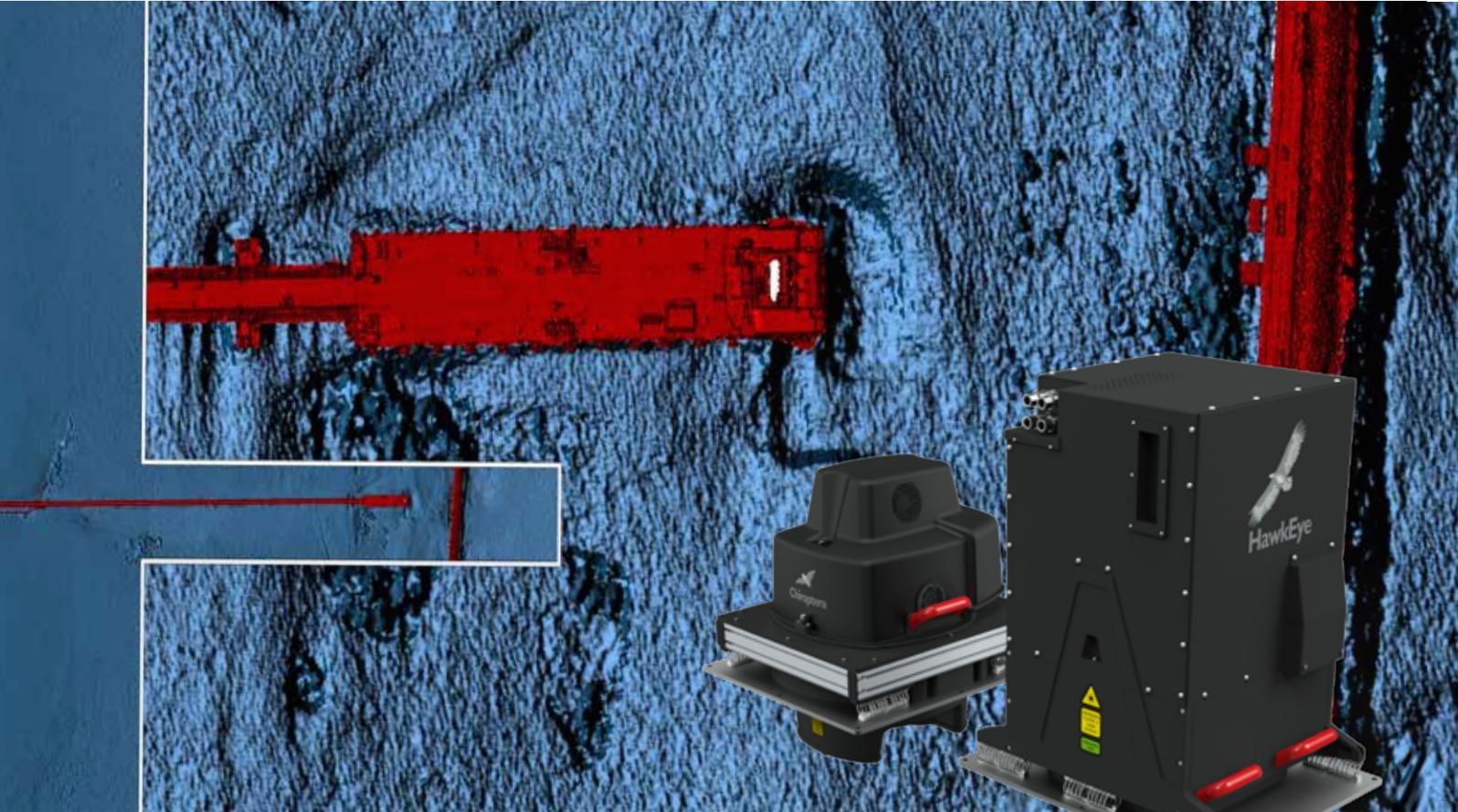


Leica HawkEye 4X

Introducing high-resolution for deep water survey



Major productivity gain

With the 4X bathymetric product line, Leica Geosystems introduces an innovative high-resolution technology, increasing the point density by factor four compared to previous versions. The Leica HawkEye 4X offers unrivalled bathymetric point density and depth penetration at the same accuracy, same turbid water performance and with increased sensitivity, offering a productivity gain of >50%.



Most competent system

The HawkEye 4X is an airborne multi-sensor deep water bathymetric and topographic LiDAR system, based on the competence of the Leica Chiroptera 4X. The system features oblique LiDAR technology that illuminates objects from multiple angles, minimising shadowing in the data. Oblique LiDAR is also superior for feature detection on land and in water.



From shore to deep waters

High-resolution and accuracy make the HawkEye 4X the perfect tool for mapping, planning, maintaining and managing national waters and coastal regions combining excellent topographic, shallow water and deep water performance. Nautical charting of nearshore and coastal zones and characterisation and mapping prior to infrastructure development are typical applications.

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- when it has to be **right**

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Leica HawkEye 4X product specifications

LASER CHARACTERISATION

Deep bathymetric capability	40,000 points/second green, digital full waveform capture
Shallow bathymetric capability	140,000 points/second green, digital full waveform capture
Topographic capability	Up to 500,000 points/second infrared
Operation altitude	Bathymetry 400 – 600 m AGL Topography up to 1,600 m AGL
Depth range ¹	Deep bathymetry $D_{max} = 4/k$ Shallow bathymetry $D_{max} = 2.7/k$
Scanner pattern	Oblique scanner
Field of view	$\pm 14^\circ$ front/back, $\pm 20^\circ$ left/right
Swath width	70% of AGL
Point density ²	Deep bathymetry: >1 pts/m ² Shallow bathymetry: >5 pts/m ² Topography: >10 pts/m ²
Bathymetric elevation accuracy ^{2, 3}	Shallow: 0.15 m (2σ) Deep: $\sqrt{0.3^2 + (0.013 \cdot \text{depth})^2}$ m (2σ)
Topographic accuracy ^{2, 3, 4}	Elevation accuracy: < 5 cm (1σ) Horizontal accuracy: 10 cm (1σ)

OPTICAL CHARACTERISATION

Q/A camera	5 MP, 2,448 x 2,050 pixels, 1 frame per second (fps), RGB
Leica RCD30 medium format camera (Optional)	80 MP, 10,320 x 7,752 pixels, 1 frame per second (fps), RGBN

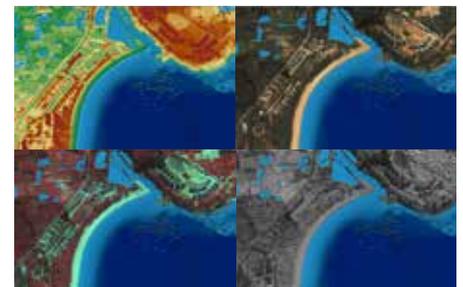
PHYSICAL & OPERATION INTERFACE

GNSS/IMU	Novatel SPAN with LCI-100C IMU (non-export restricted)
Mission planning	Leica MissionPro
Flight navigation	Leica FlightPro
Post-processing	Novatel Inertial Explorer – GNSS/IMU processing software LiDAR Survey Studio™ Leica HxMap Image processing
Storage capacity	> 1 sortie recording in ruggedised removable SSD
Operation temperature	0 °C to +35 °C
Storage temperature	-10 °C to +50 °C
Power consumption	2 x 50A @ 28 V DC
Internal battery module	Battery supports GNSS/IMU unit operation up to 30 min without external power



Leica LiDAR Survey Studio (LSS)

The Leica LiDAR Survey Studio (Leica LSS) provides a highly efficient, integrated and automated end-to-end bathymetric LiDAR processing workflow for the Leica Chiroptera 4X and HawkEye 4X. The intuitive user interface offers automatic calibration, registration and refraction correction, full waveform processing, four band LiDAR colourisation, quality control and data export. Manage projects, analyse data, detect water air and land interfaces with maximum efficiency. All topographic, bathymetric and RGBN point cloud data can be viewed with any standard formats and measuring functions that are expected of a professional software.



Point cloud in elevation, RGB, CIR and NIR view

¹ k is the diffuse attenuation coefficient. Depth penetration is valid for the diffuse attenuation coefficient in the interval $0.1 < k < 0.3$, but data is typically captured for all $k < 1.0$. Depth penetration is subject to several other parameters aside from the diffuse attenuation coefficient k. For this specification normal sea-state and 15% seabed reflectance has been assumed.

² Accuracy and point density stated in the table is acquired @400 m AGL, 60 m/s aircraft speed

³ The 2σ value represents the 95% confidence interval, the 1σ value represents the 68% confidence interval. Typically, the RMSE value is equal to 1σ accuracy value, or half of 2σ accuracy value.

⁴ Vertical accuracy here refers to the measurement accuracy of LiDAR, including GNSS/IMU errors. A GNSS/IMU error of < 4 cm has been assumed for this specification.

Visible and invisible laser radiation, avoid eye or skin exposure to direct or scattered radiation. Class 4 Laser Product in accordance with EN/IEC 60825-1:2007.

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