

STAGES AND SCANNERS

Why Use a Stage or Scanner?

Push-broom cameras acquire one slice of the sample measurement at a time, and require that the camera and sample move in relation to the other. The push-broom configuration, which is the ideal way to measure moving samples, offers several advantages over a staring array configuration, including a lower illumination heat load on the sample due to a line light source, and the ability to measure large or long samples without losing spatial resolution. It is usually easiest to move the sample past a stationary camera and light source. In a manufacturing setting, where the sample is already moving and the sample length is effectively infinite, the camera can simply be placed above the line and no additional mechanism is needed. However, when samples need to be measured in small quantities or in the lab, a linear stage can provide the necessary movement of the sample.

To maintain the advantages of push-broom imaging for unmovable targets, such as an outdoor scene, a scanner can be used to move the camera, so the sample can remain stationary. Both mirror scanners and rotating scanners are available, and sweep the camera's view across the scene or sample. The following stages and scanners from Specim Ltd. are designed specifically for the push-broom cameras in this catalog.

Applications

- Vegetation research and mapping
- Environmental research and monitoring
- Urban planning
- Spectral color scanning
- Mineralogy mapping for research and mine face scanning
- Water reservoir monitoring
- Target detection and security applications
- Scanning of human body and other biological targets



STAGES

Linear Stages

For laboratory measurements, Middleton Research provides moving linear stages that move the sample in front of the hyperspectral camera, or move the camera over the sample, in order to build the hypercube. The customer can specify the optical arrangement, reflection or transmission, the degrees of freedom of the stage (the directions in which it moves), the payload, scanning distance, etc., and Middleton Research can help identify the appropriate stage for the specific camera and application. For special illumination and camera arrangements, please refer to the Illumination and the Complete Systems chapters or contact us.



Two linear stages shown mounted for two-directional (X,Y) motion

Use of Linear Stages

Computer controlled stages can be incorporated into customer specific applications. The stages offered by Middleton Research are designed to work with the SpectralDAQ™ software accompanying the hyperspectral cameras in this catalog. The stages are able to move continuously in a loop or perform a single scan. They are rigid, self contained units, thus they can be designed and incorporated into a laboratory or process setup and perform measurements and data collection without further electrical or software developments. Please contact us with your requirements for stages of different lengths, sizes or weight bearing capacity.

Stages Ordering Information		
Part Number	Description	Product Name
MRC-313-001-01	Linear stage. X-stage, 10", stepper motor, serial interface, power supply	XSTAGE/10
MRC-313-001-02	Linear stage. X-stage, 15", stepper motor, serial interface, power supply	XSTAGE/15
MRC-313-001-03	Linear stage. X-stage, 40", stepper motor, serial interface, power supply	XSTAGE/40

SCANNERS

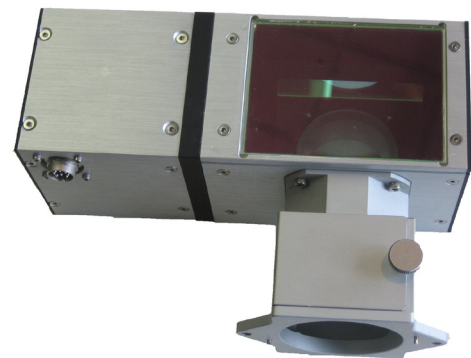
Mirror Scanner

The mirror scanner accessory is available for the hyperspectral cameras that are based on the Specim Enhanced Series ImSpector spectrographs. This includes cameras in the UV, some of the visible (HS, PFD, and certain PS models), NIR, and SWIR. There are two versions of the mirror scanner: one optimized for the Visible/VNIR range (380 – 1700 nm) and one optimized for the NIR/SWIR range (900 – 2500 nm). The mirror scanner unit fits directly onto the hyperspectral camera's front plate and includes a protective window to prevent dust and debris from getting to the mirror's surface. It can be easily installed and removed from the camera.

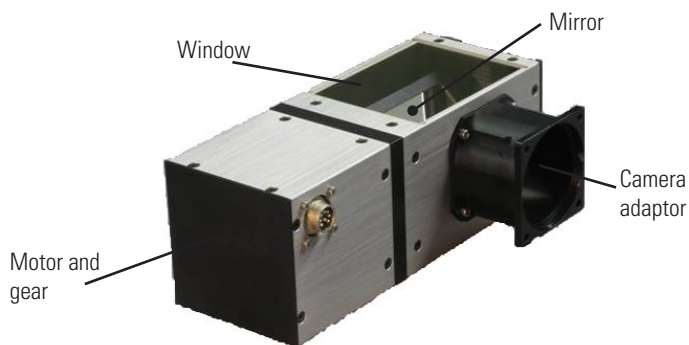
The mirror scanner operates by turning the high quality front surface mirror with a precision stepper motor and gear. The scanning rate is set by the user. As it turns, a full spectrum is collected at each point on the imaging line to build the hypercube. The scanner provides a maximum field-of-view (FOV) angle of 80 degrees, depending on the fore lens used. It is important to note that the scanner may not fit with all objective fore lenses, and the lens is not easily accessible for focusing while the mirror scanner is connected.

Specifications

- Computer control is through the camera (no additional cables required)
- +24 V DC operating voltage (provided through the camera cable)
- Maximum FOV: 80 x 30 degrees, depending on the fore lens
- Scan speed: 0.01 – 25 degrees/s for 5 – 300 frames/s
- Supported by SpectralDAQ™ software
- Weight: approximately 2 kg



SWIR mirror scanner unit



VNIR mirror scanner unit



Rotating Scanner

The rotating scanner is available with all hyperspectral cameras and connects to them with a special bayonet, allowing a quick and easy installation and release. When connecting to a cased hyperspectral camera, no additional cables are required; the computer control connects through the camera. If the rotating scanner is to be used with an uncased hyperspectral camera, one cable for both the power supply and serial connection is provided. The rotating scanner can be attached to a heavy duty 3/8" tripod. This is necessary to provide stability for the rotation. The rotating scanner operates with a stepper motor and can achieve a maximum FOV of 180 degrees. FOV can be extended to 270 degrees upon special request.

Specifications

- Computer control connectivity is through the camera (no additional cables required for use with a cased camera)
- +24 V DC operating voltage (provided through the cased camera cable)
- Maximum FOV: 180 x 60 degrees, depending on the fore lens
- Emergency stop switch
- Scan speed: 0.01 – 25 degrees/s , 5 – 300 frames/s
- Supported by SpectralDAQ software
- Size (L x W x H): 212 x 122 x 78 mm
- Weight: 4.5 kg



VNIR camera mounted on rotating scanner unit with heavy duty tripod

Scanners Ordering Information		
Part Number	Description	Product Name
MRC-313-002-01	Mirror scanner (380 - 1700 nm), serial interface	MSCR/VNIR
MRC-313-002-02	Mirror scanner (900 - 2500 nm), serial interface	MSCR/SWIR
MRC-313-003-01	Rotating scanner light	ROTSCRL

TRIPOD



3/8" screw on heavy duty tripod mounts rotating scanner

This heavy duty tripod is capable of supporting loads up to 44 lbs. (20 kg), at a height of over 8.5 ft. (2.6 m). It is an ideal large format tripod for use with hyperspectral cameras and the rotating scanner. This tripod offers a working range from a minimum of 17.3" to a maximum of 105". The center column is geared for easy, accurate adjustment. The tripod can easily handle the combined weight of the scanner and camera.

Features

- The standard 3/8" screw allows the scanner to be mounted directly to the tripod.
- The tripod is equipped with a bubble level to make adjustments easier.
- The built-in mid-level spreader adds anti-torsional rigidity, stops the tripod legs from accidentally being knocked wider apart and makes it suitable for use on uneven terrain.
- The geared center column allows for safe and precise height adjustments.
- The three set screws in the camera platform can be used to permanently secure the scanner to the tripod, providing additional security.

Specifications

- Load Capacity: 44 lbs (20 kg)
- Attachment Fitting: 3/8"
- Maximum Height: 105" (267 cm)
- Minimum Height: 17.3" (44 cm)
- Folded Length: 41.3" (105 cm)
- Weight: 17.5 lbs (7.95 kg)
- Material: Aluminum



Heavy duty tripod used for rotating scanner

Scanners Ordering Information		
Part Number	Description	Product Name
MR-211-003-07	Heavy duty tripod	HDTripod