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Confocal Fluorescence Microscopy Systems (Page 1 of 4)



CLS-UVSS Two-Channel Fluorescence Confocal System and MLS203 Stage Mounted on an Olympus IX51 Microscope (Stage and Microscope Not Included)

Features

- Confocal Imaging Module for Inverted and Upright Microscopes
- Complete Image Acquisition Software Package Included
- Video-Rate Image Acquisition (512 x 512 Pixels @ 30 fps)
- Capture Resolution
 - 2048 x 2048 Pixels (Bi-Directional)
 - 4096 x 4096 Pixels (Uni-Directional)
- Two- and Four-Channel Options
- Choice of Standard Multialkali PMTs or High-Sensitivity GaAsP PMTs
- Optimized for 400 – 750 nm

Thorlabs' Confocal Laser Scanning (CLS) Microscopy Systems are comprised of compact, purpose built, imaging modules for infinity-corrected, compound microscopes. They add the ability to acquire high-resolution optical sections within a thick sample or to reduce background fluorescence from a thin culture. The CLS systems offer turnkey integration to almost any upright or inverted microscope with access to an intermediate image plane (e.g., a camera port) via a C-Mount thread. The included software has an intuitive graphical interface that allows data to be quickly recorded and reviewed while providing sophisticated peripheral controls for image acquisition. All CLS systems are user installable; however, on site installation is available.

All hardware components are directly controlled through the ThorImageLS™ software, including automated Z stepping control for optical sectioning (via piezo or stepper motor) and automatic calculation of Airy disk units based on objective magnification and pinhole size combination. Our intuitive interface allows novice and experienced users alike to obtain high-resolution microscopic images quickly and easily.

All CLS complete systems include a multi-channel fiber-coupled laser source, control electronics, Scan Head, pinhole wheel, detectors, and all fibers and cables needed to interconnect the system.

Additionally, each system includes a Windows® computer with a 24" monitor, data acquisition, and control boards as well as ThorImageLS™ software. A comprehensive installation and operation manual is also included with basic preventative maintenance instructions to ensure that your

system performs optimally for years to come. Also available are complete systems that combine the Thorlabs Confocal package with third-party upright and inverted microscopes. For further details on this convenient option, please contact us at ImagingSales@thorlabs.com.

Scanner

At the heart of our systems is an efficiently designed Scan Head that incorporates a resonant scanner and a galvanometer for fast image acquisition. This allows for high imaging speeds up to 100 frames per second (at 128 x 128 pixel resolution) or high spatial resolution images (4096 x 4096 pixel resolution at 2 fps). At either extreme, or anywhere in between, the control and acquisition system creates high-quality, jitter-free images (see inset at left).

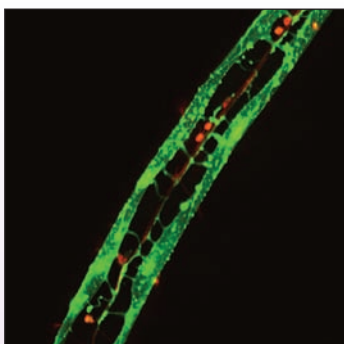


Scan Head

Located within the Scan Head is our new, kinematic fluorescence filter cube (DFMT1) for quick and repeatable exchange of the primary dichroic mirror. Our complete systems come standard with a primary dichroic that reflects four laser lines (405, 488, 532, and 642 nm). Other primary dichroics for use with other wavelengths are available upon request.

Optics

The scan lens assembly has been designed for superior imaging performance and is color corrected from 400 – 750 nm. This broad range adds to the functionality of the system, enabling the use of laser sources down to 400 nm while color correcting fluorescence emissions from even the deepest of red-emitting fluorophores. Coupled with ultra-sensitive, low-noise detectors and control electronics, we are able to provide systems that redefine the boundaries of contrast, resolution, and imaging speed at an affordable cost.



C. elegans motor neurons and muscle arms. The figure shows the *C. elegans* strain, trIs30, expressing YFP in body wall muscles (green) and DsRED2 in the ventral nerve cord and motor neurons (red) Courtesy of Dr. William Ryu, University of Toronto.

Confocal Fluorescence Microscopy Systems (Page 2 of 4)

Emission

Pinhole: An automated 16-aperture pinhole assembly with apertures ranging from $\text{Ø}25 \mu\text{m}$ to $\text{Ø}2 \text{mm}$, enables the ultimate balance between resolution and signal (for further details, see the Laser Scanning Microscopy Tutorial on page XXX). The pinhole is conveniently powered and controlled through USB. Additionally, the motorized, encoded control of the pinhole ensures perfect alignment and vibration-free movement. The emission light is focused on the pinhole and then collected by a large-core multimode fiber for transmission to the PMT detector system.

Detector: Our systems provide two different detector options. The standard sensitivity multi-alkali PMTs provide a low-noise, high-dynamic-range image that is appropriate for most life-science and industrial applications. If needed for weak or highly photosensitive samples, we also offer an option with high-sensitivity, TEC-cooled GaAsP PMTs. With either choice, the gain of the detector as well as the dynamic range of the digitizer is controlled within the ThorImage software.

DETECTORS	STANDARD SENSITIVITY	HIGH-SENSITIVITY
Photocathode	Multi-Alkali PMTs	Gallium Arsenide Phosphide (GaAsP) PMTs
Sensitivity	105 mA/W	176 mA/W
Detection Wavelength Range	185 – 900 nm	300 – 720 nm

we also offer an option with high-sensitivity, TEC-cooled GaAsP PMTs. With either choice, the gain of the detector as well as the dynamic range of the digitizer is controlled within the ThorImage software.



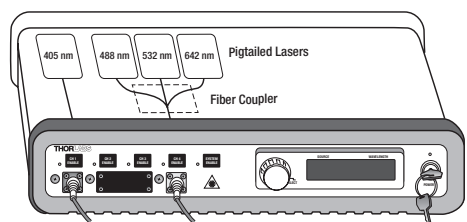
Excitation

One of the great challenges in laser scanning microscopy has been keeping the lasers in a multi-channel source aligned and therefore at peak power. We have overcome this problem by creating a four-channel laser source based on four service-free fiber-pigtailed laser sources. Three of the four wavelengths are combined into a single fiber using an advanced, fully integrated fiber optic device. This solid state coupling method provides lifetime, adjustment-free service from our laser source.

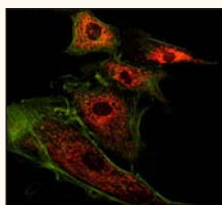
The combined visible output is contained in a single mode fiber with an FC/PC connector. The optional 405 nm laser output, which is delivered on its own single mode fiber, is combined after the beam expander in the Scan Head module. This allows the UV light to be coupled into the lightpath with a 4 mm beam diameter, thereby increases stability and maintaining the color correction of the system.

We offer four standard wavelengths in our laser source (405, 488, 532, and 642 nm); others are available upon request. The entire laser source is controlled by a single USB connection, which allows the user to turn each laser on and off as well as to control its intensity.

Schematic Diagram of Four-Channel CLS Laser Source

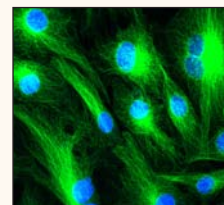


Confocal LSM Images of Bovine Pulmonary Artery Endothelial Cells

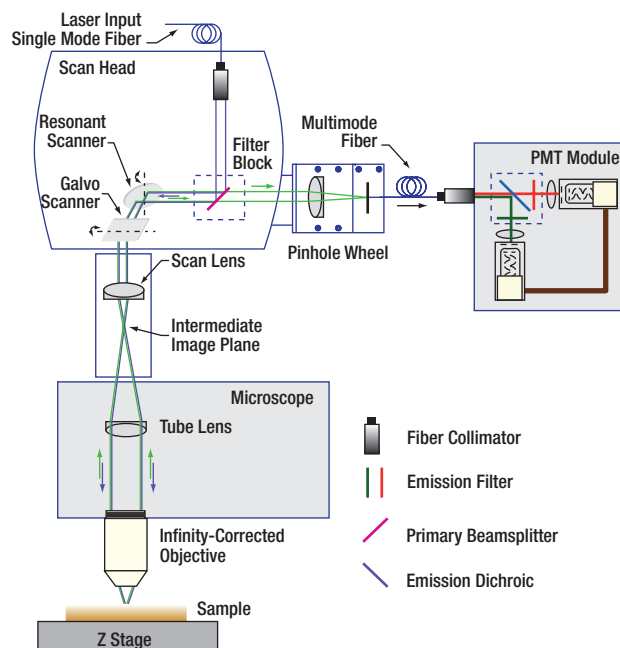


Bovine pulmonary artery endothelial cells visualized with BODIPY[®]FL goat anti-mouse IgG. The nuclei were counterstained with DAPI. Scanned Area Size: 600 μm x 600 μm . Laser Source: 405 nm and 488 nm.

Bovine pulmonary artery endothelial cells stained with a combination of fluorescent dyes. Mitochondria were labeled with red-fluorescent MitoTracker[®] Red CMXPos, F-actin was stained using green-fluorescent Alexa Fluor[®] 488 phalloidin. Scanned Area Size: 600 μm x 600 μm . Single Laser Source: 488 nm.



Schematic Diagram of Confocal Laser Scanning Microscope



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Laser Scanning Microscopy

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Multiphoton Systems

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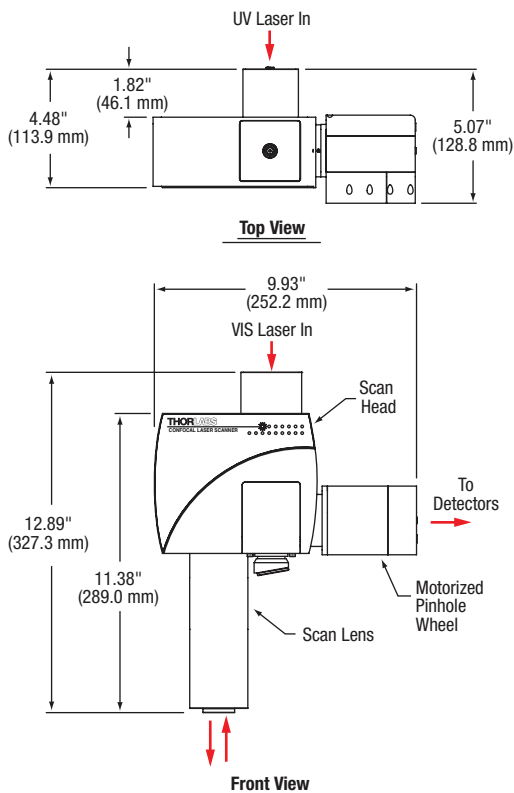
Laser Scanning Essentials Kit

Confocal Fluorescence Microscopy Systems (Page 3 of 4)

ITEM#		CLS-2SS	CLS-2HS	CLS-4SS	CLS-4HS	CLS-UV
Excitation						
Laser Wavelengths - Additional Wavelengths Available Upon Request	405 nm			✓	✓	✓
	488 nm	✓	✓	✓	✓	✓
	532 nm			✓	✓	
	642 nm	✓	✓	✓	✓	✓
Primary Dichroic Mirror	Quad Band Dichroic Beamsplitter					
Scanning						
Scanning Speed @ Resolution	100 fps @ 128 x 128 pixels (Max); 2 fps @ 4096 x 4096 pixels (Min)					
Scanner	X: 7.8 kHz Resonant Scanner; Y: Galvanometer Scan Mirror					
Scan Zoom	1X - 8X (Approximately)					
Capture Resolution	Up to 2048 x 2048 Bi-Directional Acquisition; Up to 4096 x 4096 Uni-Directional Acquisition					
Diffraction-Limited Field of View (FOV)	FN25* = 442 μm x 442 μm FOV @ 40X; FN23* = 407 μm x 407 μm FOV @ 40X					
Emission						
Number of PMTs Included	Standard Sensitivity	2		4		2
	High Sensitivity		2		4	
Emission Filters - CWL/FWHM	447 nm/60 nm Bandpass			✓	✓	✓
	514 nm/30 nm Bandpass			✓	✓	
	525 nm/50 nm Bandpass	✓	✓			✓
	559 nm/34 nm Bandpass			✓	✓	
	645 nm/Longpass	✓	✓	✓	✓	✓
Secondary Dichroic - CWL	495 nm			✓	✓	✓
	562 nm	✓	✓	✓	✓	✓
	605 nm			✓	✓	

*Field Number (FN) is the diameter of the image, formed at the intermediate image plane: FN = FOV * Magnification

Scan Head and Optics Assembly (CLS-UV)



Z-Axis Options for Recording Optical Sections

Analog Control: All of our CLS scan control modules include a 0 – 10 Volt analog output that can be controlled digitally from within the ThorImageLS™ software. The graphic interface allows the scaling of the output to be calibrated to the step size of any externally controlled focus device such as a piezo objective mover.

Z-Focus Motor: We have designed a universal focus motor (MFC1) that mounts to the fine focus knob of a commercially available microscope. Please see the specifications on the next page for more information.

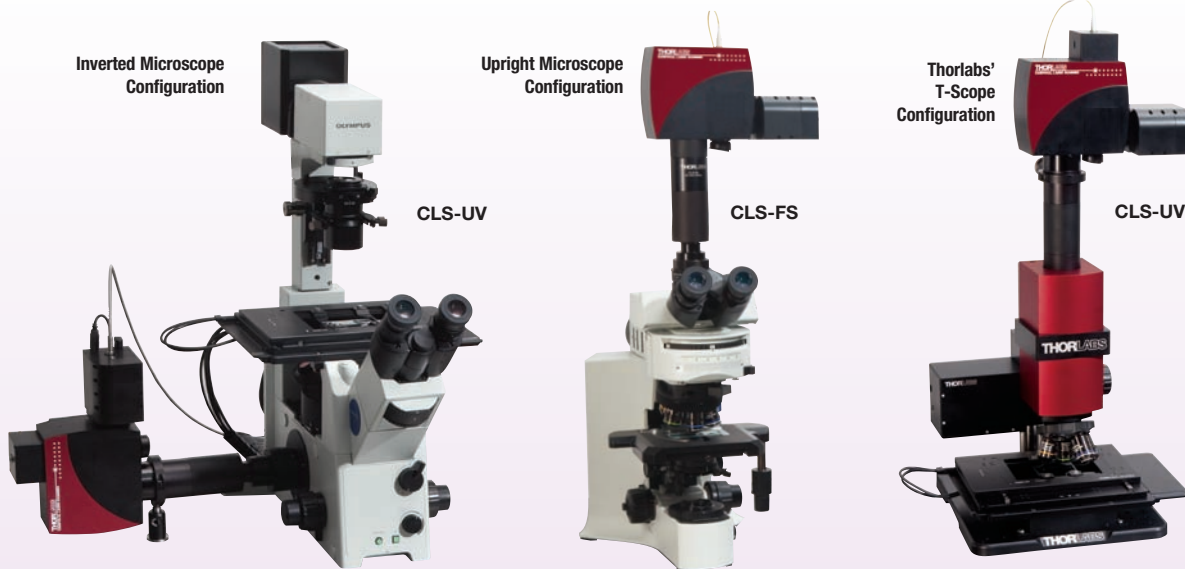
Piezo Z-Stage: The MZS500-E 500 μm piezo z-stage can also be controlled from within the ThorImageLS™ application to provide high-resolution Z sectioning of samples. The MZS500-E offers 500 μm of travel with a minimum step size of 25 nm. Please see page 1690 for more information.

We offer a variety of standard system configurations to address the application-specific needs and budgetary constraints of our customers. Aside from the standard configurations outlined above, we are also able to utilize our broad resources and breadth of knowledge to provide fully customized systems that address your specific requirements. Our strength lies in the fact that we are a vertically integrated organization, able to leverage the knowledge and technologies of other Thorlabs divisions to provide a fully integrated system at an unparalleled price.



Confocal Fluorescence Microscopy Systems (Page 4 of 4)

Thorlabs' CLS Systems on Assorted Microscopes



All Thorlabs CLS Confocal Laser Scanning Systems can be mounted on inverted and upright commercial microscopes on a standard C-mount camera port. For applications that do not require a commercial microscope, these systems are also compatible with Thorlabs' T-Scopes. Thorlabs is able to offer a complete confocal imaging solution with motorized control and synchronization for Z stack image reconstruction with the use of the Motorized T-Scope. See page XXX for details.

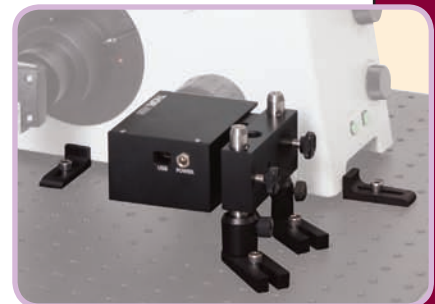
ITEM #	\$	£	€	RMB	DESCRIPTION
CLS-2SS	CALL	CALL	CALL	CALL	Two-Channel Fluorescence Confocal System with Standard Sensitivity PMTs
CLS-2HS	CALL	CALL	CALL	CALL	Two-Channel Fluorescence Confocal System with High-Sensitivity PMTs
CLS-4HS	CALL	CALL	CALL	CALL	Four-Channel Fluorescence Confocal System with High-Sensitivity PMTs
CLS-4SS	CALL	CALL	CALL	CALL	Four-Channel Fluorescence Confocal System with Standard Sensitivity PMTs
CLS-UV	CALL	CALL	CALL	CALL	Two-Channel UV Confocal System with Standard Sensitivity PMTs

Motorized Microscope Focus Controller



MFC1
Posts and Post
Holders Included

The MFC1 Motorized Microscope Focus Controller is a compact module enabling motorized focus control of commercial optical microscopes. An encoded stepper motor drive ensures repeatable positioning through the fine focus drive of the microscope and provides positional information, even if the fine adjustment is done manually. The unit is controlled via USB with our ThorImageLS™ software, instantly improving the functionality of your equipment. Please see page XXX to order a threaded breadboard to fit your application.



MFC1 Mounted on an
Inverted Microscope

Features

- Incremental Step: 100 nm (Minimum)
- USB Controlled
- Encoded Stepper Motor Drive
- Controlled Through ThorImageLS™ Software

ITEM #	\$	£	€	RMB	DESCRIPTION
MFC1	\$ 1,850.00	£ 1,332.00	€ 1,609.50	¥ 14,744.50	Motorized Microscope Focus Controller