RIEGL VMX®-3HA

Experience unmatched **speed, precision,** and **efficiency!**

up to 6 MHz PRR
800 lines/sec scan speed



The *RIEGL* VMX-3HA is a High Speed, High Performance Dual Scanner Mobile Mapping System which provides dense, accurate, and feature-rich data at highway speeds.
With 6,000,000 measurements and 800 scan lines per second, this turn-key solution is ideally suited for survey-grade mobile mapping applications.

This powerful technology comprises two *RIEGL* VUX-3HA High Performance LiDAR Sensors and a high performance IMU/GNSS unit, housed in an aerodynamically-shaped protective cover. Interfaces for up to 9 optional cameras enable complementation of the LiDAR data with precisely geo-referenced images.

High Speed, High Performance Dual Scanner Mobile Mapping System

Typical Applications

• Road Surface Measurement • Transportation Infrastructure Mapping • City Modeling • As-Built Surveying • HD Mapping for Autonomous Vehicles • Rapid Capture of Construction Sites and Bulk Material • GIS Mapping and Asset Management

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RIEGL VMX-3HA Key Features



Proven System

The *RIEGL* VMX-3HA is the consistent further development in the series of high performance *RIEGL* VMX Mobile Mapping Systems.
The well proven alignment and placement of the two VUX-3HA scanner enables a simultaneous forward/backward looking to reduce scan shadows. A compact dual scanner platform carries both, LiDAR sensors and a high-grade IMU/GNSS subsystem, and provides an accurate and long-term stable system calibration.

VMX-3HA Scan Pattern

2x 3 MHz			3 m distance			10 m distance			50 m distance		
platform speed	line spacing @ 250 lps [mm]	line spacing @ 400 lps [mm]	point spacing @ 250 lps [mm]	point spacing @ 400 lps [mm]	pts/m²	point spacing @ 250 lps [mm]	point spacing @ 400 lps [mm]	pts/m²	point spacing @ 250 lps [mm]	point spacing @ 400 lps [mm]	pts/m²
50 km/h	56	35	1.6	2.5	22900	5.2	8.4	6870	26.2	41.9	1370
80 km/h	59	56	1.6	2.5	14320	5.2	8.4	4290	26.2	41.9	850
100 km/h	111	69	1.6	2.5	11460	5.2	8.4	3430	26.2	41.9	680
120 km/h	133	83	1.6	2.5	9550	5.2	8.4	2860	26.2	41.9	570

Camera System and Features

The VMX-3HA impresses with an extremely enhanced camera performance and a number of innovative features. Camera interface and SYNC of up to 9 external devices are included in the basic system configuration. Multiple high-resolution *RIEGL* cameras allow for unique capture angles and a high level of detail in the images.
Explore the full range of camera options available for integration with the VMX-3HA!

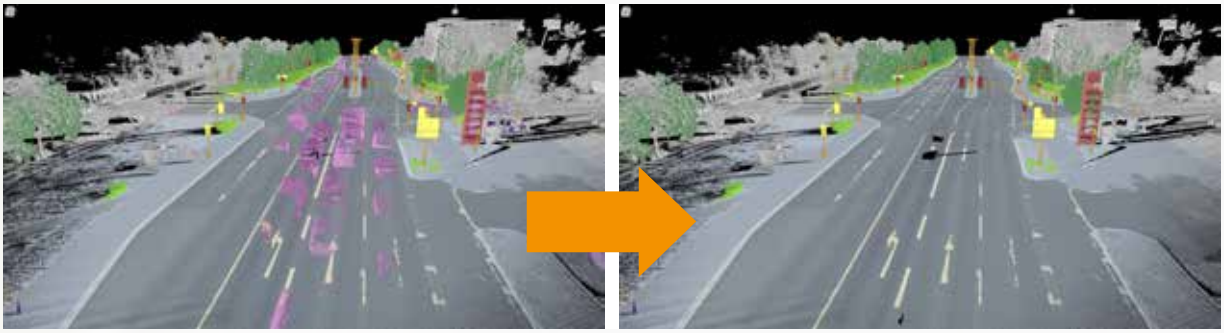
***RIEGL* MLS Systems Camera Options**

The VMX-3CU precisely controls management of power, data acquisition, and operation of the laser scanners, the IMU/GNSS sensor and the optional cameras. A 10 GigE network and a set of SSD storage media with a total of 7.6 TB (15.3 TB optional) disk space enable big data handling for uninterrupted data recording of comprehensive missions.

The modular design of the system provides unique flexibility to meet a diversity of project requirements. Ready to be mounted on road and off-road vehicles, as well as on trains and boats, it provides the user with the technology and tools to ensure full data capturing of transportation infrastructure, pavement surface, facades, overhead structures, power lines, bridges, tunnels, etc.

Seamless *RIEGL* Workflow

The *RIEGL* data acquisition software facilitates the operator's task in the field by providing real-time visualization of acquired scan data and imagery. The *RIEGL* software packages also offer comprehensive features in data processing. This includes enhanced scan data adjustment to merge overlapping mobile scan data. Furthermore it enables the scan data to be fitted to specific control objects which results in a consistent point cloud of enhanced precision and increased geo-referenced accuracy.



Exceptional level of detail with automated, AI-based classification: automatic ellemination of distracting data

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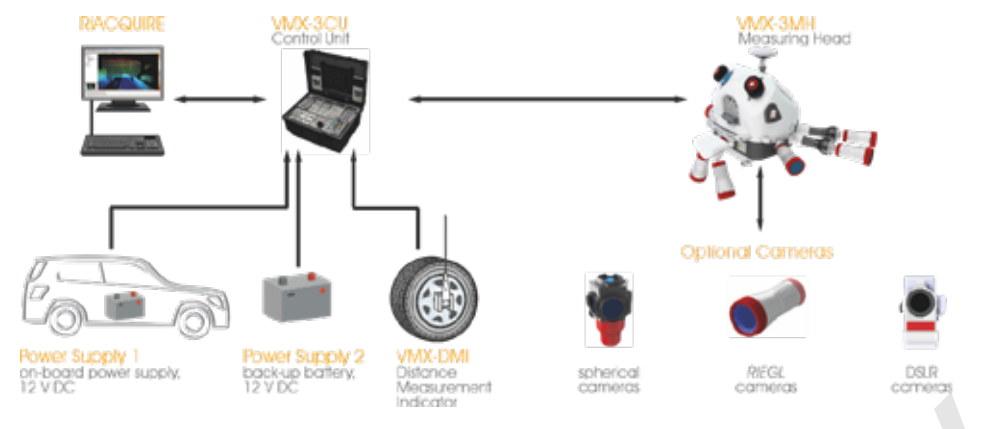
RIEGL VMX-3HA Components and Setup



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RIEGL VMX-3HA System Block Diagram



***RIEGL* VMX-3HA System Components:**

- *RIEGL* VMX-3MH Measuring Head
- *RIEGL* VMX-3CU Control Unit
- VMX-DMI Distance Measurement Indicator
- up to 9 cameras (optional)
- sustainable power supply with back-up battery
- single VMX Main Cable with Harting® connectors

RIEGL VMX Reinforced Roof Mount (optional)

This roof mount is a reinforced version of the standard VMX Roof Mount and has 6 height-adjustable brackets that allow to adjust to the aerodynamically shaped roof lines of the car.



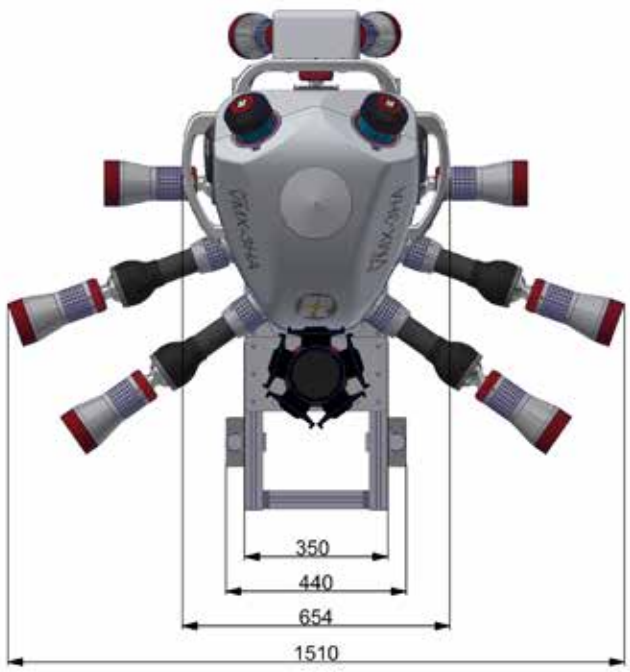


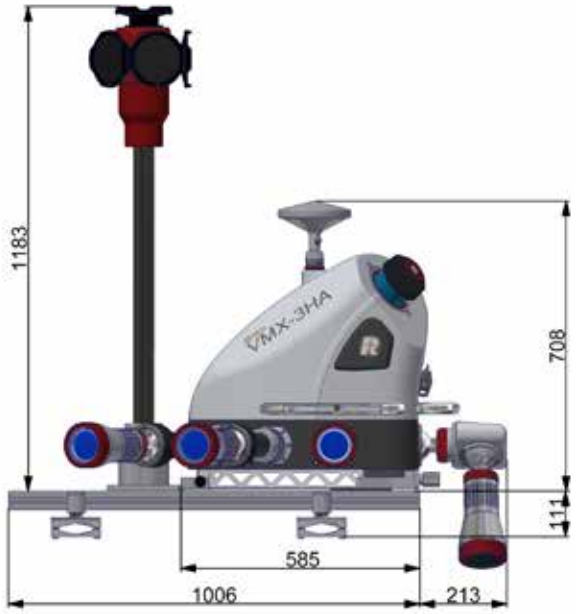
all dimensions in mm

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RIEGL VMX-3HA Dimensions





all dimensions in mm

RIEGL VMX-3HA Technical Data

- max. measurement range
- pulse repetition rate (peak)
- online waveform processing
- optional digital camera
- multiple target capability
- eye safe operation at Laser Class 1

VMX-3HA Scanner Performance

Laser Class	Laser Class 1 (Class 1 Laser Product according to IEC 60825-1:2014)			
Effective Measurement Rate [1) 2)]	2x 300 kHz	2x 1000 kHz	2x 1800 kHz	2x 3000 kHz
Max. Range, Target Reflectivity ρ ≥ 80% [3) 4)]	500 m	280 m	250 m	200 m
Max. Range, Target Reflectivity ρ ≥ 10% [3) 4)]	180 m	100 m	90 m	70 m
Max. Number of Targets per Pulse [5)]	31	15	8	5
Minimum Range	1 m			
Accuracy [6) 7)] **/ Precision** [7) 8)]	3 mm / 2 mm			
Field of View	360° "full circle"			
Scan Speed (selectable)	2x up to 400 scans/sec			

1) Rounded values, selectable by measurement program.
2) Setting of intermediate PRR values possible.
3) Typical values for average conditions. Maximum range is specified for flat targets with size in excess of the laser beam diameter, perpendicular angle of incidence, and for atmospheric visibility of 23 km. In bright sunlight, the max. range is shorter than under overcast sky.
4) Ambiguity to be resolved by post-processing with RIUNITE software.
5) If more than one target is hit, the total laser transmitter power is split and, accordingly, the achieveable range is reduced.
6) Accuracy is the degree of conformity of a measured quantity to its actual (true) value.
7) One sigma @ 30 m range under *RIEGL* test conditions.
8) Precision, also called reproducibility or repeatability, is the degree to which further measurements show the same result.

IMU/GNSS Performance	AP+60
Position Accuracy (absolute) **Horizontal** **Vertical**	 typ. 0.02 m typ. 0.03 m
Roll & Pitch Accuracy [1)]	0.0025°
Heading Accuracy [1)]	0.015°

1) Absolute Accuracy Specifications (RMS). Typical performance. Actual results are dependent upon satellite configuration, atmospheric conditions and other environmental effects. Post processed using base station data. No GNSS outages, with DMI option.

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General Technical Data

VMX-3CU Power Supply Input Voltage	11 - 15 V DC powered by on-board source (e.g. alternator) 11 - 15 V DC backup power
VMX-3MH Input Voltage	24 V DC (powered via VMX-3CU)
Typ. Power Consumption system operation without cameras additional power consumption per camera	 typ. 250 W / max. 1020 W typ. 6 W / max. 34 W
Protection Class VMX-3MH with camera system	IP64
Temperature Range VMX-3MH with camera system **Temperature Range VMX-3CU**	-20°C [1] up to +40°C (operation) / -20°C up to +50°C (storage) 0°C up to +40°C (operation) / -20°C up to +50°C (storage)
Interface VMX-3CU to VMX-3MH	single main cable for power & data interface with robust Harting® connectors
Humidity	max. 80% non condensing @ +31°C
Weight (approx.) VMX-3MH Measuring Head (without cameras) VMX Roof Mount (including Thule wing bars with Thule mountings) VMX Reinforced Roof Mount (including Thule wing bars with Thule mountings) VMX Main Cable (5m length) VMX-3CU Control Unit *RIEGL* cameras 24 MP JPEG camera / 24 MP camera 12 MP JPEG camera / 12 MP camera 5 MP JPEG camera / 5 MP camera camera extension mounting pole *RIEGL* pavement mount (excl. camera) Mounting of spherical cameras (incl. cabling, excl. camera) fix mount / tilt mount	 38.4 kg 17.3 kg 34 kg 5 kg 25 kg 1.42 kg / 1.5 kg 1.36 kg / 1.65 kg 1.4 kg / 1.25 kg 1.2 kg 2.77 kg 5.8 kg / 13.1 kg

1) Requires that the scanner is powered up at or above -10 °C ambient temperature and held in continuous scanning operation. Insulating the scanner with appropriate material will enable operation at even lower temperatures.

Data Interfaces

VMX-3MH Measuring Head	
9x multi-purpose ports supporting complementary camera systems and additional devices, each with	
- trigger pulse	- PPS
- precise time stamping of exposure pulse	- LAN 1GigE
- NMEA data	- power 24V DC, max. 34 W

VMX-3CU Control Unit
1x DMI input (for distance measuring indicator; odometer)
1x NAV RS-232 (COM port for IMU/GNSS for RTK, SBAS)
1x AUX +12V DC
1x touch screen incl. USB (for system operation)
1x HDMI (additional video output)
1x Display Port (additional video output)
2x LAN (1x 1000 Mbit/sec, 1x 10000 Mbit/sec)
4x USB3.1 Gen 1
2x USB3.1 Gen 1 specific configuration for a spherical camera
4x removable double SSD drive carrier with a total of 7.6 TB (optional up to 15.3 TB) swappable disc space

VMX Main Cable (single cable connection between VMX-3MH and VMX-3CU)

Further Information

RIEGL VUX-3HA Data Sheet

RIEGL camera systems Brochure

RIEGL RiACQUIRE Data Sheet

RIEGL RiPROCESS Data Sheet

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