RIEGL
VMQ®-1HA

MLS

Use the latest advancements in *RIEGL* LiDAR Technology for your mobile applications: 1.8 MHz effective measurement rate 250 scan lines/sec

475m	1.8MHz			optional	

The *RIEGL* VMQ-1HA is a compact, economically priced High-Speed Single Scanner Mapping System, well suited for a variety of mobile mapping applications.

The system consists of a compact measuring head with a quick release system for convenient mounting. A swivel plate enables multiple mounting angles in order to optimize the field of view of the system. The optional integration of up to four cameras allows simultaneous acquisition of imagery to complement the captured LiDAR data.

The central part of the system is the fully integrated *RIEGL* VUX-1HA[22] LiDAR sensor providing 1.8 mio. measurements and up to 250 scan lines per second for an outstanding performance in mobile applications.

High Speed
Single Scanner Mobile Mapping System

Typical Applications

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

Scan this QR code to watch the *RIEGL* VMQ-1HA video.

www.riegl.com

RIEGL®

Key Features

• *RIEGL* High-Performance LiDAR Sensor for Mobile Mapping

Core component of the *RIEGL* VMQ-1HA is the **kinematic LiDAR Sensor VUX-1HA[22]**. Especially developed for mobile applications, the high-accuracy, high-speed laser scanner offers a maximum effective measurement rate of up to 1.8 MHz, 5 mm accuracy, 250 scan lines/sec, and a 360 degree "full circle" field of view.

Fully integrated into the measuring head of the VMQ-1HA, the sensor enables acquisition of dense point cloud patterns even with single passes at common traffic speeds. At 80 km/h acquisition speed the typical average point density is about 9 cm line spacing and 4 mm point spacing on the road surface.

RIEGL VUX-1HA[22]
high-accuracy kinematic LiDAR sensor

• Multiple Swivel Positions

By means of the swivel plate the measuring head can be set to seven different pre-defined mounting angles (-45° to +45° in 15° increments). This flexible system configuration allows the generation of different point cloud patterns meeting diverse project requirements. The possibility of scan data acquisition with different horizontal orientation of the measuring head improves the scan pattern especially for multi-pass applications.

360° vertical field of view
in a single pass

• System Operation

The VMQ-1HA is powered via the VM Power Supply Box. It provides power for the VMQ-MH Measuring Head, the DMI, and either for the VM-IU Interface Unit, or a data acquisition laptop. The VM Power Supply Box enables failsafe operation by redundant power input from the vehicles on-board power supply and a backup battery.

The VM-IU is a compact data acquisition unit for convenient system operation. It provides extended disk space to store scan data as well as camera data from the *RIEGL* cameras (GigE-vision cameras) and various spherical cameras up to 72 MP.

Optionally the system can also be operated with a user laptop instead of the VM-IU, if no *RIEGL* cameras are used.
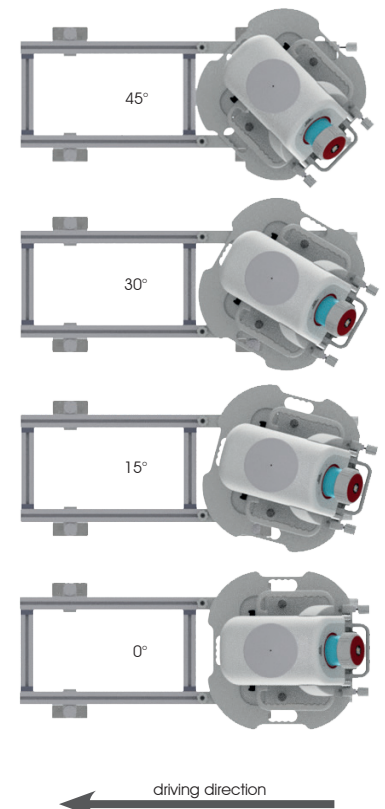
• Seamless *RIEGL* Workflow

A handy touch-screen and the *RIEGL* data acquisition software facilitate 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 covers 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. Finally, the precise geo-referenced scan data and high resolution (panorama) images can be exported to well-known file formats, or interfaced directly with third-party software.

45°

30°

15°

0°

driving direction

multiple swivel positions

RIEGL VMQ-1HA System Block Diagram

VMQ Power Supply Box — RiACQUIRE — VMQ-IU Interface Unit — Optional Cameras

RIEGL cameras

spherical cameras

DSLR cameras

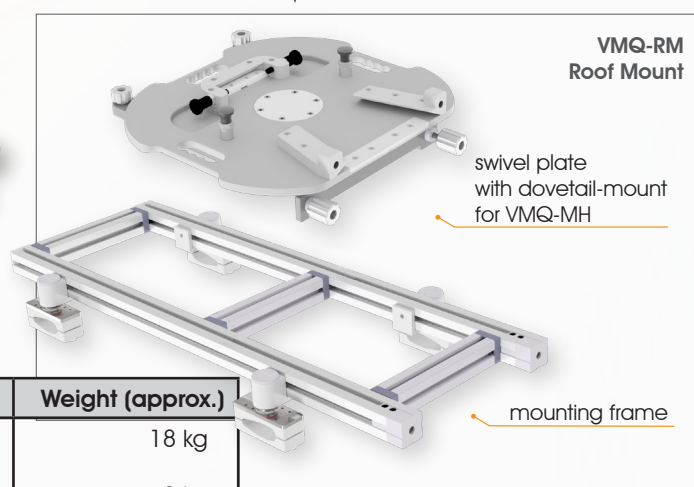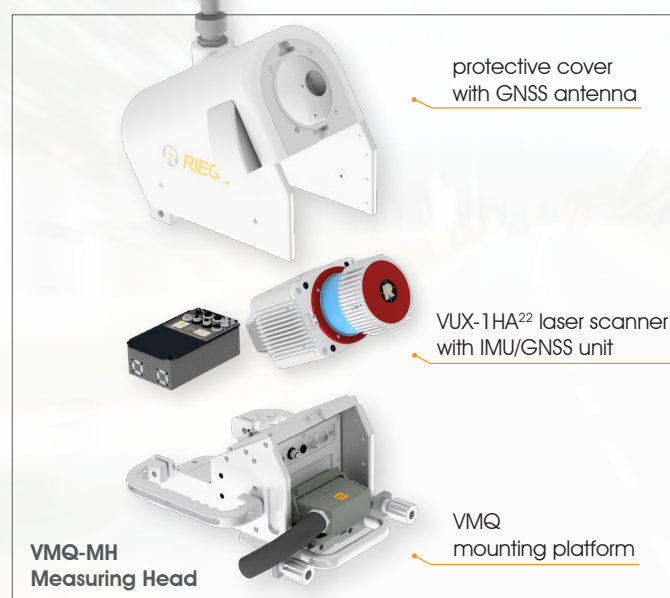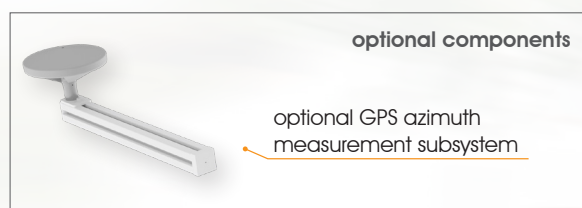on-board power supply 12V DC — back-up battery 12V DC — VMQ-DMI Distance Measurement Indicator — VMQ-MH Measuring Head
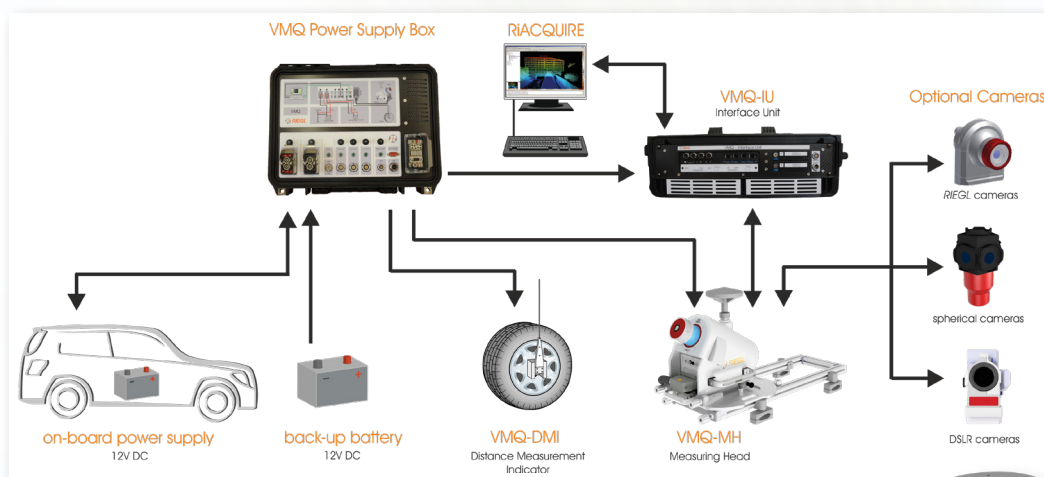
RIEGL VMQ-1HA System Components:

- *RIEGL* VMQ-MH Measuring Head
- *RIEGL* VM-IU Interface Unit
- *RIEGL* VM Power Supply Box
- VM-DMI Distance Measurement Indicator
- up to 4 cameras (optional)
- sustainable power supply with back-up battery
- connecting cables

RIEGL VMQ-1HA Setup and Components

optional components

optional GPS azimuth measurement subsystem

protective cover with GNSS antenna

VUX-1HA²² laser scanner with IMU/GNSS unit

VMQ-MH Measuring Head

VMQ mounting platform

VMQ-RM Roof Mount

swivel plate with dovetail-mount for VMQ-MH

mounting frame

Physical Data	Main Dimensions (L x W x H)	Weight (approx.)
VMQ-MH Measuring Head	496 x 387 x 507 mm	18 kg
VMQ-RM Roof Mount		
Mounting Frame	1149 x 440 x 110 mm	9 kg
Swivel Plate	568 x 514 x 70 mm	13 kg
VM Power Supply Box	415 x 330 x 175 mm	7.8 kg
VM-IU Interface Unit	550 x 353 x 230 mm	14.8 kg
VMQ-MC Main Cable	standard length 5 m	8 kg

RIEGL VMQ-1HA Camera Options

A wide range of cameras can be used with the system including 5 MP / 12 MP / 24 MP *RIEGL* cameras with GigE vision interface for seamless integration into the entire acquisition and processing workflow. Cameras such as high resolution DSLR cameras up to 45 MP or various spherical cameras up to 72 MP can also be integrated to the seamless *RIEGL* workflow.

RIEGL cameras

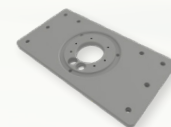The cameras are available with different resolutions and lens types. For further details please refer to the table below.
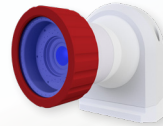
DSLR cameras

with *RIEGL* camera mount

Spherical cameras

mounting kit for spherical cameras

extended mounting plate for up to 4 cameras

RIEGL VMQ-1HA system
with 2x *RIEGL* cameras, 1x DSLR camera and 1x spherical camera

RIEGL Camera Options	max. number of cameras	max. frames [1] per second	resolution [px (H) x px (V)]	pixel size [μm]	lens focal length [mm]	Field of View (FOV) [2]
5 MP RAW [3] [4]	2	20	2464 x 2056	3.45	5	80.7° x 70.7°
12 MP RAW [3] [4]	2	8	4112 x 3008	3.45	8 / 16	83.1° x 65.9° / 47.8° x 35.9°
24 MP RAW [3] [4]	2	4.5	5328 x 4608	2.74	8	79.5° x 71.5°
24 MP JPEG [4]	2	9 [5]	5328 x 4608	2.74	8	79.5° x 71.5°

1) Maximum frame rate of a single camera operated in 8-bit mode. The use of multiple cameras may reduce maximum frame rates.
2) Nominal values (actual values may be slightly different due to manufacturing tolerances).
3) A user defined "Region of Interest" can be defined during data acquisition, resulting in a reduction of the FOV and the resolution. This may help to reduce image file sizes on the one hand and to further increase frame rates on the other hand.
4) The *RIEGL* cameras require the usage of the VM-IU Interface Unit.
5) @ 90% image compression.

RIEGL VMQ-1HA Technical Data

475m max. measurement range

1.8MHz pulse repetition rate (peak)

online waveform processing

optional digital camera

multiple target capability

eye safe operation at Laser Class 1

VMQ-1HA Scanner Performance

Laser Class	Laser Class 1 (Class 1 Laser Product according to IEC 60825-1:2014)					
Effective Measurement Rate [1] [2]	300 kHz	500 kHz	1000 kHz	1250 kHz	1500 kHz	1800 kHz
Max. Range, Target Reflectivity $\rho \geq 80\%$ [3] [4]	475 m	370 m	235 m	235 m	235 m	235 m
Max. Range, Target Reflectivity $\rho \geq 10\%$ [3] [4]	170 m	130 m	85 m	85 m	85 m	85 m
Max. Number of Targets per Pulse [5]	15	15	9	7	5	4
Minimum Range	1 m @ PRR $\geq$ 1 MHz, 1.2 m @ PRR < 1 MHz					
Accuracy [6] [7] / Precision [7] [8]	5 mm / 3 mm					
Field of View	360° "full circle"					
Scan Speed (selectable)	up to 250 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

IMU/GNSS Performance	IMU (Option A)	IMU (Option B)
Position Accuracy Horizontal Position Accuracy Vertical	typ. 0.02 m typ. 0.03 m	typ. 0.02 m typ. 0.03 m
Roll & Pitch Accuracy [9]	0.010°	0.0025°
Heading Accuracy [9]	0.025° [10]	0.015°

9) Absolute accuracy specifications (RMS). Typical performance. Actual results are dependent upon satellite configuration, atmospheric conditions, and other enviromental effects. Post processed using base station data. No GNSS outages, with DMI option.
10) Improved heading accuracy with dual antenna option @ 2 m baseline.

General Technical Data

Power Supply Input Voltage	11 - 15 V DC
Power Consumption	typ. 160 W (max. 220 W) [11]
Temperature Range	-10°C up to +40°C (operation) / -20°C up to +50°C (storage)
Humidity	max 80% non condensing @+31°C

11) with 2 x 12 MP *RIEGL* camera

Interfaces

Interfaces Measuring Head (VMQ-MH)	VM Power Supply Box	Interface Unit (VM-IU)
4x trigger pulse, exposure pulse, NMEA data (e.g. for optional cameras or additional devices) 1x PPS out pulse for synchronization of additional device 2x LAN, 1000 Mbit/sec for data transfer to control unit of external devices (e.g. image data acquisition) 1x secondary antenna connector for GPS azimuth measurement subsystem	1x DMI input (for distance measuring indicator; odometer) 1x NAV RS-232 (COM port for IMU/GNSS for RTK, SBAS) 3x power supply socket (2x 24 V DC / 1x 12 V DC)	4x LAN 1Gbit/sec M12 sockets, 3 ports pre-configured 4x LAN 1Gbit/sec RJ45 sockets, 2 ports pre-configured 4x USB 3.0 (e.g. image data transfer from a spherical camera) 1x display port 1x WLAN (integrated antenna) 1x Bluetooth (integrated antenna) 2x slots for removable hard disk 1x power supply input (+24 V DC) 1x power supply output (+24 V DC) for display (touchscreen)

Further Information

RIEGL VUX-1HA²²
Data Sheet

RiACQUIRE
Data Sheet

RiPROCESS
Data Sheet

RiUNITE
Data Sheet

RiPRECISION MLS
Brochure

You Tube
Watch our videos!
youtube.com/riegllidar

www.riegl.com

RIEGL®