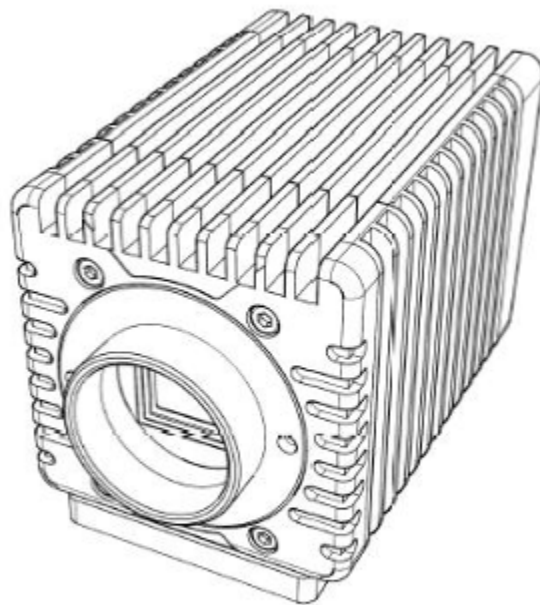




Specification

16 Band SWIR Multispectral Camera

MSC-SW16-1-A



MSC-SW16-1-A

Specifications subject to change

Revised April 24, 2024

Version 008

Table of Contents

Background Information	3
Trademarks	3
Sales and Support	3
1. Description	4
2. Key Features	4
3. Applications	4
4. Spectral Characteristics	5
5. Anti-X-Talk™ Technology	5
6. Specifications	6
7. Mechanical Drawings	8
8. External Connector Specifications	9
9. SDKs	9
10. Windows Software (optional)	9

Background Information

Trademarks

Spectral Devices Inc., MSC, MSC-SW16-1-A

Sales and Support

Contact Type	Contact Information
Email	sales@spectraldevices.com support@spectraldevices.com
Knowledge Base and Downloads	www.spectraldevices.com
Main Office	Spectral Devices Inc. 800 Collip Circle, Suite 129-130 London, Ontario, Canada N6G 4X8 +1-888-988-2077

1. Description

The MSC-SW16-1-A is a 16-band multispectral snapshot camera with high sensitivity in the SWIR range. The camera incorporates a high performance InGaAs sensor that is modified with Spectral Devices proprietary multispectral filter array technology.

This compact multispectral snapshot camera simultaneously captures images at 16 distinct bands (spaced between 1125 and 1640 nm) at 100 frames per second in full frame mode. There is no requirement for additional filters, filter wheels, or tunable filters.

The MSC-SW16-1-A offers superior image quality due to onboard thermoelectric cooling (TEC) for low dark current and optimized noise performance. The camera has a GigE Vision interface and is compatible with many pre-built software options such as 2ndlook graphical camera software. Customers can build custom camera applications in Windows and Linux using the SDK. Power is supplied through a 12V DC Hirose connector. The camera works with a broad range of C-mount lenses.

2. Key Features

- Snapshot Operation (capture spectral images simultaneously)
- Captures 16 Bands (equally spaced between 1125-1640 nm)
- Anti-X-Talk™ Technology (enhances contrast and spectral performance)
- High Frame Rate (up to 100 FPS)
- High Performance InGaAs Sensor
- GigE Vision & GenICam Compliant
- Compact (55 mm x 55 mm x 82 mm)
- Lightweight (335 g without lens)
- Low Power Requirement (< 4W without TEC)
- Multiple mounting points
- SDK

3. Applications

The camera is suitable for applications such as waste sorting, food inspection, failure analysis, semiconductor inspection, and thermal imaging of hot objects (300°C to 800°C range). Combined with Spectral Devices SBC-1 miniature vision computer, the MSC-SW16-1-A offers an easy-to-use lightweight and modular imaging solution for UAV users and customers needing a battery-operated solution.

Possible Applications:

- Plastics recycling
- Mineral exploration
- Wildfire response
- Food security

- Mining/Geology
- Urban feature identification (such as roofing and construction materials)
- Vegetation
- Petroleum spill detection
- Snow and Ice discrimination
- Soil moisture estimation

4. Spectral Characteristics

The MSC-SW16-1-A camera has 16 distinct bands centered at 1125, 1160, 1195, 1230, 1265, 1300, 1335, 1370, 1405, 1440, 1475, 1505, 1540, 1575, 1605, 1640 nm (FWHM 25-45 nm). The sensor of the camera is covered with a multispectral filter array providing each sensor element (pixel) its own spectral response. Spectral response of the MSC-SW16-1-A camera sensor is displayed in Fig.4.1.

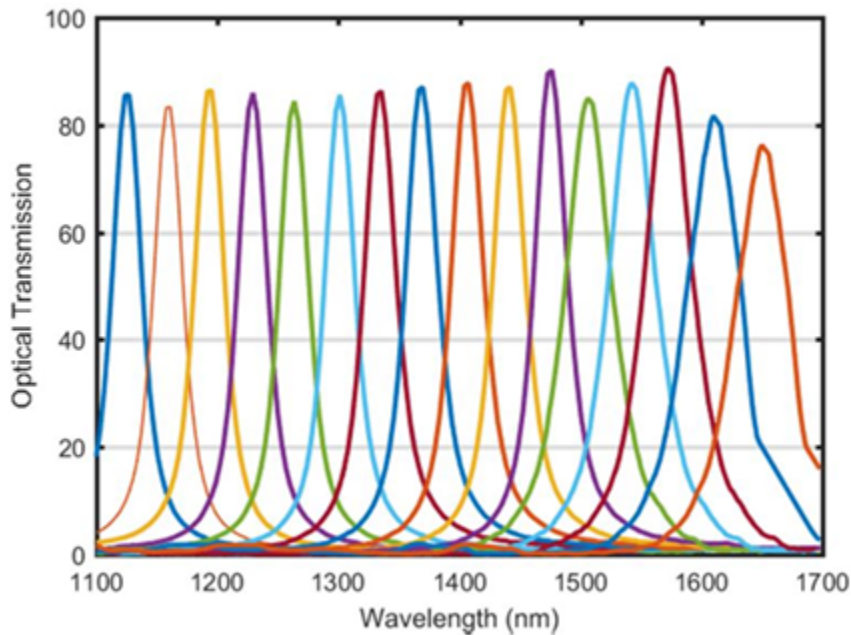


Figure 4.1. Spectral response of the MSC-SW16-1-A camera.

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 MSC-SW16-1-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).

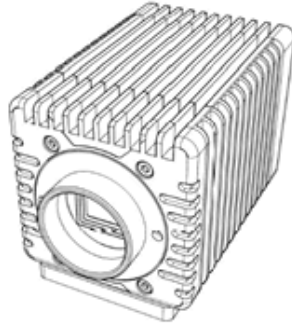
6. Specifications

Lens Mount	C-mount
Sensor Type	InGaAs
Sensor Format	1-inch
Number of Spectral Channels	16
Image Pixels Per Spectral Channel	135 x 105 (540 x 420 after debayering)
Effective Pixel Size (H x V)	20 μ m x 20 μ m
Capture Method	Area
Spectral Channels	1125, 1160, 1195, 1230, 1265, 1300, 1335, 1370, 1405, 1440, 1475, 1505, 1540, 1575, 1605, 1640 nm
Spectral Bandwidth (FWHM)	25-45 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)	100 fps
ADC bit width	14bits
Video Format	GigE Vision 16bit output
Exposure time	100 μ s to 10 ms
ROI	Minimum Size: 32 x 4 Pixels Raw, equivalent to 8 x 1 Pixels per Band
Operational Mode	External trigger / Free run
Communication	Through GigE bus
Interface	GigE (RJ45)
Input / Output	One GPIOs through SME connector
Power Input Voltage	12V DC
Power Consumption	Less than 4.0 W with TEC off
Case Construction	Anodized Aluminum
Overall Size	55 mm x 55 mm x 82 mm (W x H x L)
Weight	335 g
Operational Temperature	-40°C to +70°C
Storage Temperature	-45°C to +85°C

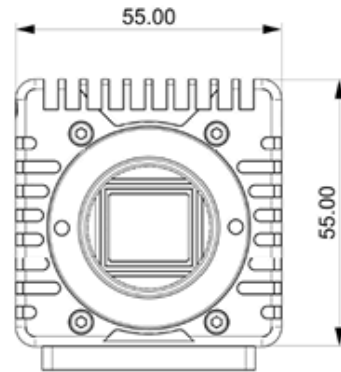
Vibration	Random: IEC60068-2-64 Ed2.0; 4.3 g [20 - 1000 Hz] Sine: IEC60068-2-6 Ed7.0; 1 g [10 - 2000 Hz]
Shock Acceleration	IEC60068-2-27 Ed4.0; half-sine; terminal saw tooth; 50 g [11 ms]
Standard Compliance	CE, RoHS

7. Mechanical Drawings

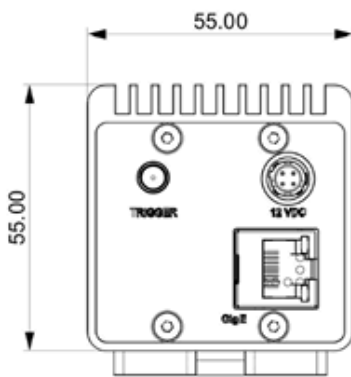
RENDERED VIEW



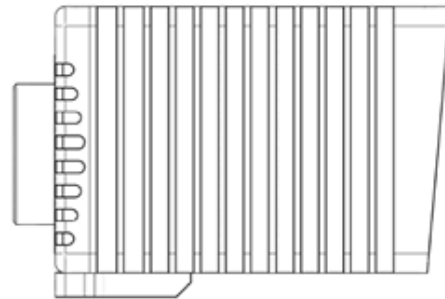
FRONT VIEW



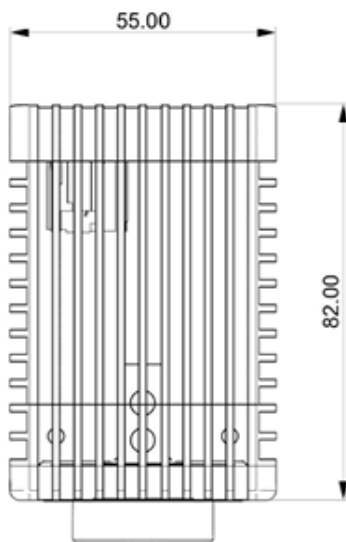
BACK VIEW



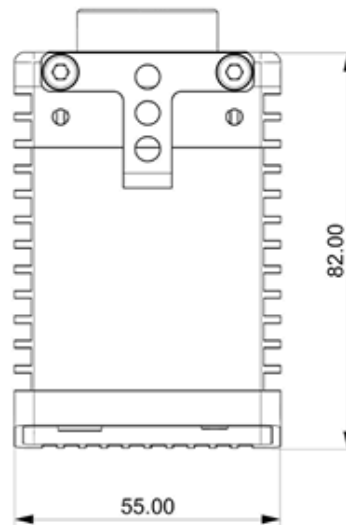
RIGHT VIEW



TOP VIEW



BOTTOM VIEW



8. External Connector Specifications

- RJ45 connector for GigE data.
- Single SMA connector for trigger in or out.
- Hirose HR10-7R-SA[73] for external power.

9. SDKs

The SDK provides a C++ interface (including C and C# samples) for controlling the camera and acquiring images. An extended set of application examples provide starting points for building custom applications. The SDK includes extensive documentation to help developers get up to speed fast. The SDK is tested on all recent versions of Windows, and Ubuntu and Fedora Linux distributions.

10. Windows Software (optional)

2ndLook is an optional image acquisition software package offering a complete solution to the customers looking for a user-friendly way to connect and acquire images without any development experience necessary. The software enables real-time synchronized video and image recording from GenICam-compliant USB3 Vision, GigE Vision, and DirectShow cameras (Fig. 10.1).

2ndLook supports popular file formats, such as AVI, TIFF, PNG, JPEG and allows recording from multiple cameras to different file formats concurrently.

Multispectral imaging conversion filters for Spectral Devices Inc. cameras are built in in the software (Fig. 10.2). This allows users to view montages of spectral images in real-time (Fig. 10.3). The built-in debayering algorithm displays color images from the raw RGB multispectral images.

It is an easy to use interface with interactive help and user guides. Demo version provides all features, except save to disk function.



Figure 10.1. Real-time display of raw multispectral images.

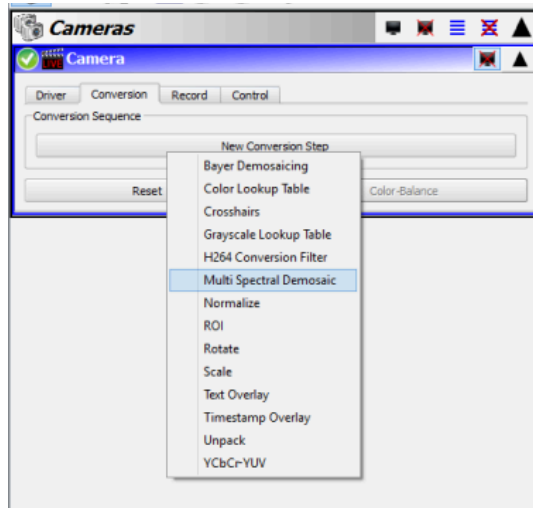


Figure 10.2. Multispectral conversion filters



Figure 10.3. Real-time display of multispectral images in montage format. Example here collected with a 4-band multispectral camera for agriculture.