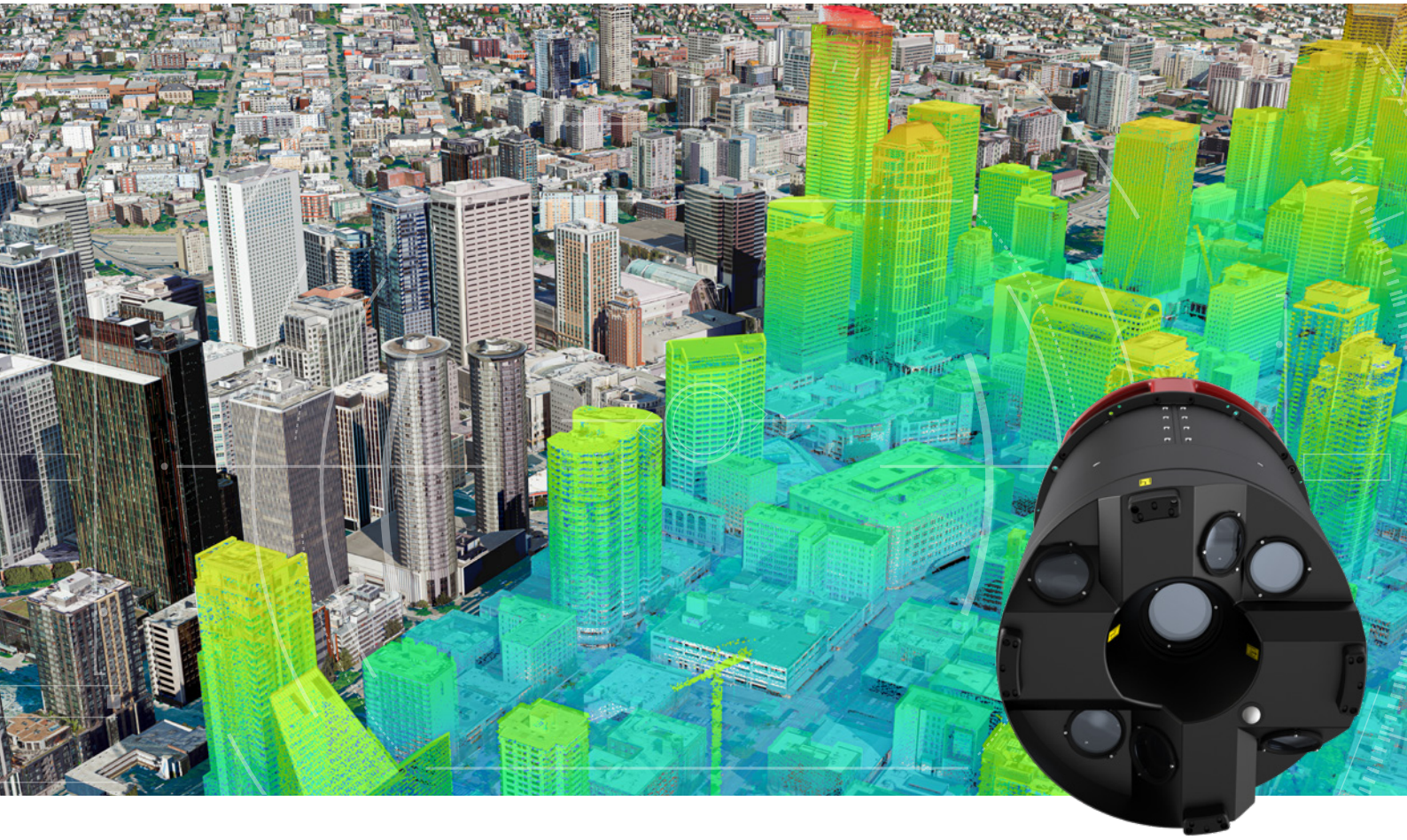
Leica CityMapper-2
More information, smarter decisions



Performance Booster

Leica CityMapper-2 succeeds the well-trusted CityMapper hybrid airborne sensor. With twice the image resolution and performance, the new system collects six 150 MP RGB & NIR images every 0.9 seconds. Together with the new 2 MHz pulse rate LiDAR, this sensor breaks all conventional barriers of urban mapping.

Outstanding Accuracy

CityMapper-2, available with three different flying height configurations, combines high-resolution nadir and oblique images with high accuracy LiDAR of < 5 cm. The newly developed cameras with customised low-distortion lenses can deliver 2 cm GSD at high flying speeds thanks to mechanical forward-motion-compensation (FMC).

Highest Throughput

The Leica HxMap post-processing workflow moves into a new generation together with CityMapper-2. Edge computing creates fully calibrated high quality image data for rapid QC and the LiDAR data undergoes discrete return extraction from the full waveform data for fast processing results. Both are stored to allow ultimate flexibility.

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Leica CityMapper-2 product specifications

LEICA CITYMAPPER-2 POD

Consists of	
Nadir RGB camera	1 x Leica MFC150
Nadir NIR camera	1 x Leica MFC150-NIR, monochrome
Oblique RGB camera	4 x Leica MFC150, viewing angle 45°
LiDAR Unit	1 x Leica Hyperion2+
GNSS/IMU	Integrated NovAtel SPAN
System Controller Module	Integrated
Height / diameter	745 mm / 408 mm (lower diameter) / 435 (upper diameter)
Weight	57.5 kg
Max. system frame rate	0.9 sec
Designed for installation in Leica PAV200 with Leica Pod Lifter Heavy Load	

LEICA CITYMAPPER-2 VERSIONS

Leica CityMapper-2L	
Nadir lenses	
RGB	Leica D69.70/4.0 with 71 mm focal length 41.2° FOV across track 31.5° FOV along track
NIR	Leica D69.70/4.0-NIR with 71 mm focal length 41.2° FOV across track 31.5° FOV along track
Oblique RGB lenses	
Left/Right	Leica D69.112/4.0 with 112 mm focal length 45° ±10.1° FOV across track 26.8° FOV along track
Forward/Backward	26.8° FOV across track 45° ±10.1° FOV along track
RGB : NIR resolution	1 : 1.0
Nadir : Oblique focal length ratio	1 : 1.6
Flying height examples	380 m AGL @ 2cm GSD 945 m AGL @ 5cm GSD 1890 m AGL @ 10cm GSD 3780 m AGL @ 20cm GSD
Leica CityMapper-2S	
Nadir lenses	
RGB	Leica D69.112/4.0 with 112 mm focal length 26.8° FOV across track 20.3° FOV along track
NIR	Leica D69.70/4.0-NIR with 71 mm focal length 41.2° FOV across track 31.5° FOV along track
Oblique RGB lenses	
Left/Right	Leica D69.146/4.8 with 146 mm focal length 45° ±7.8° FOV across track 20.7° FOV along track
Forward/Backward	20.7° FOV across track 45° ±7.8° FOV along track
RGB : NIR resolution	1 : 1.6
Nadir : Oblique focal length ratio	1 : 1.3
Flying height examples	600 m AGL @ 2cm GSD 1490 m AGL @ 5cm GSD 2980 m AGL @ 10cm GSD 5960 m AGL @ 20cm GSD
Leica CityMapper-2H	
Nadir Lenses	
RGB	Leica D69.146/4.8 with 146 mm focal length 20.7° FOV across track 15.6° FOV along track
NIR	Leica D69.70/4.0-NIR with 71 mm focal length 41.2° FOV across track 31.5° FOV along track
Oblique RGB lenses	
Left/Right	Leica D69.189/5.6 with 189 mm focal length 45° ±6.0° FOV across track 16.1° FOV along track
Forward/Backward	16.1° FOV across track 45° ±6.1° FOV along track
RGB : NIR resolution	1 : 2.1
Nadir : Oblique focal length ratio	1:1.3
Flying height examples	780 m AGL @ 2cm GSD 1940 m AGL @ 5cm GSD 3880 m AGL @ 10cm GSD 7760 m AGL @ 20cm GSD

LEICA MFC150 / LEICA MFC150-NIR CAMERA HEAD

Sensor size (150MP)	14,192 x 10,640 pixels
Pixel size & type	3.76 um, BSI CMOS
Dynamic range	83 dB
Resolution A/D converter	14-bit
Data channel	14-bit proprietary compression
Motion compensation	Mechanical FMC
Spectral bands	
Leica MFC150 (Bayer pattern)	R (580 - 660 nm) G (480 - 590 nm) B (420 - 510 nm)
Leica MFC150-NIR	NIR (720 - 850 nm, monochrome)
Shutter	Max. speed 1/1000 sec Mechanical central shutter with up to 500,000 cycles Field exchangeable
Aperture	Automatically controlled aperture 7 half f-stop steps
Lens mount	Exchangeable lenses, positive mechanical connection

LEICA HYPERION2+ LIDAR UNIT [6]

Laser wavelength	1,064 nm
Laser divergence	0.23 mrad (1/e²) nominal
Pulse repetition frequency	Up to 2 MHz (height dependent)
Return pulses	• Programmable up to 15 returns, including intensity • Full waveform recording option at down-sampled rates • Real-time waveform analysis and pulse extraction • Multiple-Pulses-in-the-Air (MPiA): Up to 35 MPiA zones simultaneously • Ambiguity resolution for targets in multiple simultaneous MPiA zones • Gateless MPiA
Intensity digitisation	14 bits
Operation altitude[1]	300 - 5,500 m AGL
Scanner pattern	Oblique scanning with options for constant point density or constant pulse rate
Scan speed	Programmable, 60-150 Hz (120-300 scans per second)
Field of view	20 - 40°
Min. vertical separation	0.5 m
Vertical accuracy [2, 3, 4]	< 5 cm 1 σ
Horizontal accuracy [2, 3, 4]	< 13 cm 1 σ

INTEGRATED SYSTEM CONTROLLER MODULE

System controller module	Controls all Camera Heads, LiDAR Unit and gyro-stabilised sensor mount Includes deeply coupled GNSS/IMU solution
Processor	64-bit WIN10, 16 GB RAM, 64 GB SSD, USB 3.0, SATA 3
Mass memory	Leica MM30 solid state drive 7,680 GB each CityMapper-2 holds 2 MM30s
Mass memory weight	0.4 kg each, 2 required, removable and portable
Mass memory capacity[5]	Joint volume 15.36 TB, ≥ 8.0 h of data collection

INTEGRATED GNSS/IMU SYSTEM

IMU	SPAN CNUS5-H, Class 5, 500 Hz, FOG no export license required US ECCN 7A994
GNSS	NovAtel SPAN OEM7, 555 channel multi constellation receiver with 10 Hz GNSS data rate
Additional features	Real-time deeply coupled solution for position and attitude at highest accuracies, fully integrated and embedded solution, no interfaces to 3rd party needed
Position RMS DGNSS	Post-processed (specification): X,Y ≤ 3-5 cm, Z ≤ 5-7 cm Post processed (typical): X,Y ≤ 2-3 cm, Z ≤ 3-5 cm
Attitude RMS	Post-processed (specification): R,P ≤ 0.005°, H ≤ 0.008° Post-processed (experienced): R,P ≤ 0.003°, H ≤ 0.004°

PERIPHERALS

Sensor mount	Leica PAV200 gyro-stabilised sensor mount for high-performance data acquisition 36.0 kg
Pod lifter (optional)	Leica Pod Lifter Heavy Load, to retract entire CityMapper-2 pod for takeoff and landing 19.6 kg
Operator console	Leica OC61 12.1" screen with 1024 x 768 resolution 3.9 kg
Pilot display	Leica PD61 6.3" screen with 1024 x 768 resolution, designed for cockpit mounting 1.0 kg
Display stand	IS40-LW stand for Leica OC61 Operator Display 3.2 kg

ENVIRONMENTAL

Pressure	Non-pressurised cabin up to ICAO 15,000 ft
Humidity	0% to 95% RH according to ISO7137 (non-condensing)
Operating temperature	-10°C to 35°C (-10°C after warm-up period)
Storage temperature	-40°C to 70°C

ELECTRICAL

Max. avg. power consumption of complete system	811 W / 28 VDC
Max. peak power consumption of complete system	1,031 W (‹ 60s) / 28 VDC
Fuse on aircraft power outlet	1 x 50 A recommended

SYSTEM WEIGHT

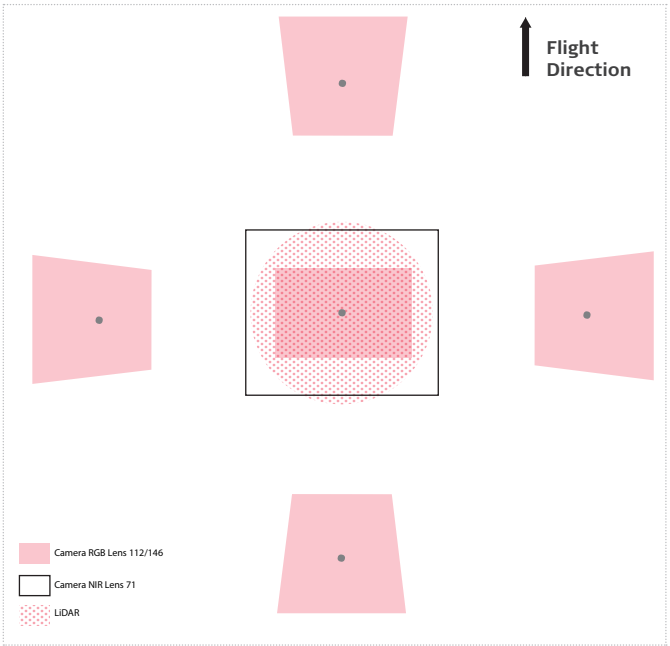
System installation without Pod Lifter	‹ 108kg
System installation with Pod Lifter	‹ 128 kg

SOFTWARE

Mission planning	Leica MissionPro
Flight navigation & sensor operation	Leica FlightPro
GNSS/INS trajectory processing	NovAtel Inertial Explorer
Point cloud/image processing	Leica HxMap

STANDARDS

RTCA DO-160G, EUROCAE-14G, USA FCC Part 15, ISO7137, EN/IEC 60825-1:2014



Example of the CityMapper-2S foot print

[1] Maximum operating altitude is specified for 90% detection at ≥10% reflectivity (e.g., dry asphalt) and 100% laser output.
[2] Accuracy and point density stated is acquired @1,000 m AGL, 60 m/s aircraft speed.
[3] The 1σ value represents the 68% confidence interval. Typically, the RMSE value is equal to 1 standard deviation.
[4] Stated vertical and horizontal accuracies after calibration and registration using Leica HxMap workflow and with an assumed GNSS position error of 4 cm
[5] Data collection is based on typical project data rate.
[6] Invisible laser radiation, avoid eye or skin exposure to direct or scattered radiation. Class 4 laser product in accordance with EN/IEC 60825-1:2014.

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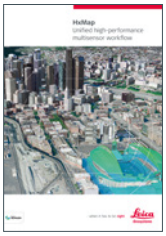
Leica CountryMapper
Hybrid sensor for large-area imaging and LiDAR data collection



Leica HxMap
Unified high-performance multisensor workflow

Leica TerrainMapper-2
Highest accuracy for regional mapping projects

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