

RIEGL VMY[®]-2



The **RIEGL VMY-2** is a compact, economically priced Dual Scanner Mapping System, that is well suited for a variety of mobile mapping applications.

The measuring head is equipped with two high-resolution **RIEGL miniVUX-HA** LiDAR sensors and mounted in the well proven angled orientation as known from the **RIEGL VMX** Mobile Mapping Systems.

The system enables data acquisition with up to 300 scan lines/second and up to 600 kHz Pulse Repetition Rate.

To further increase efficiency of the mobile mapping system, the optional integration of up to four cameras allows simultaneous acquisition of imagery to complement the captured LiDAR data.



Compact Dual Scanner Mobile Mapping System

Typical Applications

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

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Key Features

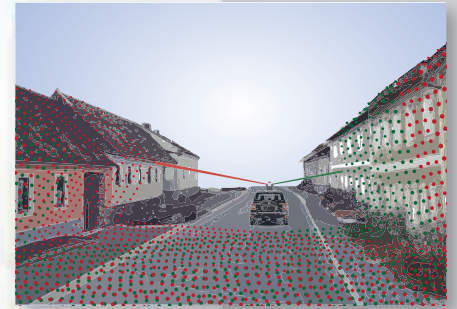
• Compact RIEGL Dual Scanner Mobile Mapping System

Core components of the RIEGL VMY-2 are two high-resolution RIEGL miniVUX-HA LiDAR sensors, mounted in a well-proven angled orientation which enables simultaneous forward and backward looking to reduce scan shadows.

The LiDAR sensor stands out with a pulse repetition rate of up to 300 kHz at a 360 degree "full circle" field of view as well as a range accuracy of 10 mm.

Fully integrated into the measuring head of the VMY-2, the sensors enable 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 on pavement surface is 1100 points per m².

The innovative design of the system enables folding and thus a convenient transport and space-saving storage.



360° vertical field of view @ up to 400 kHz PRR



convenient transportation

ready for acquisition



• System Operation

The VMY-2 is powered via the VM Power Supply Box. It provides power for the VMY-2MH 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 via a redundant power input from the vehicle's 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 and various spherical cameras up to 72 MP.

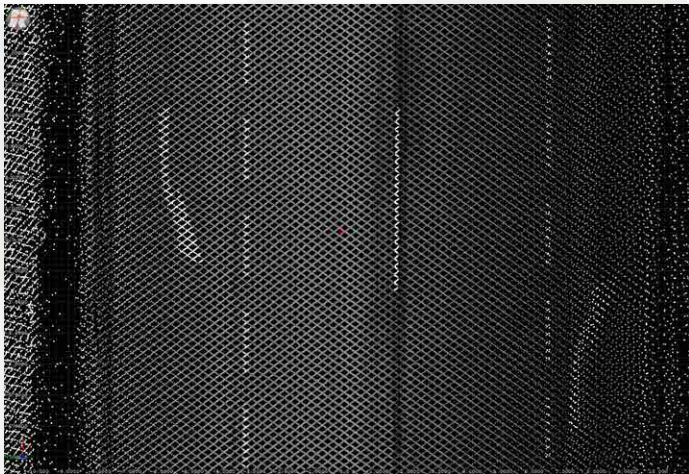
In case there is no need for RIEGL cameras, the system can also be operated with a laptop instead of the VM-IU.

• Seamless *RIEGL* Workflow

An easy-to-use interface, that is accessible via laptop or touch-screen monitor, 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.

► **VMY-2 Scan Data Examples**

scan data cross-country (acquired at 90 km/h platform speed)

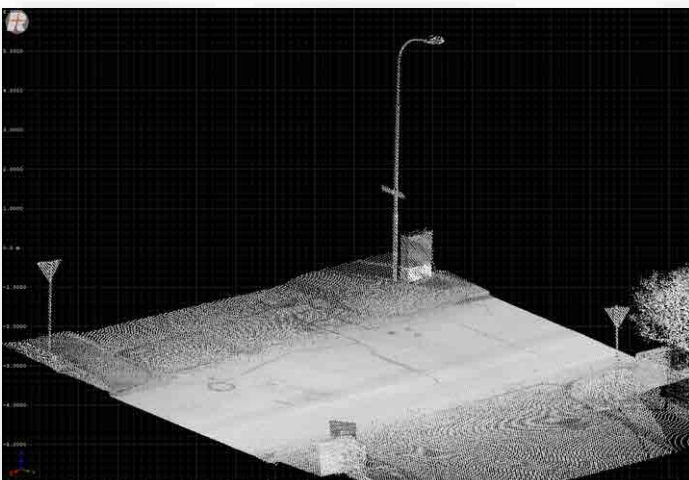


top view, reflectance scaled



perspective view, reflectance scaled

scan data urban environment (acquired at 30 km/h platform speed)



perspective view showing details of the infrastructure, reflectance scaled



perspective view, reflectance scaled

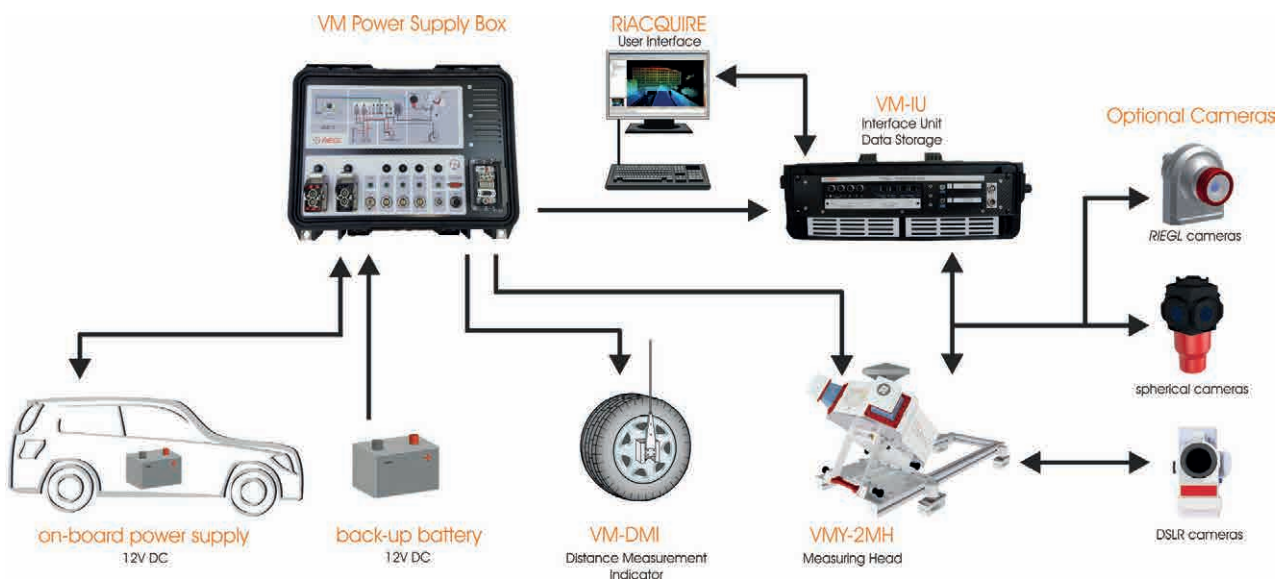
RIEGL VMY-2 System Block Diagram

RIEGL VMY-2 System Components

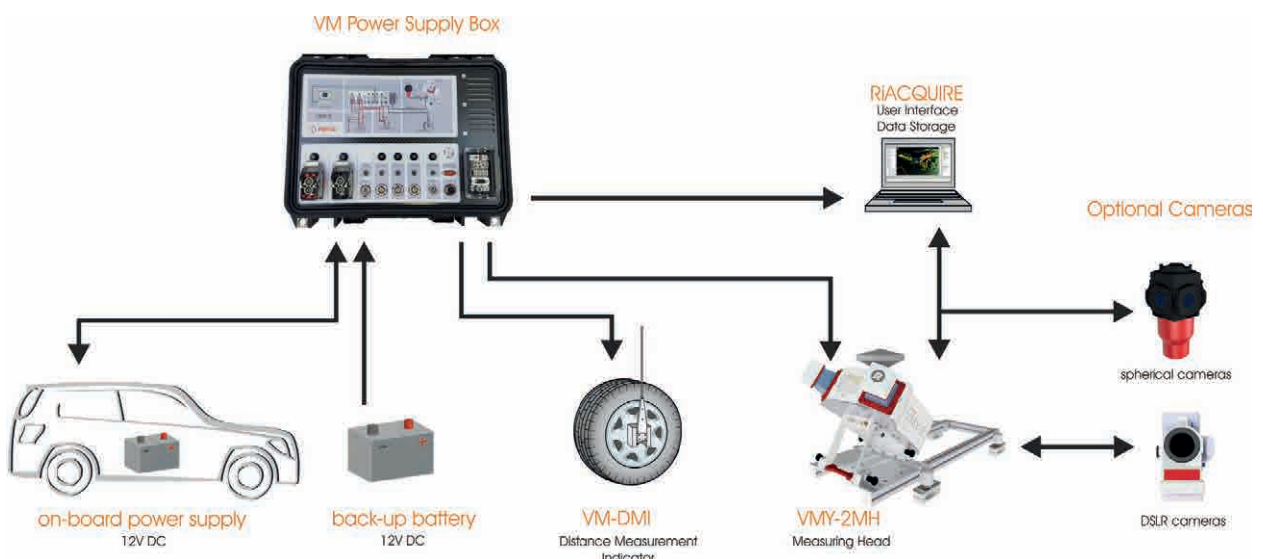
- RIEGL VMY-2MH Measuring Head
- RIEGL VM-IU Interface Unit
- RIEGL VM Power Supply Box
- VM-DMI Distance Measurement Indicator
- sustainable power supply with back-up battery
- connecting cables



RIEGL VMY-2 with VM-IU and RIEGL cameras



RIEGL VMY-2 with data acquisition laptop and spherical camera



RIEGL VMY-2 Setup and Components

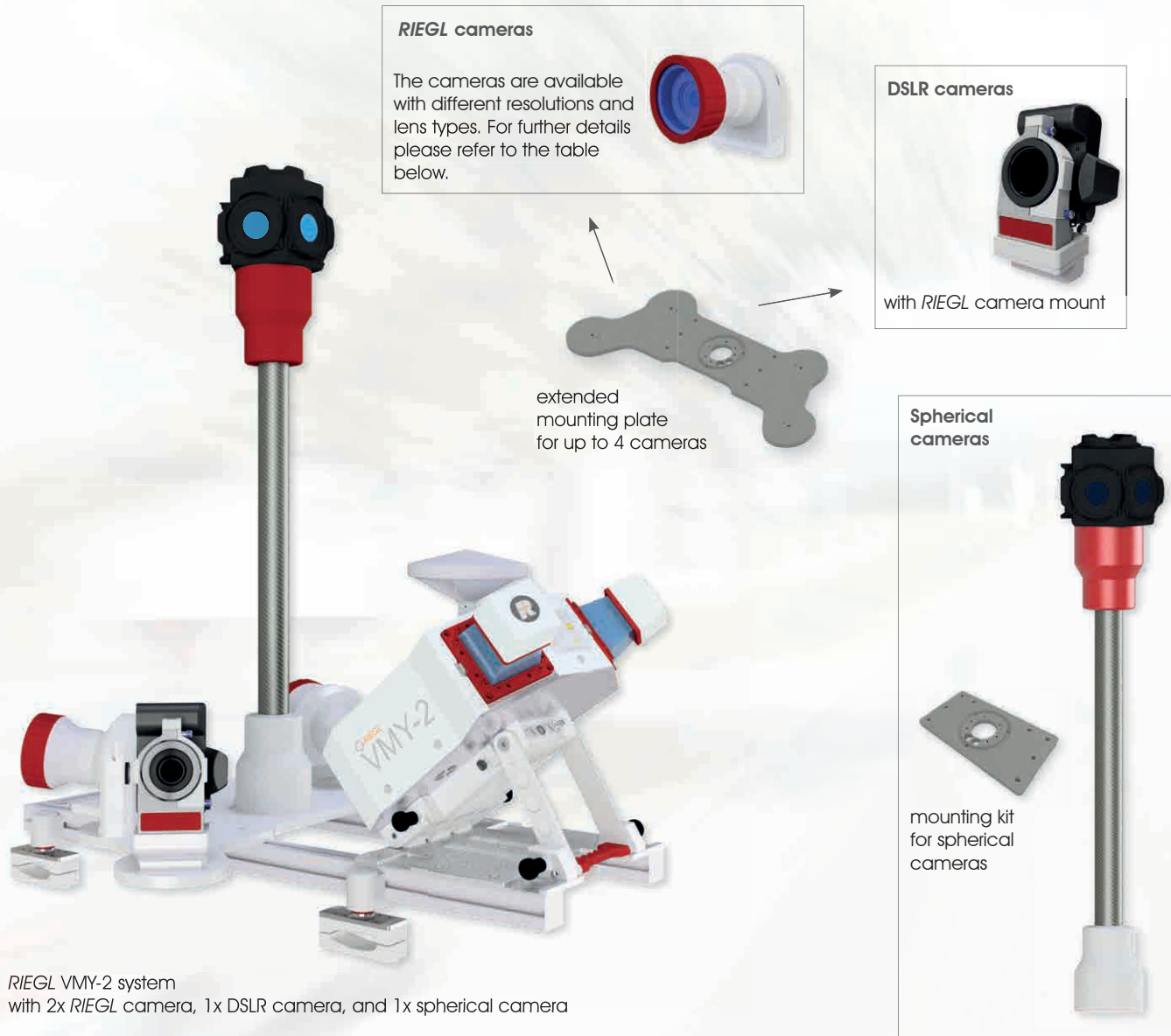


Physical Data

	Main Dimensions (L x W x H)	Weight (approx.)
VMY-2MH Measuring Head (in measuring position) with IMU (Option A) / IMU (Option B)	405 x 436 x 437 mm	11.6 kg / 13.6 kg
VMY-RM Roof Mount including mounting plate and mounting brackets, without GAMS	1006 x 441 x 171 mm	12 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
VMY-MC Main Cable	standard length 5 m	0.6 kg

RIEGL VMY-2 Camera Options

Cameras such as *RIEGL* cameras (5 MP, 12 MP, or 24 MP), high resolution DSLR cameras up to 45-mega-pixel, or various spherical cameras up to 72 MP can be seamlessly integrated into the entire acquisition and processing workflow.



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) 5)}	2	20	2464 x 2056	3.45	5	80.7° x 70.7°
12 MP RAW ^{3) 5)}	2	8	4112 x 3008	3.45	8 / 16	83.1° x 65.9° / 47.8° x 35.9°
12 MP JPEG ^{3) 5)}	2	17 ⁴⁾	4112 x 3008	3.45	8	83° x 66°
24 MP RAW ^{3) 5)}	2	4.5	5328 x 4608	2.74	8	79.5° x 71.5°
24 MP JPEG ^{3) 5)}	2	9 ⁴⁾	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 the 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⁾ @ 90% image compression

⁵⁾ The *RIEGL* cameras require the usage of the VM-IU Interface Unit.

Specifications *RIEGL* Cameras

RIEGL offers high-sensitive ball-joint directional cameras (5 MP, 12 MP, and 24 MP) with leading edge CMOS technology for high resolution images, high frame rates, and minimized lens distortion. The camera's CMOS global shutter sensor provides a high dynamic range, hardly any smearing effects caused by sunlight, great details in shadows and highlights, and low temporal dark noise for more signal gain up to 40 dB.

The VMY-2 system allows the integration of up to two *RIEGL* cameras to the appropriate mounting plate. While horizontal mounting allows standard picture acquisition, nadir mounting enables acquisition of the road surface.



horizontal mounting of *RIEGL* cameras

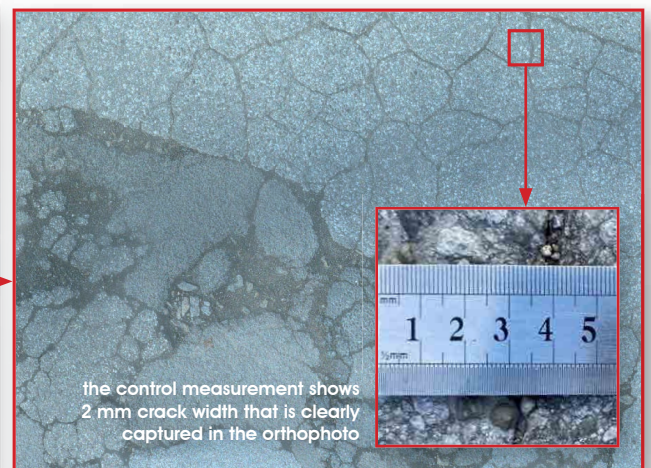
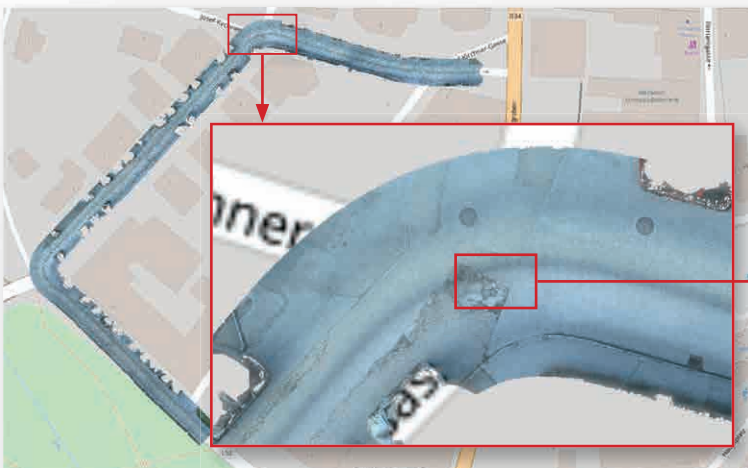


NADIR orientation of the *RIEGL* cameras with pavement mount

Mounted in nadir orientation the cameras allow focusing on the road surface, so that a lane width can be reliably covered in any case.

Used in nadir mounting the *RIEGL* cameras offer

- detailed capturing of the road surface
- reliable data for pavement analysis and crack indexing
- little distortion of projected image on road surface
- generation of true-orthophotos with up to millimeter resolution



application example of pavement data acquisition with subsequent generation of true-orthophotos (RIPROCESS)



RIEGL VMY-2 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

VMY-2 Scanner Performance

Laser Class	Laser Class 1 (Class 1 Laser Product according to IEC 60825-1:2014)		
Effective Measurement Rate ¹⁾	200 kHz	400 kHz	600 kHz
Max. Range, Target Reflectivity $\rho \geq 80\%$ ²⁾	270 m	240 m	200 m
Max. Range, Target Reflectivity $\rho \geq 60\%$ ²⁾	240 m	210 m	170 m
Max. Range, Target Reflectivity $\rho \geq 20\%$ ²⁾	140 m	120 m	100 m
Max. Number of Targets per Pulse ³⁾	5	5	5
Minimum Range	1 m		
Accuracy ⁴⁾ ⁶⁾ / Precision ⁵⁾ ⁶⁾ ⁷⁾	10 mm / 10 mm		
Field of View (selectable)	up to 360°		
Scan Speed ⁸⁾ (selectable)	up to 300 scans/sec		

1) Rounded values.

2) 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.

3) If more than one target is hit, the total laser transmitter power is split and, accordingly, the achievable range is reduced.

4) Accuracy is the degree of conformity of a measured quantity to its actual (true) value.

5) Precision, also called reproducibility or repeatability, is the degree to which further measurements show the same result.

6) One sigma @ 50 m range under RIEGL test conditions.

7) Degraded precision on targets with very low reflectivity below 1.5 m range.

8) Equivalent to revolutions per seconds.

IMU/GNSS Performance ⁹⁾	AP+30	AP+50	AP+60
Position Accuracy Horizontal	typ. 0.02 m	typ. 0.02 m	typ. 0.02 m
Position Accuracy Vertical	typ. 0.03 m	typ. 0.03 m	typ. 0.03 m
Roll & Pitch Accuracy ⁹⁾	0.010°	0.005°	0.0025°
Heading Accuracy ⁹⁾	0.025° ¹⁰⁾	0.015° ¹⁰⁾	0.015°

9) 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 outage, with DMI option.

10) Improved heading accuracy with dual antenna option @ 2 m base line.

General Technical Data

Power Supply Input Voltage	11 - 15 V DC
Power Consumption	typ. 77 W (max. 228 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 (VMY-2MH)	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 1x secondary antenna connector for GPS azimuth measurement subsystem	1x DMI input (for distance measuring indicator; odometer) 3x power supply socket (2x 24V DC/ 1x 12V 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 from a spherical camera) 1x display port 1x WLAN (integrated antenna) 1x Bluetooth (integrated antenna) 2x slot for removable hard disk 1x power supply input (+24V DC) 1x power supply output (+24V DC) for display (touchscreen)