RIEGL VMX-450

Compact Mobile Laser Scanning System

The RIEGL VMX-450 Mobile Laser Scanning System offers extremely high measurement rates providing dense, accurate, and feature-rich data even at high driving speeds.

The roof-carrier mounted measuring head integrates two RIEGL VQ-450 laser scanners as well as inertial measurement and GNSS equipment, housed under an aerodynamically-shaped protective cover. A well-designed camera platform ensures user-friendly mounting and setup of up to six digital cameras.

Fast 3D data collection, featuring high accuracy and high resolution, provides a basis for a variety of applications like mapping of roadways and rail corridors (e.g. route inventory, noise protection, clearance gauge), waterways, ports, and harbors (e.g. river banks, jetties, cliffs) as well as extended urban and vacant areas.

Typical applications include
- Mapping of Transportation Infrastructure
- City Modeling
- Fast Mapping of Construction Sites
- Surveying of Mining / Bulk Materials
- Network Planning

2 RIEGL VQ-450 scanners smoothly integrated with IMU/GNSS unit
- very high measurement rate up to 1.1 million meas./sec
- scanning rate up to 400 lines/sec
- eye safe operation (laser class 1)
- high penetration of obstructions (e.g. fences, vegetation) by means of echo digitization and online waveform processing
- precisely time-stamped images of up to 6 high-resolution cameras
- fully-calibrated system
- user-friendly mounting and installation, short setup time
- compact and lightweight design
- aerodynamically-shaped protective cover
The RIEGL VMX-450 comprises fully-integrated and calibrated laser scanners, IMU/GNSS equipment, optional camera sub-system, and corresponding RIEGL software packages. Modular design and genuine mounting mechanism ensure quick setup on different vehicles (or vessels, railcars) and reduce post-processing efforts to a minimum in a seamless workflow from data acquisition to highly accurate survey-grade 3D point cloud in common global and local coordinate systems. The integrated IMU/GNSS allows the system to be operated practically worldwide. System calibration is maintained even when the system is removed, shipped or stored.

Each of the two RIEGL VQ-450 laser scanners provides low-noise, gapless 360° profiles at a measurement rate of 550,000 meas./sec and a scan rate of up to 200 profiles/sec. RIEGL’s unrivaled echo signal digitization technology with online waveform processing results in excellent multiple target detection capability and provides calibrated amplitude and reflectance readings as valuable attributes to each point of the final point cloud.

The VMX-450-CS6 camera sub-system complements the scan data by precisely time-stamped images. Intrinsic calibration of the cameras is provided as well as seamless integration into the entire acquisition and processing workflow. Additional options include integration of POINT GREY Ladybug5 camera.

Data acquisition and operator control is accomplished through the compact control unit box VMX-450-CU, optimized for easy transportation and powered directly from the vehicle’s onboard power supply. A handy touch-screen, feedback of device states and online monitoring data facilitate the operator’s tasks in the field.

The included RIEGL software packages offer comprehensive and comfortable features in data processing, covering enhanced scan data adjustment tools, incorporating control points, synchronous measurements in scan data and images, colorizing point clouds, and even combination with other data sets of e.g. RIEGL airborne laser scanners. Finally, export your precise geo-referenced results in global and local coordinates or make use of direct interfaces to third-party software.

1) The installed IMU is listed neither in the European Export Control List (i.e. Annex 1 of Council Regulation 428/2009) nor in the Canadian Export Control List. Detailed information on certain cases will be provided on request.
VMX-450-MH Measuring Head

VMX-450-RM Roof Mount

VMX-450-MC Main Cable

VMX-450-CU Control Unit

VMX-450-DMI Distance Measurement Indicator

all dimensions in mm
PRR = 300 kHz: for long range applications

PRR = 600 kHz: for medium range applications

PRR = 1.1 MHz: for high-resolution mobile laser scanning in urban areas
RIACQUIRE
- Project-oriented acquisition software for RIEGL mobile scan data
- Management of integration settings and calibration parameters
- Control and parameterization of scanners and cameras
- Online visualization of monitoring data and image preview
- Status feedback on all system components
- Quality assurance assistance by event history and project report

RIPROCESS
- Project-oriented processing software for RIEGL mobile scan data
- Fast access to point cloud data in different visualization formats
- Advanced scan data adjustment (relative and absolute)
- Tools for processing scan and image data
- Software plugin RiPRECISION MLS (optional) for fully automated scan data adjustment
- Synchronous measurements in point cloud and images
- Combination with RIEGL airborne laser data
- Data export into global/local coordinates and interfaces to third-party software
- Operation in a multiple-workstation environment and parallel task processing

RIWORLD
- Transformation of scan data into geo-referenced point cloud data
- Consideration of geometrical system description and calibration parameters (e.g. lever arms)
- Support of different formats of position and orientation data
- Smoothly integrated into RIPROCESS task management
- Interfacing to third party software packages

The standard configuration of the optional camera system comprises 4 cameras with 5-megapixel resolution. Images are precisely time-stamped and the intrinsic camera calibration is offered as a RIEGL factory service. The unique and flexible spherical mounting mechanism allows flexible orientation according to project requirements. The exterior orientation can be easily determined by tools within RIPROCESS. Additionally, a wide range of cameras can be added to the system like DSLR cameras, thermal or hemispherical cameras. Up to 6 cameras are supported in total.

5 MPx Camera Specifications:
- 2/3” color CCD, global electronic shutter (progressive scan)
- Pixel Array: 2452 x 2056 (H x V), 3.45 x 3.45 μm²
- Interface: Gigabit Ethernet
- Trigger: distance-based / constant time-interval (each camera individually)
- Exposure: 38 μs to 60 s, auto / manual
- Gain: 0 to 32 dB, auto / manual
- Field of View: 80° x 65° (H x V), 5 mm lens
- Max. frame rates: 31) @ 6 cameras
- Gain) @ 4 cameras
- Gain) @ 2 cameras
- Other lens types on request.

1) In a typical configuration with four 5 MPx cameras. Maximum frame rate of a single camera is 9 fps.
2) Limited by transfer rate to HDDs.
3) Limited by max. trigger rate of CCD sensor.
2 x VQ-450 Measurement Performance

<table>
<thead>
<tr>
<th>Effective Measurement Rate</th>
<th>300 kHz</th>
<th>400 kHz</th>
<th>600 kHz</th>
<th>760 kHz</th>
<th>1.1 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Measurement Range (1)</td>
<td>300 m</td>
<td>260 m</td>
<td>200 m</td>
<td>180 m</td>
<td>140 m</td>
</tr>
<tr>
<td>natural targets &gt; 10 %</td>
<td>800 m</td>
<td>700 m</td>
<td>450 m</td>
<td>330 m</td>
<td></td>
</tr>
<tr>
<td>natural targets &gt; 80 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Number of Targets per Pulse</td>
<td>practically unlimited (details on request)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Minimum Range 1.5 m
Accuracy 3, 5 8 mm
Precision 4, 5 5 mm
Max. Effective Measurement Rate (1) up to 400 lines/sec (2 x 200 lines/sec)
Line Scan Speed (selectable) 1100 000 meas./sec (2 x 550 000 meas./sec)

IMU/GNSS Performance (6)
Position (absolute) typ. 20 - 50 mm
Position (relative) 7) typ. 10 mm
Roll & Pitch 0.005°
Heading 0.015°

Physical Data
VMX-450-MH Measuring Head 737 x 456 x 485 mm 43 kg
including GNSS antenna and protection caps
VMX-450 Protective Cover 620 x 747 x 364 mm 3 kg
VMX-450-CU Control Unit 560 x 455 x 265 mm 26 kg
VMX-450-RM Roof Mount 778 x 515 x approx. 120 mm 13 kg
including mounting brackets
VMX-450-MC Main Cable 3 m (standard length) 5 kg
VMX-450-CS6 Camera System 607 x 1038 x 208 mm 19 kg
8) Typical configuration with 4 cameras.

Electrical Data / Interfaces
Power Supply Input Voltage 11 - 15 V DC
Power Consumption typ. 440 W (max. 680 W) 8)
Interfaces LAN, 10/100/1000 MBit/sec
USB 3.0
DVI
SYNC OUT (synchronization output NMEA+PPS)
NAV RS232 (COM of IMU/GNSS system for RTK, SBAS)
interfacing for additional sensor devices (scanner, cameras, etc.)
removable hard disks for project data transfer

Environmental Data
Temperature Range
VMX-450-MH Measuring Head -10°C to +40°C (operation) / -20°C to +50°C (storage)
VMX-450-CU Control Unit 0°C to +40°C (operation) / -20°C to +50°C (storage)
VMX-450-CS6 Camera System -10°C to +40°C (operation) / -20°C to +50°C (storage)
max. 80% non condensing @ +31°C
Humidity IP64, dust and splash-proof
Protection Class IP64 (closed lid), IP20 (open lid)
IP65, dust and water jet-proof

RIEGL Laser Measurement Systems GmbH
Riedenburgstraße 48
3580 Horn, Austria
Phone: +43 2982 4211 | Fax: +43 2982 4210
office@riegl.co.at
www.riegl.com

RIEGL USA Inc.
Orlando, Florida | info@rieglusa.com | www.rieglusa.com
RIEGL Japan Ltd.
Tokyo, Japan | info@riegl-japan.co.jp | www.riegl-japan.co.jp
RIEGL China Ltd.
Beijing, China | info@riegl.cn | www.riegl.cn
www.riegl.com

Data Sheet, RIEGL VMX-450, 2015-03-19