THORLABS
43 Sparta Avenue
Newton, NJ 07860 | Sales: (973) 300-3000 | www.thorlabs.com

# MMP-2XY - November 7, 2024

Item # MMP-2XY was discontinued on November 7, 2024. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

## MICROSCOPE BODIES FOR DIY CERNA® SYSTEMS

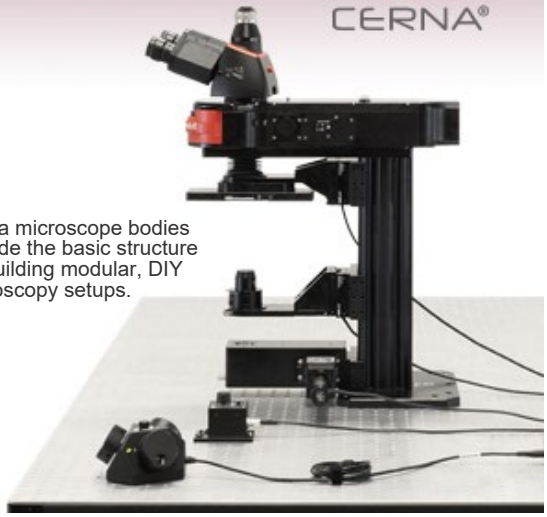
- Vertical Support Rails for Modular DIY Microscopes
- Holds Cerna® Modules at 7.74" Throat Depth
- Four Rail Heights: 350 mm, 400 mm, 500 mm, and 600 mm
- Microscope Translator Moves Body by 2" in X and Y

Bellows for Objective Holder

**CEA1350**
350 mm Rail Height

**CEA1500**
500 mm Rail Height

**CFB1500**
500 mm Rail Height,
No Epi-Illumination Arm



Cerna microscope bodies provide the basic structure for building modular, DIY microscopy setups.

Hide Overview

### OVERVIEW

#### Features

- 350 mm, 400 mm, 500 mm, or 600 mm Rail Height
- Available with or without Epi-Illumination Arm
  - Epi-Illumination Arm has Female D1N Dovetail that Sets 7.74" Throat Depth
  - Absence of Epi-Illumination Arm Provides Clearance at Top of Rail
- Linear 95 mm Dovetail Surface Provides Flexible Positioning of Modules Along the Rail
- Microscope Translator Moves Entire Microscope Body over 2" x 2" Square

Click to Enlarge
Microscope Designed for Histological Slice Imaging

Click to Enlarge
All Cerna Bodies are Engraved with the Cerna Logo and Part Number

DIY Cerna® Microscope Bodies serve as the foundation of fully modular, home-built imaging setups. They primarily consist of a vertical support rail that is available in four heights: 350 mm, 400 mm, 500 mm, and 600 mm. Each side of the rail offers a 95 mm wide dovetail that mates to our microscope modules for DIY Cerna systems. Based upon Thorlabs' 95 mm optical construction rails, these microscope bodies provide stable long-term support and excellent vibrational damping. In addition, they have been precision machined to ensure a high degree of perpendicularity with the workstation.

These microscope bodies are offered with and without epi-illumination arms. Each epi-illumination arm has a female D1N dovetail on top that accepts our widefield viewing and epi-illumination components. The arm also sets a large throat depth of 7.74", defining an exceptionally large working volume. For applications that would benefit from increased clearance in the plane above the top of the rail, we offer a 500 mm body without the arm. Each body includes a pre-installed mounting base with counterbores spaced for typical imperial and metric tapped hole patterns. This base can be replaced by the MMP-2XY Microscope Translator, available below, which translates the microscope body and any attachments over a 2" range in X and Y.

Thorlabs' DIY Cerna platform includes modules that provide objective mounting and condenser mounting , widefield viewing using trinoculars and scientific cameras, sample mounting, and transmitted light imaging using differential interference contrast (DIC), Dodt contrast, and brightfield and oblique illumination. These components mate to each other using a system of dovetails that locks the components in place along the optical path. In addition, our body attachments and extensions integrate DIY Cerna systems with Thorlabs' cage systems and SM-threaded components, enabling fully customizable DIY solutions.

Hide Microscope Dovetails

## MICROSCOPE DOVETAILS

### Introduction to Microscope Dovetails

Click to Enlarge
This photo shows the male 95 mm dovetail on the microscope body and the female 95 mm dovetail on the CSA1002 Fixed Arm.


Click to Enlarge
This photo shows the male D1N dovetail on the trinoculars next to the female D1N dovetail on the epi-illumination arm.

Dovetails are used for mechanical mating and optical port alignment of microscope components. Components are connected by inserting one dovetail into another, then tightening one or more locking setscrews on the female dovetail. Dovetails come in two shapes: linear and circular. Linear dovetails allow the mating components to slide before being locked down, providing flexible positioning options while limiting unneeded degrees of freedom. Circular dovetails align optical ports on different components, maintaining a single optical axis with minimal user intervention.

Thorlabs manufactures many components which use dovetails to mate with our own components or those of other manufacturers. To make it easier to identify dovetail compatibility, we have developed a set of dovetail designations. The naming convention of these designations is used only by Thorlabs and not other microscope manufacturers. The table to the right lists all the dovetails Thorlabs makes, along with their key dimensions.

In the case of Thorlabs' Cerna® microscopes, different dovetail types are used on different sections of the microscope to ensure that only compatible components can be mated. For example, our WFA2002 Epi-Illuminator Module has a male D1N dovetail that mates with the female D1N dovetail on the microscope body's epi-illumination arm, while the CSS2001 XY Microscopy Stage has a female D1Y dovetail that mates with the male D1Y dovetail on the CSA1051 Mounting Arm.

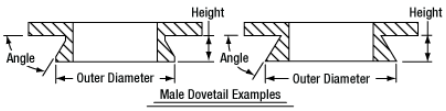
To learn which dovetail type(s) are on a particular component, consult its mechanical drawing, available by clicking on the red Docs icon ( ) below. For adapters with a female dovetail, the drawing also indicates the size of the hex key needed for the locking setscrew(s). It is important to note that mechanical compatibility does not ensure optical compatibility. Information on optical compatibility is available from Thorlabs' web presentations.

For customers interested in machining their own dovetails, the table to the right gives the outer diameter and angle (as defined by the drawings below) of each Thorlabs dovetail designation. However, the dovetail's height must be determined by the user, and for circular dovetails, the user must also determine the inner diameter and bore diameter. These quantities can vary for dovetails of the same type. One can use the intended mating part to verify compatibility.

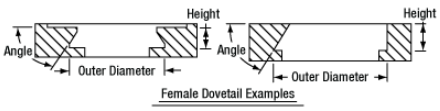
In order to reduce wear and simplify connections, dovetails are often machined with chamfers, recesses, and other mechanical features. Some examples of these variations are shown by the drawings below.

| Thorlabs Dovetail Reference[a] | | | |
|---|---|---|---|
| **Type** | **Shape** | **Outer Dimension** | **Angle** |
| **95 mm** | Linear | 95 mm | 45° |
| **D1N** | Circular | Ø2.018" | 60° |
| **D2N[b]** | Circular | Ø1.50" | 90° |
| **D2NB[b]** | Circular | Ø1.50" | 90° |
| **D3N** | Circular | Ø45 mm | 70° |
| **D5N** | Circular | Ø1.58" | 90° |
| **D6N** | Circular | Ø1.90" | 90° |
| **D7N** | Circular | Ø2.05" | 90° |
| **D8N** | Circular | Ø40 mm | 90° |
| **D9N** | Circular | Ø50 mm | 90° |
| **D10N** | Circular | Ø52 mm | 90° |
| **D1T** | Circular | Ø1.50" | 60° |
| **D3T** | Circular | Ø1.65" | 90° |
| **D4T** | Circular | Ø1.20" | 90° |
| **D1Y** | Circular | Ø107 mm | 60° |
| **D2Y** | Circular | Ø2.32" | 50° |
| **D3Y** | Circular | Ø1.75" | 90° |
| **D4Y** | Circular | Ø56 mm | 60° |
| **D5Y** | Circular | Ø46 mm | 60° |
| **D6Y** | Circular | Ø41.9 mm | 45° |
| **D1Z** | Circular | Ø54 mm | 60° |
| **D2Z** | Circular | Ø57 mm | 60° |
| **D3Z** | Circular | Ø54 mm | 45° |

- These dovetail designations are specific to Thorlabs products and are not used by other microscope manufacturers.
- D2N and D2NB dovetails have the same outer diameter and angle, as defined by the drawings below. The D2N designation does not specify a height. The D2NB designation specifies a dovetail height of 0.40" (10.2 mm).



Click to Enlarge
Two examples of how circular male dovetails can be manufactured.



Click to Enlarge
Two examples of how circular female dovetails can be manufactured.

Hide DIY Cerna Interfaces

## DIY CERNA INTERFACES

### Standard Mechanical Interfaces on DIY Cerna® Components

The table below gives the dovetail, optical component threads, and cage system interfaces that are present on each DIY Cerna component. If a DIY Cerna component does not have one of the standard interfaces in the table, it is not listed here. Please note that mechanical compatibility does not ensure optical compatibility. Information on optical compatibility is available from Thorlabs' web presentations.

| | Microscope Dovetails | | | | | | | | | | Optical Component Threads[a] | | Cage Systems[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Item # | 95 mm | D1N | D2N | D2NB | D3N | D5N | D1T | D3T | D1Y | D5Y | Internal | External | |
| 2CM1 | - | - | - | - | - | - | - | - | - | - | SM1[c] (1.035"-40) and SM2[d] (2.035"-40) | SM1[c] (1.035"-40) | 60 mm[d] |
| 2CM2 | - | - | - | - | - | - | - | - | - | - | SM1[c] (1.035"-40) and SM2[d] (2.035"-40) | SM1[c] (1.035"-40) | 30 mm[c] |
| BSA2000[e] | - | - | - | - | Female | - | - | - | - | - | - | - | - |
| CEA1350 | Male | Female | - | - | - | - | - | - | - | - | - | - | 60 mm[d] |
| CEA1400 | Male | Female | - | - | - | - | - | - | - | - | - | - | 60 mm[d] |
| CEA1500 | Male | Female | - | - | - | - | - | - | - | - | - | - | 60 mm[d] |
| CEA1600 | Male | Female | - | - | - | - | - | - | - | - | - | - | 60 mm[d] |
| CFB1500 | Male | - | - | - | - | - | - | - | - | - | - | - | - |
| CSA1000 | Female | - | - | - | - | - | - | - | - | - | - | - | - |
| CSA1001 | Female | - | - | - | - | - | - | - | - | - | SM1[c] (1.035"-40) | - | 30 mm[c] |
| CSA1002 | Female | - | - | - | - | - | - | - | - | - | SM2[d] (2.035"-40) | - | 60 mm[d] |
| CSA1003 | - | Female | - | - | - | - | - | - | - | - | - | - | 60 mm[d] |
| CSA1051 | Female | - | - | - | - | - | - | - | Male | - | - | - | - |
| CSA1200[e,f] | - | - | - | - | - | - | - | - | - | - | - | - | 60 mm[d] |
| CSA1400[e] | - | - | - | - | - | - | Female | - | - | - | - | - | 60 mm[d] |
| CSA1500[e,g] | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CSA2000[e] | - | - | - | - | Female | - | - | - | - | - | SM2[d] (2.035"-40) | - | 60 mm[d] |
| CSA2001 | - | - | - | - | Female | - | - | - | - | - | - | SM2[d] (2.035"-40) | - |
| CSA2100[e] | - | - | - | - | - | - | - | - | - | - | SM2[d] (2.035"-40) | - | 60 mm[d] |
| CSA3000(/M) | - | Male | - | - | - | - | - | - | - | - | - | - | - |
| CSA3010(/M) | - | Male | - | - | - | - | - | - | - | - | - | - | 30 mm[c] and 60 mm[d] |
| **Item #** | **95 mm** | **D1N** | **D2N** | **D2NB** | **D3N** | **D5N** | **D1T** | **D3T** | **D1Y** | **D5Y** | **Internal** | **External** | **Cage Systems** |
| CSC1001 | - | - | - | - | Male | - | - | - | - | - | - | - | - |
| CSC1002 | - | - | - | - | Male | - | - | - | - | - | - | - | - |
| CSC2001 | - | - | - | - | Male | - | - | - | - | - | - | - | - |
| CSD1001 | - | Male & Female | - | Female | - | - | - | - | - | - | - | - | - |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CSD1002 | - | Male & Female | - | - | - | - | - | - | - | - | - | C-Mount[h] | - |
| CSE2000 | - | Male & Female | - | - | - | - | - | - | - | - | - | - | 60 mm[d] |
| CSE2100 | - | Male & Female | - | - | - | - | - | Female | - | - | SM1[c] (1.035"-40) | - | 30 mm[c] and 60 mm[d] |
| CSE2200 | - | Male & Female | - | - | - | - | - | Female | - | - | SM1[c] (1.035"-40) | - | 30 mm[c] and 60 mm[d] |
| CSN100[e] | - | - | - | - | - | - | - | - | - | - | M32 x 0.75 | - | 60 mm[d] |
| CSN110 | - | - | - | - | - | - | Male | - | - | - | M32 x 0.75 | - | 30 mm[c] and 60 mm[d] |
| CSNK10 | - | - | - | - | - | - | - | - | - | - | M32 x 0.75 | - | 60 mm[d] |
| CSNK100[e] | - | - | - | - | - | - | - | - | - | - | M32 x 0.75 | - | 60 mm[d] |
| CSN200 | - | - | - | - | - | - | Male | - | - | - | M32 x 0.75 | - | - |
| CSN210 | - | - | - | - | - | - | Male | - | - | - | M32 x 0.75 | - | - |
| CSN1201[f] | - | - | - | - | - | - | - | - | - | - | M32 x 0.75 | - | - |
| CSN1202[f] | - | - | - | - | - | - | - | - | - | - | M25 x 0.75 | - | - |
| CSS2001 | - | - | - | - | - | - | - | - | Female | - | - | - | - |
| LAURE1 | - | Male | Female | - | - | - | - | - | - | - | - | - | - |
| LAURE2 | - | Male | Female | - | - | - | - | - | - | - | - | - | - |
| LCPN1 | - | - | - | - | Male | - | - | - | - | - | SM30 (M30.5 x 0.5) | - | 30 mm[c] and 60 mm[d] |
| LCPN2 | - | Male | - | - | - | - | - | - | - | - | SM30 (M30.5 x 0.5) | - | 30 mm[c] and 60 mm[d] |
| **Item #** | **95 mm** | **D1N** | **D2N** | **D2NB** | **D3N** | **D5N** | **D1T** | **D3T** | **D1Y** | **D5Y** | **Internal** | **External** | **Cage Systems** |
| LCPN3 | - | Male | - | - | - | - | - | - | - | Female | SM30 (M30.5 x 0.5) | - | 60 mm[d] |
| LCPN4 | - | Male | - | - | - | - | - | - | - | - | SM2[d] (2.035"-40) | - | 60 mm[d] |
| LCPN5 | - | - | - | - | Male | - | - | - | - | - | SM2[d] (2.035"-40) | - | 60 mm[d] |
| LCPN6 | - | - | Female | - | - | - | - | - | - | - | SM1[c] (1.035"-40) | - | 30 mm[c] and 60 mm[d] |
| LCPY2 | - | - | - | - | - | - | - | - | - | Male | SM30 (M30.5 x 0.5) | - | 30 mm[c] and 60 mm[d] |
| LCPY3 | - | - | - | - | - | - | - | - | - | Female | - | - | 30 mm[c] and 60 mm[d] |
| OPX2400(/M) | - | Male & Female | - | - | - | - | - | - | - | - | SM2[d] (2.035"-40) | - | 60 mm[d] |
| SM1A70 | - | - | - | - | - | - | - | - | - | - | SM30 (M30.5 x 0.5) | SM1[c] (1.035"-40) | - |
| SM1A58 | - | - | Male | Male | - | - | - | - | - | - | SM1[c] (1.035"-40) | SM2[d] (2.035"-40) | 30 mm[c] |
| SM2A56 | - | - | - | - | - | - | - | Male | - | - | - | SM2[d] (2.035"-40) | - |
| SM2A59 | - | Male | - | - | - | - | - | - | - | - | SM2[d] (2.035"-40) | - | - |
| TC1X | - | - | Male | - | - | - | - | - | - | - | - | - | - |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WFA0150 | Female | - | - | - | - | - | - | - | - | - | - | - | - |
| WFA1000 | - | - | - | - | - | - | - | - | - | - | - | - | 30 mm[c] |
| WFA1010 | - | - | - | - | - | - | - | - | - | - | SM1[c] (1.035"-40) | - | 30 mm[c] |
| WFA1020 | - | - | - | - | - | - | - | - | - | - | SM1[c] (1.035"-40) | - | 30 mm[c] |
| WFA1051 | - | - | - | - | - | - | - | - | - | - | SM1[c] (1.035"-40) | - | 30 mm[c] |
| WFA1100 | - | - | - | - | - | - | - | - | - | - | - | - | 30 mm[c] |
| WFA2001 | - | Male & Female | - | - | - | - | - | - | - | - | SM1[c] (1.035"-40) | SM1[c] (1.035"-40) | - |
| WFA2002 | - | Male & Female | - | - | - | - | - | - | - | - | SM1[c] (1.035"-40) | - | 30 mm[c] |
| **Item #** | **95 mm** | **D1N** | **D2N** | **D2NB** | **D3N** | **D5N** | **D1T** | **D3T** | **D1Y** | **D5Y** | **Internal** | **External** | **Cage Systems** |
| WFA4100 | - | Male | - | - | - | - | - | - | - | - | SM1[c] (1.035"-40) | C-Mount[h] | - |
| WFA4101 | - | Male | - | - | - | - | - | - | - | - | SM1[c] (1.035"-40) | C-Mount[h] | - |
| WFA4102 | - | Male | - | - | - | - | - | - | - | - | SM1[c] (1.035"-40) | C-Mount[h] | - |
| WFA4111 | - | Male | - | - | - | - | - | - | - | - | - | SM2[d] (2.035"-40) | - |
| WFA4112 | - | - | - | Male | - | - | - | - | - | - | - | C-Mount[h] | - |
| XT95RC1(/M) | Female | - | - | - | - | - | - | - | - | - | - | - | - |
| XT95RC2(/M) | Female | - | - | - | - | - | - | - | - | - | - | - | - |
| XT95RC3(/M) | Female | - | - | - | - | - | - | - | - | - | - | - | - |
| XT95RC4(/M) | Female | - | - | - | - | - | - | - | - | - | - | - | - |
| XT95P12(/M) | Female | - | - | - | - | - | - | - | - | - | - | - | - |
| ZFM1020 | Female | - | - | - | - | - | - | - | - | - | - | - | - |
| ZFM1030 | Female | - | - | - | - | - | - | - | - | - | - | - | - |
| ZFM2020 | Female | - | - | - | - | - | - | - | - | - | - | - | - |
| ZFM2030 | Female | - | - | - | - | - | - | - | - | - | - | - | - |

- Thorlabs' optical component thread adapters can be used to convert between C-Mount threads, SM1 threads, SM2 threads, and virtually every other optical thread standard.
- Our cage system size adapters and drop-in adapter can be used to convert between 16 mm, 30 mm, and 60 mm cage systems.
- Our 30 mm cage plates can convert between SM1 lens tubes and 30 mm cage systems.
- Our 60 mm cage plates can convert between SM2 lens tubes and 60 mm cage systems.
- Attach to a ZFM focusing module to add a female 95 mm dovetail.
- The CSA1200 mounting arm is compatible with the CSN1201 and CSN1202 nosepieces.
- This blank arm is designed for custom DIY machining for non-standard components, threads, and bores.
- C-Mount and CS-Mount standards feature the same 1.00"-32 threads, but C-Mounts have a 5 mm longer flange-to-sensor distance.

Hide Cerna Videos

## CERNA VIDEOS

### Building a Cerna® Microscope

The Cerna microscopy platform's large working volume and system of dovetails make it straightforward to connect and position the components of the microscope. This flexibility enables simple and stable set up of a preconfigured microscope, and provides easy paths for later upgrades and modification. See below for a couple examples of the assembly of some DIY Cerna microscopes.

## DIY Cerna Design and Assembly

**DIY Microscope Configuration Assembly**
The simplicity of Thorlabs optomechanical interfaces allows a custom DIY microscope to be quickly assembled and reconfigured for custom imaging applications.

Hide Microscope Guide

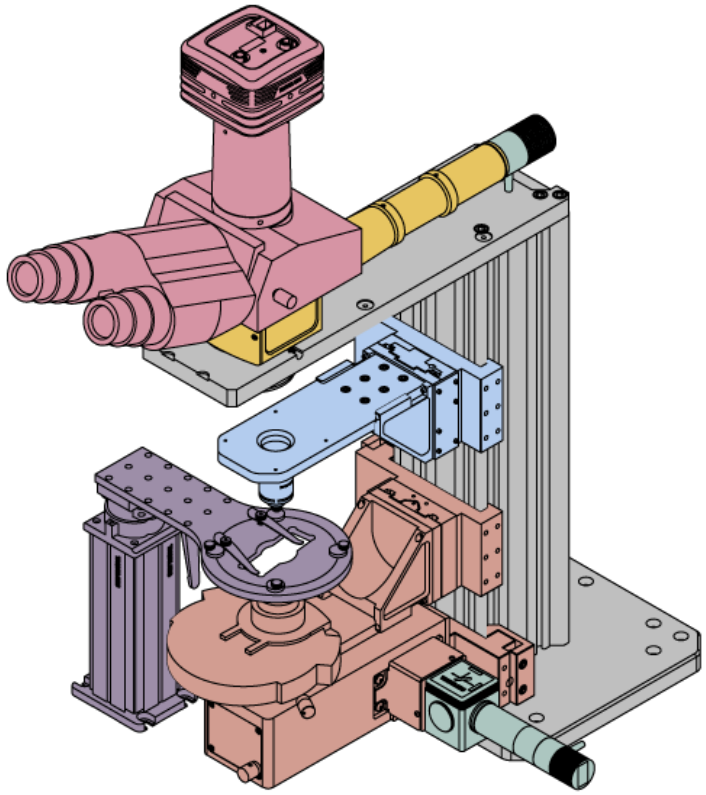
### MICROSCOPE GUIDE

#### Elements of a Microscope

This overview was developed to provide a general understanding of a Cerna® microscope. Click on the different portions of the microscope graphic to the right or use the links below to learn how a Cerna microscope visualizes a sample.

- Terminology
- Microscope Body
- Illumination
- Sample Viewing/Recording
- Sample/Experiment Mounting

**Click on the different parts of the microscope to explore their functions.**



#### Terminology

**Arm:** Holds components in the optical path of the microscope.

**Bayonet Mount:** A form of mechanical attachment with tabs on the male end that fit into L-shaped slots on the female end.

**Bellows:** A tube with accordion-shaped rubber sides for a flexible, light-tight extension between the microscope body and the objective.

**Breadboard:** A flat structure with regularly spaced tapped holes for DIY construction.

**Dovetail:** A form of mechanical attachment for many microscopy components. A linear dovetail allows flexible positioning along one dimension before being locked down, while a circular dovetail secures the component in one position. See the *Microscope Dovetails* tab or here for details.

**Epi-Illumination:** Illumination on the same side of the sample as the viewing apparatus. Epi-fluorescence, reflected light, and confocal microscopy are some examples of imaging modalities that utilize epi-illumination.

**Filter Cube:** A cube that holds filters and other optical elements at the correct orientations for microscopy. For example, filter cubes are essential for fluorescence microscopy and reflected light microscopy.

**Köhler Illumination:** A method of illumination that utilizes various optical elements to defocus and flatten the intensity of light across the field of view in the sample plane. A condenser and light collimator are necessary for this technique.

**Nosepiece:** A type of arm used to hold the microscope objective in the optical path of the microscope.

**Optical Path:** The path light follows through the microscope.

**Rail Height:** The height of the support rail of the microscope body.

**Throat Depth:** The distance from the vertical portion of the optical path to the edge of the support rail of the microscope body. The size of the throat depth, along with

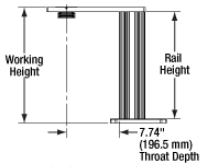
the working height, determine the working space available for microscopy.

**Trans-Illumination:** Illumination on the opposite side of the sample as the viewing apparatus. Brightfield, differential interference contrast (DIC), Dodt gradient contrast, and darkfield microscopy are some examples of imaging modalities that utilize trans-illumination.

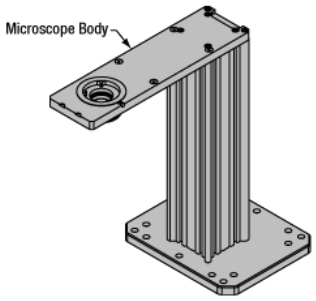
**Working Height:** The height of the support rail of the microscope body plus the height of the base. The size of the working height, along with the throat depth, determine the working space available for microscopy.

## Microscope Body

The microscope body provides the foundation of any Cerna microscope. The support rail utilizes 95 mm rails machined to a high angular tolerance to ensure an aligned optical path and perpendicularity with the optical table. The support rail height chosen (350 - 600 mm) determines the vertical range available for experiments and microscopy components. The 7.74" throat depth, or distance from the optical path to the support rail, provides a large working space for experiments. Components attach to the body by way of either a linear dovetail on the support rail, or a circular dovetail on the epi-illumination arm (on certain models). Please see the *Microscope Dovetails* tab or here for further details.



Click to Enlarge
Body Details



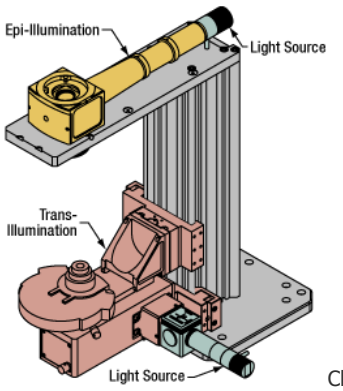
Click to Enlarge
Cerna Microscope Body

| | |
|---|---|
|  |  |
| Microscope Bodies | Microscope Translator |

## Illumination

Using the Cerna microscope body, a sample can be illuminated in two directions: from above (epi-illumination, see yellow components to the right) or from below (trans-illumination, see orange components to the right).

Epi-illumination illuminates on the same side of the sample as the viewing apparatus; therefore, the light from the illumination source (green) and the light from the sample plane share a portion of the optical path. It is used in fluorescence, confocal, and reflected light microscopy. Epi-illumination modules, which direct and condition light along the optical path, are attached to the epi-illumination arm of the microscope body via a circular D1N dovetail (see the *Microscope Dovetails* tab or here for details). Multiple epi-illumination modules are available, as well as breadboard tops, which have regularly spaced tapped holes for custom designs.



Click to Enlarge
Illumination with a Cerna microscope can come from above (yellow) or below (orange). Illumination sources (green) attach to either.

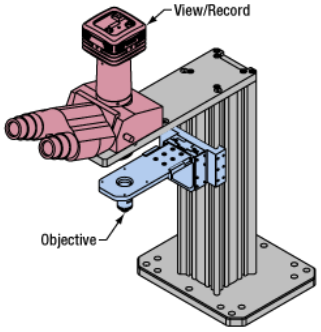
Trans-illumination illuminates from the opposite side of the sample as the viewing apparatus. Example imaging modalities include brightfield, differential interference contrast (DIC), Dodt gradient contrast, oblique, and darkfield microscopy. Trans-illumination modules, which condition light (on certain models) and direct it along the optical path, are attached to the support rail of the microscope body via a linear dovetail (see *Microscope Dovetails* tab or here). Please note that certain imaging modalities will require additional optics to alter the properties of the beam; these optics may be easily incorporated in the optical path via lens tubes and cage systems. In addition, Thorlabs offers condensers, which reshape input collimated light to help create optimal Köhler illumination. These attach to a mounting arm, which holds the condenser at the throat depth, or the distance from the optical path to the support rail. The arm attaches to a focusing module, used for aligning the condenser with respect to the sample and trans-illumination module.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |
| Epi-Illumination Modules | Breadboards & Body | Brightfield | DIC | Dodt | Condensers | Condenser Mounting | Light Sources |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Attachments | | | | | | |

## Sample Viewing/Recording

Once illuminated, examining a sample with a microscope requires both focusing on the sample plane (see blue components to the right) and visualizing the resulting image (see pink components).




Click to Enlarge
Light from the sample plane is collected through an objective (blue) and viewed using trinocs or other optical ports (pink).

A microscope objective collects and magnifies light from the sample plane for imaging. On the Cerna microscope, the objective is threaded onto a nosepiece, which holds the objective at the throat depth, or the distance from the optical path to the support rail of the microscope body. This nosepiece is secured to a motorized focusing module, used for focusing the objective as well as for moving it out of the way for sample handling. To ensure a light-tight path from the objective, the microscope body comes with a bellows (not pictured).

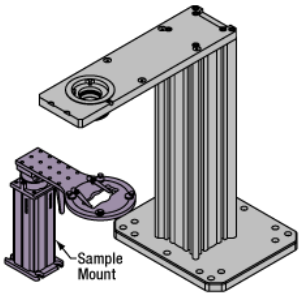
Various modules are available for sample viewing and data collection. Trinoculars have three points of vision to view the sample directly as well as with a camera. Double camera ports redirect or split the optical path among two viewing channels. Camera tubes increase or decrease the image magnification. For data collection, Thorlabs offers both cameras and photomultiplier tubes (PMTs), the latter being necessary to detect fluorescence signals for confocal microscopy. Breadboard tops provide functionality for custom-designed data collection setups. Modules are attached to the microscope body via a circular dovetail (see the *Microscope Dovetails* tab or here for details).

Objectives & Accessories | Objective Mounting

Sample Viewing | Cameras | PMTs | Breadboards & Body Attachments

## Sample/Experiment Mounting

Various sample and equipment mounting options are available to take advantage of the large working space of this microscope system. Large samples and ancillary equipment can be mounted via mounting platforms, which fit around the microscope body and utilize a breadboard design with regularly spaced tapped through holes. Small samples can be mounted on rigid stands (for example, see the purple component to the right), which have holders for different methods of sample preparation and data collection, such as slides, well plates, and petri dishes. For more traditional sample mounting, slides can also be mounted directly onto the microscope body via a manual XY stage. The rigid stands can translate by way of motorized stages (sold separately), while the mounting platforms contain built-in mechanics for motorized or manual translation. Rigid stands can also be mounted on top of the mounting platforms for independent and synchronized movement of multiple instruments, if you are interested in performing experiments simultaneously during microscopy.




Click to Enlarge
The rigid stand (purple) pictured is one of various sample mounting options available.

Close

Translating Platforms | Rigid Stands | Translation Stages for Rigid Stands | Motorized XY Stages | Manual XY Stage

For sample viewing, Thorlabs offers trinoculars, double camera ports, and camera tubes. Light from the sample plane can be collected via cameras, photomultiplier tubes (PMTs), or custom setups using breadboard tops. Click here for additional information about viewing samples with a Cerna microscope.

Product Families & Web Presentations


Sample Viewing


Breadboards & Body Attachments


Cameras


PMTs

Close

Microscope objectives are held in the optical path of the microscope via a nosepiece. Click here for additional information about viewing a sample with a Cerna microscope.

Product Families & Web Presentations


Objectives


Objective Thread Adapters


Parfocal Length Extender


Piezo Objective Scanner


Objective Mounting

Close

Large and small experiment mounting options are available to take advantage of the large working space of this microscope. Click here for additional information about mounting a sample for microscopy.

Product Families & Web Presentations


Translating Platforms


Rigid Stands


Translation Stages for Rigid Stands


Motorized XY Stages


Manual XY Stage

Close

Thorlabs offers various light sources for epi- and trans-illumination. Please see the full web presentation of each to determine its functionality within the Cerna microscopy platform.

Product Families & Web Presentations


Trans-Illumination Kits


Solis™ High-Power LEDs


Mounted LEDs


X-Cite® Lamps


Other Light Sources

Close

Epi-illumination illuminates the sample on the same side as the viewing apparatus. Example imaging modalities include fluorescence, confocal, and reflected light microscopy. Click here for additional information on epi-illumination with Cerna.

Product Families & Web Presentations

Epi-Illumination

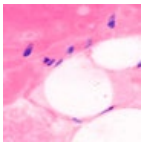
Body Attachments

Light Sources

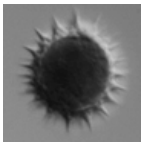
Close

Trans-illumination illuminates from the opposite side of the sample as the viewing apparatus. Example imaging modalities include brightfield, differential interference contrast (DIC), Dodt gradient contrast, oblique, and darkfield microscopy. Click here for additional information on trans-illumination with Cerna.

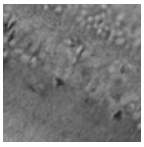
Product Families & Web Presentations



Brightfield



DIC



Dodt

Condensers

Condenser Mounting

Illumination Kits

Other Light Sources

Close

The microscope body provides the foundation of any Cerna microscope. The 7.74" throat depth provides a large working space for experiments. Click here for additional information about the Cerna microscope body.

Product Families & Web Presentations

Microscope Bodies

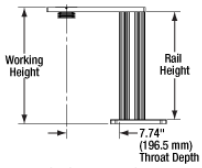
Microscope Translator

Hide Microscope Bodies with Epi-Illumination Arm

## Microscope Bodies with Epi-Illumination Arm


- 350 mm, 400 mm, 500 mm, or 600 mm Rail Height
- Linear 95 mm Dovetail for Flexible Positioning of Microscope Modules
- Includes Epi-Illumination Arm
  - Structural Support for Widefield Viewing, Epi-Illumination, and Custom Modules
  - Female D1N Dovetail at 7.74" Throat Depth
  - Four 4-40 Taps for 60 mm Cage System on Bottom
  - Magnetic Bellows Creates Light-Tight Beam Path to Objective Holder
- Mounting Base with 1/4" and M6 Counterbores for Imperial and Metric Workstations

Click to Enlarge
Female D1N Dovetail in Epi-Illumination Arm Accepts Male D1N Dovetail Components




Click to Enlarge
Refer to the Table Below for Available Working Heights and Rail Heights

Microscope bodies with epi-illumination arms provide a large working volume for DIY setups. The vertical rail has a linear 95 mm dovetail surface for mounting user-built and pre-built microscope modules, and the epi-illumination arm defines a large 7.74" throat depth.

These microscope bodies are offered in four rail heights ranging from

| Item # | Rail Height | Working Height | Weight |
|---|---|---|---|
| CEA1350 | 350 mm (13.78") | 365.9 mm (14.40") | 13.75 kg (30.25 lbs) |
| CEA1400 | 400 mm (15.75") | 415.9 mm (16.37") | 14.55 kg (32.01 lbs) |
| CEA1500 | 500 mm (19.69") | 515.9 mm (20.31") | 16.15 kg (35.53 lbs) |

| | | | |
|---|---|---|---|
| CEA1600 | 600 mm (23.62") | 615.9 mm (24.24") | 17.80 kg (39.16 lbs) |

350 mm to 600 mm. Shorter heights offer better access to the top of the microscope, making it easier to use trinoculars or build widefield viewing, epi-illumination, and laser scanning pathways. In contrast, taller heights provide additional space along the vertical rail for designing optical paths using our body attachments and extensions, objective mounting and condenser mounting accessories, or trans-illumination modules for DIC imaging, Dodt contrast, or brightfield and oblique illumination. This rail also accepts the mounting brackets for our Manual XY Stage and Fast XY Scanning Stage sample holders.

The top of the epi-illumination arm has a female D1N dovetail at the 7.74" throat depth, while the bottom of the epi-illumination arm has four 4-40 taps for our 60 mm cage system and a magnetic bellows that creates a light-tight beam path to DIY Cerna objective holders. This bellows can be adjusted from 0.40" to 2.00" long. We offer a range of male D1N dovetail adapters and breadboard tops that can be mated to the female D1N dovetail, which confer compatibility with Thorlabs' SM-threaded components, cage systems, and complete range of optomechanics.

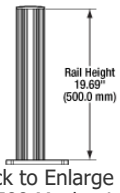
Please note that at 350 mm tall, the CEA1350 Microscope Body does not have enough room for DIC imaging setups and leaves only limited room for Dodt contrast and brightfield illumination.

| Part Number | Description | Price | Availability |
|---|---|---|---|
| **CEA1350** | **Cerna Microscope Body with Epi-Illumination Arm, 350 mm Rail** | **$983.61** | **Today** |
| **CEA1400** | **Cerna Microscope Body with Epi-Illumination Arm, 400 mm Rail** | **$994.29** | **Today** |
| **CEA1500** | **Cerna Microscope Body with Epi-Illumination Arm, 500 mm Rail** | **$1,016.86** | **Today** |
| **CEA1600** | **Cerna Microscope Body with Epi-Illumination Arm, 600 mm Rail** | **$1,039.44** | **Today** |

Hide Microscope Body without Epi-Illumination Arm

## Microscope Body without Epi-Illumination Arm


- 500 mm Rail Height
- Linear 95 mm Dovetail for Flexible Positioning of Microscope Modules
- Absence of Epi-Illumination Arm Creates Additional Clearance Above the Top of the Rail
- Mounting Base with 1/4" and M6 Counterbores for Imperial and Metric Workstations



Click to Enlarge
CFB1500 Mechanical Drawing


Click to Enlarge
The absence of the epi-illumination arm creates additional space above the macro lens in this functional imaging setup.

| Item # | Rail Height | Weight |
|---|---|---|
| CFB1500 | 500 mm (19.69") | 13.20 kg (29.04 lbs) |

The CFB1500 Microscope Body is offered without an epi-illumination arm for DIY setups that require added clearance in the region above the top of the vertical support rail. It is ideal for applications such as intrinsic imaging, in which it is necessary to mount a tall optical assembly directly above the specimen, as shown in the image to the right. It also provides greater versatility in setups where the epi-illumination arm is not needed.

This microscope body has a 500 mm rail height and the same linear 95 mm dovetail surface as the microscope bodies sold above.

| Part Number | Description | Price | Availability |
|---|---|---|---|
| **CFB1500** | **Cerna Microscope Body without Epi-Illumination Arm, 500 mm Rail** | **$732.95** | **Today** |

Hide Microscope Body Translator

## Microscope Body Translator


- Motorized Translation of Entire Microscope Body Over 2" Range in X and Y
- Fits Behind Support Rail, Leaving Rest of Workstation Free
- Moving the Microscope Body Lets Sensitive Samples Remain Stationary
- Operated by MCM3002 3-Axis Controller (Sold Separately)

| MMP-2XY Specifications | |
|---|---|
| **Number of Axes** | Two |
| **Travel Range per Axis** | 2" (50.8 mm) |
| **Encoder Resolution** | 0.5 µm |
| **Load Capacity When Base Mounted Horizontally** | 34 kg (74.8 lbs) |
| **Velocity (Max)** | 3.66 mm/s |
| **XY Orthogonality** | <2.4 mrad |


Click to Enlarge
MMP-2XY Being Used to Translate a Home-Built Imaging Rig

Thorlabs' MMP-

| Microscope Body Item # | Weight of Microscope Body without Mounting Base[a] |
|---|---|
| CEA1350 | 11.59 kg (25.50 lbs) |
| CEA1400 | 12.39 kg (27.26 lbs) |
| CEA1500 | 13.99 kg (30.78 lbs) |
| CEA1600 | 15.64 kg (34.41 lbs) |
| CFB1500 | 11.04 kg (24.29 lbs) |

- The user removes the Cerna microscope body's mounting base in order to install the MMP-2XY microscope translator. Subtract the weights here from 34 kg to determine how much of the MMP-2XY's load capacity remains available for use.

| | |
|---|---|
| **Angular Deviation** | Pitch: <350 µrad (Max)<br>Yaw: <150 µrad (Max) |
| **Bearings** | Crossed Roller |

2XY Microscope Translator is ideal for applications that require the field of view to translate without disturbing a specimen. The microscope translator is constructed using two high-performance linear stages that incorporate stepper motor actuators. Each stepper motor has a 2" travel range and 0.5 µm encoder resolution. The motors are operated by the MCM3002 3-Axis Controller sold below, which enables fine, variable-speed motorized travel.

To secure the translator to the microscope body, simply unscrew the mounting base included with the body, then tighten the three side-located 4 mm hex setscrews on the 95 mm dovetail clamp. As shown by the photo to the right, when the translator is secured in place, it will be conveniently located behind the microscope body and away from the optical path and experimental setups. Please note that the MMP-2XY should be attached to the tabletop before the microscope body is secured to the translator.

The microscope translator can support a maximum load of 34 kg (74.8 lbs). When attaching a Cerna microscope body, some of this load capacity will be consumed by the vertical support rail and the epi-illumination arm (if present). To help determine how much load capacity will remain after mounting the body, the weights of our Cerna microscope bodies without their pre-installed mounting bases are given in the table to the left.

| Part Number | Description | Price | Availability |
|---|---|---|---|
| **MMP-2XY** | **Microscope Translator with 2" Travel in X and Y** | **$12,308.23** | **Today** |

Hide Motion Controller for Cerna® Components with 2" Travel Range

## Motion Controller for Cerna® Components with 2" Travel Range


- Designed for Cerna® Components with 2" Motorized Travel
- Knobs Provide Hand-Operated Control for Up to Three Axes
- Each Axis Can Be Individually Disabled to Prevent Unintended Movements or to Retain a Position
- Adjust Translation Speed via Top-Located Knob
- Remotely Control Translation Using Standalone Software (Requires 64-Bit Windows® 7 or 10)


Click to Enlarge
MCM3002 Being Used to Control the PMP-2XY Translating Breadboard

| Compatible Stages |
|---|
| Microscope Body Translator |
| Translating Platforms |

**Controller Specifications** More [+]

**Compatible Motor Specifications** More [+]

### Software

**Version 4.0 (August 8, 2019)**

The software package contains the installation files for the GUI interface, driver, SDK, and support documentation. The software is compatible with Windows® 7 and 10 (64-bit) systems.

Software

The MCM3002 3-Axis Controller consists of a hand-operated knob box and a separate controller. Each side face of the knob box includes a rotating knob and a push-button switch that are dedicated to a single axis. The push-button switch enables and disables the axis, and is lit in green when the axis is enabled. Disabling the axis lets the user preserve a position or prevent accidental movements. A smaller knob on the top face adjusts the amount of translation per rotation of the knob (see the Controller Specifications table for details).

Since each MCM3002 controller has three channels, you only need to purchase enough channels for each of the modules you intend to drive. For example, a Cerna microscope equipped with a PMP-2XY Translating Platform (which has two axes) only requires one MCM3002 controller.

The MCM3002 is compatible with motorized Cerna components that have a travel range of 2", such as our MMP-2XY Microscope Body Translator and Translating Platforms; see the Compatible Motor Specifications table above for use with alternate motorized products. For components with a 1" travel range, such as our Translation Stages and Motorized Focusing Modules, the MCM301 controller should be used instead. If you would like a controller configured to drive more than one type of stage, please contact Tech Support.

Axis translation can also be adjusted remotely via software. Alternatively, LabVIEW™ software development kit (SDK) and support documentation are available to integrate these controllers with custom imaging software.

The MCM3002 includes adapter cables for connecting to motorized Cerna components with a 2" travel range.

| Part Number | Description | Price | Availability |
|---|---|---|---|
| MCM3002 | Three-Channel Controller and Three-Knob Joystick for 2" Cerna Travel Stages | $4,274.15 | Today |