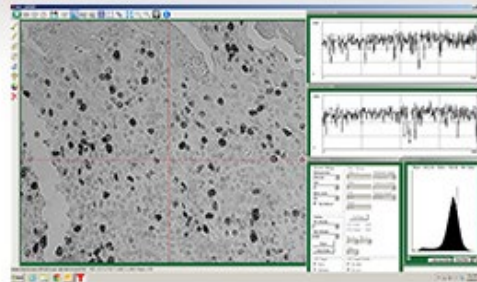**THORLABS**

DCU224C - August 19, 2021

Item # DCU224C was discontinued on August 19, 2021. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

HIGH-RESOLUTION USB CCD CAMERA

▶ **1280 x 1024 Pixel Resolution**
▶ **15 fps Frame Rate**
▶ **USB 2.0 Interface**

GUI and Software Package Included

DCU224C

USB

I/O

OVERVIEW

Features

- 1280 x 1024 Pixel Resolution
- 1/2" Image Sensor with Square Pixels
- 15 fps Frame Rate (Full Frame Mode)
- C-Mount Lens Mount for use with our Standard C-Mount Camera Lenses and High-Magnification Zoom Lenses
- Global Shutter
- Universal Trigger Input
- ThorCam™ Software for Windows® 7 and 10 Operating Systems
- SDK and Programming Interfaces Provide Support for:
  - C, C++, C#, and Visual Basic .NET APIs
  - LabVIEW, MATLAB, and µManager Third-Party Software

Item #	DCU224C
Resolution	1280 x 1024 Pixels
Pixel Clock Range[a]	5-30 MHz
Binning	Vertical[b]
AOI	Horizontal, Vertical[b]
Frame Rate at 320 x 240 Pixel (Cif)	38 fps

a. The max possible pixel clock depends on the computer used.
b. Function increases the frame rate.

Sensors and Functionality

The DCU224C ultra compact, lightweight CCD camera features USB connections, making it extremely versatile for a wide range of applications including industrial automation, quality control, medical imaging, microscopy, and security technology. This camera has a 1/2" CCD sensor with SXGA resolution (1280 x 1024) and provide a full frame repetition rate of 15 fps.

Higher frame rates can be achieved by using the Area of Interest (AOI) or Binning functions; the former increases the frame rate by only reading a selected area of the sensor, whereas the latter increases the frame rate by combining pixel readings before
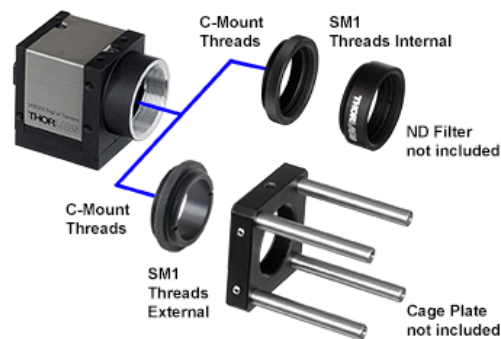
SM1 Thread Compatibility

transferring them to the PC, but in this case, image resolution is sacrificed. The computer can communicate digitally with the camera through the USB 2.0 interface, thus enabling the user to transmit images and control camera settings seamlessly.

Software
This CCD camera comes with ThorCam, our Windows-compatible software package on CD. In addition, the cameras are supported by an extensive software development kit. Standard drivers like Direct Show (WDM), Active X, and TWAIN are provided. In addition, over 20 demo programs (including source code) are supplied. A USB cable for connecting the camera to a PC is also included.

Compatibility of the CCD Camera with Thorlabs' SM1 Internal or External Threadings via the Included SM1 (1.035"-40) Adapters. Replacement adapters are shown below.

Included Mounting Adapters
The DCU224C includes two thread adapters: one external C-Mount to internal SM1 (1.035"-40) and one external C-Mount to external SM1. The C-Mount threading of the CCD camera can be easily connected to components with Thorlabs' standard SM1 thread via one of the two included SM1 adapters, as shown in the photo to the right. Additional or replacement adapters may be purchased below. A mounting adapter plate is also provided with the CCD camera; by using the included M4 x 10 mm or 8-32 x 3/4" cap screw, the camera can be threaded onto Thorlabs' TR series Ø1/2" posts. Every unit also ships with four M3 x 6 mm screws for mounting the adapter plate to the camera.

Trigger Option
The optional CAB-DCU-T1 and CAB-DCU-T2 cables can replace the standard USB connection while also enabling the use of the additional trigger input and output ports of these cameras. The exposure and readout/transfer events of the camera can be initiated via the input trigger; external events like strobe lights can be triggered by the camera through the output trigger. The trigger configuration, i.e. the source of the input trigger and the timing for the output trigger, can be set through the provided software or the LabVIEW drivers. Please click here for more details about the cables and the ordering information.

SPECS

Item #	DCU224C
Sensor	
Sensor Type	CCD
Exposure Mode	Electronic Global Shutter
Read Out Mode	Progressive Scan
Resolution	1280 x 1024 Pixels
Optical Sensor Class	1/2"
Exact Sensitive Area	5.95 mm x 4.76 mm
Exact Optical Sensor Dimension (Diagonal)	7.6 mm (0.30")
Pixel Size	4.65 µm x 4.65 µm
Sensor Name	Sony ICX205AK
A/D Converter Resolution	8 Bit
S/N Ratio	≥38 dB
Frame Rates	
Pixel Clock Range[a] (Allowed/Recommended)	5 - 30 MHz/10 - 20 MHz
Frame Rate, Freerun Mode[b]	15 fps
Frame Rate, Trigger Mode, 1 ms Exposure Time[b]	17 fps
Exposure Time in Freerun Mode	66 µs[b] - 1360 ms[c]
Exposure Time in Trigger Mode	66 µs[b] - 10 min[c]
Binning	Vertical[d]
Method	V: Monochrome Binning, Additive

Factor, Maximum Resolution, Frame Rate	2x, 1280 x 512 Pixel, 23 fps
Factor, Maximum Resolution, Frame Rate	4x, 1280 x 256 Pixel, 31 fps
Subsampling	-
AOI	Horizontal, Vertical [d]
Frame Rate at 320 x 240 Pixel (Cif)	38 fps
Absolute Image Width, Step Width	16 - 1280 Pixel, 4
Absolute Image Height, Step Width	120 - 1024 Pixels, 2
Position Raster Horizontal	2
Position Raster Vertical	2
Gain	
Monochrome Model	8.9X/4.0X (Master/RGB)
Offset Control, Mode	Auto, Manual, Additive
Gain Boost	n/a
Trigger	
Hardware Trigger	Asynchronous
Trigger Delay With Rising Edge, Jitter	39.9 µs ± 2.5 µs
Trigger Delay With Falling Edge, Jitter	57.7 µs ± 2.5 µs
Additive Trigger Delay To the Sensor	15 µs - 4 s
Sensor Delay To the Exposure Start	<100 µs[b]
Trigger Low Level[e]	0 V Min, 2 V Max
Trigger High Level[e]	5 V Min, 24 V Max
Power Consumption	1.1 - 2.1 W
Housing	
Protective Window, Removable	IR Filter D263 with HQ coating
Interface	USB 2.0
Power Supply	1.1 to 2.1 W
Operating Temperature	32 to 122 °F (0 to 50 °C)
Security Labels	CE, FCC, Class A
Dimention (H x W x D)	1.59" x 1.26" x 1.35" (40.35 mm x 32 mm x 34.4 mm)
Weight	0.21 lbs (96 g)
Lens Connector	C-Mount
Included Adapters	External C-Mount to External SM1 (Replacement Item # SM1A39) and External C-Mount to Internal SM1 (Replacement Item # SM1A9 or SM1A9TS)

a. The max. possible pixel clock depends on the used computer.
b. Values are only achieved with maximum pixel clock.
c. Values are only achieved with minimum pixel clock.
d. Function increases the frame rate.
e. Trigger High and Low voltages are for the current USB board revision. A previously purchased camera contains the current USB board revision if it is compatible with our most recent driver (Version 3.82).
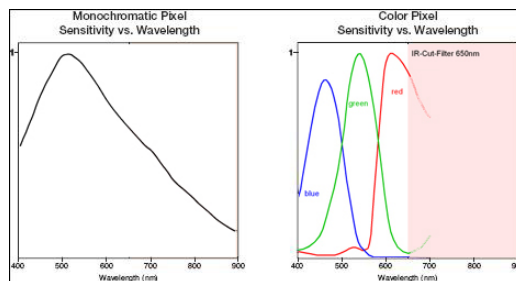
PIXEL SENSITIVITY

Pixel Sensitivity of the CCD Camera

Pixel sensitivity versus wavelength plots are shown at the right for the monochromatic and color versions of these CCD

cameras. The color model incorporates a removable IR filter that blocks the spectral region marked by the pink background. For this model, the popular Bayer color filter array is used to acquire digital color images. The filter is based on the repeating 2 x 2 pattern shown to the left; half of the total number of pixels are green (G), and the remaining pixels are equally divided between red (R) and blue (B).

Due to this arrangement, each pixel is only sensitive to one color, and as a result, the overall sensitivity of the color image is three times lower than that achievable with a monochromatic sensor. Thus, B&W CCD cameras are preferred in low-light situations. Even though only one third of the color information is obtained at each pixel, a full-color image can be achieved through the use of various demosaicing algorithms that interpolate a set of red, green, and blue B G B G values at each point.
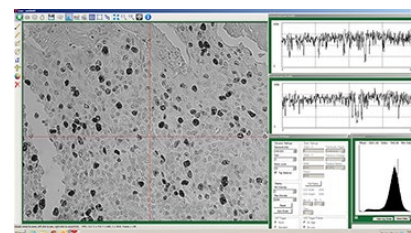
SOFTWARE

ThorCam™

Software
Version 3.6.0

Click the button below to visit the ThorCam software page.

Click to Enlarge
ThorCam Graphical User Interface (GUI)

Software ⬇

ThorCam is a powerful image acquisition software package that is designed for use with our cameras on 32- and 64-bit Windows® 7 or 10 systems. This intuitive, easy-to-use graphical interface provides camera control as well as the ability to acquire and play back images. Single image capture and image sequences are supported. Application programming interfaces (APIs) and a software development kit (SDK) are included for the development of custom applications by OEMs and developers. The SDK provides easy integration with a wide variety of programming languages, such as C, C++, C#, and Visual Basic .NET. Support for third-party software packages, such as LabVIEW, MATLAB, and μManager* is available.

*μManager control of Zelux and 1.3 MP Kiralux cameras is not currently supported. When controlling the Kiralux Polarization-Sensitive Camera using μManager, only intensity images can be taken; the ThorCam software is required to produce images with polarization information.

High-Resolution USB CCD Camera

Part Number	Description	Price	Availability
DCU224C	CCD Camera, 1280 x 1024 Resolution, Color, USB 2.0	$2,386.52	Lead Time

USB and Trigger Cables

Item #	CAB-DCU-T1			Pin	Assignment
	Connector Device Side	Micro Sub-D, 90° Angled		2	Trigger Input +
	Connector PC Side	USB 2.0 A Male		3	Shield

			Pin	Assignment
USB Standard	Hi-Speed USB2.0		4	USB +5 V
Trigger In (Bare Wire)	x		5	USB GND
Flash & Digital Out (Bare Wire)	x		6	Flash Strobe Output +
Wire Gauge USB	24AWG/2C and 28AWG/1PR		7	Trigger Input -
Shielding	Double Shielded 80 °C 30 V		8	USB D+
Length	3 m		9	USB D-

Item #	CAB-DCU-T2		Pin	Assignment
Connector Device Side	Micro Sub-D, Straight		2	Trigger Input +
Connector PC Side	USB 2.0 A Male		3	Shield
USB Standard	Hi-Speed USB2.0		4	USB +5 V
Trigger In (Bare Wire)	x		5	USB GND
Flash & Digital Out (Bare Wire)	-		6	Not Connected
Wire Gauge USB	24AWG/2C and 28AWG/1PR		7	Trigger Input -
Shielding	Double Shielded 80 °C 30 V		8	USB D+
Length	3 m		9	USB D-

Item #	CAB-DCU-T3		Pin	Assignment
Connector Device Side	Hirose HR25-7TP-8S		2	Flash Output[a]
End Opposite Connectors	Tinned End of Wires		3	GPIO 1, 3.3 V LVCMOS
Function	GPIO		4	Trigger Input[a] -
Trigger In (Bare Wire)	yes		5	Flash Output[a] +
Flash & Digital Out (Bare Wire)	yes		6	GPIO 2, 3.3 V LVCMOS
Cable Type	Shielded High-Flexible Control Cable 8 x 0.1 mm, Ø4.9 mm		7	Trigger Input[a] +
Shielding	Single Shielded		8	Output Supply Voltage, 5 V (100 mA)
Length	2 m		9	N/A

a. These pins are opto-decoupled inside the camera to protect against high or incorrect voltages.

Part Number	Description	Price	Availability
CAB-DCU-T1	**Customer Inspired!** USB and Trigger Cable (In/Out) for DCU Series and DCC1240 Cameras, 3 m	$145.33	Today
CAB-DCU-T2	**Customer Inspired!** USB and Trigger Cable (In Only) for DCU Series and DCC1240 Cameras, 3 m	$85.23	Today
CAB-DCU-T3	Trigger and I/O Cable, Hirose 25, for DCC3240, DCC3260, WFS30 and WFS40, 2 m	$103.81	Today

C-Mount to SM1 Adapters for Cameras

Each CCD camera includes two thread adapters: one external C-Mount to internal SM1 (1.035"-40) and one external C-Mount to external SM1. Replacement adapters are sold below.

Item #	SM1A9	SM1A9TS[a]	SM1A39

	Image (Click To Enlarge)			
Thread 1	External C-Mount (1.00"-32)		
Thread 2	Internal SM1 (1.035"-40)		External SM1 (1.035"-40)
Material	Anodized Aluminum	Black Delrin®b	Anodized Aluminum
Typical Application	ⓘ Mount a C-Mount Camera to an Externally Threaded SM1 Lens Tube	ⓘ Mount a C-Mount Camera to an Externally Threaded SM1 Lens Tube	ⓘ Mount a C-Mount Camera to an Internally Threaded SM1 Lens Tube

a. Thermally Insulating Adapter

b. Delrin® is a registered trademark of DuPont Polymers, Inc.

Part Number	Description	Price	Availability
SM1A9	**Adapter with External C-Mount Threads and Internal SM1 Threads, 4.4 mm Spacer**	$19.96	Lead Time
SM1A9TS	**Customer Inspired! Thermally Insulating Adapter with External C-Mount Threads and Internal SM1 Threads, 6.5 mm Spacer**	$23.61	Today
SM1A39	**Customer Inspired! Adapter with External C-Mount Threads and External SM1 Threads, 3.2 mm Spacer**	$21.21	5-8 Days