiver, magnetometers and a pressure sensor, together with a temperature calibrated Inertial Motion Unit (IMU) containing the accelerometers and gyroscopes. These are coupled in a sophisticated fusion algorithm to deliver accurate and reliable navigation and orientation information.

The triple frequency GNSS receiver provides up to 1 cm accurate positioning. Supports all of the current satellite navigation systems including GPS, GLONASS, GALILEO and can be upgraded to include BeiDou. It also supports the Omnistar service for hassle free high accuracy positioning.

Horizontal Position Accuracy (with RTK): 0.008 m
Vertical Position Accuracy (with RTK): 0.015 m
Roll and Pitch Accuracy: 0.15°
Heading Accuracy: 0.07° (with 2 m GNSS antenna spacing)
Internal Filter Rate: 1000 Hz
Output Data rate: up to 100 Hz

Radio Telemetry

Dual channel UHF data link to provide remote control for the LidarPod, transmit RTK corrections to the LidarPod and enable sampled sensor data to be transmitted back to the Ground Station for Status and Quality Assurance purposes.

Operating Frequency: User configurable between 403 – 473 MHz
Transmitter Power: User configurable 100 mW, 200 mW, 500 mW and 1 W
Channel bandwidth: 25 kHz

Configurable radio frequency: To ensure that the LidarPod can operate legally within your country, the radio frequency is configurable and can be set to a unique channel. A radio licence may be required in certain countries.

Accuracy

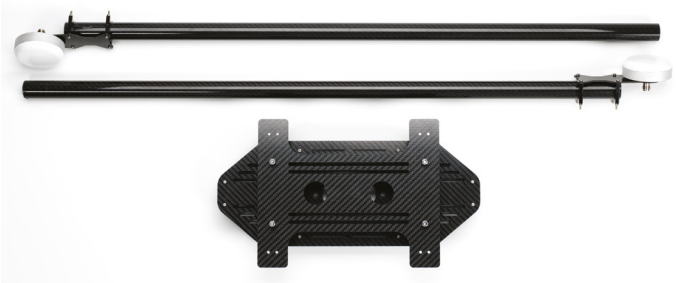
Accuracy depends on the flying height of the UAV, the distance to an object and the angle of incidence of the laser beam at any given point. The LidarPod INS sensor has an angular error which means that the accuracy diminishes with increasing distance.

- Absolute position accuracy of 0.04 at 20 m range
- Absolute position accuracy of 0.06 at 40 m range
- The relative accuracy within a single scanner frame is 30mm (dependent on range).

UAV mounting kit

The LidarPod is UAV agnostic and will fit on any rotary UAV that can take a payload of 3 kg. Our carbon fiber vibration damping mounting kit for the LidarPod is lightweight. Specially designed and tested for ease of use and to reduce vibration from the UAV, the mounting kit includes an equipment plate which is compatible with 12 mm diameter UAV equipment rails, the 2 rails can be between 155 – 160 mm apart. The equipment plate includes quick release clamps for easy deployment.

Mounting kit weight: 0.6 kg



Technical details of the Routescene Ground Station

For the Routescene UAV solution the Ground Station is an essential component of the package.

The Ground Station ensures RTK corrections are transmitted to the LidarPod and quality assurance and status information is transmitted to QA Monitor, the real-time in-flight data monitoring software.

The Ground Station supports L1, L2 and L5 frequencies and monitors all the GPS, GLONASS, GALILEO and BeiDou satellites. This delivers the quickest and most reliable RTK initialization for 10 – 20 mm positioning.

The Ground Station is robust, lightweight and portable made from carbon fiber.

The Ground Station can also be used as a stand alone GNSS RTK base station to transmit RTK corrections to a compatible rover.

Weight: 1.3 kg
Dimensions: 220 x 195 x 55 mm
Supply Voltage: 12 – 24 v, 12 W

GNSS receiver

336 Channels:

- GPS: L1 C/A, L2 E, L2 C. L5
- GLONASS: L1, L2 C/A, L3 CDMA
- Galileo: E1, E5 A, E5 B
- QZSS: L1 C/A, L1 SAIF, L2 C, L5
- SBAS: L1 C/A, L5
- Navic/IRNNS L5

High precision multiple correlator for GNSS pseudo-range measurements

- Unfiltered, unsmoothed pseudo-range measurements data for low noise, low multipath error, low time domain correlation and high dynamic response
- Very low noise GNSS carrier phase measurements with <1 mm precision in a 1 Hz bandwidth
- Up to 20 Hz raw measurement and position outputs

Radio Telemetry

Operating Frequency: User configurable between 403 – 473 MHz
Transmitter Power: User configurable 100 mW, 200 mW, 500 mW and 1 W
Channel bandwidth: 25 kHz

Product conformity

The Routescene LidarPod and Ground Station are available for use in any country worldwide. The products are non-ITAR (International Traffic in Arms Regulations) rated so they are not subjected to export controls.

The LidarPod and Ground Station have been independently CE and FCC certified to ensure they are compliant to electrical and radio transmission standards.

Real-time in-flight Routescene's QA Monitor software

LidarViewer Pro

A Microsoft Windows 10 application offering powerful filters to decimate, analyse and convert huge volumes of point cloud data. Supplied with a Filter Development Toolkit to create your own filters to further improve the workflow. Filters to export to ASCII, LAS, LAZ and to convert the pointcloud to the OSGB co-ordinate system are included.

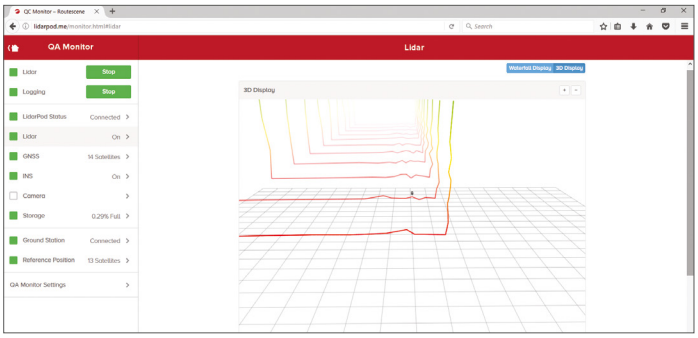
Recommended PC hardware: 8 Gb graphics card, Solid State Disk (SSD), 32 Gb RAM.

Real-time in-flight QA Monitor software

For immediate and continuous real-time in-flight data monitoring, this web based app gives you confidence in the data you are collecting while you are collecting it.

Accessed using a web browser from a mobile device or laptop which has a wifi connection, QA Monitor receives and displays real-time Status and Quality Assurance data from the LidarPod via the wifi access point on the Ground Station.

- Windows 10, 8, 7, Apple OS X, Linux with a modern web browser
- Android or Windows Phone or Apple iPad or iPhone
- Connection to the Ground Station via wifi, USB or Ethernet



QA Monitor Dashboard for ease of use in flight

PROVEN PRODUCT

At Routescene we're always looking beyond the point...

Software packages
Technical details of Routescene's LidarViewer® Pro

As part of the integrated system you receive our two specially developed software packages – Routescene® QA Monitor and LidarViewer® Pro. All our software has been specifically developed with survey, LiDAR and GIS data analysis in mind.

The power of LidarViewer® Pro

Its power is immense. A Microsoft Windows 10 application offering powerful filters to reduce, manage, and analyze the huge volumes of point cloud data.

- pre-built LiDAR processing workflows ready for you to use
  - bare earth modelling
  - data decimation based on range or field of view
  - statistical analysis using gridding algorithms
  - co-ordinate conversion
  - exporting using standard delimited ASCII, LAS or LAZ
- Filter Development Toolkit to develop your own repeatable workflows

Recommended PC hardware: 8 Gb graphics card, Solid State Disk (SSD), 32 Gb RAM.

Filter Development Toolkit

We've made bespoke data processing and workflow creation really easy for you with the Filter Development Toolkit. You can develop your own filters for data cleaning, data reduction, co-ordinate conversion and interfacing to third party software. These filters enable you to create repeatable workflows and extract only the relevant data for use in external software.

Filters are developed using Visual Studio and C++. You can create a filter very quickly using predefined headers and function calls, so you can concentrate on writing your data processing algorithm.

Self reliance in remote locations

LidarViewer Pro is a stand-alone desktop application and accesses LiDAR data held locally on a disk. It does not rely on third party based packages or modules to operate.

We have consciously chosen to develop a stand-alone Window's based application because:

- No reliance on the internet: In many areas, especially where UAV LiDAR surveys are conducted there is no, or very limited, internet
- Quicker processing: LiDAR data files are very large so uploading the data to a server for processing "in the cloud" is both time consuming, impractical and can be fraught with problems. Working locally solves this problem
- Data security: Especially important if your data is classified or commercially sensitive
- Self reliant: You can process data when and where you please regardless of where you are in the world

Beyond the point...
powerful software for data processing

Technical details of the Routescene Vehicle upgrade

To maximize the use of your Routescene UAV solution and provide flexibility we have developed a Vehicle upgrade. The Vehicle upgrade includes extra component parts to transform the UAV system into a completely operational Mobile Mapping System. To find out more contact us or go to **www.routescene.com/the-3d-mapping-solution/vehicle-lidar-system**

routescene®

Beyond the point...

At Routescene we're always looking beyond the point... to help customers solve real problems.

From considered survey design and planning, precise data acquisition in the field, automated data processing to repeatable workflows, our aim is to bring you efficiency and improved productivity. This is at the core of our business across service delivery, health and safety, product development and performance. Accuracy and quality come as standard.

www.routescene.com

Routescene Inc, 200 Troon Trail, Durango, CO 81301, USA
Part of the Mapix technologies Group of companies
T +1-303-915-5528 **E** sales@routescene.com • www.routescene.com