

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 0.8 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 two different focal lengths, combines high-resolution nadir and oblique images with high accuracy LiDAR of <math>< 5\text{ cm}</math>. 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.

Leica CityMapper-2 product specifications

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
Sensor controller/data logger	Integrated
Height / diameter	747 mm / 408 mm
Weight	62 kg
Max. system frame rate	0.8 sec
Designed for installation in Leica PAV100 with Leica PodLifter.	

CITYMAPPER-2 VERSIONS

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 70 mm focal length 41.7° FOV across track, 31.9° FOV along track
Oblique RGB lenses	
Left/Right	Leica D69.146/4.8 with 146 mm focal length 45° ±10.4° FOV across track, 15.6° 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	1490 m AGL @ 5 cm GSD

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 70 mm focal length 41.7° FOV across track, 31.9° FOV along track
Oblique RGB lenses	
Left/Right	Leica D69.189/5.6 with 189 mm focal length 45° ±8.1° FOV across track, 12.1° 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	1940 m AGL @ 5 cm GSD

CAMERA HEAD LEICA MFC150 / LEICA MFC150-NIR

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	
MFC150 (Bayer pattern)	R (580 - 660 nm) G (480 - 590 nm) B (420 - 510 nm)
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

LIDAR UNIT LEICA HYPERION2 6

Laser wavelength	1,064 nm
Laser divergence	0.25 mrad (1/e ²)
Pulse repetition frequency	Up to 2 MHz (height dependent)
Return pulses	<ul style="list-style-type: none"> • 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 altitude¹	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 scan lines 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



Leica CityMapper-2 with peripherals:
Operator display Leica OC60, pilot display Leica PD60, gyro-stabilised sensor mount Leica PAV100 and Leica Pod Lifter.

INTEGRATED SENSOR CONTROL MODULE & DATA LOGGER

Sensor Controller	Controls all camera heads, LiDAR unit and gyro-stabilised 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	0.5 kg each, 2 required, removable and portable
Mass memory capacity⁵	Joint volume 15.36 TB, ≥ 8.0 h of data collection

INTEGRATED GNSS/IMU SYSTEM

IMU	SPAN CNU55-H, Class 5, 500 Hz, FOG no export license required US ECCN 7A994
GNSS	NovAtel SPAN OEM7, 555 channel multi constellation Receiver with 20 Hz GNSS data rate
Additional features	Real-time deeply coupled solution for position, velocity and attitude at highest accuracies, fully integrated and embedded solution, no interfaces to 3 rd 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 PAV100 gyro-stabilised mount for high-performance data acquisition 36 kg
Pod lifter (optional)	Leica PodLifter, to retract entire CityMapper-2 pod for takeoff and landing 20 kg
Operator display	Leica OC60 12.1" screen with 1024 x 768 resolution 5.0 kg
Pilot display	Leica PD60 6.3" screen with 1024 x 768 resolution, designed for cockpit mounting 1.0 kg
IS40 stand	Pedestal for Operator Display OC60 3.5 kg

ENVIRONMENTAL

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

ELECTRICAL

Max. avg. power consumption of complete system	950 W / 28 VDC
Max. peak power consumption of complete system	1,200 W (< 60s) / 28 VDC
Fuse on aircraft power outlet	1 x 50A recommended

SYSTEM WEIGHT

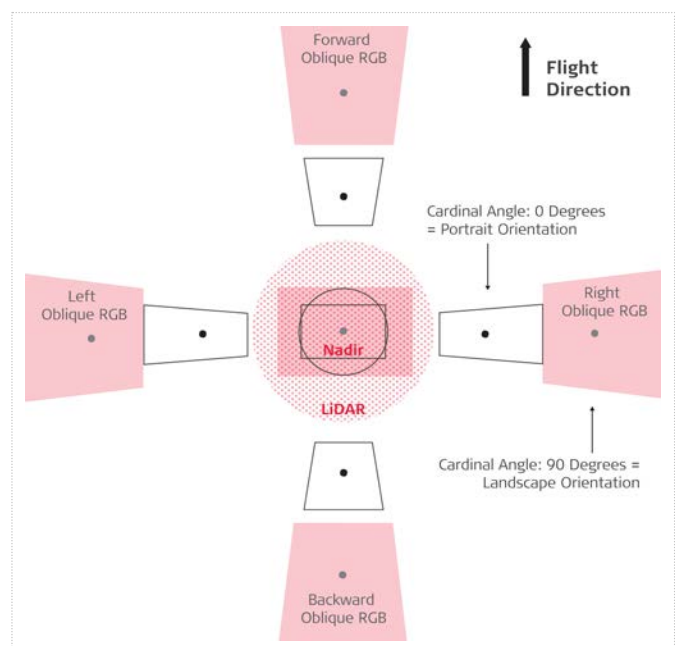
System installation without Pod Lifter	< 115 kg
System installation with Pod Lifter	< 135 kg

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



System configuration seen from the top, comparing CityMapper-2S (red) to CityMapper (grey).

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 RealCity
Airborne reality capture



Leica HxMap
Unified high-performance multisensor workflow



Leica TerrainMapper
Highest accuracy for regional mapping projects

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- when it has to be **right**

