HSC23V
Multispectral Imaging System

User Guide



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Chapter 1 Introduction

1.1 Intended Use

The HSC23V Multispectral Imaging System is designed to simplify the capture of spectral images (data cubes) with user-configurable filter sets. With the 12-slot wheel, the imaging system can generate a data cube with 12 spectral channels. This image capture is performed using the Thorlabs Multispectral Imaging System Software, which can be found on the Thorlabs website. These data cubes offer value in performing spatial spectroscopy of a user's samples. By selecting wavelengths relevant to an application, a user may develop a measurement system capable of classifying between various analytes or quantifying the response in a particular wavelength range.

The product may only be used in accordance with the instructions described in this manual. Any other use will invalidate the warranty.

1.2 Explanation of Safety Warnings

NOTICE Indicates information considered important, but not hazard-related, such as possible damage to the product.


Danger, Warning, or Caution

The CE/UKCA markings on the product are the manufacturer's declaration that the product complies with the essential requirements of the relevant European health, safety, and environmental protection legislation.


The wheelie bin symbol on the product, the accessories or packaging indicates that this device must not be treated as unsorted municipal waste but must be collected separately.

1.3 Description

Thorlabs' HSC23V Multispectral Imaging System consists of an integrated camera, filter wheel, and motion control hardware, which allows users to capture multispectral images using a variety of Thorlabs bandpass filters. The integrated camera is a monochrome image sensor. The 12-slot wheel can be populated with a pre-configured layout using off-the-shelf filter sets or customized to meet the needs of a user's particular application.

1.4 Technical Data

1.4.1 Specifications

CMOS Sensor Specifications	
Sensor Type	CMOS Monochrome
Wavelength Range	400 - 1000 nm
Number of Active Pixels (Width x Height)	1936 (W) x 1216 (H)
Pixel Size	5.86 µm x 5.86 µm
Imaging Area	11.34 mm (W) x 7.13 mm (H)
Optical Format	1/1.2" (13.4 mm Diagonal)
Peak Quantum Efficiency	71% at 500 nm
Shutter Type	Global
ADC	12 Bit
Max. Frame Rate at Full Resolution	40 fps
Dark Current Compensation	Automatic

Imaging Specifications	
Filter-to-Filter Time	160 ms
Exposure Time	0 - 10000 ms (0.1 ms Increments)
ADC Resolution	12 Bit
Vertical and Horizontal Digital Binning	1 x 1 to 5 x 5
Region of Interest (Width x Height)	1936 (W) x 1216 (H) Max

General Specifications	
Power Consumption[a]	2.1 W
Operating Temperature[b]	10 °C to 40 °C
Storage Temperature	0 °C to 55 °C

a. Typical Power Consumption for USB 3.1 Gen 1
b. Non-Condensing

1.4.2 Graphs

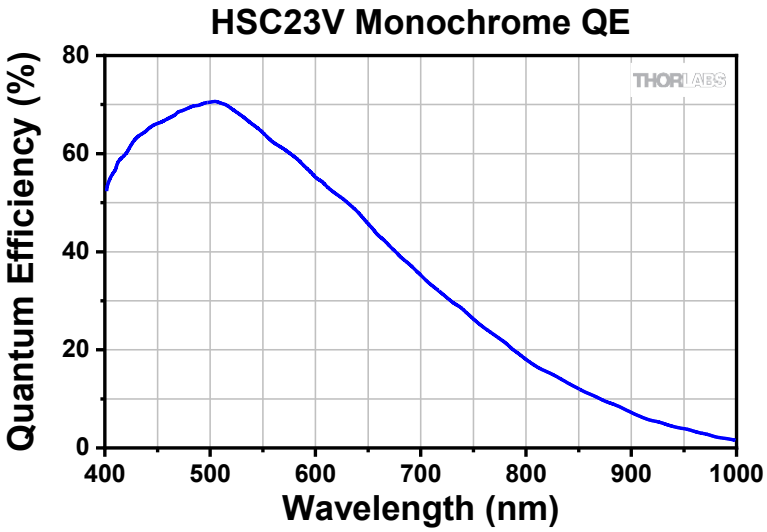


Figure 1 Quantum Efficiency for HSC23V

1.4.3 Mechanical Drawings

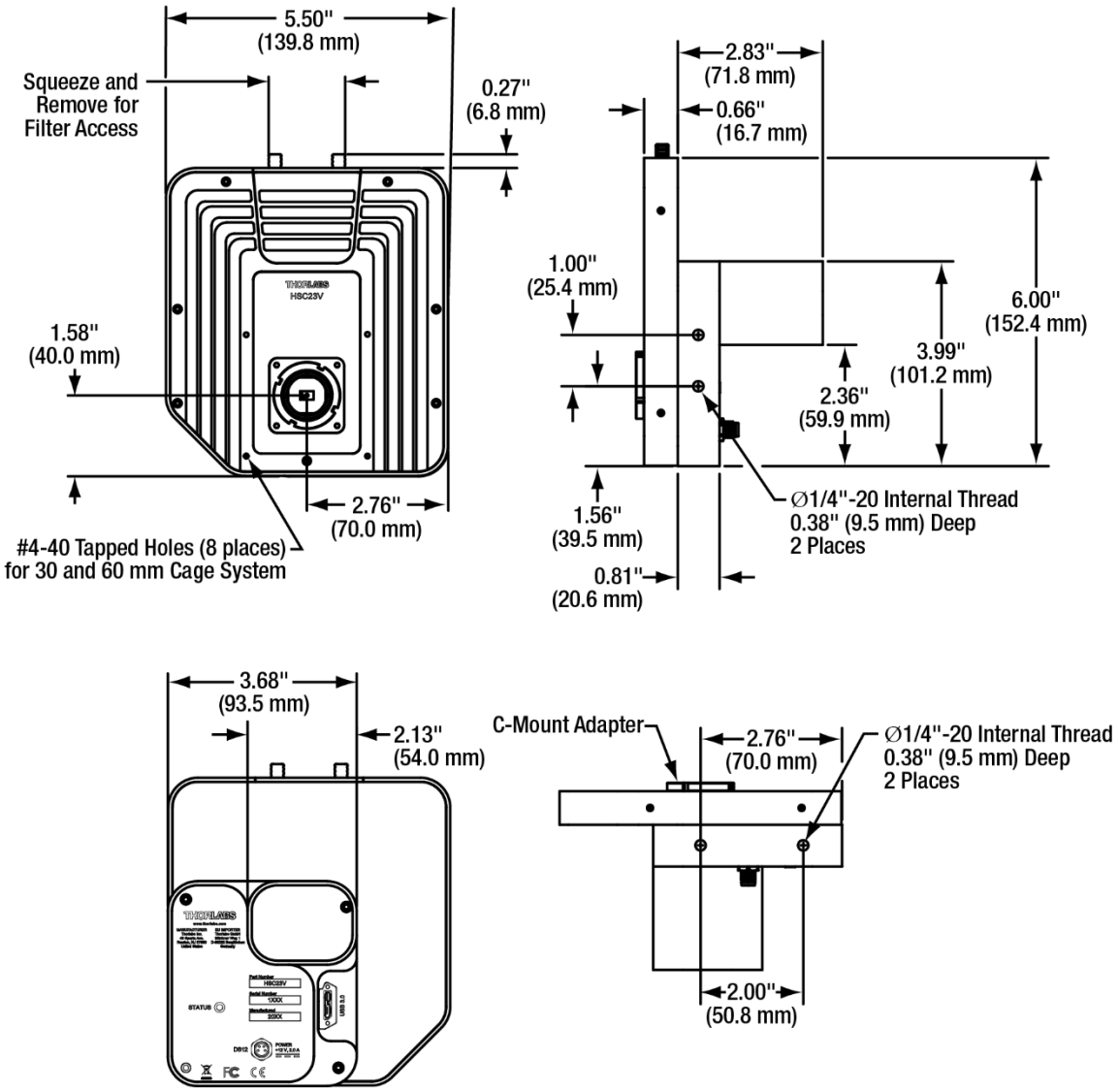


Figure 2 Mechanical Drawing

1.5 Components

The tables and figures below list the standard components of the HSC23V Multispectral Imaging System.



Figure 3 HSC23V Multispectral Imaging System Housing (Front)

Multispectral Imaging System Housing (Front)	
Callout	**Description**
1	Filter Hatch
2	Cage Assembly Rod Holes (4-40 Tapped Holes, 8 Total)
3	C-Mount Adapter
4	1/4"-20 Tapped Holes



Figure 4 HSC23V Multispectral Imaging System Housing (Rear)

Multispectral Imaging System Housing (Rear)	
Callout	**Description**
1	Power Indicator LED
2	Four-Pin Power Connector
3	USB 3.0 Connector

1.6 Simplified Declaration of Conformity



EU Declaration of Conformity

Manufacturer: Thorlabs Inc.

Address: 43 Sparta Ave, Newton, 07860, USA

We hereby declare under our sole responsibility that:

Product: **HSC23V**

Product description: **Multispectral Imaging System**

is/are in conformity with the following directive(s):

2014/30/EU	Electromagnetic Compatibility (EMC) Directive
2011/65/EU	Restriction of Use of Certain Hazardous Substances (RoHS), including 2015/863
2006/42/EC	Machinery Directive (MD)

and (harmonized) standards / technical specifications :

EN 61326-1	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements	2013
EN IEC 63000	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances	2018
EN ISO 12100	Safety of Machinery. General Principles for Design. Risk Assessment and Risk Reduction	2010

I hereby declare that the equipment named has been designed to comply with the relevant sections of the above referenced specifications and complies with all applicable Essential Requirements of the Directives.

Signed:

Name: Danielle Strong *On:* 11/13/2025

Position: Director of Compliance

CE



UK Declaration of Conformity

Manufacturer: Thorlabs Inc.

Address: 43 Sparta Ave, Newton, 07860, USA

We hereby declare under our sole responsibility that:

Product: **HSC23V**

Product description: **Multispectral Imaging System**

is/are in conformity with the following directive(s):

SI 2016/1091	The Electromagnetic Compatibility (EMC) Regulations
SI 2012/3032	RoHS in Electrical and Electronic Equipment Regulations 2012
SI2008/1597	The Supply of Machinery (Safety) Regulations

and (harmonized) standards / technical specifications :

BS EN 61326-1	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements	2013
BS EN IEC 63000	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances	2018
BS EN ISO 12100	Safety of Machinery. General Principles for Design. Risk Assessment and Risk Reduction	2010

I hereby declare that the equipment named has been designed to comply with the relevant sections of the above referenced specifications and complies with all applicable Essential Requirements of the Directives.

Signed:

Name: Danielle Strong *On:* 11/13/2025

Position: Director of Compliance

UK CA

1.7 FCC Designation

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Chapter 2 Safety

The safety of any system incorporating the equipment is the responsibility of the assembler of the system.

All statements regarding safety of operation and technical data in this instruction manual will only apply when the unit is operated correctly as it was designed.



WARNING: Risk of Serious Injury and Even Death Due to Explosion
The HSC23V Multispectral Imaging System must not be operated in explosion-endangered environments.

2.1 Product Care

Handle the imaging system with care during transportation and unpacking. Bumping or dropping the imaging system can damage the unit or lower performance. If the imaging system is mishandled during shipment, the optical components may become misaligned, which could decrease the image quality. If this happens, the imaging system will need to be re-aligned by a qualified professional. To ensure proper care and operation of your device, please follow the handling instructions below.

- Do not store or operate in a damp, closed environment.
- Do not use solvents on or near the equipment.
- Keep away from dust, dirt, and air-borne pollutants (including cigarette smoke). The camera is not designed for outdoor use. Protect the equipment from rain, snow, and humidity.
- Do not use the system with the filter wheel exposed. Always ensure the cover and hatch are in place before powering on.
- Do not expose to mechanical or thermal extremes. Protect the equipment from rapid variation in temperature. Protect the equipment from intense and/or prolonged vibrations.
- Handle all connectors with care. Do not use unnecessary force inserting or removing connectors, as this may damage the connectors.
- Clean non-optical components using a soft, lint-free cloth. Use of isopropyl alcohol is permitted, however do not immerse in any liquid or solvent.
- Clean any accessible optical surfaces with an appropriate optics grade tissue or cloth. Best practices for caring for your optics can be found in Thorlabs' **Optics Handling and Care Tutorial**.

2.1.1 Service

Only trained and approved Thorlabs' personnel should service the camera. Please contact Thorlabs' Technical Support at **techsupport@thorlabs.com** and a member of our team will be happy to assist you.

2.1.2 Accessories and Customization

Although the imaging system is easily adapted for custom interfaces, to achieve the listed specifications and performance, this imaging system should only be used with accessories approved by Thorlabs. Any modification or service by unqualified personnel renders the warranty null and void, leaving Thorlabs free of liability. Please contact Thorlabs for any questions on customization.

All imaging systems are supplied with one USB 3.1 cable. These cables are constructed to provide reliable data throughput at a length of 3 m and properly fit any connection points. Do not replace this cable with a 3 m cable from a different vendor. The use of a shorter cable (<3 m) might be acceptable but is not guaranteed. Never use any cable that is longer than 3 m on a USB 3.1 system.

Chapter 3 Installation

3.1 Warranty Information

This precision device is only serviceable if returned and properly packed into the complete original packaging including the complete shipment plus the cardboard insert that holds the enclosed devices. If necessary, ask for replacement packaging. Refer servicing to qualified personnel.

3.2 Receiving and Unpacking

Your device was thoroughly tested and carefully packed at the factory. Once the shipment is accepted for delivery, the carrier assumes full responsibility for its safe arrival. Should you receive your shipment with any damage – concealed or apparent – please contact the carrier at once. The carrier will instruct you on how to initiate a damage claim. If a visual inspection reveals damage upon receipt, it must be noted on the freight bill or express receipt and the notation signed by the carrier's agent. Failure to do so can result in the carrier refusing to honor the claim.

The package for the Multispectral Imaging System will arrive with the following components:

- HSC23V Multispectral Imaging System
- HSCFWB Filter Wheel (Mounted Inside the Multispectral Imaging System)
- DS12 Power Supply
- CABU31 USB 3.1 Type A to Micro B Cable, Locking Screws, 3 m (118") Long
- Accessory and Tool Kit

To return your imaging system to Thorlabs for service, you must first contact Thorlabs' Support or distributor and request a Return Material Authorization (RMA). Returns will not be accepted without an RMA.

The Accessory and Tool kit that is supplied with your imaging system consists of the following accessories and tools:

- SPW502 Spanner Wrench for C-Mount Adapter
- SPW909 Spanner Wrench for HSC Series Filters and Hub Nut
- SM1 Retaining Ring

3.3 Filter Kits

The HSC23V Multispectral Imaging System ships with an empty filter wheel. This enables customers to tailor their camera to their own application needs. Filter Kits are sold separately as sets of twelve (12) filters. Kits may be

mixed if not all filters are required from a single set. An extra HSCFWB empty filter wheel may be purchased from the Thorlabs website to make swapping between sets easier. Available filter kits include:

- HSCFW1 - Broadband (400 nm - 950 nm) Filter Kit with 12 Bandpass Filters (40 nm FWHM)
- HSCFW2 - Broadband (400 nm - 950 nm) Filter Kit with 12 Bandpass Filters (10 nm FWHM)
- HSCFW3 - VIS (380 nm - 710 nm) Filter Kit with 12 Bandpass Filters (10 nm FWHM)
- HSCFW4 - NIR (650 nm - 980 nm) Filter Kit with 12 Bandpass Filters (10 nm FWHM)

3.4 Pre-Installation - USB 3.0

If a replacement USB 3.1 cable is required, you can find a replacement cable (Item # CABU31) on the Thorlabs website.

3.5 Installing the Software

The Thorlabs Multispectral Imaging System Software runs on Windows® 10 (64-bit) and Windows® 11 operating systems ONLY. The software and software manual can be found on the software tab on the HSC23V Multispectral Imaging System webpage and are also available for download from **www.thorlabs.com/software**.

3.6 Connecting the Camera

3.6.1 Plug-in Sequence

- Connect the USB 3.1 cable to the Multispectral Imaging System and your computer.
- Connect the DS12 Power Supply to the 4-pin “Power” plug on the rear housing of the Multispectral Imaging System.
- Plug in DS12 Power Supply to a standard wall outlet (100-240 VAC, 50-60 Hz).

3.6.2 Disconnecting the USB

The supplied USB 3.1 cable has screws for securing the cable to the imaging system’s USB connector. These screws are to minimize the risk of the cable coming loose during operation but are not intended to support any load. It is important when removing the USB cable from the camera to ensure that both locking screws are released. The USB plug should be pulled by its connector housing and not the cable.

3.7 Optical and Mechanical Mounting Considerations

3.7.1 Using a C-Mount Lens

The HSC23V Multispectral Imaging System utilizes an adapter for mounting C-Mount lenses. All C-Mount lenses from the Thorlabs catalog have been approved to work with the system as shipped. The C-Mount adapter also contains a rear, internally threaded SM1 slot for accepting Ø1" optics, allowing additional pre-filtering to be applied at the system level. The unit is shipped with no pre-filtering optics in place to allow the greatest flexibility of lens options. When a filter is inserted into the adapter, not all C-Mount lenses are compatible with the system due to the limited space between the C-Mount flange and the additional filter. If you choose to use any additional filtering optics, please refer to the approved C-Mount lenses in Chapter 7.

C-Mount lenses are designed to utilize the same flange focal distance from lens flange to sensor array. As the focusing occurs between the rear of the lens and the image sensor, the addition of a filter between the two will shift the effective focal length of the camera. While this does not limit the operation of the camera, the focus will

need to be adjusted if a pre-filter is added. Additional insights into flange focal distance can be found on the **Camera Lens Tutorial** page on Thorlabs' website.

3.7.2 Installing a C-Mount Lens

Unscrew the cap from the C-Mount adapter. Install your C-mount lens. If a pre-filter is to be used, refer to Sections 3.9.1 - 3.9.3 before lens installation.

3.7.3 Mounting the Imaging System

Two 1/4"-20 tapped holes, with a 2" spacing, are provided on the bottom of the imaging system. Two additional 1/4"-20 tapped holes, with a 1" spacing, are provided on the side of the imaging system. The 1/4"-20 threads offer a range of mounting options and will fit most commercially available tripods, in addition to Thorlabs 1/2" optical posts. To learn more about our optical posts, visit the Thorlabs website.

3.7.4 Using the Imaging System with a Cage System

The HSC23V Multispectral Imaging System provides both 30 mm and 60 mm cage rod compatibility. The 4-40 threaded holes on the front of the device will accept any Thorlabs Ø6 mm Cage Assembly Rods. The use of 30 mm cage rods will likely impair the ability to use most C-Mount lenses. Lenses that fit within the 30 mm cage rods often require removal of locking screws for the focus and aperture, if present. Refer to the drawings to find out if a lens diameter is compatible with 30 mm and 60 mm cage systems. To learn more about Thorlabs Cage Systems, refer to the Thorlabs website.

3.8 Optical Front End

3.8.1 Description of Components

- Lens: Front-end optic (or set of optics) which takes the incoming images and focuses them onto the image plane of the camera sensor.
- Lens Adapter: Adapter on the front of the main body of the camera which contains C-Mount threads for a lens and SM1 threads on the rear to accept the addition of a pre-filter.
- Pre-Filter: Pre-filtering allows for the application of an additional Ø1" filter (longpass, shortpass, or bandpass) on top of the filters of the wheel. As this filter is static, it will be applied to all images captured.

3.9 Optical Front-End Procedures

3.9.1 C-Mount Adapter Removal

The C-Mount adapter is notched to allow for tightening and loosening, using a SPW502 Spanner Wrench (provided with the system).



Figure 5 C-Mount Adapter and SPW502 Spanner Wrench

3.9.2 Pre-Filter Removal and Replacement Procedure

Once the C-Mount adapter is removed, the pre-filter (on the backside of the adapter) can be inserted or removed. The pre-filter is held in place by a SM1 retaining ring. All systems are shipped with no pre-filter in place. A SM1 retaining ring for mounting an additional filter into the adapter can be found in the accessory kit provided with the system.

Due to limited space between the back of the lens and the pre-filter, the addition of a pre-filter does limit the depth that a lens can protrude beyond the lens flange. Pre-filters are also limited to a 4 mm thickness to allow the retaining ring to be fully inserted. Filters or retaining rings protruding beyond the SM1 threads of the adapter will risk damage to the filter wheel and its components.

3.9.3 C-Mount Mechanical Considerations

As noted in previous sections, a pre-filter limits the range of C-Mount lenses that can be used with the system. A list of lenses that have been confirmed to fit with the pre-filter in place is provided in the Appendix. If the user would like to confirm that a lens is compatible with the pre-filter in place, then the protrusion beyond the lens flange should be measured. The protrusion must be less than 23.1 mm in diameter. The length of the protrusion should be no more than 6.5 mm. However, with no pre-filter in place, a flange protrusion of up to 10.5 mm is allowed without interfering with the filter wheel mechanics.

3.9.4 Filter Installation – General

There are three methods for installing or replacing a filter mounted into the filter wheel. Review the instructions and choose the best method for your situation.

NOTICE When replacing filters, care should be taken to avoid touching or contaminating the optical surfaces of the filter. Wearing gloves is advised.

3.9.5 Filter Replacement - Method 1 (Front Panel Removal)

The first method requires the removal of the front panel of the camera but offers the greatest access to the filter wheel. This method is best for populating an empty wheel. The entire wheel can be removed using the supplied SPW909 Spanner Wrench. The lock nut for the hub of the wheel has two holes which allow for the insertion of the pins on the SPW909. Make note when re-installing the filter wheel that the wheel label and the filter labels are facing out and that the flat of the wheel aligns with the flat of the wheel hub. Install the hub nut with the SPW909 pin holes facing out.

The front panel can be removed without removing the lens or the lens adapter, but care should be taken to avoid damaging or contaminating the lens.

NOTICE

With the front cover off and the filter wheel removed, the camera's image sensor and cover glass are more exposed. Care should be taken to avoid damaging the sensor or contaminating the cover glass.

1. Remove the filter hatch by pinching the two spring-loaded hatch tabs together and tilting forward and out (See Figure 6).



Figure 6 Removing the Filter Hatch

2. Using a 5/64" hex driver, remove the seven 2-56 screws (#1 to 7 in Figure 7).



Figure 7 Removing Front Panel Screws

3. Lift the front panel away from the housing.
4. While keeping the wheel stationary the SPW909 Spanner Wrench can be used to loosen the hub nut holding the filter wheel onto the motor (Figure 8). The inside of the hatch has been designed with two tabs that can be used for holding the wheel in place while minimizing risk of touching optical surfaces.



Figure 8 Removing Empty Wheel Using SPW909 Spanner Wrench

5. Remove the hub nut and spring lock washer.
6. Lift the wheel out and away from the motor hub.

7. Place the wheel on a clean flat surface for removing the filters. If an entire replacement wheel is available, proceed directly to step 11.
8. Note that filter wheel positions numbered 0 - 11 are engraved on the wheel. Make note of where new filters are installed so that the filter settings in the software can be updated later.
9. Place the two pins of the SPW909 Spanner Wrench into the two notches of the filter to be removed and turn counterclockwise.
10. When remounting a filter, always start the threads by hand, to ensure threads are not crossed, before using the SPW909 Spanner Wrench to tighten.
11. Once filter replacements have been completed:
    a. Remount the wheel onto the hub, ensuring that the flat of the hub aligns with the flat of the wheel and the filter wheel label and filter labels are facing to the lens side of the housing (Figure 9). It is helpful to insert the filter hatch into the wheel slots as shown in Figure 9 so that the flat of the wheel can be held steady against the flat of the hub during steps 11b-d. This is important to avoid vignetting during imaging.



Figure 9 Tightening Populated Wheel Using SPW909 Spanner Wrench

    b. Reinstall the spring lock washer with serrated teeth towards the hub nut.
    c. Reinstall the hub nut and hand-tighten.
    d. Tighten the hub nut with the SPW909 Spanner Wrench. The hatch can be used here again to hold the wheel in place while tightening the hub nut.
12. Return the front cover.
    a. The front cover has two alignment pins to ensure proper alignment.
13. Insert the seven 2-56 screws and tighten with the 5/64" hex driver.

14. Reinstall the hatch.

3.9.6 Filter Replacement - Method 2 (Filter Hatch, Power Off)

The second method is via the filter replacement hatch at the top of the imaging system. This method works best when there are only a few filters to be replaced or when the mounting of the imaging system prohibits easily removing the front of the imaging system (such as when mounted into a cage system).

1. Power off the HSC23V Multispectral Imaging System.
    a. Disconnect the DS12 Power Supply from the 4-pin “Power” plug on the rear housing of the Multispectral Imaging System.
    b. There is no need to unplug the USB 3.1 cable.
2. It is beneficial, but not required, to lay the system on its back.
3. Remove the filter hatch by pinching the two spring-loaded hatch tabs together and tilting forward (See Figure 6).
4. Rotate the wheel to the position of the filter to be removed.
    a. The wheel can be rotated by hand once power is removed.
5. Once removed, the hatch must be flipped around and re-inserted to stabilize the wheel in place (See Figure 10).



Figure 10 Filter Hatch Reversed to Stabilize Filter Wheel

6. Place the two pins of the SPW909 Spanner Wrench into the two notches of the filter to be removed and turn counterclockwise.
7. Start to install the new filter by hand to avoid cross threading, then finish using the SPW909 Spanner Wrench.

8. Restore the filter hatch to its normal position.
9. Connect the DS12 Power Supply from the 4-pin "Power" plug on the rear housing of the Multispectral Imaging System.

3.9.7 Filter Replacement - Method 3 (Filter Hatch, Power On)

This method uses the "Quick Load" feature in the software and the filter replacement hatch at the top of the imaging system. This hatch has two spring-loaded tabs which lock the hatch into the housing. This method works best when there is only one filter to be replaced and when the hatch is easily accessible in-place as the imaging system is mounted. Refer to the Multispectral Imaging System Software User Guide for additional information.

1. Activate the Quick Load feature in the software.
2. Follow the instructions in the software manual to rotate the filter to be replaced to the filter access hatch.
3. Remove the filter hatch by pinching the two spring-loaded hatch tabs together and tilting forward. See Figure 6.
4. The hatch, once removed, must be flipped around and re-inserted to stabilize the wheel in place. See Figure 10.
5. Place the two pins of the SPW909 Spanner Wrench into the two notches of the filter to be removed and turn counterclockwise.
6. Start to install the new filter by hand to avoid cross threading, then finish using the SPW909 Spanner Wrench.
7. Restore the filter hatch to its normal position.
8. In the software, acknowledge that the filter has been replaced.

Chapter 4 Operation

4.1 Starting the Imaging System

The HSC23V Multispectral Imaging System has its own software package for controlling the various camera parameters, acquiring images, and basic image processing. Refer to the Multispectral Imaging System Software User Guide.

4.2 Connecting the Camera

The Multispectral Imaging System software has been developed to automatically detect and connect to our cameras. If the camera does not connect automatically, check the integrity of the USB and power connections and restart the software. Consult the software manual for further troubleshooting information.

4.3 Setting Up the Imaging System

The HSC23V Multispectral Imaging System was designed to offer flexibility in how the wheel is configured and the ability to swap out filters best suited for the user's application. Due to this flexibility, it is important to ensure a proper configuration of the setup in the Multispectral Imaging System software before capturing images. The Multi-Spectral Filter-Wheel software comes pre-configured for a standard VIS/NIR wheel, but it is important to verify the configuration.

1. Open the Options ( ) menu
2. Select the Filter Wheel tab

3. Ensure the names of the filters align with the configuration of your filter wheel
    a. Filters can be renamed by selecting the filter name in the list.
4. Close the Settings menu
5. Navigate to the Setup tab in the main window
6. Select the Filter Settings list ( )
    a. This will open a list of all settings (Type, Wavelength, FWHM, Exposure, and Gain) available for each filter.
7. Verify that the details (Type, Wavelength, and FWHM) in the list are correct.
    a. Exposure and Gain settings can be updated through the Filter Settings list but will also be updated through the main window.
8. Select OK.

4.4 Capturing Images

The HSC23V Filter-Wheel software allows a user to view a Live output from the camera, capture individual images from a single filter (Single), and capture all filters in the wheel (Full Stack). Please refer to the software manual for further details on how to use these functions.

Chapter 5 Maintenance and Cleaning

The HSC23V Multispectral Imaging System was designed with minimal expectations of regular maintenance. It is important, as with any imaging system, to ensure that optics are clean. Within the imaging system, there are multiple surfaces which could become contaminated with varying levels of likelihood.

1. Lens Surfaces
2. Pre-Filter Surfaces
3. Bandpass Filters
4. Image Sensor

The highest risk of surface contamination comes from the forward-facing surface of the lens. In most cases, if the imaging system is in a sealed, operational state, there should be no need to clean internal optical surfaces. When the system cover or hatch is open, there is a higher risk of filters becoming contaminated. If the filter wheel is removed, the image sensor cover glass could become contaminated. The recommended process for cleaning optics can be found on Thorlabs' **Optics Handling and Care Tutorial**.

Chapter 6 Troubleshooting and Repair

6.1 Device Does Not Show Up When Connected to PC

- Ensure that a Thorlabs' approved USB 3.1 cable is being used.
- Verify that cable is fully inserted into the connector. The base of the connector should fully contact the rear housing.
- Other troubleshooting tips for the device not showing up in Thorlabs' Multispectral Imaging System Software can be found in the Multispectral Imaging System Software User Guide.

6.2 Wheel Comes Loose During Operation

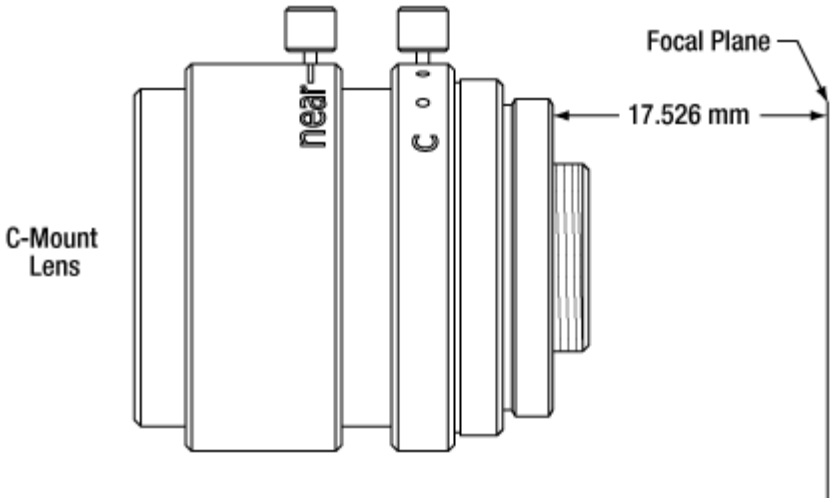
The system ships with a conical spring washer. This is to maintain consistent pressure on the wheel and minimize the chances of the hub nut coming loose during operation. This spring washer has been tested and confirmed to work under normal operating conditions. Prolonged or extreme vibrations to the system during operation can cause the hub nut to become loose. Make sure the system is isolated from vibrations during operation.

- Ensure spring lock washer is re-installed if wheel has been removed.
- Ensure the hub nut is fully tightened.

Chapter 7 Appendix

7.1 C-Mount Compatibility

Flange focal distance (FFD) is defined as the distance between the flange of a lens to the image sensor. Each lens standard (C-Mount, F-Mount, CS-Mount, etc.) relies on their own established flange focal distance and threading (or locking mechanism) to make interoperability of different lenses within the same format, possible. C-Mount lenses utilize a 17.526 mm flange focal distance. Due to the limited space between the flange of the C-Mount lens and the image sensor of the Multispectral Imaging System, and the addition of filters (pre-filter and bandpass) between the two, there is limited space for flange protrusion. Flange protrusion is the distance the lens protrudes past the flange towards the image sensor (see diagram below).



With the system with no pre-filter (as shipped), any C-Mount lens from the Thorlabs catalog will fit. If pre-filtering is needed for your application, then options for lenses become more limited. Below is a list of tested and approved lenses from the Thorlabs catalog that are confirmed to work with a pre-filter in place.

Item #	Description
MVL12M23	12 mm EFL, f/1.4, for 2/3" C-Mount Format Cameras
MVL35M23	35 mm EFL, f/2.0, for 2/3" C-Mount Format Cameras

If you are interested in a lens available through Thorlabs that you do not see listed here, please contact Thorlabs Technical Support at **techsupport@thorlabs.com**. If you have a lens that is not available through Thorlabs, measurements will need to be taken to verify that the Cage Compatibility and Flange Protrusion specifications are met, as laid out in Sections 3.7.3 and 3.9.3, respectively.

7.2 Filter Compatibility

The HSC23V Multispectral Imaging System is designed to be used with the filter wheel (and its filters) situated between the lens and image sensor. With the lens focusing light through the filters, there is a nominal shift in focal length as light passes through the filter. It is therefore important when selecting filters that the thickness of each filter is the same or as close as possible to each other. Any deviation in thickness between subsequent filters will cause focus to shift between two filters. All filters offered in the Thorlabs catalog for the HSC23V Multispectral Imaging System (Item #s HSCFW1, HSCFW2, HSCFW3, and HSCFW4) have been chosen to ensure that focal shifts between filters are minimized. If another filter is needed for an application, Thorlabs has the ability to fabricate custom filter assemblies, but care should be taken to choose filters with consistent thicknesses. The maximum allowable filter thickness is 2 mm (not including coatings).

Chapter 8 Disposal



Thorlabs verifies our compliance with the WEEE (Waste Electrical and Electronic Equipment) directive of the European Community and the corresponding national laws. Accordingly, all end users in the EC may return “end of life” Annex I category electrical and electronic equipment sold after August 13, 2005 to Thorlabs, without incurring disposal charges. Eligible units are marked with the crossed out “wheelie bin” logo (see right), were sold to and are currently owned by a company or institute within the EC and are not dissembled or contaminated. Contact Thorlabs for more information. Waste treatment is your own responsibility. “End of life” units must be returned to Thorlabs or handed to a company specializing in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site. It is the user’s responsibility to delete all private data stored on the device prior to disposal.

Chapter 9 Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at www.thorlabs.com/contact for our most up-to-date contact information.



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