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 two 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.

- when it has to be right
Leica CityMapper-2 product specifications

**LEICA CITYMAPPER-2 POD**

- Consists of:
  - Nadir RGB camera
  - Nadir NIR camera
  - Oblique RGB camera
  - LiDAR Unit
  - GNSS/IMU
  - Sensor controller/data logger

- 1 x Leica MFC150
- 1 x Leica MFC150-NIR, monochrome
- 4 x Leica MFC150, viewing angle 45°
- 1 x Leica Hyperion2+
- Integrated NovAtel SPAN

- Height / diameter: 747 mm / 408 mm
- Weight: 62 kg
- Max. system frame rate: 0.9 sec

Designed for installation in Leica PAV100-HPH with Leica Pod Lifter Heavy Load.

**LEICA CITYMAPPER-2 VERSIONS**

**Leica CityMapper-2S**

- **Nadir lenses**
  - RGB: Leica D69.112/4.0 with 112 mm focal length
  - NIR: Leica D69.70/4.0-NIR with 70 mm focal length

- **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: 1500 m AGL @ 5 cm GSD

**Leica CityMapper-2H**

- **Nadir lenses**
  - RGB: Leica D69.146/4.8 with 146 mm focal length
  - NIR: Leica D69.70/4.0-NIR with 70 mm focal length

- **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° ±6.0° FOV along track

- RGB : NIR resolution: 1 : 2.1
- Nadir : Oblique focal length ratio: 1 : 1.3
- Flying height: 1900 m AGL @ 5 cm 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
- Aperture: Automatically controlled aperture 7 half f-stop steps
- Lens mount: Exchangeable lenses, positive mechanical connection

**LEICA HYPERION2+ LIDAR UNIT**

- 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: 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: < 5 cm 1 σ
- Horizontal accuracy: < 13 cm 1 σ

**Leica CityMapper-2 with peripherals:**

Operator display Leica OC60, pilot display Leica PD60, gyro-stabilised sensor mount Leica PAV100-HPH and Leica Pod Lifter Heavy Load.
**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 50 A 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**


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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 at 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.

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**INTEGRATED SENSOR CONTROL MODULE & DATA LOGGER**

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Controller</td>
<td>Controls all Camera Heads, LiDAR Unit and gyro-stabilised sensor mount</td>
</tr>
<tr>
<td></td>
<td>Includes deeply coupled GNSS/IMU solution</td>
</tr>
<tr>
<td>Processor</td>
<td>64-bit WIN10, 16 GB RAM, 64 GB SSD, USB 3.0, SATA 3</td>
</tr>
<tr>
<td>Mass memory</td>
<td>Leica MW30 solid state drive 7,680 GB each</td>
</tr>
<tr>
<td></td>
<td>CityMapper-2 holds 2 MW30s</td>
</tr>
<tr>
<td>Mass memory weight</td>
<td>0.5 kg each, 2 required, removable and portable</td>
</tr>
<tr>
<td>Mass memory capacity</td>
<td>Joint volume 15.36 TB, ≥ 8.0 h of data collection</td>
</tr>
</tbody>
</table>

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**INTEGRATED GNSS/IMU SYSTEM**

<table>
<thead>
<tr>
<th>Component</th>
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</tr>
</thead>
<tbody>
<tr>
<td>IMU</td>
<td>SPAN CNUS5-H, Class 5, 500 Hz, FOG</td>
</tr>
<tr>
<td></td>
<td>no export license required US ECCN 7A994</td>
</tr>
<tr>
<td>GNSS</td>
<td>NovAtel SPAN OEM7, 555 channel multi constellation</td>
</tr>
<tr>
<td></td>
<td>Receiver with 20 Hz GNSS data rate</td>
</tr>
<tr>
<td>Additional features</td>
<td>Real-time deeply coupled solution for position and attitude at highest</td>
</tr>
<tr>
<td></td>
<td>accuracies, fully integrated and embedded solution, no interfaces to 3rd</td>
</tr>
<tr>
<td></td>
<td>party needed</td>
</tr>
<tr>
<td>Position RMS DGNSS</td>
<td>Post processed (specification): X, Y ≤ 3-5 cm, Z ≤ 5-7 cm</td>
</tr>
<tr>
<td></td>
<td>Post processed (typical): X, Y ≤ 2-3 cm, Z ≤ 3-5 cm</td>
</tr>
<tr>
<td>Attitude RMS</td>
<td>Post processed (specification): R, P ≤ 0.005°, H ≤ 0.008°</td>
</tr>
<tr>
<td></td>
<td>Post processed (experienced): R, P ≤ 0.003°, H ≤ 0.004°</td>
</tr>
</tbody>
</table>

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**PERIPHERALS**

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor mount</td>
<td>Leica PAV100-HPH gyro-stabilised sensor mount for high-performance data</td>
</tr>
<tr>
<td></td>
<td>acquisition 36 kg</td>
</tr>
<tr>
<td>Pod lifter (optional)</td>
<td>Leica Pod Lifter Heavy Load, to retract entire CityMapper-2 pod for</td>
</tr>
<tr>
<td></td>
<td>takeoff and landing 20 kg</td>
</tr>
<tr>
<td>Operator console</td>
<td>Leica OC60 12.1” screen with 1024 x 768 resolution 5.0 kg</td>
</tr>
<tr>
<td>Pilot display</td>
<td>Leica PD60 6.3” screen with 1024 x 768 resolution designed for cockpit</td>
</tr>
<tr>
<td></td>
<td>mounting 1.0 kg</td>
</tr>
<tr>
<td>IS40-LW Interface stand</td>
<td>Pedestal for Leica OC60 Operator Display 3.5 kg</td>
</tr>
</tbody>
</table>

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**ENVIRONMENTAL**

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>Non-pressurised cabin up to ICAO 15,000 ft</td>
</tr>
<tr>
<td>Humidity</td>
<td>0% to 95% RH according to ISO7137 (non-condensing)</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0°C to 35°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40°C to 70°C</td>
</tr>
</tbody>
</table>

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5. Data collection is based on typical project data rate.
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