

China Daheng Group, Inc. Beijing Image Vision Technology Branch

MERCURY USB2.0 Cameras

User Manual

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DAHENG | **大恒图像**
IMAGING

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Preface

We really appreciate your choosing the product of DAHENG IMAGING.

MERCURY USB2.0 series camera is the mature area scan digital camera, featuring mega pixels resolution, super precision, high definition, extremely low noise and perfect color conversion. The camera, which is equipped with a standard USB2.0 interface, is convenient for use and connection. It could be used in a wide and diverse range of applications including machine vision, high-definition imaging and surveillance, medical imaging, intelligent transportation systems, character recognition and documents processing, and any more.

This manual describes in detail on how to install and use the MERCURY USB2.0 digital cameras.

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1. Introduction

1.1. Models

The current MERCURY USB2.0 camera models are listed in the top row of the specification tables on the next pages of this manual. The camera models are differentiated by their resolution, their maximum frame rate at full resolution, and whether the camera's sensor is mono or color.

1.2. General Specifications

1.2.1. MER-030-120UM/C (-L)

Specifications	MER-030-120UC	MER-030-120UC-L
Resolution	656 × 492	
Sensor Type	Sony ICX618, CCD	
Optical Size	1/4 inch	
Pixel Size	5.6μm × 5.6μm	
Frame Rate	120fps@ 656 × 492	
ADC Bit Depth	12bit	
Pixel Bit Depth	8bit, 12bit	
Shutter Time	12μs~1s *	
Digital Gain	×1, ×0.5, ×0.25, ×0.125, ×0.0625	
Pixel Data Formats	Bayer RG8/ Bayer RG12	
Synchronization	Hardware trigger, software trigger	Software trigger
I/O	1 opto-isolated input line and 1 opto-isolated output line, 1 GPIO	N/A
Operating Temp.	0°C~45°C	
Operating Humidity	10%~80%	
Power Consumption	<1.2W	
Lens Mount	C	
Dimensions	29 mm×29 mm×29mm (without lens adapter or connectors)	
Weight	42g	40g
Software	Windows XP/Win7/Win8/Win10 32bit and 64bit OS	
Data Interface	USB2.0	
Programmable Control	Image size, gain, Exposure time, trigger polarity, flash polarity, etc.	Image size, gain, Exposure time, etc.

Conformity	CE, RoHs, FCC, GenICam
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Table 1- 1 MER-030-120UC (-L) General Specifications

*The value is related to the ROI/Video mode/capture speed level/horizontal blanking and etc.

Specifications	MER-030-120UM	MER-030-120UM-L
Resolution	656 × 492	
Sensor Type	Sony ICX618,CCD	
Optical Size	1/4 inch	
Pixel Size	5.6μm × 5.6μm	
Frame Rate	120fps@ 656 × 492	
ADC Bit Depth	12bit	
Pixel Bit Depth	8bit, 12bit	
Shutter Time	12μs~1s *	
Digital Gain	×1, ×0.5, ×0.25, ×0.125, ×0.0625,	
Pixel Data Formats	Mono8/ Mono12	
Synchronization	Hardware trigger, software trigger	Software trigger
I/O	1 opto-isolated input line and 1 opto-isolated output line,1 GPIO	N/A
Operating Temp.	0°C~45°C	
Operating Humidity	10%~80%	
Power Consumption	<1.2W	
Lens Mount	C	
Dimensions	29 mm×29 mm×29mm (without lens adapter or connectors)	
Weight	42g	40g
Software	Windows XP/Win7/Win8/Win10 32bit and 64bit OS	
Data Interface	USB2.0	
Programmable Control	Image size, gain, Exposure time, trigger polarity, flash polarity, etc.	Image size, gain, Exposure time, etc.
Conformity	CE, RoHs, FCC, GenICam	

Table 1- 2 MER-030-120UM (-L) General Specifications

*The value is related to the ROI/Video mode/capture speed level/horizontal blanking and etc.

1.2.2. MER-040-60UM/C (-L)

Specifications	MER-040-60UC	MER-040-60UC-L
Resolution	752 × 480	
Sensor Type	Global Shutter CMOS	
Optical Size	1/3 inch	
Pixel Size	6.0μm × 6.0μm	
Frame Rate	60fps@ 752 × 480	
ADC Bit Depth	10bit	
Pixel Bit Depth	8bit, 10bit	
Shutter Time	1μs~1s *	
Digital Gain	×2, ×1, ×0.5, ×0.25	
Pixel Data Formats	Bayer BG8/ Bayer BG10	
Signal Noise Ratio	50dB	
Synchronization	Hardware trigger, software trigger	Software trigger
I/O	1 opto-isolated input line and 1 opto-isolated output line, 1 GPIO	N/A
Sensitivity (550nm)	4.8V/Lux-s	
Operating Temp.	0°C~45°C	
Operating Humidity	10%~80%	
Power Consumption	<1W	
Lens Mount	C	
Dimensions	29 mm×29 mm×29mm (without lens adapter or connectors)	
Weight	42g	40g
Software	Windows XP/Win7/Win8/Win10 32bit and 64bit OS	
Data Interface	USB2.0	
Programmable Control	Image size, gain, Exposure time, trigger polarity, flash polarity, etc.	Image size, gain, Exposure time, etc.
Conformity	CE, RoHs, FCC, GenICam	

Table 1- 3 MER-040-60UC (-L) General Specifications

*The value is related to the ROI/Video mode/capture speed level/horizontal blanking and etc.

Specifications	MER-040-60UM	MER-040-60UM-L
Resolution	752 × 480	
Sensor Type	Global Shutter CMOS	
Optical Size	1/3 inch	
Pixel Size	6.0μm × 6.0μm	
Frame Rate	60fps@ 752 × 480	
ADC Bit Depth	10bit	
Pixel Bit Depth	8bit, 10bit	
Shutter Time	1μs~1s *	
Digital Gain	×2, ×1, ×0.5, ×0.25	
Pixel Data Formats	Mono8/ Mono10	
Signal Noise Ratio	35dB	
Synchronization	Hardware trigger, software trigger	Software trigger
I/O	1 opto-isolated input line and 1 opto-isolated output line,1 GPIO	N/A
Sensitivity (550nm)	4.8V/Lux-s	
Operating Temp.	0°C~45°C	
Operating Humidity	10%~80%	
Power Consumption	<1W	
Lens Mount	C	
Dimensions	29 mm×29 mm×29mm (without lens adapter or connectors)	
Weight	42g	40g
Software	Windows XP/Win7/Win8/Win10 32bit and 64bit OS	
Data Interface	USB2.0	
Programmable Control	Image size, gain, Exposure time, trigger polarity, flash polarity, etc.	Image size, gain, Exposure time, etc.
Conformity	CE, RoHs, FCC, GenICam	

Table 1- 4 MER-040-60UM (-L) General Specifications

*The value is related to the ROI/Video mode/capture speed level/horizontal blanking and etc.

1.2.3. MER-125-30UM/C (-L)

Specifications	MER-125-30UC	MER-125-30UC-L
Resolution	1292 × 964	
Sensor Type	Sony ICX445, CCD	
Optical Size	1/3 inch	
Pixel Size	3.75μm × 3.75μm	
Frame Rate	30fps@1292 x 964	
ADC Bit Depth	12bit	
Pixel Bit Depth	8bit, 12bit	
Shutter Time	10μs~1s *	
Digital Gain	×1, ×0.5, ×0.25,×0.125, ×0.0625	
Pixel Data Formats	Bayer RG8 / Bayer RG12	
Synchronization	Hardware trigger, software trigger	Software trigger
I/O	1 opto-isolated input line and 1 opto-isolated output line,1 GPIO	N/A
Operating Temp.	0°C~45°C	
Operating Humidity	10%~80%	
Power Consumption	<1.2W	
Lens Mount	C	
Dimensions	29 mm×29 mm×29mm (without lens adapter or connectors)	
Weight	42g	40g
Software	Windows XP/Win7/Win8/Win10 32bit and 64bit OS	
Data Interface	USB2.0	
Programmable Control	Image size, gain, Exposure time, trigger polarity, flash polarity, etc.	Image size, gain, Exposure time, etc.
Conformity	CE, RoHs, FCC, GenICam	

Table 1- 5 MER-125-30UC (-L) General Specifications

*The value is related to the ROI/Video mode/capture speed level/horizontal blanking and etc.

Specifications	MER-125-30UM	MER-125-30UM-L
Resolution	1292 × 964	
Sensor Type	Sony ICX445, CCD	
Optical Size	1/3 inch	
Pixel Size	3.75μm × 3.75μm	
Frame Rate	30fps@1292 x 964	
ADC Bit Depth	12bit	
Pixel Bit Depth	8bit, 12bit	
Shutter Time	10μs~1s *	
Digital Gain	×1, ×0.5, ×0.25,×0.125, ×0.0625	
Pixel Data Formats	Mono8 / Mono12	
Synchronization	Hardware trigger, software trigger	Software trigger
I/O	1 opto-isolated input line and 1 opto-isolated output line,1 GPIO	N/A
Operating Temp.	0°C~45°C	
Operating Humidity	10%~80%	
Power Consumption	<1.2W	
Lens Mount	C	
Dimensions	29 mm×29 mm×29mm (without lens adapter or connectors)	
Weight	42g	40g
Software	Windows XP/Win7/Win8/Win10 32bit and 64bit OS	
Data Interface	USB2.0	
Programmable Control	Image size, gain, Exposure time, trigger polarity, flash polarity, etc.	Image size, gain, Exposure time, etc.
Conformity	CE, RoHs, FCC, GenICam	

Table 1- 6 MER-125-30UM (-L) General Specifications

*The value is related to the ROI/Video mode/capture speed level/horizontal blanking and etc.

1.2.4. MER-130-30UM (-L)

Specifications	MER-130-30UM	MER-130-30UM-L
Resolution	1280 × 1024	
Sensor Type	Rolling Shutter CMOS	
Optical Size	1/1.8 inch	
Pixel Size	5.2μm × 5.2μm	
Frame Rate	30fps@1280 × 1024	
ADC Bit Depth	10bit	
Pixel Bit Depth	8bit, 10bit	
Shutter Time	288μs~1s *	
Digital Gain	×2, ×1, ×0.5, ×0.25	
Pixel Data Formats	Mono8/ Mono10	
Signal Noise Ratio	45dB	
Synchronization	Hardware trigger, software trigger	Software trigger
I/O	1 opto-isolated input line and 1 opto-isolated output line, 1 GPIO	N/A
Sensitivity (550nm)	2.1V/Lux-s	
Operating Temp.	0°C~45°C	
Operating Humidity	10%~80%	
Power Consumption	<1W	
Lens Mount	C	
Dimensions	29 mm×29 mm×29mm (without lens adapter or connectors)	
Weight	42g	40g
Software	Windows XP/Win7/Win8/Win10 32bit and 64bit OS	
Data Interface	USB2.0	
Programmable Control	Image size, gain, Exposure time, trigger polarity, flash polarity, etc.	Image size, gain, Exposure time, etc.
Conformity	CE, RoHs, FCC, GenICam	

Table 1- 7 MER-130-30UM (-L) General Specifications

*The value is related to the ROI/Video mode/capture speed level/horizontal blanking and etc.

1.2.5. MER-132-30UM/C (-L)

Specifications	MER-132-30UC	MER-132-30UC-L
Resolution	1292 × 964	
Sensor Type	CCD	
Optical Size	1/3 inch	
Pixel Size	3.75μm × 3.75μm	
Frame Rate	30fps@1292 x 964	
ADC Bit Depth	12bit	
Pixel Bit Depth	8bit, 12bit	
Shutter Time	50μs~1s *	
Digital Gain	×1, ×0.5, ×0.25,×0.125, ×0.0625	
Signal Noise Ratio	49dB	
Pixel Data Formats	Bayer RG8 / Bayer RG12	
Synchronization	Hardware trigger, software trigger	Software trigger
I/O	1 opto-isolated input line and 1 opto-isolated output line, 1 GPIO	N/A
Operating Temp.	0°C~45°C	
Operating Humidity	10%~80%	
Power Consumption	<1.2W	
Lens Mount	C	
Dimensions	29 mm×29 mm×29mm (without lens adapter or connectors)	
Weight	42g	40g
Software	Windows XP/Win7/Win8/Win10 32bit and 64bit OS	
Data Interface	USB2.0	
Programmable Control	Image size, gain, Exposure time, trigger polarity, flash polarity, etc.	Image size, gain, Exposure time, etc.
Conformity	CE, RoHs, FCC, GenICam	

Table 1- 8 MER-132-30UC (-L) General Specifications

*The value is related to the ROI/Video mode/capture speed level/horizontal blanking and etc.

Specifications	MER-132-30UM	MER-132-30UM-L
Resolution	1292 × 964	
Sensor Type	CCD	
Optical Size	1/3 inch	
Pixel Size	3.75μm × 3.75μm	
Frame Rate	30fps@1292 x 964	
ADC Bit Depth	12bit	
Pixel Bit Depth	8bit, 12bit	
Shutter Time	50μs~1s *	
Digital Gain	×1, ×0.5, ×0.25,×0.125, ×0.0625	
Signal Noise Ratio	37dB	
Pixel Data Formats	Mono8 / Mono12	
Synchronization	Hardware trigger, software trigger	Software trigger
I/O	1 opto-isolated input line and 1 opto-isolated output line,1 GPIO	N/A
Operating Temp.	0°C~45°C	
Operating Humidity	10%~80%	
Power Consumption	<1.2W	
Lens Mount	C	
Dimensions	29 mm×29 mm×29mm (without lens adapter or connectors)	
Weight	42g	40g
Software	Windows XP/Win7/Win8/Win10 32bit and 64bit OS	
Data Interface	USB2.0	
Programmable Control	Image size, gain, Exposure time, trigger polarity, flash polarity, etc.	Image size, gain, Exposure time, etc.
Conformity	CE, RoHs, FCC, GenICam	

Table 1- 9 MER-132-30UM (-L) General Specifications

*The value is related to the ROI/Video mode/capture speed level/horizontal blanking and etc.

1.2.6. MER-310-12UC (-L)

Specifications	MER-310-12UC	MER-310-12UC-L
Resolution	2048 × 1536	
Sensor Type	Rolling Shutter CMOS	
Optical Size	1/2 inch	
Pixel Size	3.2μm × 3.2μm	
Frame Rate	12fps@ 2048× 1536	
ADC Bit Depth	10bit	
Pixel Bit Depth	8bit, 10bit	
Shutter Time	151μs~1s *	
Digital Gain	×2, ×1, ×0.5, ×0.25	
Pixel Data Formats	Bayer GR8/ Bayer GR10	
Dynamic Range	60dB	
Signal Noise Ratio	43dB	
Synchronization	Hardware trigger, software trigger	Software trigger
I/O	1 opto-isolated input line and 1 opto-isolated output line, 1 GPIO	N/A
Sensitivity (550nm)	1.0V/Lux-s	
Operating Temp.	0°C~45°C	
Operating Humidity	10%~80%	
Power Consumption	<1W	
Lens Mount	C	
Dimensions	29 mm×29 mm×29mm (without lens adapter or connectors)	
Weight	42g	40g
Software	Windows XP/Win7/Win8/Win10 32bit and 64bit OS	
Data Interface	USB2.0	
Programmable Control	Image size, gain, Exposure time, trigger polarity, flash polarity, etc.	Image size, gain, Exposure time, etc.
Conformity	CE, RoHs, FCC, GenICam	

Table 1- 10 MER-310-12UC (-L) General Specifications

*The value is related to the ROI/Video mode/capture speed level/horizontal blanking and etc.

1.2.7. MER-500-7UM/C (-L)

Specifications	MER-500-7UC	MER-500-7UC-L
Resolution	2592 × 1944	
Sensor Type	Rolling Shutter CMOS	
Optical Size	1/2.5 inch	
Pixel Size	2.2μm × 2.2μm	
Frame Rate	7fps@ 2592 x 1944	
ADC Bit Depth	12bit	
Pixel Bit Depth	8bit, 12bit	
Shutter Time	50μs~1s *	
Digital Gain	×1, ×0.5, ×0.25,×0.125, ×0.0625	
Pixel Data Formats	Bayer GR8/ Bayer GR12	
Dynamic Range	70.1dB	
Signal Noise Ratio	44dB	
Synchronization	Hardware trigger, software trigger	Software trigger
I/O	1 opto-isolated input line and 1 opto-isolated output line,1 GPIO	N/A
Sensitivity (550nm)	1.4V/Lux-s	
Operating Temp.	0°C~45°C	
Operating Humidity	10%~80%	
Power Consumption	<1W	
Lens Mount	C	
Dimensions	29 mm×29 mm×29mm (without lens adapter or connectors)	
Weight	42g	40g
Software	Windows XP/Win7/Win8/Win10 32bit and 64bit OS	
Data Interface	USB2.0	
Programmable Control	Image size, gain, Exposure time, trigger polarity, flash polarity, etc.	Image size, gain, Exposure time, etc.
Conformity	CE, RoHs, FCC, GenICam	

Table 1- 11 MER-500-7UC (-L) General Specifications

*The value is related to the ROI/Video mode/capture speed level/horizontal blanking and etc.

Specifications	MER-500-7UM	MER-500-7UM-L
Resolution	2592 × 1944	
Sensor Type	Rolling Shutter CMOS	
Optical Size	1/2.5 inch	
Pixel Size	2.2μm × 2.2μm	
Frame Rate	7fps@ 2592 x 1944	
ADC Bit Depth	12bit	
Pixel Bit Depth	8bit, 12bit	
Shutter Time	50μs~1s *	
Digital Gain	×1, ×0.5, ×0.25,×0.125, ×0.0625	
Pixel Data Formats	Mono8/ Mono12	
Dynamic Range	70.1dB	
Signal Noise Ratio	44dB	
Synchronization	Hardware trigger, software trigger	Software trigger
I/O	1 opto-isolated input line and 1 opto-isolated output line,1 GPIO	N/A
Sensitivity (550nm)	1.4V/Lux-s	
Operating Temp.	0°C~45°C	
Operating Humidity	10%~80%	
Power Consumption	<1W	
Lens Mount	C	
Dimensions	29 mm×29 mm×29mm (without lens adapter or connectors)	
Weight	42g	40g
Software	Windows XP/Win7/Win8/Win10 32bit and 64bit OS	
Data Interface	USB2.0	
Programmable Control	Image size, gain, Exposure time, trigger polarity, flash polarity, etc.	Image size, gain, Exposure time, etc.
Conformity	CE, RoHs, FCC, GenICam	

Table 1- 12 MER-500-7UM (-L) General Specifications

*The value is related to the ROI/Video mode/capture speed level/horizontal blanking and etc.

1.3. Spectral Response

1.3.1. MER-030-120UM/C (-L)

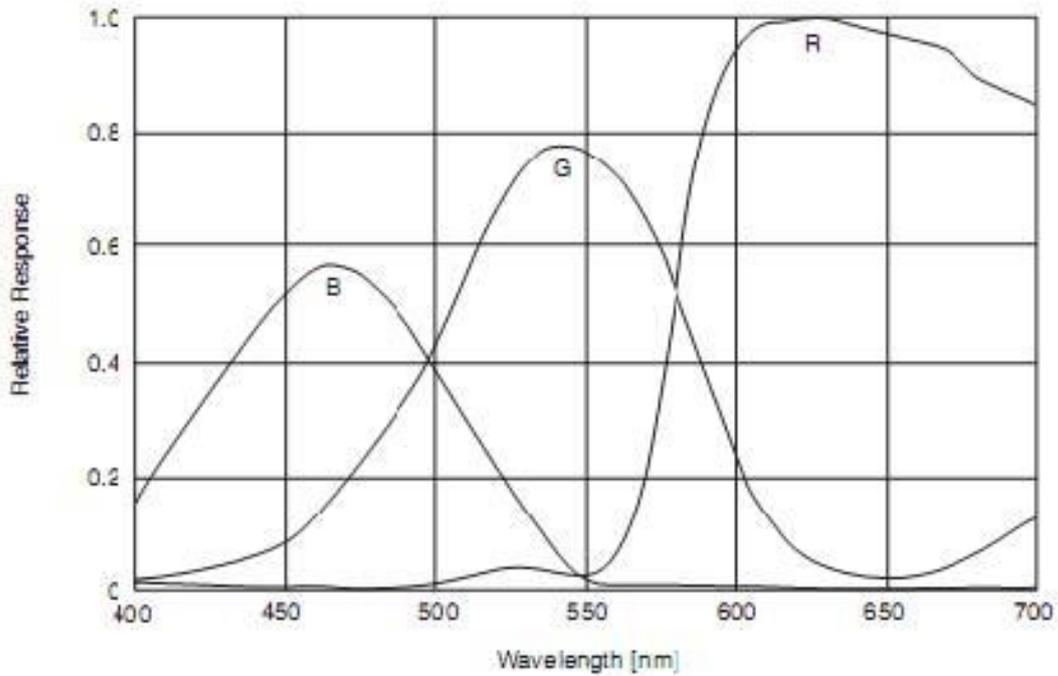


Figure1- 1 MER-030-120UC (-L) Sensor Spectral Response

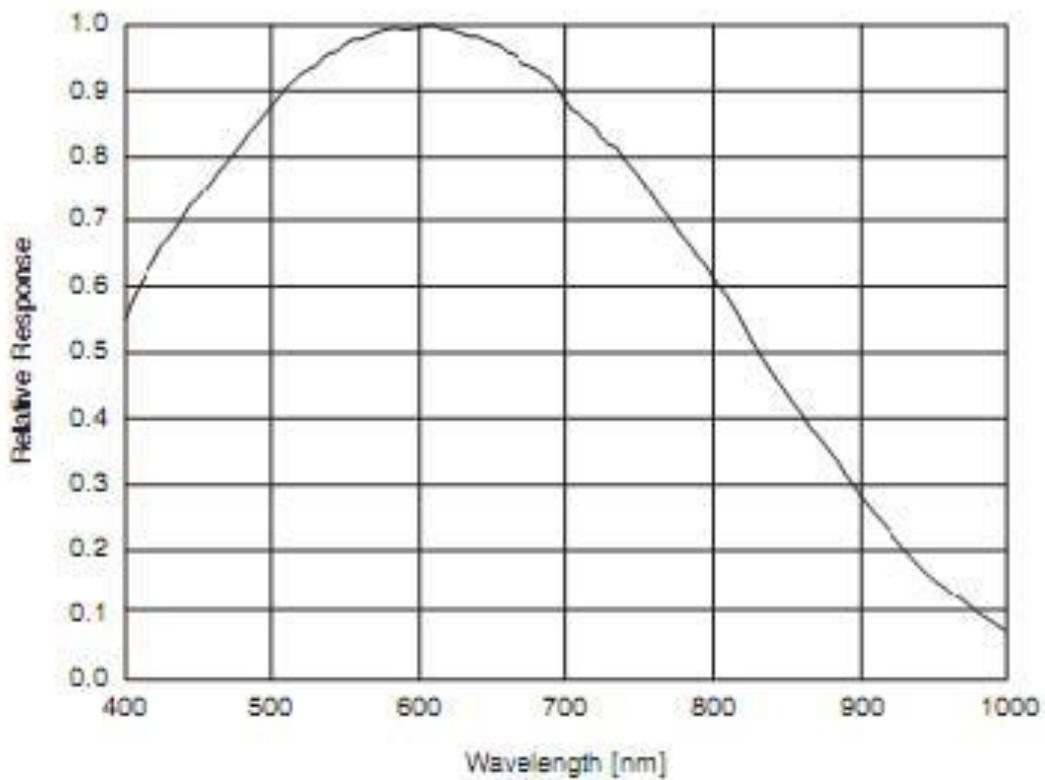


Figure1- 2 MER-030-120UM (-L) Sensor Spectral Response

1.3.2. MER-040-60M/C (-L)

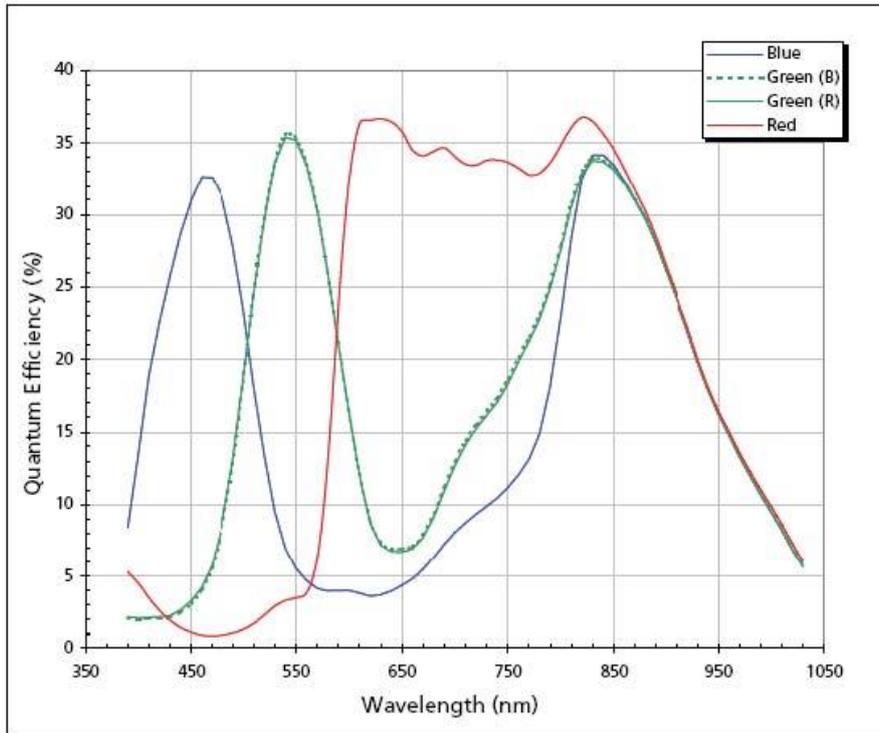


Figure1- 3 MER-040-60UC (-L) Sensor Spectral Response

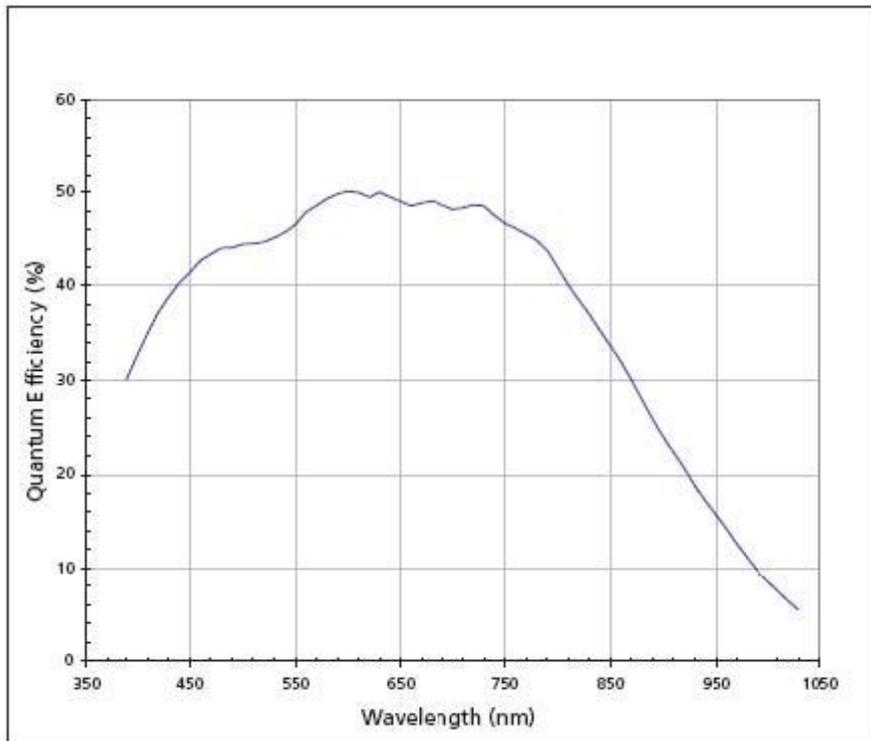


Figure1- 4 MER-040-60UM (-L) Sensor Spectral Response

1.3.3. MER-125-30M/C (-L)

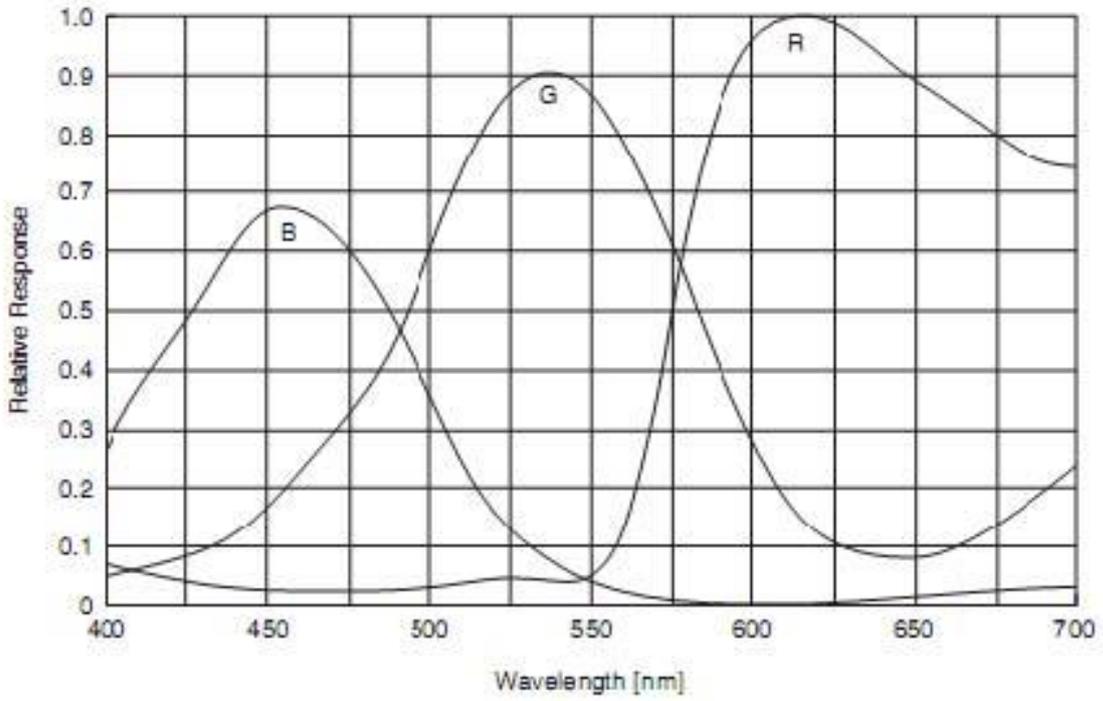


Figure1- 5 MER-125-30UC (-L) Sensor Spectral Response

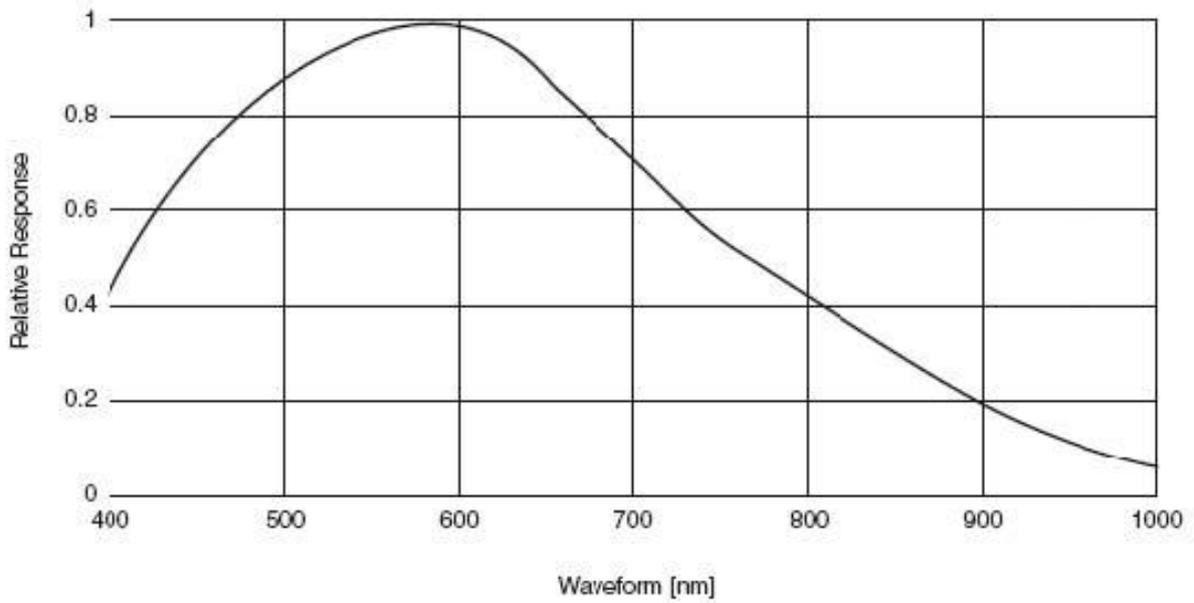


Figure1- 6 MER-125-30UM (-L) Sensor Spectral Response

1.3.4. MER-130-30UM (-L)

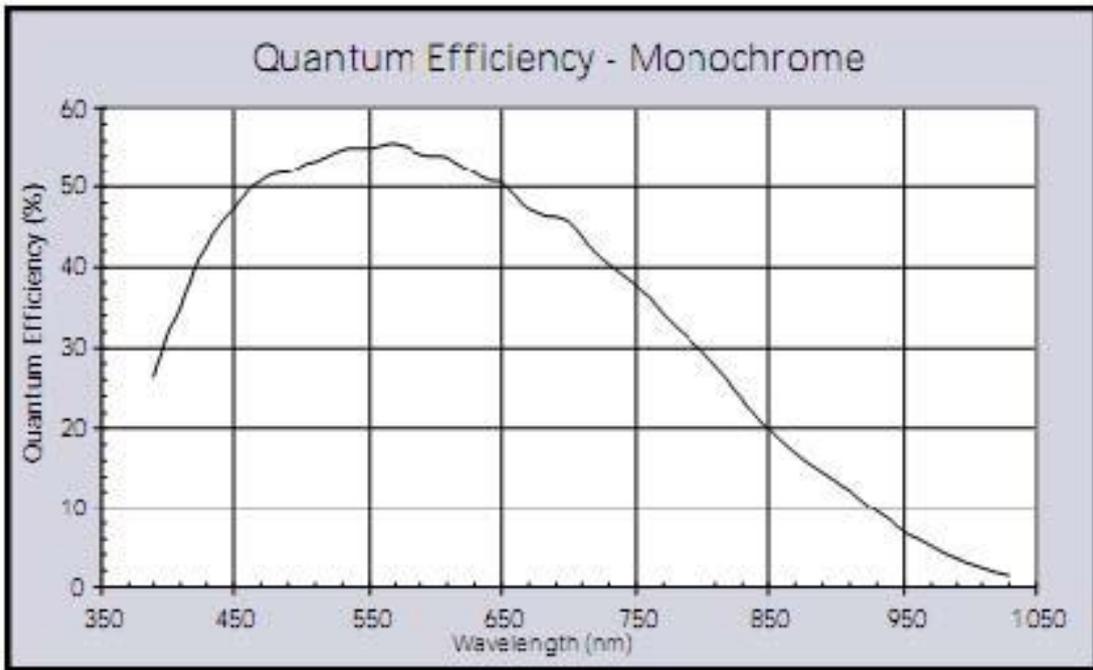


Figure1- 7 MER-130-30UM (-L) Sensor Spectral Response

1.3.5. MER-132-30M/C (-L)

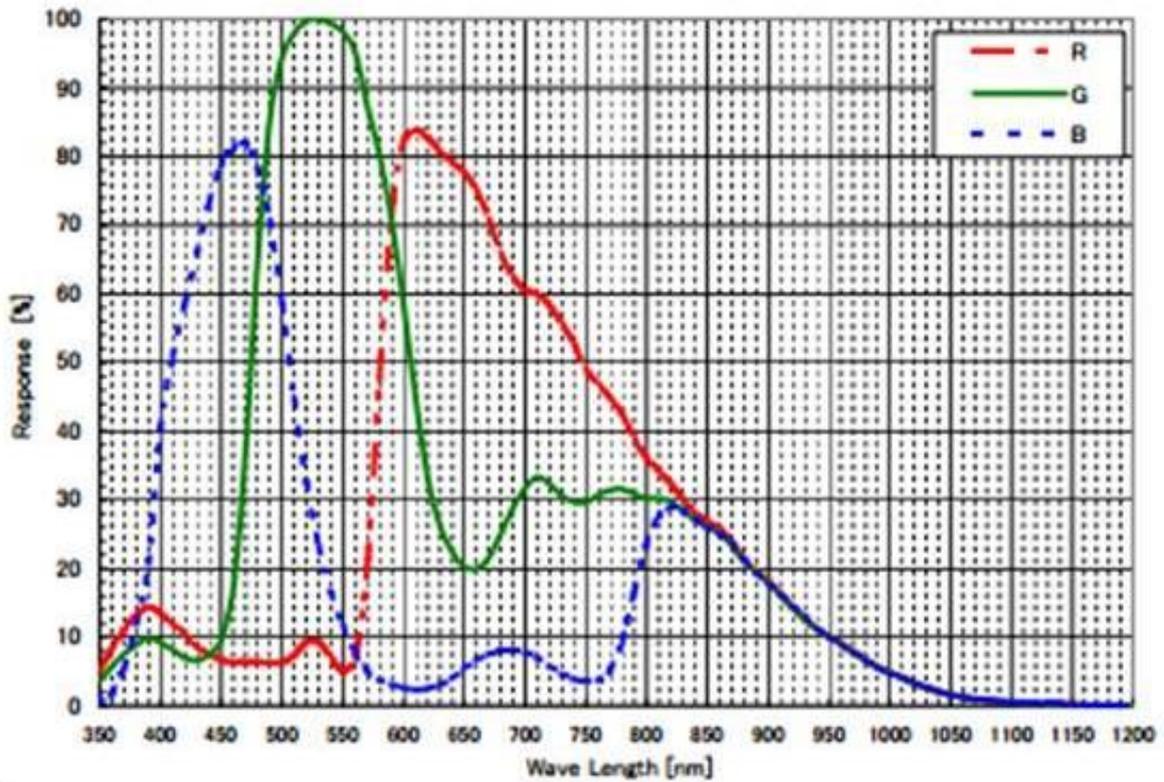


Figure1- 8 MER-132-30UC (-L) Sensor Spectral Response

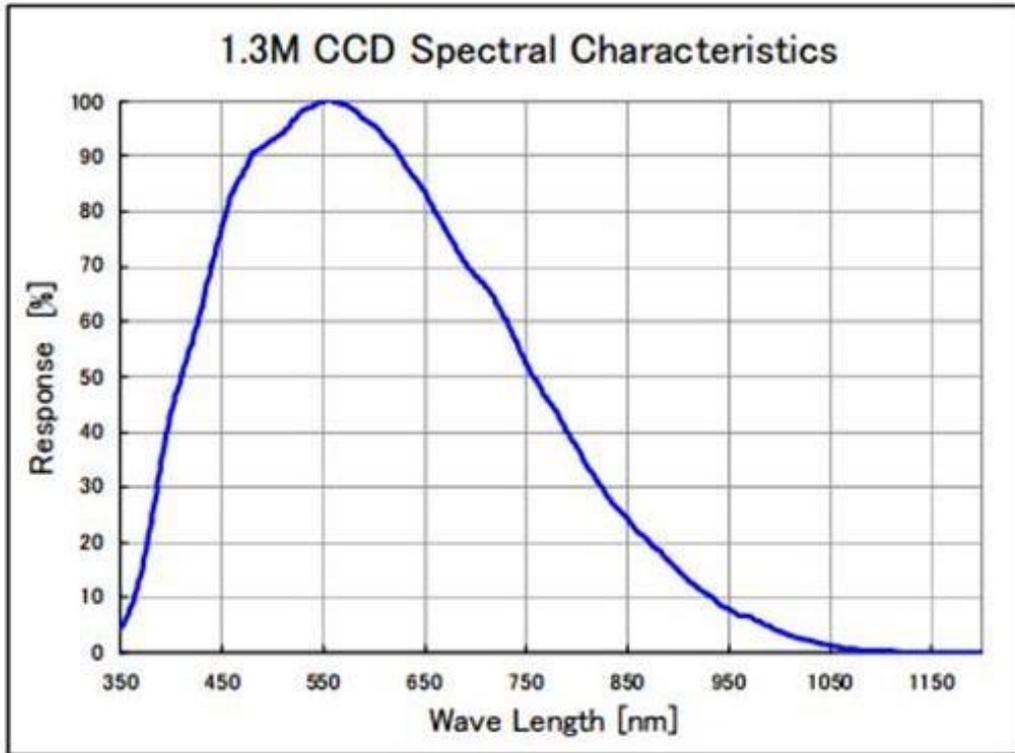


Figure1- 9 MER-132-30UM (-L) Sensor Spectral Response

1.3.6. MER-310-12UC (-L)

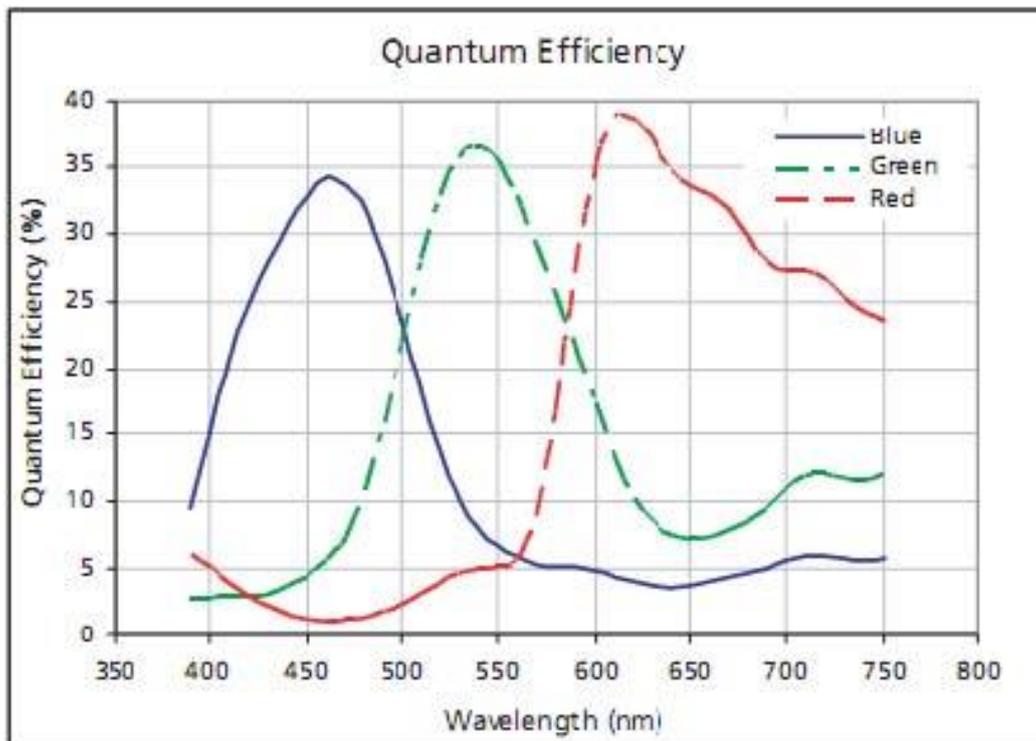


Figure1- 10 MER-310-12UC (-L) Sensor Spectral Response

1.3.7. MER-500-7M/C (-L)

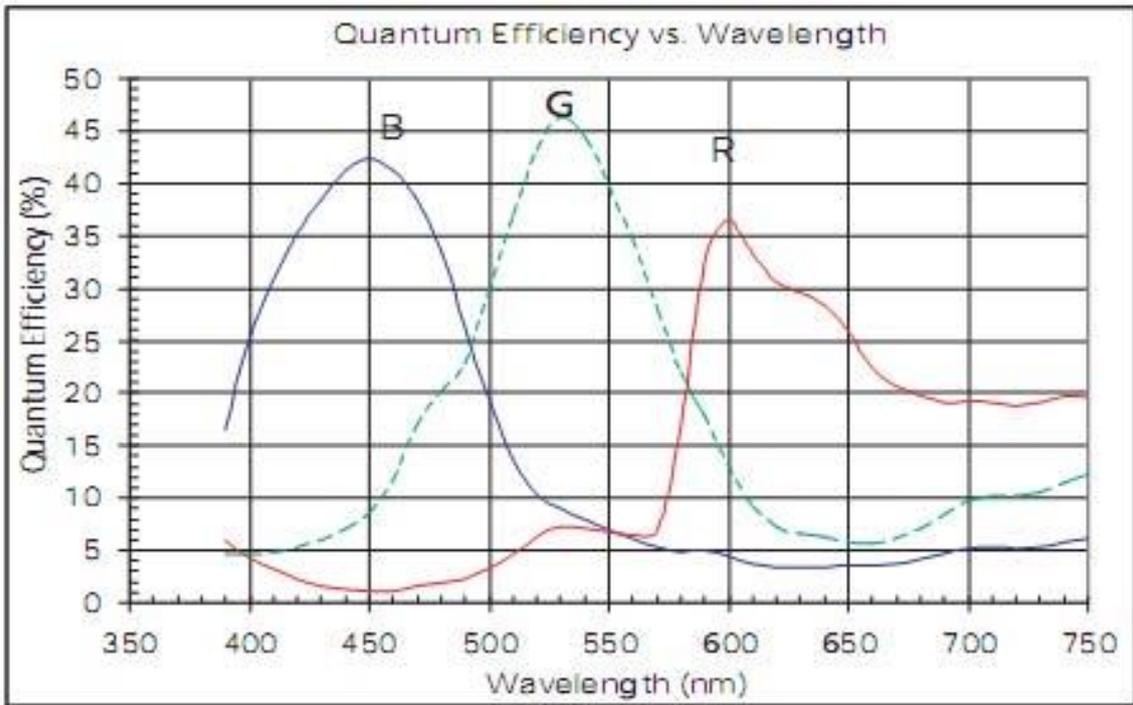


Figure1- 11 MER-500-7UC (-L) Sensor Spectral Response

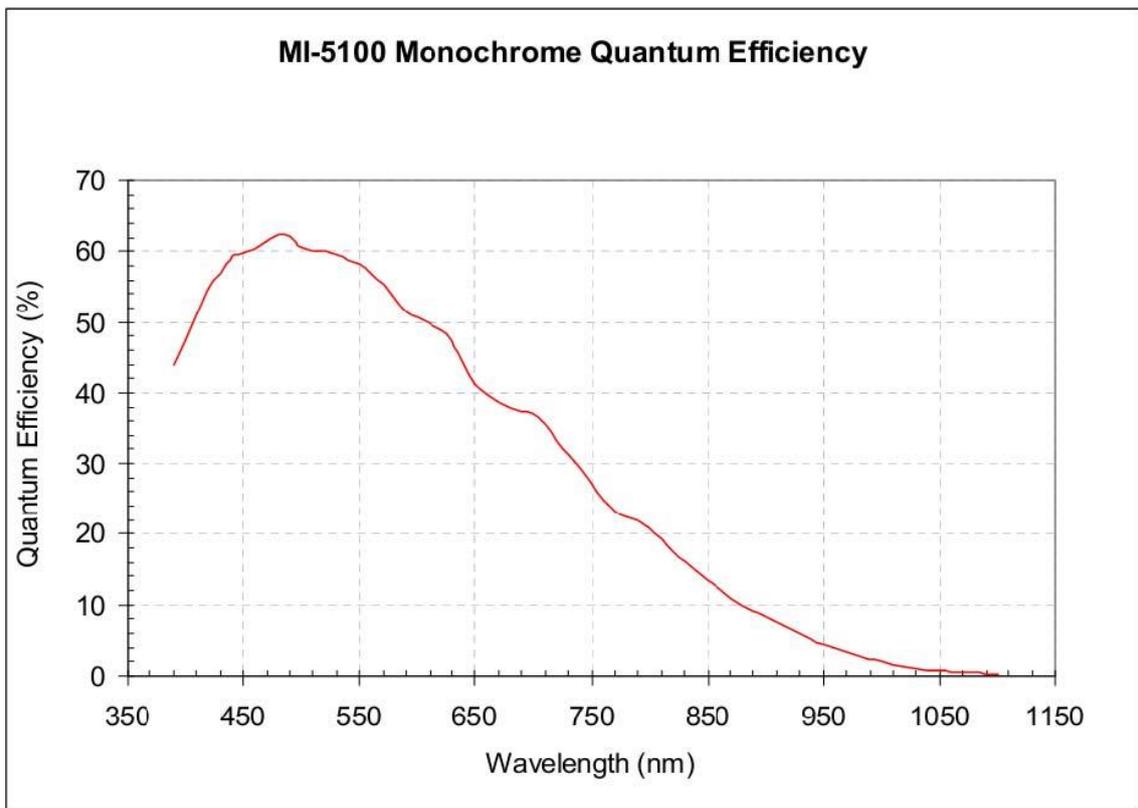


Figure1- 12 MER-500-7UM (-L) Sensor Spectral Response

2. Mechanical Interface

2.1. Mechanical Dimensions

Three Views: (Unit: mm)

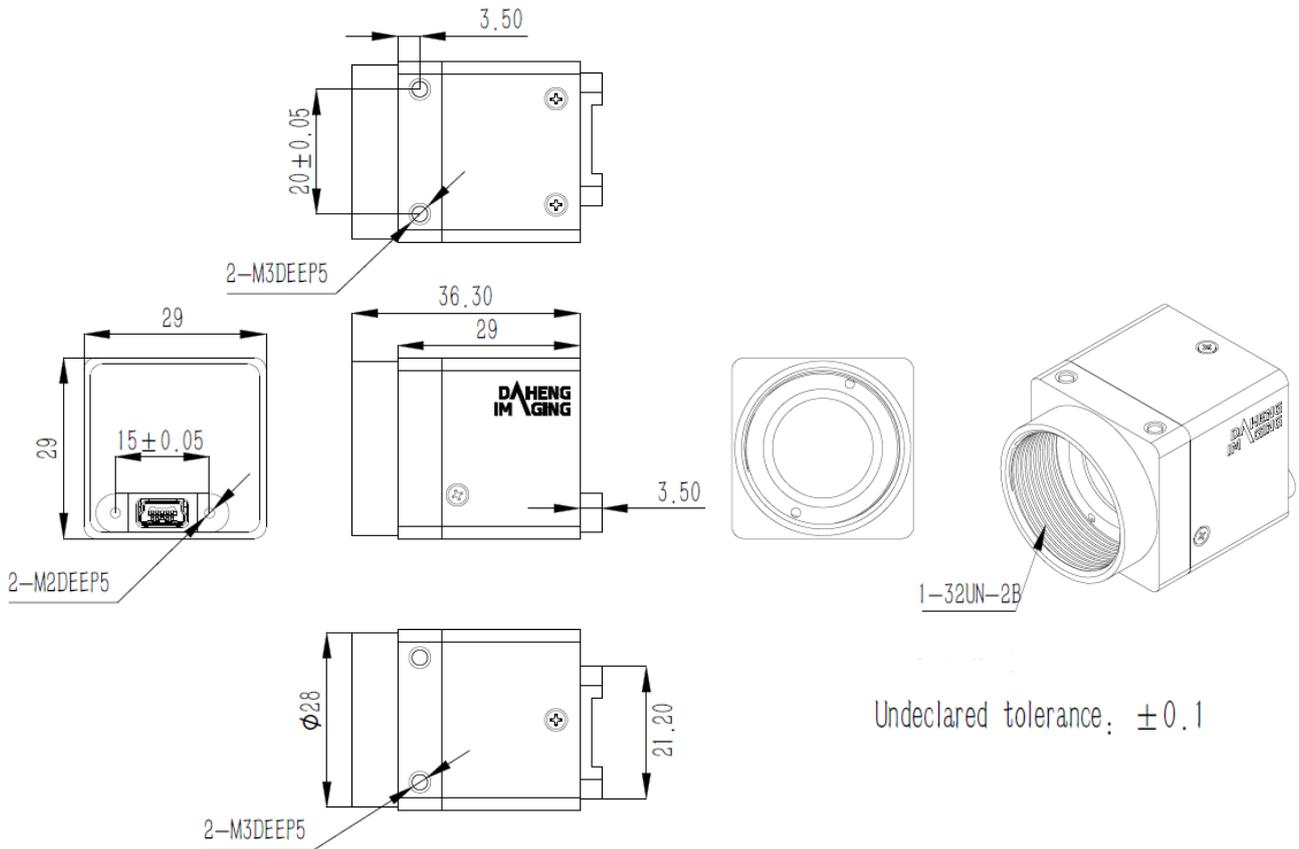


Figure2- 1 MER-U-L Series Mechanical Dimensions

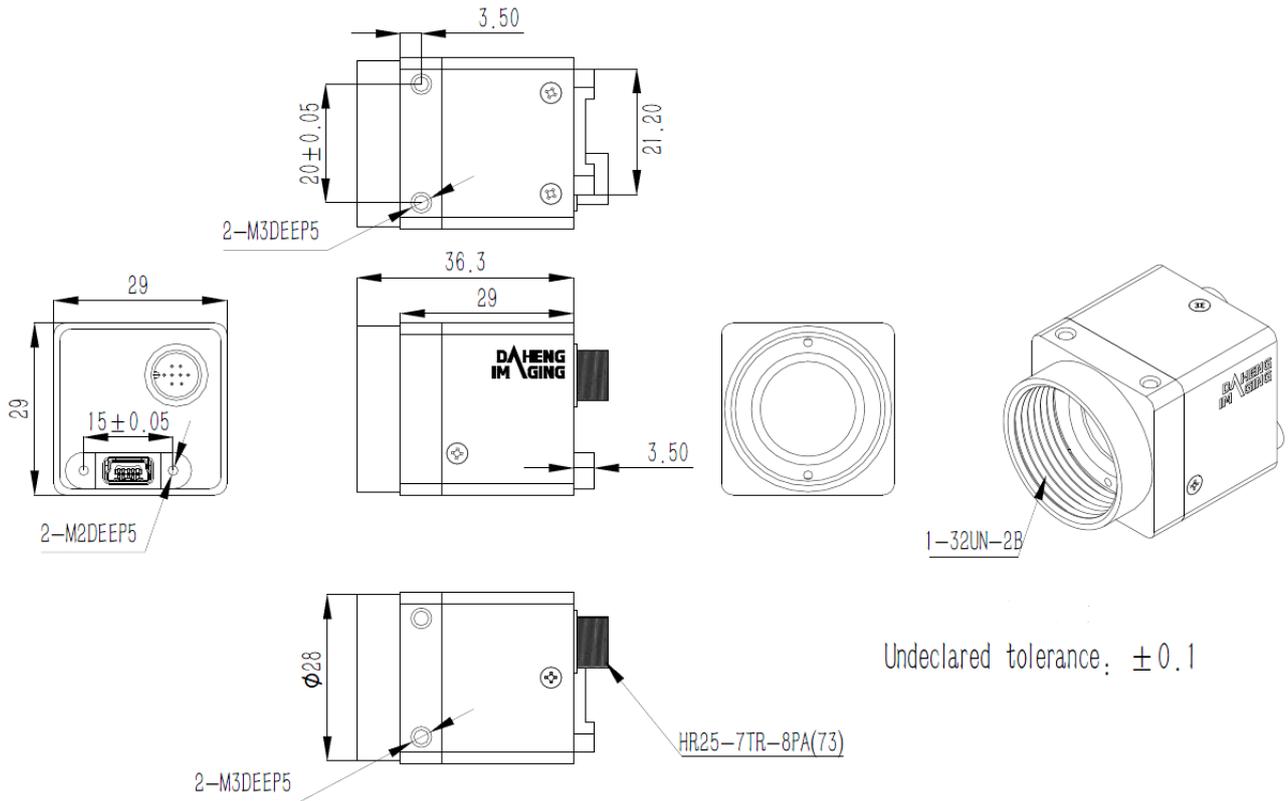


Figure2- 2 MER-U Series Mechanical Dimensions

2.2. Filters/ Anti-reflective Glass

Each MERCURY color camera is equipped with an additional infrared cut-Off filter, and each monochrome camera is equipped with a piece of transparent anti-reflection glass.

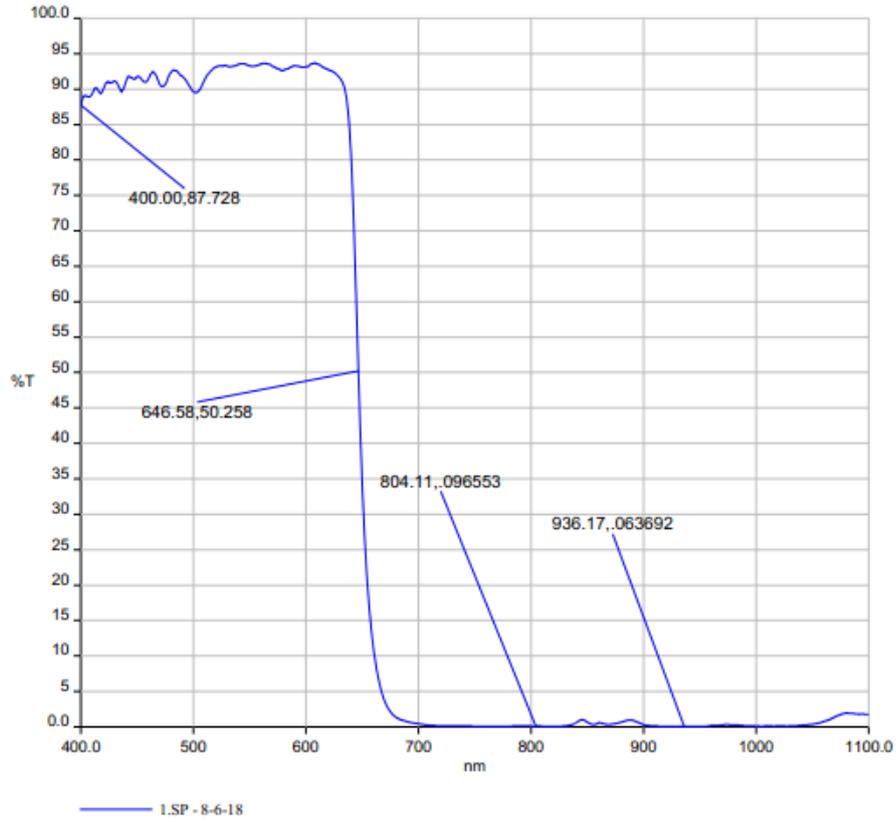


Figure2- 3 Infrared cut-off filter transmittance curve for MERCURY series color camera

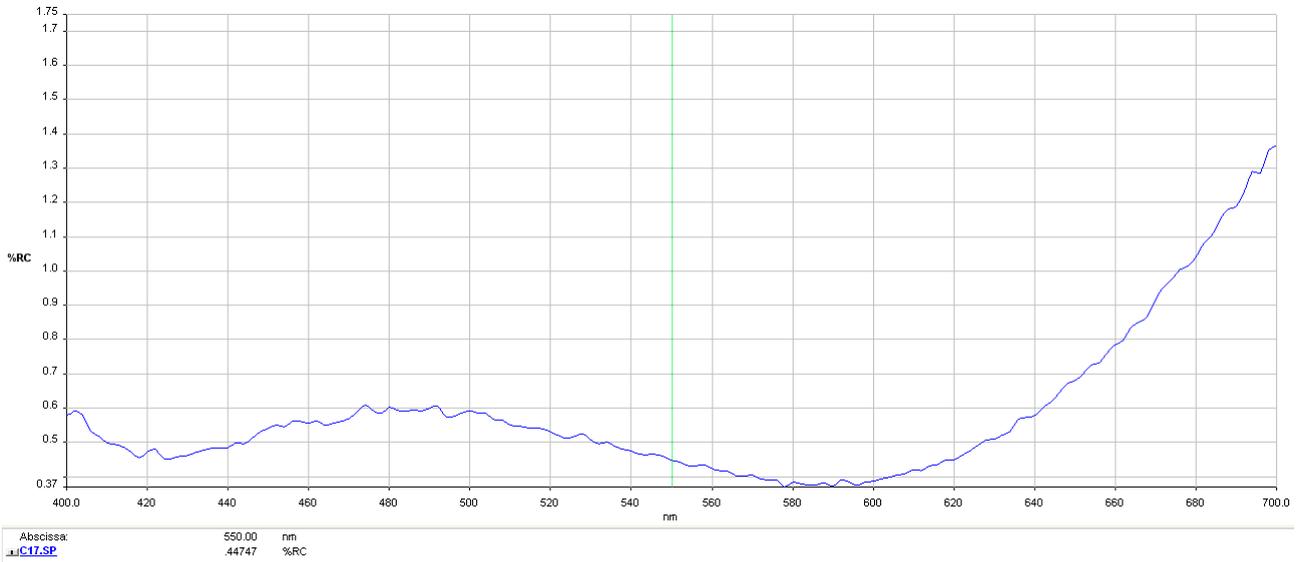


Figure2- 4 Transparent glass reflectance curve for MERCURY series mono camera

2.3. Optical Interface

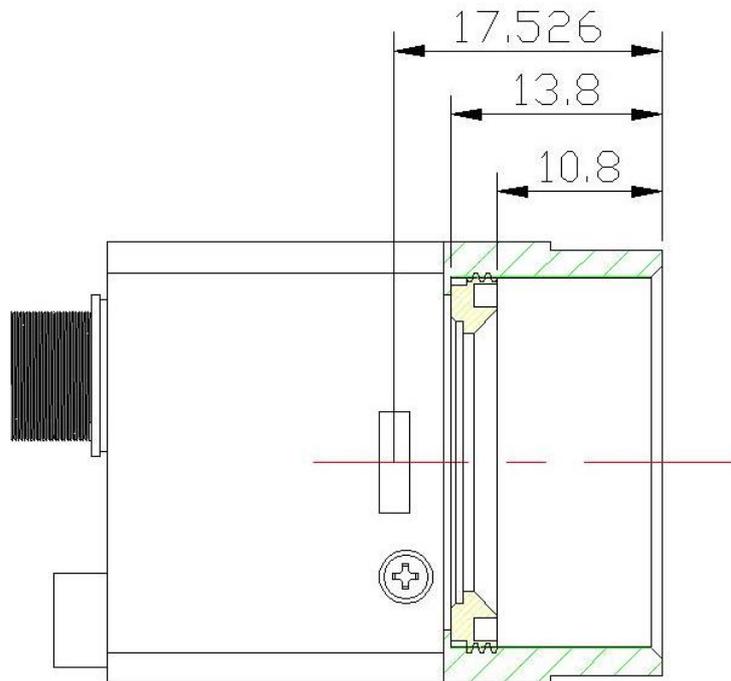


Figure2- 5 Optical interface

MERCURY USB cameras are equipped with C-mount lens adapters. The distance between the installation datum of lens and sensor photosensitive surface is 17.526 mm (in the air).

After the filter/ transparent glass is installed, the distance between the installation datum and the filter/ transparent glass is 10.8mm, As shown in Figure2- 5, the lens can intrude into the camera body a maximum of 10.8mm.

The infrared cut-off filters/ anti-reflection glasses have an impact on back focus, and their removal may lead to an unclear focus.

If they must be removed, please contact the DAHENG IMAGING technical support team.

2.4. Guideline for Avoiding EMI

- 1) USB cable certificated by USB-IF with lock screw is recommended.
- 2) Connect I/O cable shield conductor to ground.
- 3) Try to use camera cables that are the correct length. Avoid coiling camera cables. If the cables are too long, use a meandering path rather than coiling the cables.
- 4) Keep your cameras away from equipments with high voltage, or high current (as motor, inverter, relay, etc.). If necessary, use additional shielding.
- 5) ESD (electro-static discharge) may damage cameras permanently, so use suitable clothing (cotton) and shoes, and touch the metal to discharge the electro-static before operating cameras.

2.5. Environment Requirement

- 1) Housing temperature during operation:0°C ~ 45°C, Humidity during operation:10% ~ 80% (relative , non-condensing).
- 2) To avoid collecting dust on the optical filter, always keep the plastic cap on cameras when no lens is mounted.
- 3) Make sure that cameras are transported in the original factory packages.

3. Installation and Use

3.1. Setup Guide

The installation of DAHENG IMAGING Camera Software Suite is very simple, but you have to take attention to the following matters.

- 1) The path of installation can only be ASCII characters; otherwise you will not start the applications successfully.
- 2) When you are installing the setup suit, antivirus will ask you whether to allow some operations, then you must allow these operations.
- 3) If you are using USB2.0 Cameras in Windows XP, and you have installed the DAHENG IMAGING Camera Software Suite without cameras connected to your PC, you must run MER-Series UpdateDriver firstly.

3.2. Application Programming Interface

After the DAHENG IMAGING MERCURY Camera Software Suite has been installed on your PC, you can control all the camera parameters using the programming interface. The Programmer Guides and the API References are also included in the Software Suite.

DAHENG IMAGING MERCURY Camera Software Suite includes these components:

- 1) Driver: such as MERCURY USB 2.0 driver, MERCURY USB3.0 Vision driver, and MERCURY GigE Vision filter driver.
- 2) API: including the API to control cameras and the API to process images, with a variety of programming languages.
- 3) Demo (GalaxyView.exe): the suite provides a demo to show how a camera works.
- 4) SDK and Samples: providing lots of source code samples for users to refer to.
- 5) Documentations: programming guides and API reference.

You can also download the DAHENG IMAGING MERCURY Camera Software Suite from the DAHENG IMAGING website: www.daheng-imaging.com/en

4. Image Acquisition Control

4.1. Exposure

4.1.1. Exposure Mode

MERCURY series camera has two exposure modes:

- 1) CCD cameras: Global shutter;
- 2) CMOS cameras: the MER-040-60UM/C camera is global shutter, and the others are electronic rolling shutter;

Global shutter means that all the lines in the sensor are exposed at the same time. The high frame rate of up to 60fps allows the Mer-040-60UM/C camera to be more suitable for moving objects and not to produce shadows.

4.1.2. Exposure Time

When the external light source is sunlight or direct current (DC), the MERCURY series USB interface camera has no special requirements for the exposure time. When the external light source is alternating current (ac), the exposure time must synchronize with the external light source (under 50Hz light source, the exposure time must be a multiple of 1/100s, under 60Hz light source, the exposure time must be a multiple of 1/120s), to ensure better image quality. You can set the exposure time that is synchronized with the external light source by using the demo or interface function.

In addition, at different acquisition speed level, the minimum exposure time of the MERCURY series CCD camera is different, as the following tables:

	Speed level 0	Speed level 1	Speed level 2	Speed level 3	Speed level 4
RAW8/Mono 8(μs)	46	23	13.8	12.3	11.5
RAW12/Mono 12(μs)	92	46	27.2	24.6	23

Table4- 1 the minimum exposure time at different acquisition speed level for MER-030-120UM/C

	Speed level 0	Speed level 1	Speed level 2	Speed level 3
RAW8/Mono 8(μs)	39.75	19.875	13.25	9.93
RAW12/Mono 12(μs)	79.5	39.75	26.5	19.875

Table4- 2 the minimum exposure time at different acquisition speed level for MER-125-30UM/C

	acquisition Speed level 0
RAW8/Mono 8(μs)	50
RAW12/Mono 12(μs)	100

Table4- 3 the minimum exposure time at different acquisition speed level for MER-132-30UM/C

4.1.3. Auto Exposure

The MERCURY series camera is designed for the industrial applications, designed for automatic exposure control, which can be adapted to different light variations without human intervention. The user can choose the operating environment according to the surrounding environment, and sets the Maximum & Minimum values of the adjustment, and ExpectedGrayValue, which can be automatically adjusted.

4.2. PixelFormat

MERCURY series camera supports two output PixelFormat:

Mode	PixelFormat
MER-030-120UM/C	MONO8/RAW8(Bayer) MONO12/RAW12(Bayer)
MER-125-30UM/C	
MER-132-30UM/C	
MER-500-7UM/C	
MER-040-60UM/C	MONO8/RAW8(Bayer) MONO10/RAW10(Bayer)
MER-130-30UM	
MER-310-12UC	

Table4- 4 output pixelformat

4.3. Acquisition Speed

The speed of the MERCURY series camera can be adjusted through AcquisitionSpeedLevel! The user can choose the suitable acquisition speed level.

4.4. Adjust Gain

4.4.1. Analog Gain

The MERCURY series camera can adjust the analog gain, and the range as follows:

Mode	Code range	Default	Gain
MER-040-60UM/C	16 - 64	16	Gain(dB)=0.0625×Code (Code range: 16 - 64)
MER-130-30UM MER-310-12UC	0 - 63	8	Gain(dB)=(-0.125)×Code (Code range: 0 - 8) Gain(dB)=0.125×Code (Code range: 8 - 63)
MER-500-7UM/C	9 - 63	9	Gain(dB)=0.1875×Code (Code range: 9 - 63)
MER-030-120UM/C MER-125-30UM/C MER-132-30UM/C	0 - 1023	296	Gain(dB)=(0.0358×Code) + 5.75dB (Code range: 0 - 1023)

Table4- 5 Analog Gain

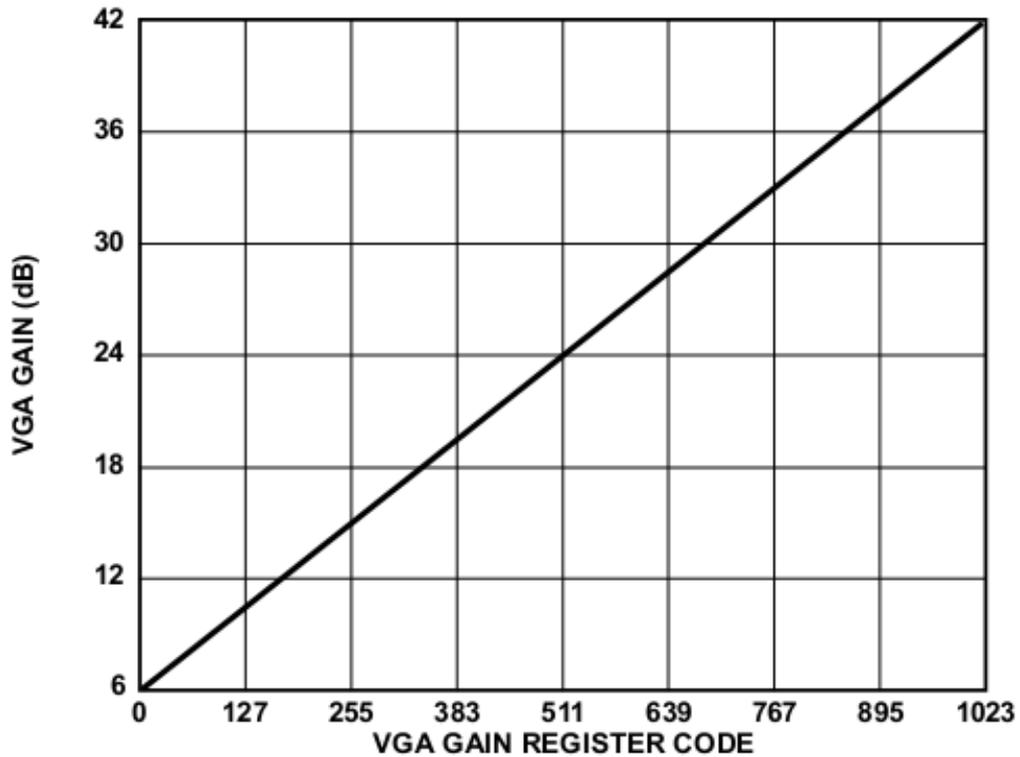


Figure 4- 1 VGA Gain

4.4.2. Digital Gain

The camera also provides a hardware digital gain when outputting 8bit images.

Mode	Hardware digital Gain
MER-500-7UM/C MER-030-120UM/C MER-125-30UM/C MER-132-30UM/C	ADC Level 0: Original brightness × 1 ADC Level 1: Original brightness ÷ 2 ADC Level 2: Original brightness ÷ 4 ADC Level 3: Original brightness ÷ 8 ADC Level 4: Original brightness ÷ 16
MER-040-60UM/C MER-130-30UM/C MER-310-12UM/C	ADC Level 0: Original brightness × 2 ADC Level 1: Original brightness × 1 ADC Level 2: Original brightness ÷ 2 ADC Level 3: Original brightness ÷ 4

Table4- 6 Digital Gain

4.5. Black Level

The MERCURY series USB interface camera is all with black level adjustable function. When the user needs to adjust the black level manually, he should disable the automatic black level calibration function, otherwise the camera may adjust it automatically.

For CMOS cameras, if the automatic black level calibration function is disabled, some problems will appear in some situations, especially when using the Mono cameras, some fine grid will appear in the image. Then you should use the white balance function which is belong to the color cameras to eliminate the grid, but that will reduce the sharpness of the image.

4.6. White Balance

Under different color temperatures, the object's color may change. Especially the white objects. Indoors, the white objects looks with orange tonal under the tungsten light which is of a low color temperature, under that light condition, the image will yellow shift; if in the blue sky which is of high color temperature, the image will be bluer. In order to minimize the external light's impact and to restore the real color of the object, color correction is required, to achieve the correct color balance, known as the white balance adjustment.

4.6.1. Auto White Balance

The MERCURY series camera provides auto white balance adjustment function, the camera can change the white balance factor of the current RED/BLUE channel according to the current environment temperature automatically.

4.6.2. Manual White Balance

The MERCURY series camera provides a more flexible way of white balance function, users can select three modes: Off, Once, Continuous. On the "Off" mode, you can adjust the white balance manually.

4.7. Filters/Anti-reflection Glass

The MERCURY series USB interface camera come with filters or anti-reflection glass. The color cameras are with IR-cut filters, and the IR-Cut frequency is 700nm, the filters can reduce the effect of the invisible light on the image. For Mono cameras, they are all with anti-reflection glasses. The IR-cut filters/ anti-reflection glass can help to adjust the focal length, if there is no special requirement, please do not remove it.

4.8. Hardware Trigger

4.8.1. Input Port

The MERCURY series camera provides an input signal, and the input signal is connected into the camera by the Hirose of the camera.

See as the following schematic (Figure 4- 2): The input signal is opto-isolated.

Note: The voltage range of the input signal must between **6VDC – 24VDC**.

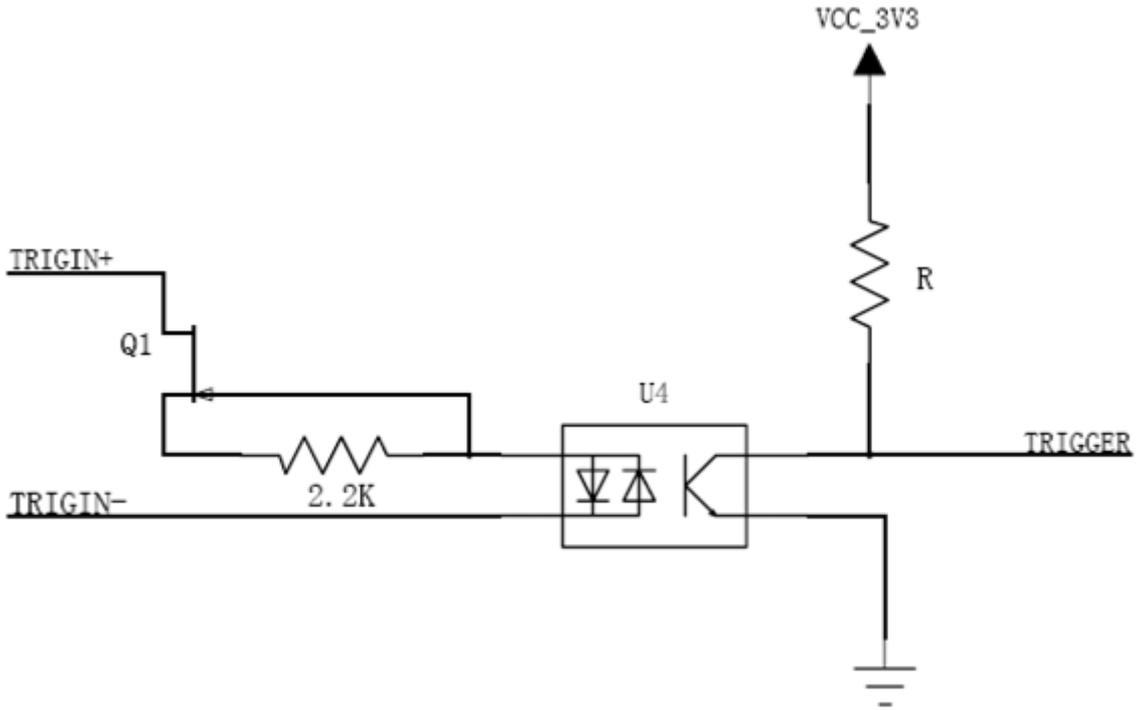


Figure 4- 2 Camera input circuit

4.8.2. Output Port

The MERCURY series camera has one channel output signal, which is connected into the camera by the Hirose of the camera. And the output signal is opto-isolated. The voltage range of the VCC must between **5VDC -24VDC**. The Maximum electric current of output signal is 50mA.

At the output end of the camera, when the triode is turned on, the output signal is logical 1, and when the triode is turned off, the output signal is logical 0.

See as the following schematic (Figure 4- 3):

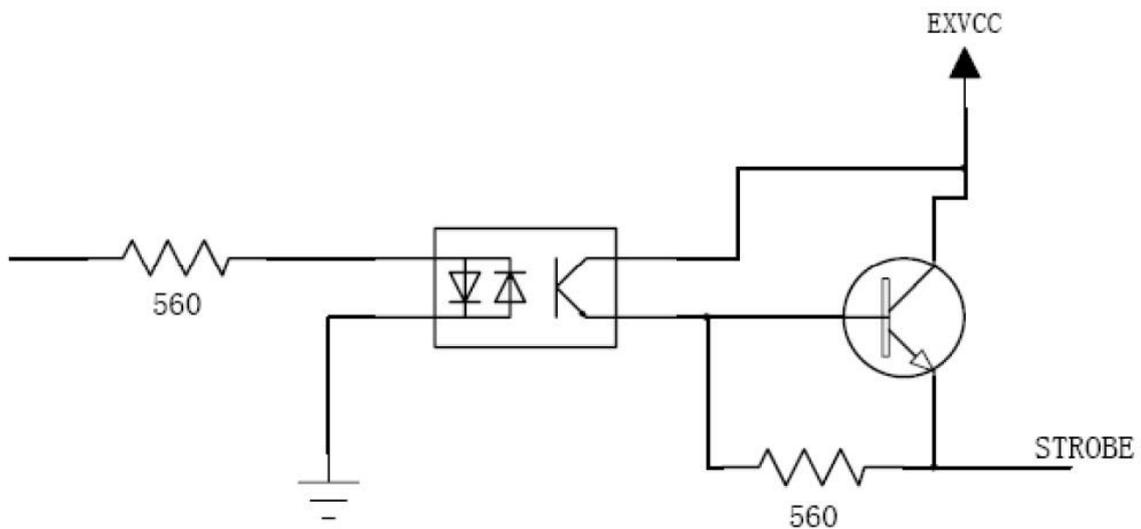


Figure 4- 3 Camera output circuit

4.8.3. Connection Method of Cables

The MERCURY USB interface cameras have two types of trigger signals, one is positive voltage drive signal and the other is negative voltage drive signal. Both the **High** and the **Low** which are described in the software interface function and the demo, are based on positive voltage drive. When driven by negative voltage, the polarity is reversed.

The MERCURY USB interface cameras use industry-specific connectors, see as the following Table4- 7:

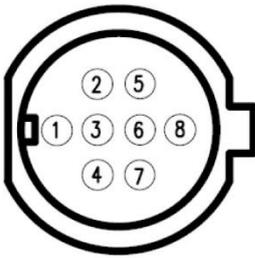
Figure	Pin	Definition	Description
	1	Trigger +	Hardware Trigger 1
	2	Reserve	Reserved
	3	Trigger -	Hardware Trigger 2
	4	Reserve	Reserved
	5	Not connected	Not connected
	6	Not connected	Not connected
	7	Strobe	Light Source Control Output
	8	ExtVCC	External Power Supply

Table4- 7 I/O Port definition (back sight of camera)

4.8.4. Trigger Filtering

In order to suppress the interference signal during external triggering, the MERCURY series camera has designed trigger filtering function, including rising/falling edge filter. The **set range** is **0us - 1ms**, step: 100us. If the value of rising edge filter is set as 1ms, then the rising edge pulse width which less than 1ms will be filtered out, and the camera will not be triggered.

The User Data Encryption Area

The user data encryption area is designed to protect the user's self-owned intellectual property rights. Users can define it by themselves. When the user data encryption area can be accessed, the ordinary parameters are used, if the user data encryption area is not accessible, the user must use a secret key to open it. The users can be more closely tied to their software through the data encryption area, then to improve the difficulty of decryption and protect their self-owned intellectual property.

The user data encryption area can be accessed when the camera leaves the factory. How to use it please contact the support engineer. support@daheng-imaging.com

5. FAQ

NO.	General Question	Answer
1	The cameras often stop capturing while working, but returned to normal after executing the start capture command.	<ol style="list-style-type: none"> 1) Lower the acquisition speed; 2) Increase the horizontal blanking length; 3) Check the cable, Host and working environment; 4) Recommend to use the USB port which is on the motherboard; 5) The driver provides error interfaces, if error occurs, click to continue;
2	The frame rate is not up to the maximum value.	<ol style="list-style-type: none"> 1) Change another PC with high performance; 2) Avoid using the USB interface card; 3) Avoid using the USB port on the front panel of the host; 4) If you have any other questions, please contact us.
3	Frames are lost while multiple cameras are acquiring images at the same time.	<ol style="list-style-type: none"> 1) Decrease the acquisition frequency and increase the horizontal blanking, but this method may reduce the frame rate greatly; 2) Connect the cameras to the host controllers separately;

6. Revision History

NO.	Version	Remarks	Date
1	V1.0.0	Initial release	2017-06-22
2	V1.0.1	Change manufacturer name to DAHENG IMAGING Change logo	2017-12-19
3	V1.0.2	Revise Figure 4- 2 Delete pin number of U4	2019-05-22
4	V1.0.3	Revise Figure 2- 1, 2-2 Delete definition parameters	2020-01-13
5	V1.0.4	Modify the description of Figure 2-3 and Figure 2-4	2020-06-12