Leica HawkEye-5

Highest efficiency for deep bathymetric LiDAR surveys

Superior productivity

Installed in the Leica PAV100 gyro-stabilised sensor mount, the Leica HawkEye-5 offers up to 25% higher flight efficiency compared to previous generations. The system captures data faster, allowing customers to reduce the operational costs, project time and carbon footprint of each mapping project.

From land to deep ocean

Bundled with the Leica Chiroptera-5, the HawkEye-5 features three LiDAR sensors, one 4-band high-resolution camera and one QC camera. Each module is optimised for a specific task, allowing seamless acquisition of the highest quality data from land to deep ocean seafloor.

High-performance workflow

The HawkEye-5 is supported by Leica Geosystems' integrated workflow. The Leica LiDAR Survey Studio (LSS) processing suite enables full waveform analysis, automatic data classification, and advanced turbid water enhancement to support multiple applications in all bathymetric channels.

- when it has to be **right**

Leica Geosystems

Leica HawkEye-5 product specifications

CHIROPTERA-5 SENSOR HEAD

Consists of 1 x Chiroptera-5 bathymetric LiDAR unit 1 x Chiroptera-5 topographic LiDAR unit 1 x Leica RCD30 RGBN mid-format camera 1 x RGB small format QA camera 1 x IMU class 5, 500 Hz	
Dimensions (l/w/h)	480 / 510 / 640 mm
Weight	48 kg
Designed for installation in the Leica PAV100 mount	

HAWKEYE-5 DEEP MODULE SENSOR HEAD

Consists of 1 x HawkEye-5 bathy LiDAR unit 1 x IMU class 5, 500 Hz	
Dimensions (l/w/h)	435/435/600 mm
Weight	53 Kg
Designed for installation in the Leica PAV100 mount	
Typical data resolution [1,2]	
Deep bathymetric data	1 points/m²
Shallow bathymetric data	5 points/m²
Topographic data	Up to 12 points/m²
RGB image	5 cm GSD
NIR image	5 cm GSD

HAWKEYE-5 / CHIROPTERA-5 SENSORS CONTROLLER UNIT

Consisting of 1 x HE/CH-5 SCU, that controls and logs the bathymetric and topographic LiDAR scanners 1 x Leica CC43 camera controller, that controls and logs the RCD30 camera, controls the Chiroptera-5 sensor head PAV stabilisation and includes a deeply coupled GNSS 4 x SSD removable mass memories	
Dimensions (l/w/h)	560 / 540 / 580 mm
Weight	57 Kg

HAWKEYE-5 LASER COOLER UNIT

Consist of 1 x HawkEye-5 laser cooler 1 x Leica CC43 camera controller, that controls and logs the HawkEye-5 deep module sensor head PAV stabilisation and includes a deeply coupled GNSS 2 x SSD removable mass memories	
Dimensions (l/w/h)	560 / 540 / 580 mm
Weight	60 Kg

HAWKEYE-5 PERIPHERALS

2 x Leica PAV 100 gyro stabilised sensor mount for high performance data acquisition (40 kg each)
2 x Leica OC60 12.1" operators' consoles (3.2 kg each)
1 x Leica PD 60 6.3" Pilot display, designed for installation in Cockpit (1.0 kg)
1 x Leica IS40 stand for mounting the OC60's (8 kg)
GPS antenna, cabling and safety controls (10-15 kg)

DEEP BATHYMETRIC LIDAR

Laser wavelength	515 nm
Laser divergence	7.5 mrad
Bathymetric capture [2]	40 KHz, full waveform capture
Depth penetration [1,3,8]	Dmax >4.0/K_d @ ρ=15% TBC
Flying altitude	400-600 m AGL nominal
Ranging accuracy [4]	‹2 cm (1 σ)
Elevation accuracy [1,3,5,6]	√(0.3²+(0.013*d)² m (2σ)
Horizontal accuracy [1,3,5,6]	(2.0 + 0.075d) m (2σ)

SHALLOW BATHYMETRIC LIDAR

Laser wavelength	515 nm
Laser divergence	4.75 mrad
Bathymetric capture [2]	200 KHz, full waveform capture
Depth penetration [1,3]	D_{max}=3.2/K_d @ ρ=15% D_{max}≈3.8/K_d @ ρ=60%
Flying altitude	400-600 m AGL nominal. Higher altitudes feasible
Ranging accuracy [4]	‹1 cm (1 σ)
Elevation accuracy [1,3,5,6]	IHO special order
Horizontal accuracy [1,3,5,6]	IHO special order

TOPOGRAPHIC LIDAR

Laser wavelength	1.064 nm
Laser divergence	0.5 mrad
Topographic capture	Up to 500.000 KHz. Full waveform recording option at down-sampled rate's
Flying altitude	400 – 1.600 m AGL
Ranging accuracy [4]	‹1 cm (1 σ)
Elevation accuracy [1,5]	‹5 cm (1 σ)
Horizontal accuracy [1,5]	‹15 cm (1 σ)

COMMON LIDAR SPECS

Field of view	± 14° front/back ± 20° left/right
Scan pattern	Oblique front-back palmer scan pattern
Scanner speed topo / shallow	Up to 5.000 rpm (170 scans/s)
Scanner speed deep	Up to 3.000 rpm (100 scans/s)
Swath width	70% of AGL
Intensity digitisation	14 bit
Sampling speed	1.8 GHz
Min vertical separation	‹50 cm

MID FORMAT MULTISPECTRAL CAMERA

Type	Leica RCD30
Resolution	80 MP (10.320 x 7.752 pixels)
Motion compensation	2-axis mechanical
Spectral co-registered bands	B: 440-520 nm G: 500-580 nm R: 570-650 nm NIR: 780-850 nm
Frame rate	1 fps
Lens	50 mm 53.8°FOV across track 41.8° FOV along track

CHIROPTERA QA CAMERA

Resolution	5 MP (2.448 x 2.050 pixels)
Spectral bands	RGB
Typical GSD [1]	25 cm

INTEGRATED GNSS IMU SYSTEM

IMU	2 x SPAN CNUS5-H, Class 5, 500 Hz
GNSS	NovAtel SPAN OEM7, 555 channel multi constellation, 10 Hz GNSS data rate
Additional features	Real-time deeply coupled solution for position and attitude at highest accuracies.
Position RMS DGNSS	Post-processed spec X,Y ‹3-5 cm, Z ‹5-7cm Post processed typical X,Y ‹2-3 cm, Z ‹3-5 cm

ENVIRONMENTAL

Pressure	3.000 m operational, 5.000 m non-operational
Humidity	DO-160G, Section 6, Cat A
Operating temperature	0 to 30°C
Storage temperature	-10 to 50°C

ELECTRICAL

Average power	‹2.000 W
Max peak power	‹2.800 W
Fuse on AC power	1x40 A + 1x50 A recommended @ 28 VDC

SOFTWARE

Mission Planning	Leica MissionPro
Flight Navigation and Flight Operation	Leica FlightPro, Leica Chiroptera AOC
GNSS / INS trajectory processing	NovAtel Inertial Explorer
Image processing	Leica HxMap
Topo/Bathy LiDAR processing	Leica LiDAR Survey Studio (LSS)

SENSOR MOUNT

Sensor mount	Leica PAV100 Stabilised sensor mount

Leica PAV100

The Leica PAV100 stabilises the sensor heads from aircraft pitch, yaw, and roll movements, allowing flying with less overlap between flight lines and significantly improving flight efficiency. The stabilisation prevents glitches between flight lines, rotates the camera images in the orientation of the flight direction, independent of side wind, for better image quality, and provides a more even distance between scan lines. The increased flight efficiency allows the capture of larger areas faster, reducing survey costs, reducing aircraft carbon footprint, reducing risk for the need for re-flights and increasing the total yearly area possible to collect with the sensor. This enables a higher return on sensor investment and delivers better data quality.

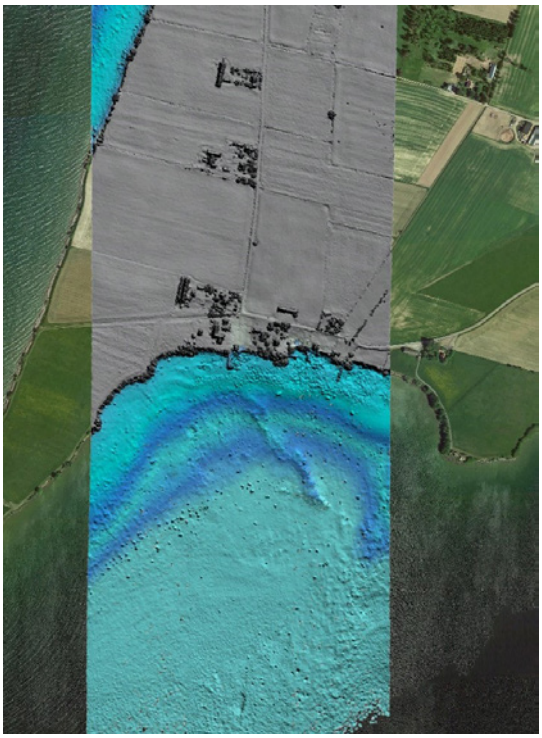
STANDARDS

RTCA DO-160G, EUROCAE-14G, USA FCC Part 15, ISO 7137, EN/IEC 60825-1:2014, IHO S-44 Ed 6.0.

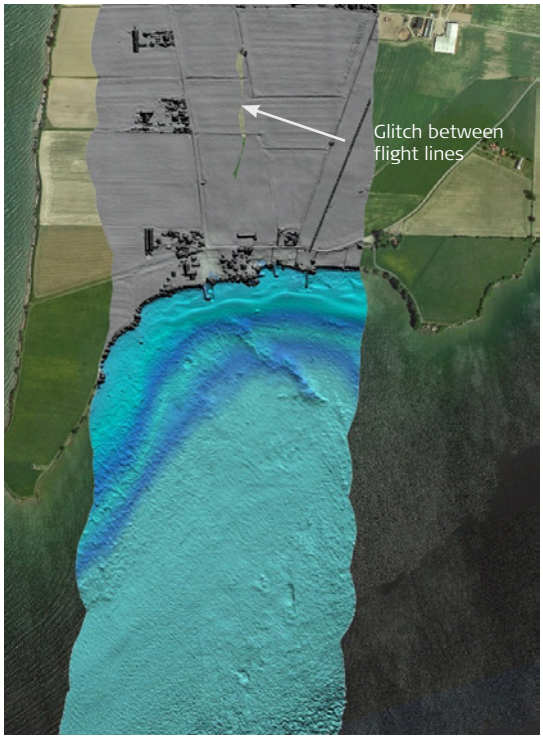
EXPORT CONTROL

Subject to European export regulations EU 4 28/2009, classifications 6A008j. 3 (Hardware) and 6D002 (Software).

[1] Assumed 400 m AGL flight altitude, 65 m/s flight speed
[2] Using Leica proprietary 4X technology
[3] Kd is the water down-dwelling diffuse attenuation coefficient. Formula valid for 0.1 < K_d < 0.4. Data is however captured both in clearer water K_d < 0.1, and significant more turbid water up to approximately K_d=1.0. Stated vertical and horizontal accuracies after calibration and registration using Leica Geosystems workflow and with assumed GNSS position error < 4.0 cm
[4] In Leica test lab environment towards flat target
[5] Post processed data with GPS reference station within 30 km and under good satellite coverage conditions
[6] Referenced to IHO S44 specification. Transformation errors between ellipsoid and chart datum (not measured by the system) assumed neglectable
[7] Object diffuse reflection assumed ρ=15%
[8] Final depth penetration specification to be confirmed, preliminary Dmax=4.4/Kd @ =15%"



Captured with PAV100 stabilised sensor



Captured without PAV100 stabilised sensor

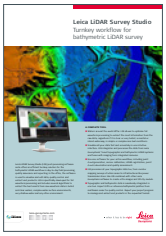
Revolutionising the world of measurement and survey for nearly 200 years, Leica Geosystems creates complete solutions for professionals across the planet. Known for premium products and innovative solution development, professionals in a diverse mix of industries, such as surveying and engineering, safety and security, building and construction, and power and plant, trust Leica Geosystems to capture, analyse and present smart geospatial data. With the highest-quality instruments, sophisticated software and trusted services, Leica Geosystems delivers value every day to those shaping the future of our world.

Leica Geosystems is part of Hexagon (Nasdaq Stockholm: HEXA B; hexagon.com), a leading global provider of information technologies that drive quality and productivity improvements across geospatial and industrial enterprise applications.

Swiss Technology
by Leica Geosystems

981386 en – 08.23

Leica Chiroptera-5
Highest bathymetric efficiency



Leica LiDAR Survey Studio
Turnkey workflow

Airborne Bathymetric LiDAR Solutions
Proven productivity

Leica Geosystems AG
leica-geosystems.com

- when it has to be **right**

Leica Geosystems