Spectral DEVICES INC.

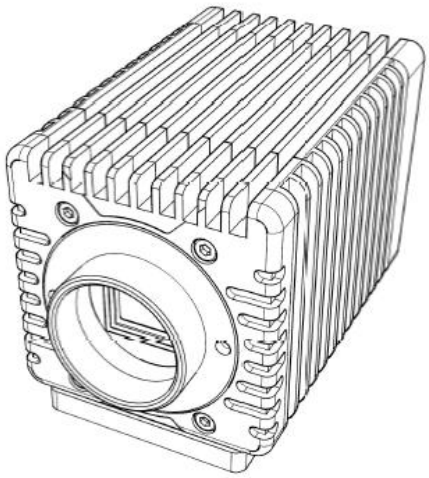
Pembroke Instruments, LLC
120 Stanford Heights Avenue
San Francisco, CA 94127 USA

Tel. 415-860-4217
www.pembrokeinstruments.com
sales@pembrokeinstruments.com

Product Sheet

16 Band SWIR Multispectral Camera

MSC-SW16-1-A



MSC-SW16-1-A

Specifications subject to change

Revised January 2, 2023

Version 07

Table of Contents

1. Description

The MSC-SW16-1-A is a 16-band multispectral snapshot camera with high sensitivity in the SWIR range. The multispectral 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 at 100 frames per second in full frame mode. There is no requirement for additional filters, filter wheels, or tunable filters. The camera offers 16 bands of spectral discrimination spaced between 1125 nm and 1640 nm. The MSC-SW16-1-A offers superior image quality due to onboard thermo electric 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 Equally Spaced Bands (1100-1650nm)
Anti-X-Talk™ Technology (enhances contrast and spectral performance)
High Frame Rate (up to 100 FPS at full frame)
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.

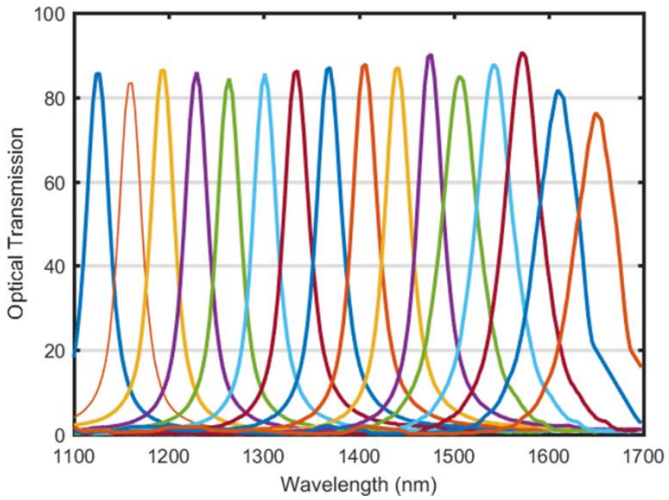
Possible Applications:

- 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

Spectral response of bands in the filter set



On-chip position and bandwidth of spectral bands

Center Wavelength (nm)	Full-Width at Half Maximum (nm)
1125 ± 10	25 ± 5
1160 ± 10	25 ± 5
1195 ± 10	25 ± 5
1230 ± 10	25 ± 5
1265 ± 10	30± 5
1300 ± 10	30± 5
1335 ± 10	30± 5
1370 ± 10	30± 5
1405 ± 10	35± 5
1440 ± 10	35± 5
1475 ± 10	35± 5
1505 ± 10	40± 5
1540 ± 10	40± 5
1575 ± 10	40± 5
1605 ± 10	45± 5
1640 ± 10	45± 5

5. Anti-X-Talk™ Technology

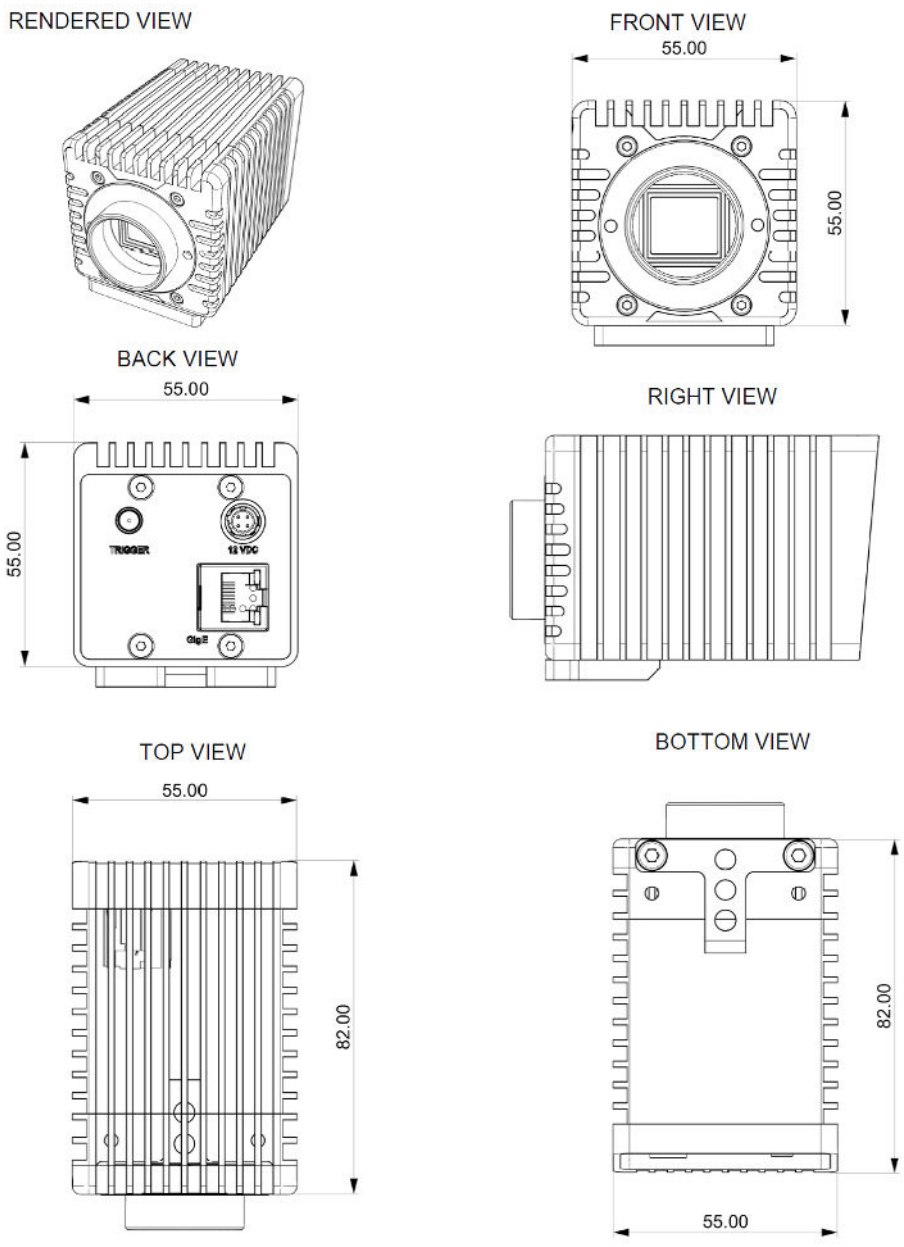
Unique to Spectral Devices is an on-chip technology we refer to as Anti-X-Talk™ technology. Anti-X-Talk™ technology works at the filter level and prevents light leakage between individual filters. Without Anti-X-Talk™ technology, stray light between spectral channels is significant, often exceeding the 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 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 µm x 20 µm
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
Sensor temperature stabilization	TE cooler
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 µs 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
Data Interface	GigE (RJ45)
Input / Output	One GPIO through SMA 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 to +70 °C
Storage Temperature	-45 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]
Regulatory Compliance	CE, RoHS

7. Mechanical Drawing



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. SDK

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

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 10.1). 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 10.2). View montage of spectral images in real-time (Figure 10.3). 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.

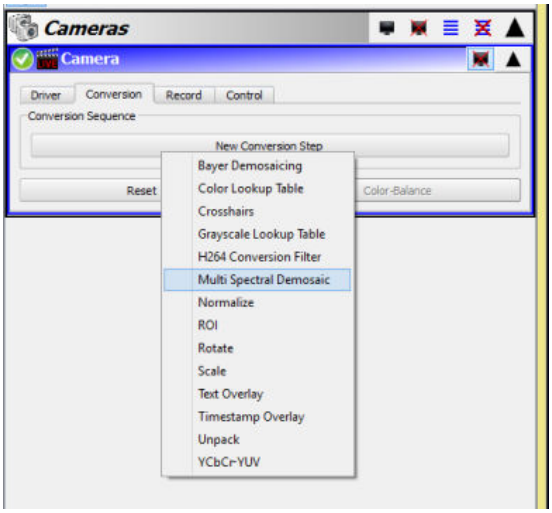


Figure 10.2. Multispectral conversion filters

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