



Product Sheet

UV/NIR Multispectral Camera

MSC-UN-1-A



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MSC-UN-1-A

Specifications subject to change

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Version 001

¹ Shown with example lens. Lens not included with camera.

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1. Description

The MSC-UN-1-A multispectral camera incorporates a high performance 4MP CMOS sensor that is modified with Spectral Devices proprietary multispectral filter array technology. This multispectral snapshot camera simultaneously captures images at 2 distinct bands at up to 94 frames per second in full frame mode. There is no requirement for additional filters, filter wheels, or tunable filters. The spectral information in the 4 bands is captured simultaneously by the multispectral sensor. The camera offers 2 bands of spectral discrimination spaced. The first band is centered at 400 nm. The second band is centered at 800 nm. The camera is USB3 Vision-compliant with many pre-built software options such as 2ndlook graphical camera software. Programmers can build camera applications in Windows and Linux using a variety of SDKs. Power is supplied through the USB3 interface. The MSC-UN-1-A is compact, light, and designed for unique imaging applications.

2. Key Features

- Snapshot Operation (capture spectral images simultaneously)
- Captures 2 Bands (400, & 800 nm)
- Anti-X-Talk™ Technology (enhances contrast and spectral performance)
- High Frame Rate (up to 94 FPS at full frame)
- High Performance (4MP Global Shutter CMOS Sensor)
- USB3 Vision & GenICam Compliant
- Compact (56 mm x 50 mm x 52 mm)
- Light (200 g)
- Low Power Requirement (< 5W from USB cable)
- Multiple M3, ¼-20, and 4-40 Mounting Points
- SDK for Windows included
- SDK for Linux (optional)

3. Applications

The camera is suitable for applications such as cosmetic and horticultural research (see examples below). Combined with Spectral Devices SBC-1 miniature vision computer, the MSC-UN-1-A offers an easy-to-use lightweight and modular imaging solution for UAV users.

Example Images



UV (left) and NIR (right) images of human hand with sun screen applied



Color image of human hand



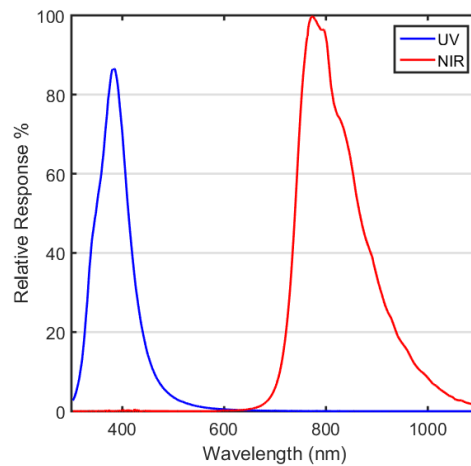
UV (left) and NIR (right) images of a flower



Color image of a flower

4. Spectral Characteristics

Spectral response of the MSC-UN-1-A filter set



5. Anti-X-Talk™ Technology

Unique to Spectral Devices is an on-chip technology we refer to as Anti-X-Talk™ technology. Anti-X-Talk™ technology works at the filter level and prevents 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. Without Anti-X-Talk™ technology, 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, so the pixel response is 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 camera 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

Lens Mount	C-mount
Sensor Type	CMOS
Sensor Model	AMS CMV4000
Sensor Format	1-inch
Number of Spectral Channels	2
Image Pixels Per Spectral Channel	2048 x 512 (2048 x 1024 after debayering)
Effective Pixel Size (H x V)	5.5 μm x 5.5 μm
Capture Method	Area
Spectral Channels	400, 800 nm
Spectral Bandwidth (FWHM)	~100 nm
On-chip Spectral Enhancement	Anti-X-Talk™ Technology
Shutter Type	Global
Sync System	External trigger (Hardware, Software) / Free run
Maximum Frame Rate (at Full Frame). Frame rate increases with smaller frame size	8 bit output 94 fps 10 bit output 75 fps 12 bit output 62 fps
A/D Converter	10 and or 12 bits in sensor
Video Data Output	8, 10 and 12-bit
Image Data Formats	Mono/Multispectral: 8 or 10 bit packed, 12 bit packed Color: Bayer 8 or 10 bit packed, RGB, YCC 422
Dynamic Range	60 dB
Exposure time	200 μs to 1.5 seconds (Default: 15,000 μs)
Digital Gain	Supported
Black Level	Supported
ROI	Up to 16 ROIs
Binning	Available in horizontal direction

Decimation	Not Available
HDR	Not Available
Image Flip	Not Available
Defective Pixel Correction	Turned off for multispectral readout
Auto Exposure	Not Supported
Auto Gain	Not Supported
GPIO	12-pin Hirose HR10A GPIO, opto isolated trigger, 2 opto isolated strobes
External Trigger Modes	Single Frame, Burst Mode, Bulb Mode
Synchronization	Via external trigger or software trigger
Image Buffer	256 MB Buffer
Dimensions (W x H x D)	56 mm x 50 mm x 52 mm
Mass	200 g
Power Consumption	5V via USB3.0 interface, maximum <4.5W
Compliance	CE, FCC, RoHS
Operating System	Windows, Linux
Warranty	One Year

7. MSC Camera Physical Properties

Appearance

The MSC series camera has a CNC precision machined aluminum case for strength that is anodized black for durability (Figure 7.1). The C-mount lens holder is centered with respect to the front of the case for easy alignment. The case offers three sets of deeply threaded holes enabling a wide variety of mounting options.

Front Perspective



Front

Side



Back

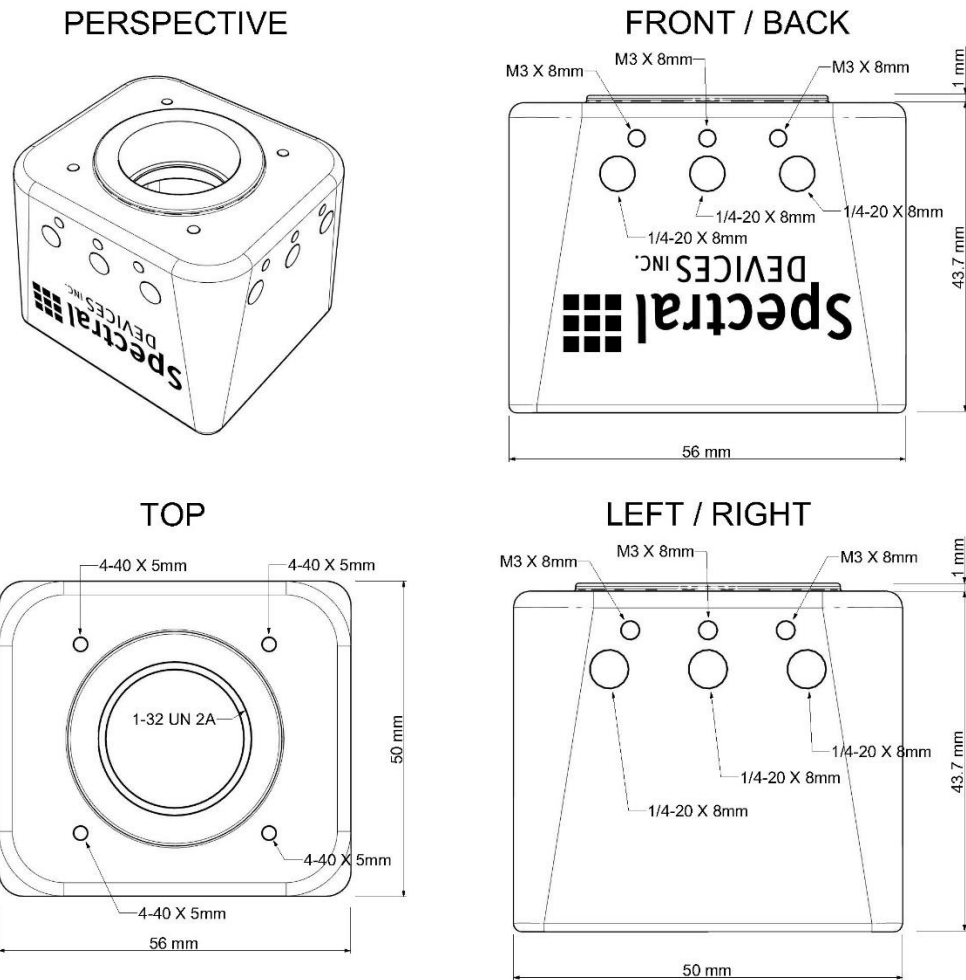


Photos of the MSC-series camera.

Exterior features

1. Lens holder
 - C-mount lens ready.
2. Glass or filter
 - Some models of cameras are fitted with a protective glass, an IR Cut filter, or a specialized filter, which is mounted at the back of the Lens Holder. The glass or filter is held in place with a retaining ring. Although the glass and filter are removable, doing so will void the warranty since the sensor will be unprotected and easily damaged.
3. M3x0.5 mounting holes
 - Twelve locations on camera case for multiple mounting options.
4. ¼-20 mounting holes
 - Twelve locations on camera case for multiple mounting options.
5. 4-40 mounting holes
 - Four locations on front of camera case for mounting 30 mm cage components from Thorlabs and Newport.
6. General purpose I/O connector
 - A 12 pin Trigger/Strobe connector.
7. Status LED
 - Indicates the current state of the camera operation.
8. USB3 connector

Mechanical Drawings



Dimensional drawings of MSC-UN-1-A. All measurements in mm.

8. Software

The MSC series of cameras can be controlled using various software packages, including:

1. IO Industries 2ndLook
2. National Instruments LabVIEW with Vision
3. MATLAB
4. Pleora eBUS SDK
5. JADAK Medley SDK

USB3 Vision is a communication interface for vision applications based on the USB 3.0 technology. All cameras supporting USB3 Vision interact the same way with software also supporting USB3 Vision. All MSC cameras are USB3 Vision compliant.

The USB3 Vision standard defines required elements for camera identification, control, and output. It uses GenICam, a programming interface for camera attribute control. GenICam allows camera vendors to define features and attributes in an XML file stored inside the camera. The file is parsed by the host application when the camera is initially discovered. One of the key benefits of GenICam is the ability for camera vendors to introduce new camera-specific features without needing to update the host application.

Each camera attribute, such as exposure time, is controlled by a specific GenICam feature. The camera includes an XML device description file for interfacing with third-party GenICam-compliant APIs. A full listing of features that are included in the XML file is provided in the user manual.

For more information on the USB3 Vision standard, visit visiononline.org.

For more information on GenICam, visit <http://www.emva.org/standards-technology/genicam/>

IO Industries 2ndLook

2ndLook is a complete image acquisition software package that enables users to connect and acquire images from one or more cameras on a single PC. The software offers real-time synchronized video recording from GenICam-compliant USB3 Vision, GigE Vision, and DirectShow cameras. Easily record directly to popular file formats such as AVI and TIFF. Even record from multiple cameras to different file formats concurrently. For example, record from a USB3 Vision camera to QuickTime and from a GigE Vision camera to TIFF at the same time. 2ndLook offers an easy-to-use interface with interactive help and user guides. 2ndLook must be purchased separately. See Section 9 for a detailed example.

National Instruments LabVIEW

National Instruments LabVIEW can be used for MSC control and image acquisition if the LabVIEW Vision component is installed.

MATLAB

Users can acquire images and video from MSC cameras using MATLAB. MATLAB provides a high-level programming language to manipulate data in matrix format. Users can modify the graphical interface using MATLAB's GUIDE and program new features into the example code to solve a specific imaging task. MATLAB must be purchased separately, but an example application with source code is provided with every MSC camera.

Pleora eBUS SDK

The Pleora eBUS SDK is the industry standard for USB3 Vision cameras that allows customers to create custom applications to control MSC cameras in Windows and Linux. Included in the SDK are a number of source code examples to help programmers get started. For end users, a full-featured USB3 vision camera viewer application is provided. The Pleora eBUS SDK must be purchased directly or through a Pleora channel partner. Please visit www.pleora.com for more information.

JADAK Medley SDK

Similar to the Pleora eBUS SDK, the JADAK Medley SDK enables users to program MSC using a variety of languages on Windows platforms. The Medley SDK is provided with every MSC camera free of charge. Our MATLAB code requires that the Medley SDK be installed. The Medley SDK is available at <https://www.jadaktech.com/products/machine-vision/medley-software-development-kit/>.

9. Windows Software (optional)

2ndLook is a complete image acquisition software package that enables users to connect and acquire images from one or more multispectral cameras on a single PC. Offers real-time synchronized video recording from GenICam-compliant USB3 Vision, GigE Vision, and DirectShow cameras (Figure 9.1). Easily record directly to popular file formats such as AVI and TIFF. Record from multiple cameras to different file formats concurrently. Multispectral imaging conversion filters for Spectral Devices cameras are built in (Figure 9.2). View montage of spectral images in real-time (Figure 9.3). Easy to use interface with interactive help and user guides. Demo version provides all features, except save to disk function.



Figure 9.1. Real-time display of raw multispectral images.

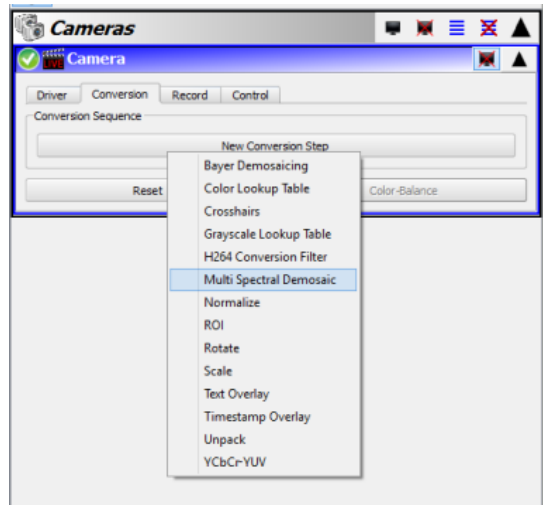


Figure 9.2. Multispectral conversion filters



Figure 9.3. Real-time display of multispectral images in montage format. Example here collected with 4-band multispectral camera for agriculture.