



# Specification

## Multispectral Imaging System

### MSIS-RGBN-1-A



MSIS-RGBN-1-A

Specifications subject to change

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# Background Information

## Trademarks

Spectral Devices Inc., MSC2, MSIS-RGBN-1-A, mcCapture

## Sales and Support

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# 1. Description

The MSIS-RGBN-1-A is a multispectral imaging system incorporating an MSC2-RGBN-1-A snapshot multispectral camera, a 4-channel LED illuminator and a control box with embedded vision computer and software.

The MSIS does not require additional computers or hardware to operate. The MSIS can be powered with an 18V to 75V DC power source such as a battery system. A separate AC power supply is included for operation from a 110-240 V AC power source.

The camera head, control box and cabling are waterproof and dustproof (IP67 rated). The system is constructed from durable CNC-machined aluminum components.

The system saves multispectral images to a micro-SD card for quick and reliable data transfer. A text-based configuration file on the SD card allows users to easily configure camera and LED settings. Image acquisition is started and stopped from a pushbutton on the front of the control box. A second push button allows users to shut down the MSIS to remove the SD card.

There are several built-in integration options that allow the MSIS to synchronize with other equipment. In addition to manual operation through the front panel, users can control image acquisition using simple commands over a network connection, and digital signals from an external clock timing source. Detailed logs of system operation are written to the SD card and available to users for offline analysis.

# 2. Key Features

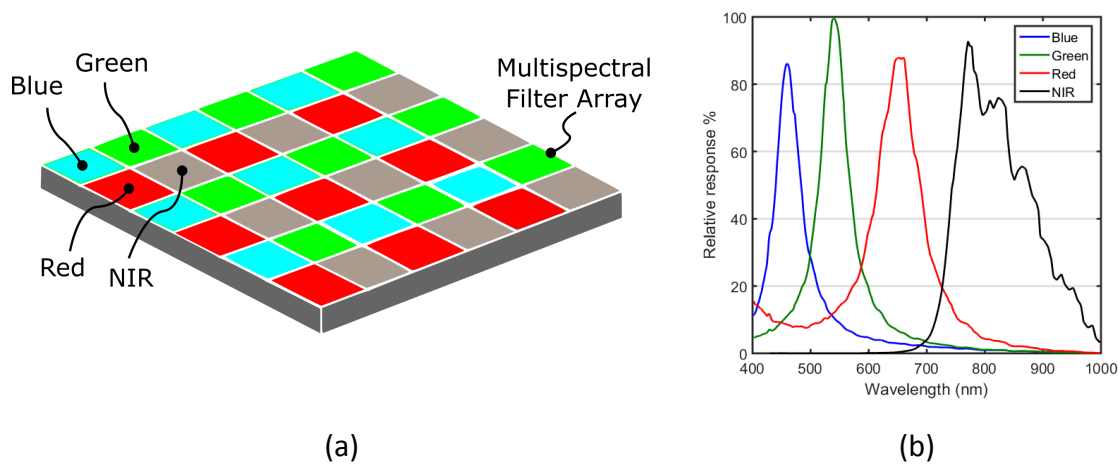
- Snapshot Operation (capture spectral images simultaneously)
- Captures 4 Bands (450, 550, 650, 800 nm)
- Anti-X-Talk™ Technology (enhances contrast and spectral performance)
- High Performance (4MP Global Shutter CMOS Sensor)
- USB3 Vision & GenICam Compliant
- High power pulsed LED light source (pulse duration from 1  $\mu$ s to 999  $\mu$ s)
- Compact waterproof and dustproof camera head and cable connections (IP67)
- Operates from AC or DC power supply
- Water resistant control module with computer and all software included
- Easy camera configuration using configuration file on SD card
- Real-time multispectral display over HDMI
- Sustained frame rates of up to 10 FPS (MSC2, 8bit, decimated) with simultaneous recording to SD card
- Over 8 h of sustained frame recording at 1 FPS (8 bit)

### 3. Applications

- Greenhouse monitoring of plants
- Research and development
- Industrial machine vision
- Tractor-mounted imaging applications
- CCTV-like monitoring
- Biomedical research
- Time-lapse multispectral imaging

### 4. Sensor and its Spectral Characteristics

The MSC2-RGBN-1-A camera has 4 distinct bands centered at 450, 550, 650, 800 nm (FWHM ~70 nm). The sensor of the camera is covered with a multispectral filter array providing each sensor element (pixel) its own spectral response (Fig.4.1a). Spectral response of the MSC2-RGBN-1-A camera sensor is displayed in Fig.4.1b.



**Figure 4.1.** (a) Example of MSC2-RGBN-1-A multispectral filter array structure (note: band arrangement can vary between cameras) (b) Spectral response of the MSC2-RGBN-1-A camera.

### 5. Anti-X-Talk™ Technology

Anti-X-Talk™ technology is a unique Spectral Devices Inc. on-chip technology working at the filter level and preventing light leakage between individual filters. Without Anti-X-Talk™ technology, stray light between spectral channels is significant, often exceeding the light leakage due to spectral overlap between adjacent filters. As a result images suffer from low contrast and spectral ambiguity.

Spectral Devices invented Anti-X-Talk™ technology to overcome these problems. It works by blocking stray light between adjacent filters, making the pixel response more predictable and directly related to the actual spectral response of the overlying pixelated filter. The result is multispectral images with better spectral discrimination and higher contrast.

Furthermore, high quality image data from the MSC2-RGBN-1-A can be used as is without the need for proprietary post-processing algorithms and the camera can be used with a wide range of lens types even at large apertures (e.g. f/2).

## 6. Specifications

Camera	MSC2-RGBN-1-A (see spec. for more info) Sensor size: 1" Bands: 450, 550, 650, 800 nm
Lens	C-mount, 8.5 mm to 50 mm focal lengths available Manual iris, manual focus, locking screws Optional electronic focus and iris
Number of LED channels	4
Number of LEDs per channel	8 (80W per channel)
LED control	Each channel is controllable via software configuration file on SD card. Strobe output from the camera flashes all 4 LED channels simultaneously. Other sequences customizable by user.
LED channels	450, 550, 650, 800 nm
Exposure Modes	Timed exposure (22 $\mu$ s – 1.5 s). Timed interframe interval (5.7 ms – years).
External Trigger	Hardware trigger 5-24 V DC signal (rising or falling edge), pre-wired to LED controller or externally triggerable through M12 connector.
Network	1Gb Ethernet (RJ45)
Operating System	Linux
Software	Preconfigured image acquisition software on board control box
External construction	6061 aluminum, polycarbonate, and 316 stainless steel hardware
Surface finish	black anodization, polycarbonate
Power Requirement	18-75 V DC (60 W) A separate AC power supply is included for operation from a 110-240 V AC power source.
Dimensions	Camera head: 260 mm diameter x 170 mm deep Control module: 146 mm x 200 mm x 270 mm (HxWxD)
Weight	Camera head: 2.5 kg Control box: 4 kg

## 7. Package Contents

The MSIS is shipped with several items including the camera head, control box, 48V DC power adaptor, power adaptor, power cord, mounting bracket, micro-SD card, and several M12 cables. All components are shipped in a waterproof case.

Camera Head



Control Box



48V DC power adaptor



AC power cord



Mounting bracket & hardware



MicroSD card and adaptor



Camera trigger cable



LED power cable



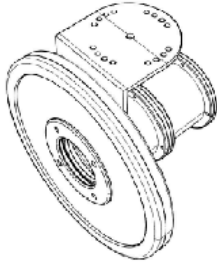
Network cable



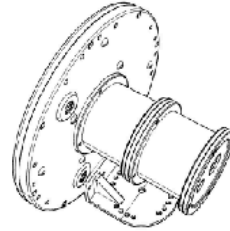
**Figure 7.1.** Items shipped with the MSIS

## 8. Drawing: Camera Head

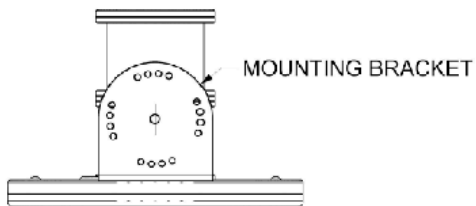
RENDERED TOP VIEW



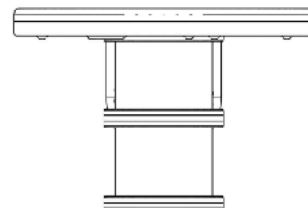
RENDERED BOTTOM VIEW



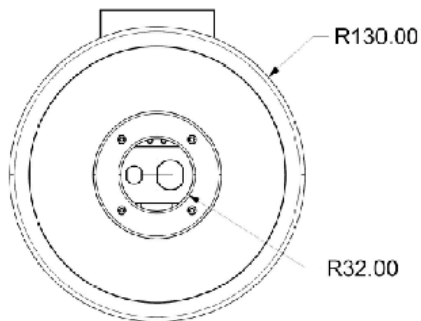
TOP VIEW



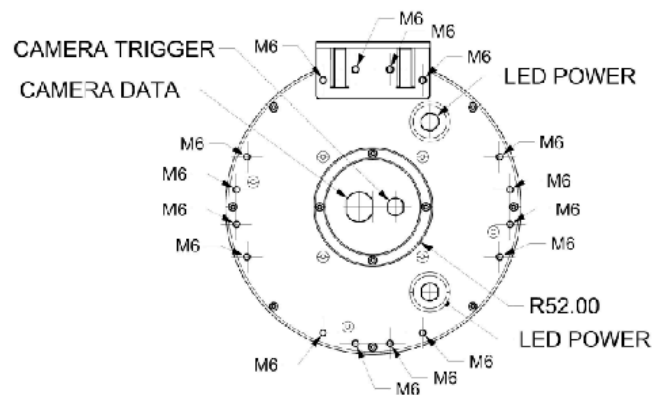
BOTTOM VIEW



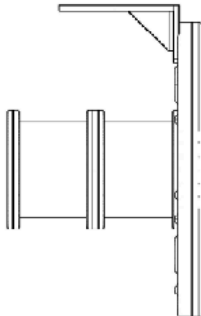
FRONT VIEW



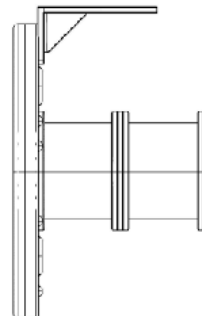
BACK VIEW



LEFT VIEW



RIGHT VIEW





## 9. Photos: Camera Head

Front View



Back View



Side View



Perspective View



Figure 9.1. Camera head photos

## 10. Photos: Control Box

Front View



Back View



Front View (open)

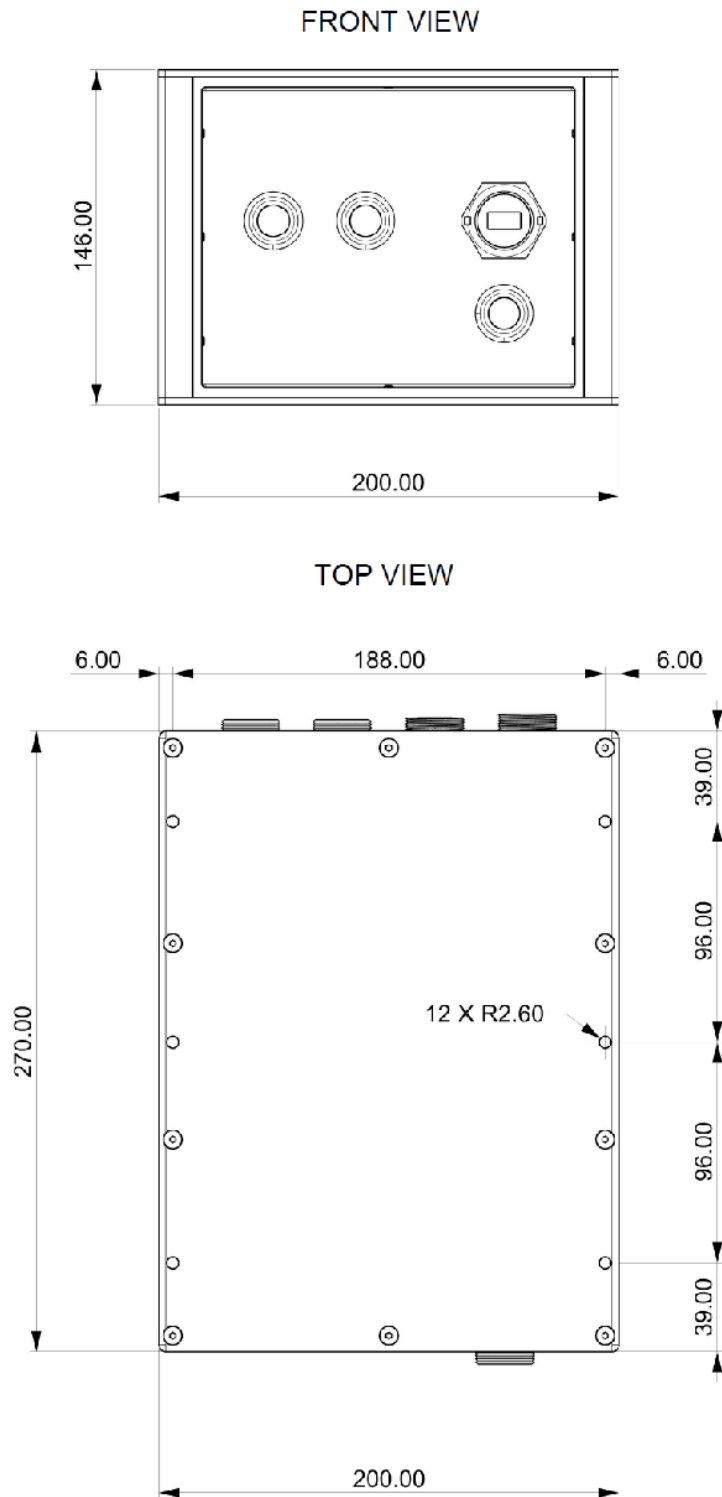


Back View (open)



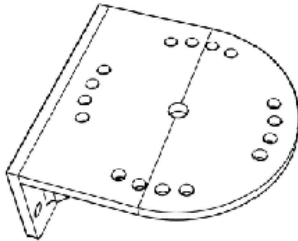
Figure 10.1. Control Box photos

## 11. Drawing: Control Module

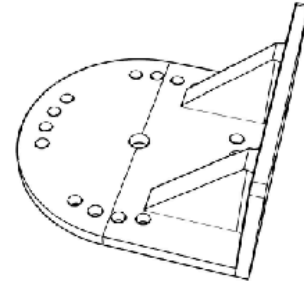


## 12. Drawing: Mounting Bracket

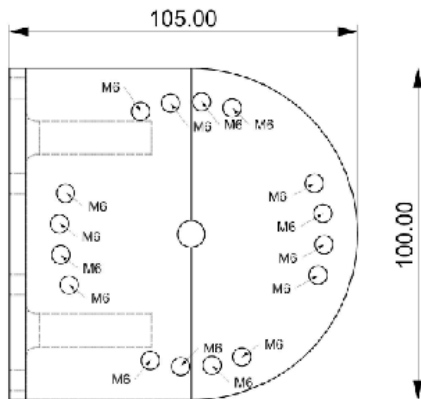
RENDERED TOP VIEW



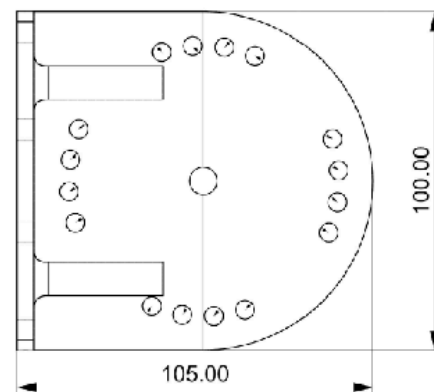
RENDERED BOTTOM VIEW



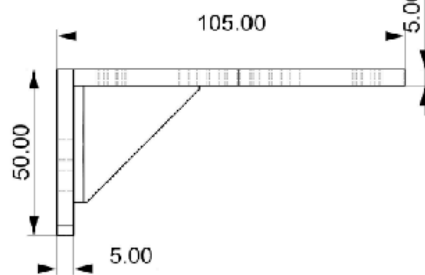
TOP VIEW



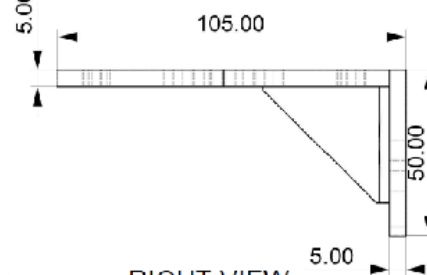
BOTTOM VIEW



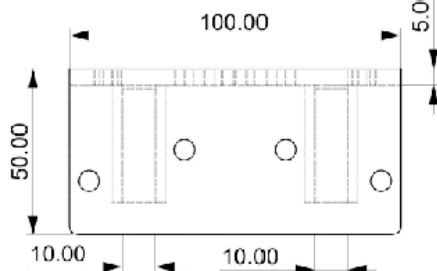
FRONT VIEW



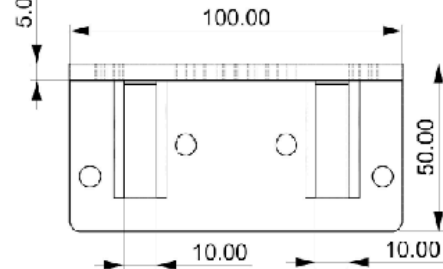
BACK VIEW



LEFT VIEW

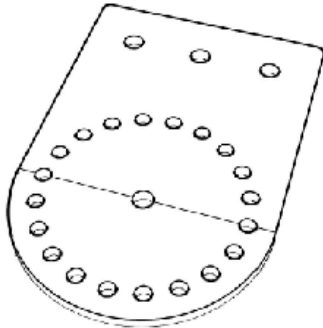


RIGHT VIEW

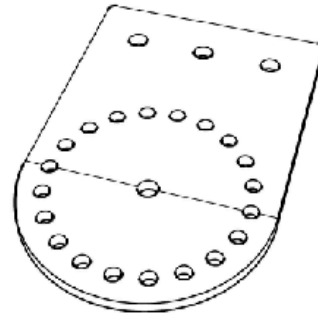


## 13. Drawing: Mounting Plate

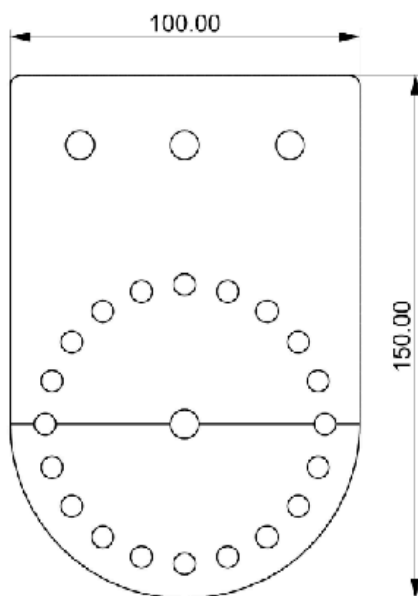
RENDERED TOP VIEW



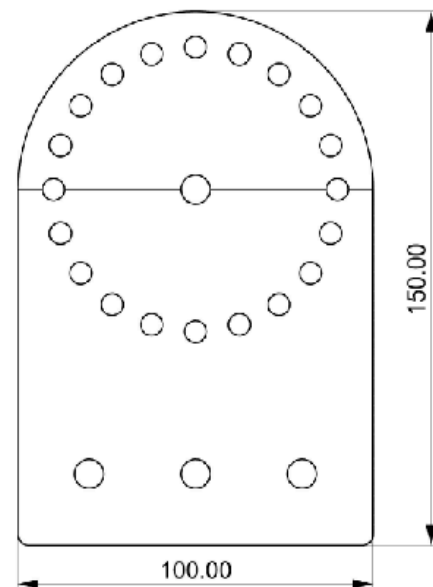
RENDERED BOTTOM VIEW



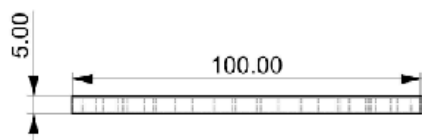
TOP VIEW



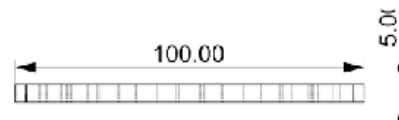
BOTTOM VIEW



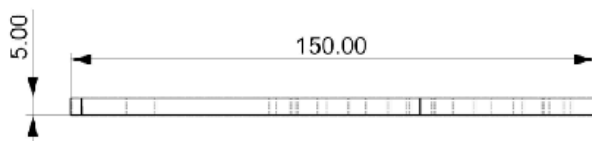
FRONT VIEW



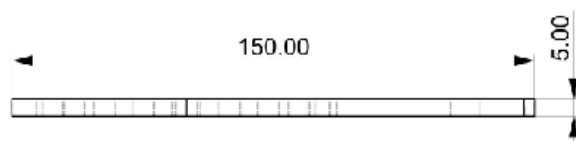
BACK VIEW



LEFT VIEW



RIGHT VIEW



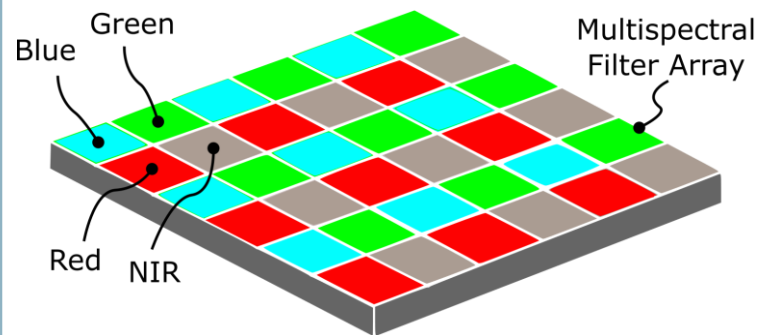


The MSIS RGBN is a multispectral imaging system incorporating an MSC2-RGBN-1-A snapshot multispectral camera and a 4-channel LED illuminator into a single waterproof and dustproof camera head.

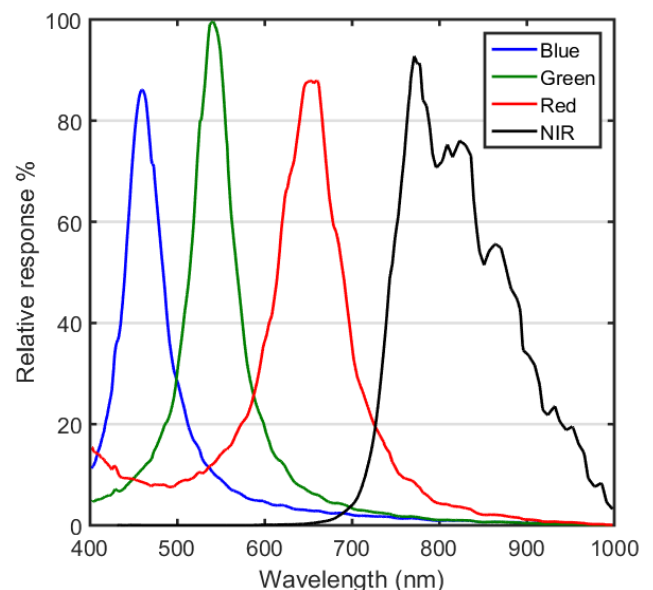
## FEATURES

- Captures co-registered spectral images simultaneously
- 4 bands – 450, 550, 650, 800 nm
- Anti-X-Talk™ Technology - enhances contrast and spectral performance
- Sustained frame rates @ 178 FPS
- 4MP Global Shutter CMOS sensor
- High power pulsed LED light source
- Compact waterproof and dustproof camera head and control unit
- Accommodates c-mount lenses
- Camera head: 2.5 kg, Control box: 4 kg

## SENSOR



## SPECTRAL RESPONSE



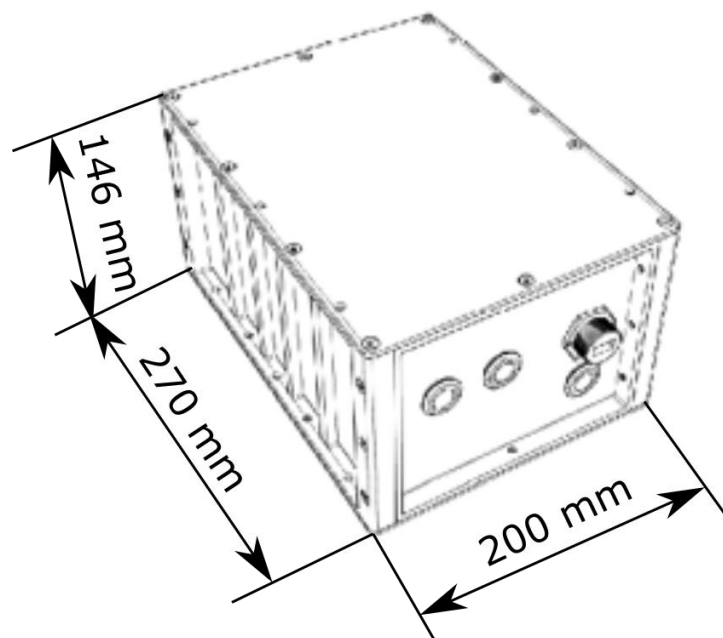


## TECHNICAL SPECIFICATIONS

Feature	Description
# of bands	4
Band Locations for LED and Camera	450, 550, 650, 800 nm
Camera Spectral Bandwidth	~70 nm
Pixels/band	512x512
Camera	MSC2-RGBN-1-A, 1-inch, CMOS
Effective pixel size	5.5 x 5.5 $\mu\text{m}$
Shutter Type	Global
Frame Rate	8bits @ 178 fps 10bits @ 90 fps 12bits @ 74 fps
Exposure Time	22 $\mu\text{s}$ to 16.77 s
Lens Compatibility	c-mount, 6mm to 50mm focal lengths available, manual iris, manual focus, locking screws
Connectors	USB 3.0, Hirose
System Sync	External trigger (Hardware, Software), Free run

## DIMENSIONS

Control box



Camera head

