Spectral DEVICES INC.

Product Sheet

Multispectral Imaging System

MSIS-AGRI-1-A

MSIS-AGRI-1-A

Specifications subject to change

Revised October 8, 2021

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1. Description

The MSIS-AGRI-1-A is a multispectral imaging system incorporating an MSC2-AGRI-1-A snapshot multispectral camera and a 4-channel LED illuminator into a single waterproof and dustproof camera head (IP64). The camera head provides an adjustable mount for fixing the camera head to a user-supplied fixture and adjusting the pointing direction of the camera head in increments of 4.5° around a central axis. The LED illuminator contains 16 high power LEDs arranged in a ring pattern surrounding the lens of the camera. The camera and LEDs are protected by a 5 mm thick polycarbonate window. The LEDs are arranged into 4 channels. The four LED channels are matched to the spectral transmission characteristics of the snapshot multispectral camera. Each LED channel is controlled with a strobe circuit capable of overdriving the LEDs to achieve high light output. The system is shipped with an external water-resistant control box that houses the strobe controller and an embedded Windows PC. Control of the system is through an easy-to-use Windows graphical desktop application. A variety of SDKs are available for Windows, Linux, MacOS, Python, Raspberry PI to build custom applications. The system is CNC machined from 6061 aluminum with black anodization.

2. Key Features

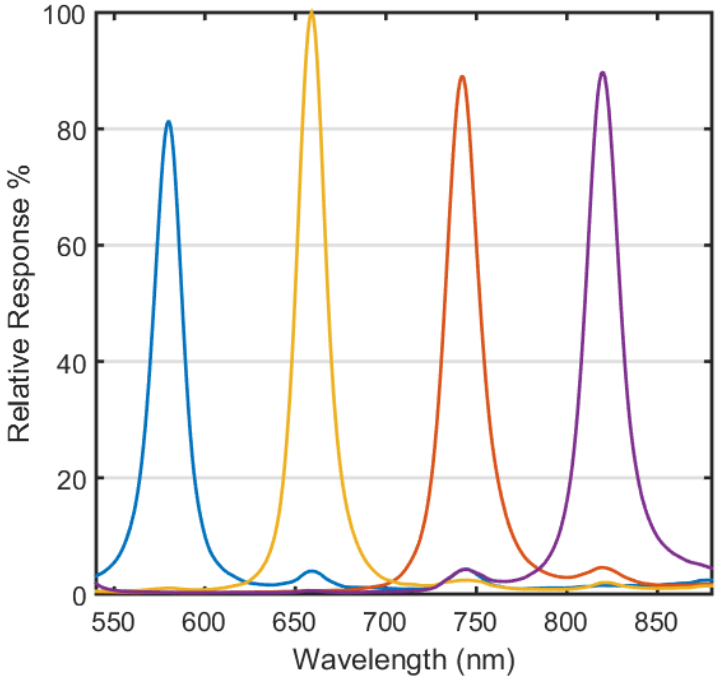
Snapshot Operation (capture spectral images simultaneously)
Captures 4 Bands (580, 660, 735, 820 nm)
Anti-X-Talk™ Technology (enhances contrast and spectral performance)
High Frame Rate (up to 180 FPS at full frame)
High Performance (4MP Global Shutter CMOS Sensor)
USB3 Vision & GenICam Compliant
Built-in LED light source
Compact waterproof and dustproof camera head (IP64)
Water-resistant control box with PC included
Windows graphical camera control and image acquisition software included
SDK for modern operating systems included (for applications needing user customization)

3. Applications

- Greenhouse monitoring of plants
- Research and development
- Industrial machine vision
- Tractor-mounted imaging applications
- CCTV-like monitoring of crops

4. Spectral Characteristics

Spectral response of the MSIS-AGRI-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 MSIS-AGRI-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).

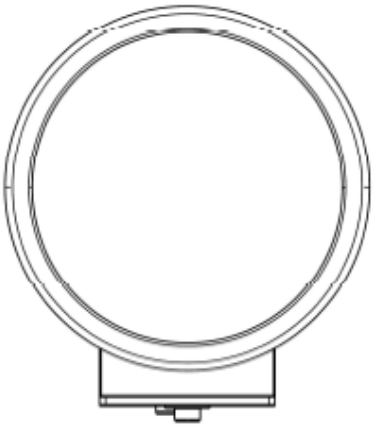
6. Specifications

Camera	MSC2-AGRI-1-A Sensor size: 1” Bands: 580 nm, 660 nm, 735 nm, 820 nm
Lens	C-mount, 1” sensor, focal lengths available (6mm to 50mm) Manual iris, manual focus, locking screws Optional electronic focus and iris (available for extra cost)
Number of LED channels	4
Number of LEDs per channel	4 (40W per channel)
LED control	Each channel controllable via serial interface and manually through front panel Strobe output from camera flashes all 4 LED channels simultaneously. Other sequences customizable by user.
LED channels	580 nm, 660 nm, 735 nm, 820 nm
Camera Triggering	Hardware trigger 5-24 Vdc signal, rising or falling edge, pre-wired to LED controller or externally triggerable through M12 connector.
Network	Wifi (IEEE 802.11ac) and 1Gb Ethernet (RJ45)
Operating System	Microsoft Windows 10
Software	Graphical multicamera acquisition software for Windows 10
External construction	6061 aluminum, polycarbonate, 316 stainless steel hardware, and glass-filled polymer
Surface finish	Camera head: black anodization
Power Requirement	100 - 240 VAC (250 W) Supplied with 10 foot power cord. Custom lengths available at time of order. Optional 24VDC operation for solar powered applications (available for extra cost)
Dimensions	Camera head: 200 mm diameter x 170 mm deep Control box: 356 mm x 305 mm x 180 mm (HxWxD)
Weight	Camera head: 2.5 kg Control box: 6 kg

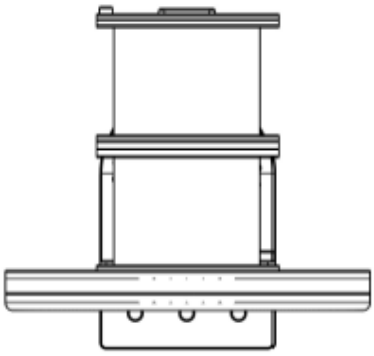
7. Drawing: Camera Head

RENDERED VIEW

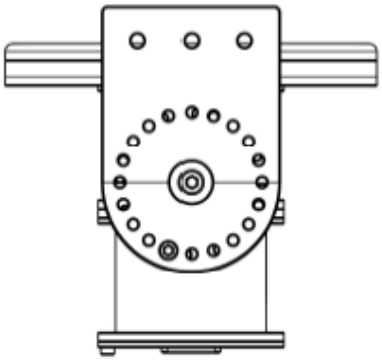
FRONT VIEW



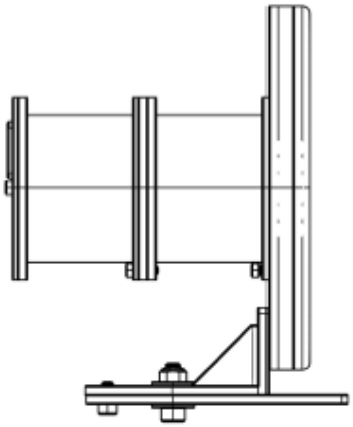
TOP VIEW



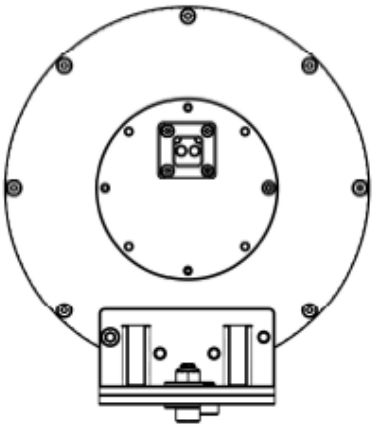
BOTTOM VIEW



SIDE VIEW

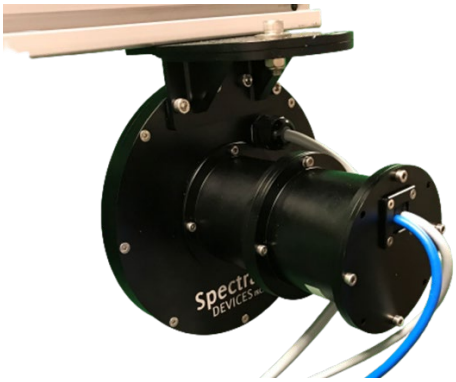


BACK VIEW



8. Photos

Front View

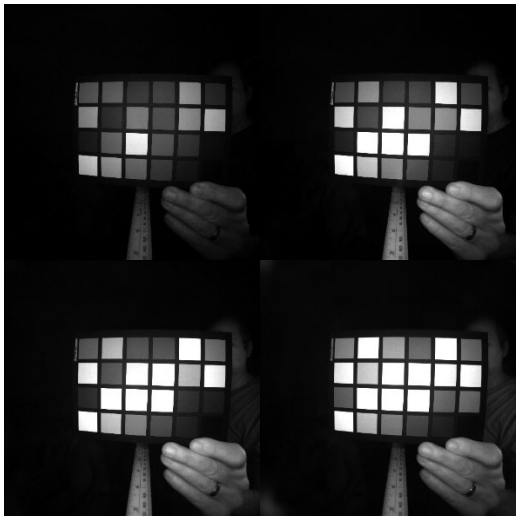


Side View

Back View

Side View

Stereo Setup (available at extra cost)



Color Target (6 mm focal length lens)

9. SDKs

Included with the MSIS-AGRI-1-A is an industrial-grade SDK for camera control and image capture. The SDK is compatible with variety of Windows, Linux and MacOS operating systems. It includes drivers, libraries, documentation, and samples. Environments such as Python and OpenCV are also supported.

Operating System	Development Environments	SDK Includes
Windows 10 (32bit / 64bit) Windows 8.1 (32bit / 64bit) Windows 7 SP1 (32bit / 64bit)	Visual Studio 6 Visual Studio 2003 Visual Studio 2005 Visual Studio 2008 Visual Studio 2010 Visual Studio 2012 Visual Studio 2013 Visual Studio 2015 MinGW (Minimalist GNU for Windows) embarcadero Free C++ Compiler Python 3.6.x Python 3.7.x	Windows driver Windows SDK StApi (Visual C++, .net Framework 2.0, C) StGenTL module Viewing Software (StViewer) Sample Programs (Visual C++, Visual C#, Visual Basic, C) DirectShow Filter Documentation
Ubuntu 18.04 (64bit) Ubuntu 18.04 (ARM 64bit) Raspberry Pi OS (32bit)	Python 3.6.x Python 3.7.x	StApi (C++, C) StGenTL module Viewing Software (StViewer) Sample Programs (C++, C) Documentation
MacOSX Sierra MacOSX High Sierra MacOSX Catalina	Python 3.6.x Python 3.7.x	StApi (C++) StGenTL module Viewing Software (StViewer) Sample Programs Documentation

10. Windows Software (included)

A complete image acquisition software package is included with every MSIS-AGRI-1-A purchased. The software 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.

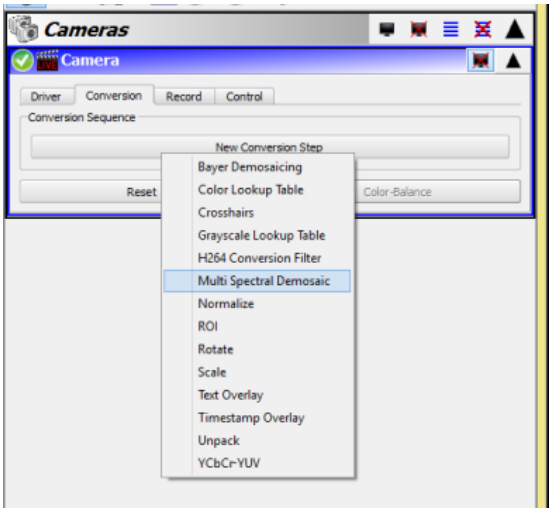


Figure 10.2. Multispectral conversion filters built-in to software

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