

# 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.

# Leica CityMapper-2 product specifications

## LEICA CITYMAPPER-2 POD

<b>Consists of</b>	
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
<b>Height / diameter</b>	747 mm / 408 mm
<b>Weight</b>	58 kg
<b>Max. system frame rate</b>	0.9 sec
Designed for installation in Leica PAV100-HPH with Leica Pod Lifter HL.	

## LEICA CITYMAPPER-2 VERSIONS

Leica CityMapper-2L	
<b>Nadir lenses</b>	
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
<b>Oblique RGB lenses</b>	
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
<b>RGB : NIR resolution</b>	1 : 1.0
<b>Nadir : Oblique focal length ratio</b>	1 : 1.6
<b>Flying height</b>	940 m AGL @ 5 cm GSD
Leica CityMapper-2S	
<b>Nadir lenses</b>	
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
<b>Oblique RGB lenses</b>	
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
<b>RGB : NIR resolution</b>	1 : 1.6
<b>Nadir : Oblique focal length ratio</b>	1 : 1.3
<b>Flying height</b>	1500 m AGL @ 5 cm GSD
Leica CityMapper-2H	
<b>Nadir Lenses</b>	
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
<b>Oblique RGB lenses</b>	
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
<b>RGB : NIR resolution</b>	1 : 2.1
<b>Nadir : Oblique focal length ratio</b>	1 : 1.3
<b>Flying height</b>	1900 m AGL @ 5 cm GSD

## LEICA MFC150 / LEICA MFC150-NIR CAMERA HEAD

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

## LEICA HYPERION2+ LIDAR UNIT <sup>6</sup>

<b>Laser wavelength</b>	1,064 nm
<b>Laser divergence</b>	0.23 mrad (1/e <sup>2</sup> ) nominal
<b>Pulse repetition frequency</b>	Up to 2 MHz (height dependent)
<b>Return pulses</b>	<ul style="list-style-type: none"> <li>• Programmable up to 15 returns, including intensity</li> <li>• Full waveform recording option at down-sampled rates</li> <li>• Real time waveform analysis and pulse extraction</li> <li>• Multiple-Pulses-in-the-Air (MPiA): Up to 35 MPiA zones simultaneously</li> <li>• Ambiguity resolution for targets in multiple simultaneous MPiA zones</li> <li>• Gateless MPiA</li> </ul>
<b>Intensity digitisation</b>	14 bits
<b>Operation altitude<sup>1</sup></b>	300 - 5,500 m AGL
<b>Scanner pattern</b>	Oblique scanning with options for constant point density or constant pulse rate
<b>Scan speed</b>	Programmable, 60-150 Hz (120-300 scans per second)
<b>Field of view</b>	20 - 40°
<b>Min. vertical separation</b>	0.5 m
<b>Vertical accuracy <sup>2, 3, 4</sup></b>	< 5 cm 1 $\sigma$
<b>Horizontal accuracy <sup>2, 3, 4</sup></b>	< 13 cm 1 $\sigma$



Leica CityMapper-2 with peripherals



## INTEGRATED SENSOR CONTROL MODULE & DATA LOGGER

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

## INTEGRATED GNSS/IMU SYSTEM

<b>IMU</b>	SPAN CNU55-H, Class 5, 500 Hz, FOG no export license required US ECCN 7A994
<b>GNSS</b>	NovAtel SPAN OEM7, 555 channel multi constellation receiver with 10 Hz GNSS data rate
<b>Additional features</b>	Real-time deeply coupled solution for position and attitude at highest accuracies, fully integrated and embedded solution, no interfaces to 3 <sup>rd</sup> party needed
<b>Position RMS DGNSS</b>	Post processed (specification): X,Y ≤ 3-5 cm, Z ≤ 5-7 cm Post processed (typical): X,Y ≤ 2-3 cm, Z ≤ 3-5 cm
<b>Attitude RMS</b>	Post processed (specification): R,P ≤ 0.005°, H ≤ 0.008° Post processed (experienced): R,P ≤ 0.003°, H ≤ 0.004°

## PERIPHERALS

<b>Sensor mount</b>	Leica PAV100-HPH gyro-stabilised sensor mount for high-performance data acquisition 42.4 kg
<b>Pod lifter (optional)</b>	Leica Pod Lifter Heavy Load, to retract entire CityMapper-2 pod for takeoff and landing 19.6 kg
<b>Operator console</b>	Leica OC60 12.1" screen with 1024 x 768 resolution 3.9 kg
<b>Pilot display</b>	Leica PD60 6.3" screen with 1024 x 768 resolution, designed for cockpit mounting 1.0 kg
<b>Display stand</b>	IS40-LW stand for Leica OC60 Operator Display 3.2 kg

## ENVIRONMENTAL

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

## ELECTRICAL

<b>Max. avg. power consumption of complete system</b>	780 W / 28 VDC
<b>Max. peak power consumption of complete system</b>	1,010 W (<60s) / 28 VDC
<b>Fuse on aircraft power outlet</b>	1 x 50 A recommended

## SYSTEM WEIGHT

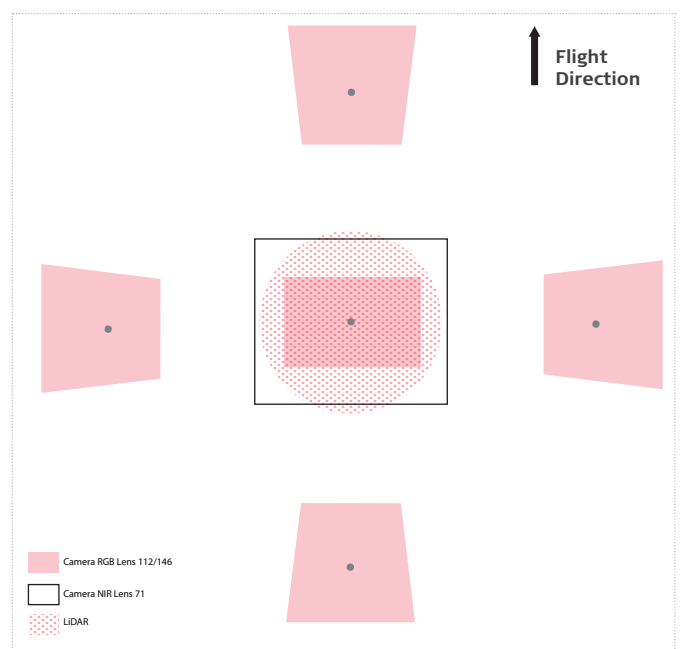
<b>System installation without Pod Lifter</b>	< 113 kg
<b>System installation with Pod Lifter</b>	< 132 kg

## SOFTWARE

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

## STANDARDS

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



Exampel of the CityMapper-2S foot print

<sup>1</sup> Maximum operating altitude is specified for 90% detection at ≥10% reflectivity (e.g., dry asphalt) and 100% laser output.

<sup>2</sup> Accuracy and point density stated is acquired @1,000 m AGL, 60 m/s aircraft speed.

<sup>3</sup> The 1σ value represents the 68% confidence interval. Typically, the RMSE value is equal to 1 standard deviation.

<sup>4</sup> Stated vertical and horizontal accuracies after calibration and registration using Leica HxMap workflow and with an assumed GNSS position error of 4 cm

<sup>5</sup> Data collection is based on typical project data rate.

<sup>6</sup> 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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Unified high-performance multisensor workflow



**Leica TerrainMapper-2**  
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- when it has to be **right**

