

USB2.0 Camera with HDMI Monitor Output

ARTCAM-HD2 Series

INSTRUCTION BOOKLET

1.3M pixels CMOS

ARTCAM-130MI-HD2 Series

10.0M pixels CMOS

ARTCAM-1000MI-HD2 Series

1.25M pixels CCD

ARTCAM-445KY2-HD2 Series

1.5M pixels CCD

ARTCAM-150P5-HD2 Series

ARTRAY

ARTRAY CO., LTD.

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1. Attention

■About this manual

1. Before using the camera, please read this manual thoroughly.
2. Please keep this manual reachable and always refer to the contents when needed.
3. Please contact us if the manual is lost or damaged. We will provide a replacement.
4. We cannot guarantee the safety of improper uses of the camera.
5. For your safety, please follow the directions of this manual.
6. All contents are subject to change.
7. Images in this manual may have been simplified to be easier comprehended.
8. Please contact us if you find any unclear points or mistakes in this manual.
9. Quoting, copying or altering some or all parts of the manual without our permission is prohibited.
10. We are not responsible for any lost or damages on your profits due to the use of our products.
11. Please understand that our oversea branches do not provide maintenance or repair services.

■About the Icons

To keep the safety of the user, other people and their properties, please pay attention to the following icons.



Warning

If the user fails to follow the instruction, physical injury on human or damages on hardware may occur.



Caution

If the user fails to follow the instruction, serious injury or death may occur.

■For Safe Use



Warning

●In following circumstances, please stop using the product and turn off the power immediately to prevent the risks of fires and electric shocks. If the product is defective, please contact us for repair or exchange. For your safety, please do not disassemble, modify or repair the camera on your own.

Please stop using the product and turn off the power immediately when :

- The product becomes smoky or gets extremely hot on the surface, or makes unusual smells or sounds.
- Foreign material or water gets into the product.
- The product falls and becomes damaged.

●Do not place the product on unstable surfaces. The product may be fallen and people may get hurt.



Caution

●Do not expose the product to steam or fumes to avoid electric shocks and fires.

●Do not leave the product in high temperature places such as inside of vehicles or under direct sunlight. High temperature may cause damages to the camera, or even cause fires.

●Do not cover the product with cloth or other materials. The product may get extremely hot and the heat may cause deformations on the parts or even cause fires.

●Please avoid dropping or shocking the product as the product may be damaged.

●Do not touch the cable with a wet hand. Such action may cause electric shocks.

●Please avoid continuously contacting the surface of the camera to your skin when the camera is being used. The surface temperature of the camera may cause burns.

■Other Notices

●Please do not use the camera under strong lights such as sun light for a long period. Also please do not expose the camera under strong lights even when the product is not being used because the sensor might be damaged.

Maintenance

● Wipe the dirt on surface with soft cloth or tissue paper. Do not use alcohol, thinner or benzene to avoid damaging the surface paints.

Electro Magnetic Interference

●The camera may interference with electronic devices such as TV and radio. Please do not place the camera next to such equipment.

■Export Control

The Government of Japan controls military sensitive goods and technologies including relevant dual-use goods and technologies.

This product is a Catch-all Control item subject to the Foreign Exchange and Foreign Trade Act and its relevant legislations. Except for exporting to the 27 white countries designated in the Cabinet Order, export licenses are required if the products are going to be used for military use or if the end user of the product is related to all kinds of military activities. If your circumstances cause the need to apply export licenses, please notify us before you place orders. Also, please notify us in advance if the end users or purposes of use change after the purchase and thus cause the need to apply export licenses.

*The 27 white countries not under the UNSC Arms Embargo :

Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Republic of Korea, Luxemburg, Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States

About the Japanese Security Export Controls, please refer to the webpage for Security Export Control Policy, The Ministry of Economy, Trade and Industry:

<http://www.meti.go.jp/policy/anpo/englishpage.html>

■Guarantee

To save the environment, we do not issue warranty in printed format. Instead, all records of the warranty periods, delivery dates and the customer information are well kept in our system.

For more details, please refer to the sites below :

Hardware Warranty : http://www.artray.us/download/artray_warranty.pdf

2. Introduction

ARTCAM-HD2 Series is HDMI / USB2.0 output cameras for industrial use.

This series adopts USB2.0 interface, so the data can be delivered to PC directly without a capture board.

Also, the HDMI (High Definition Multimedia Interface) output function is enable direct delivery of images to a digital monitor without a PC.

3. Main Features

- High Resolution, High quality

Various models of different sensor types and resolutions are available now.

Sensor Type	Resolution	Series	Remark
CMOS	1.3M pixels	ARTCAM-130MI-HD2 Series	
	10.0M pixels	ARTCAM-1000MI-HD2 Series	Color model only
CCD	1.25M pixels	ARTCAM-445KY2-HD2 Series	
	1.5M pixels	ARTCAM-150P5-HD2 Series	

- USB2.0 Interface

Our cameras adopt USB2.0 interface, so the data can be delivered to PC directly and no capture board is needed.

- HDMI Output

Our HDMI series adopts with HDMI terminal, which is able to deliver images to digital monitor directly.

ARTCAM-445KY2-HD2 (HDMI 720P@60)

ARTCAM-130MI-HD2/150P5-HD2 (HDMI 720P@60 or SXGA(1280x1024) *These two options are available for customer's choice)

ARTCAM-1000MI-HD2 (HDMI 1080P@60 or 720P@60 *Output can be switched by software)

- Varieties to Your Needs

We offer color, monochrome and NIR models for our customer to choose based on their specific needs.

(Please note that there is only color model for ARTCAM-1000MI-HD2 Series)

- Global shutter(ARTCAM-150P5-HD2 / 445KY2-HD2 Series)

The ARTCAM-150P5-HD2 / 445KY2-HD2 series adopt CCD sensor and global shutter, which is suitable for use of machine vision.

- Bounded Viewer Software

We provide the Viewer Software - ART-Viewer (Windows XP/Vista/7). With this software, users can easily preview, save images and change camera settings.

- 2D Measurement & Filing Software(Optional)

Useful 2D measuring functions are available with the optional 2D Measuring & Filing Software - ART-MEASURE.

- Recording Software(Optional)

The optional recording software - ART-REC allows user to save movies in AVI format.

- Software Development Kit(Optional)

For customer who prefers to create their own image processing software or use our camera with other applications, we provide SDK upon requests.

4. The Product

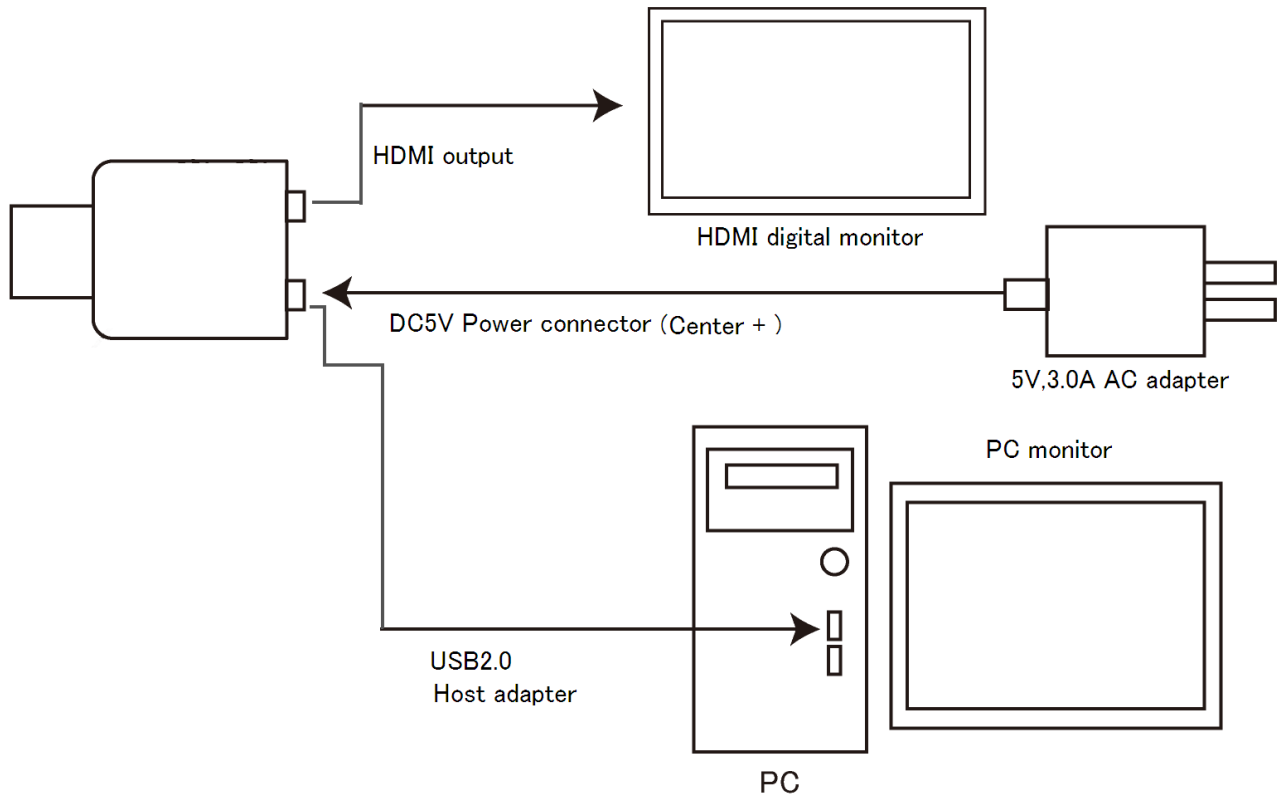
- 1) Camera
- 2) USB Cable (A-miniB) 2m
- 3) AC adapter (DC 5V)
- 4) Instruction Booklet
- 5) Viewer software/Device Driver CD

<Options>

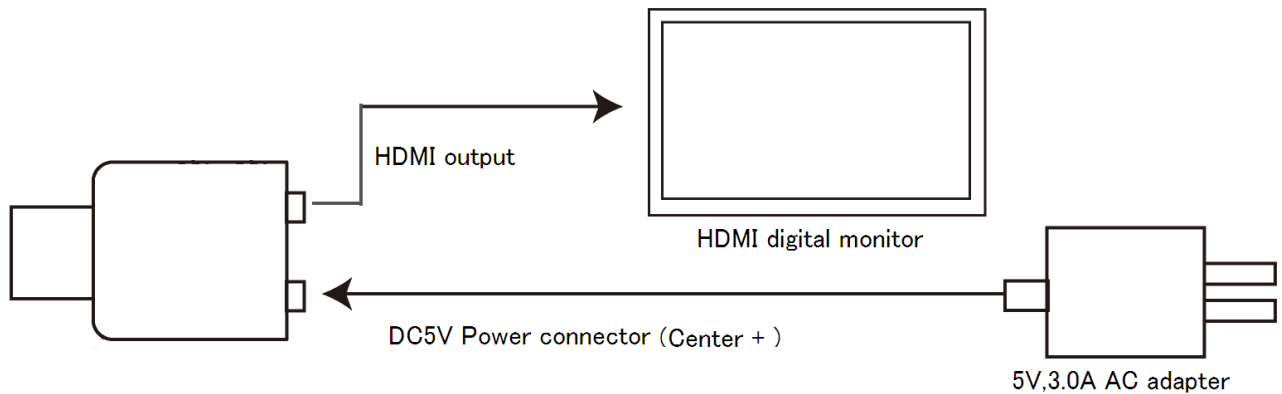
- 1) HDMI cable(1.5m/3m/5m) · HDMI-DVI connector · HDMI-DVI cable
- 2) C Mount lens
- 3) 2 Measurement & Filing Software [ART-MEASURE]
- 4) Recording Software [ART-REC]
- 5) Software Development Kit [ARTCCM-SDK]
- 6) 5m extension cable with USB2.0 repeater

5. Connect the Camera

5-1-1 How to connect a camera [PC / Monitor]



5-1-2 How to connect a camera [Monitor]



Attention *The image settings, such as white balance and gain can be accessed from parameter when camera is connects to PC by USB cable.

*In the case of connecting to a PC, installations of device driver and viewer software are necessary.

5-2 Shutter Speed

Shutter speed can be changed on the standard viewer software ART-Viewer.

The shutter speed is set directly on the sensor register, so please refer to the following formulas for the real exposure time.

Model	Method
130MI-HD2 Series	Range : 1~16383(Exposure Time : 1/17992~1sec) Exposure Time= $((\text{Shutter Value} \times 1514) - 180) \times 0.0417$ [μsec] *1280 x 1024, 24MHz
1000MI-HD2 Series	1080P Mode Range : 1~8191(Exposure Time : 1/23220~1/3.6sec) Exposure Time= $((\text{Shutter Value} \times 2032)+552) \times 0.0167$ [μsec]
	720P Mode Range : 1~8191(Exposure Time : 1/28958~1/4.82sec) Exposure Time= $((\text{Shutter Value} \times 1520)+552) \times 0.0167$ [μsec]
	3664 x 2748 Mode Range : 1~8191(Exposure Time : 1/5329~1.35sec) Exposure Time= $((\text{Shutter Value} \times 3952)+552) \times 0.0417$ [μsec]
445KY2-HD2 Series	Range : 4~1001(Exposure Time : 1/7500~1/15sec) Exposure Time= $(1001 - 2+4 - \text{Shutter Value}) \times 1600 \times 0.0417$ [μsec] *1296 x 966, 24MHz
150P5-HD2 Series	Range : 8~1068(Exposure Time : 1/2234~1/12.5sec) Exposure Time= $(1074 - \text{Shutter Value}) \times 1790 \times 0.0417$ [μsec] *1392 x 1040, 24MHz

5-3 Image sensor output range and pixel

Effective pixel of image sensor and output range will vary when using either USB2.0 or HDMI output.

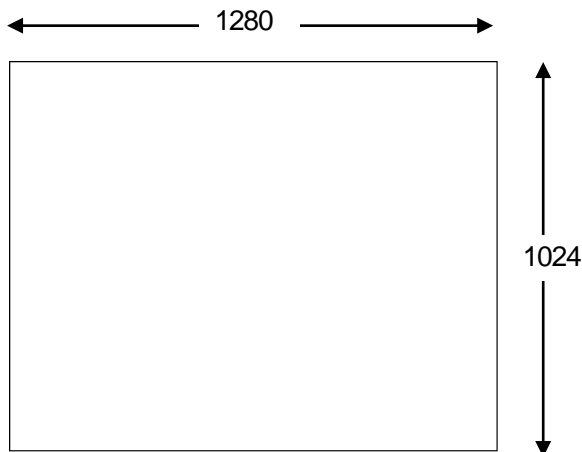
Please find information of output resolution for different cameras as below.

5-3-1 ARTCAM-130MI-HD2 Series

In case of HDMI setting of 1280 x 1024 output

USB Output (Acquired Image from PC)

Effective pixel 1280 x 1024
 Read-only area 1280 x 1024
 Output resolution 1280 x 1024

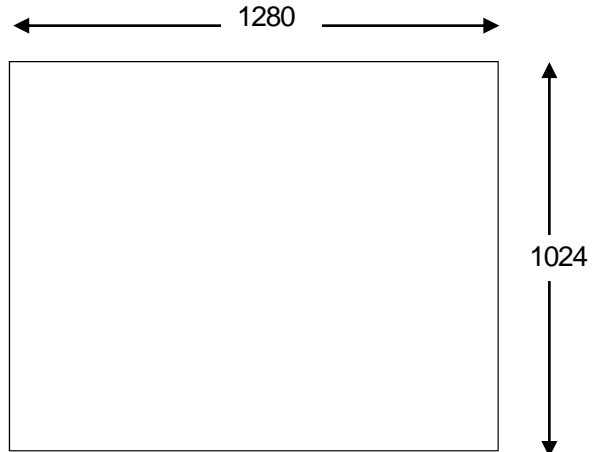


Capture frame rate 7.5 fps

*The frame rate of sensor is 15 fps, but only half of the frame rate of 7.5 fps can be achieved in this setting.

HDMI Output (Displayed image on monitor)

Effective pixel 1280 x 1024
 Read-only area 1280 x 1024
 Output resolution 1280 x 1024



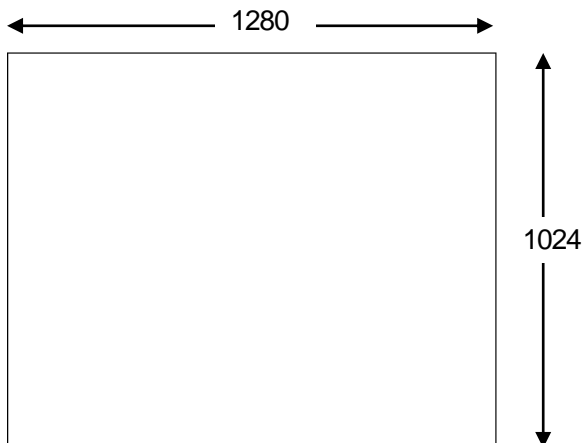
Display frame rate 60 fps

*The frame rate of sensor is 15 fps, but HDMI output can reach up to 60 fps.

In case of HDMI setting of 720P output

USB Output (Acquired Image from PC)

Effective pixel 1280 x 1024
 Read-only area 1280 x 1024
 Output resolution 1280 x 1024

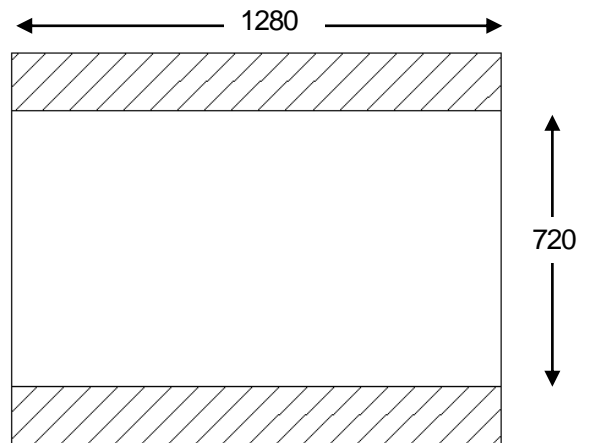


Capture frame rate 7.5 fps

*The frame rate of sensor is 15 fps, but only half of the frame rate of 7.5 fps can be achieved in this case.

HDMI Output (Displayed image on monitor)

Effective pixel 1280 x 1024
 Read-only area 1280 x 1024
 Output resolution 1280 x 720



Display frame rate 60 fps

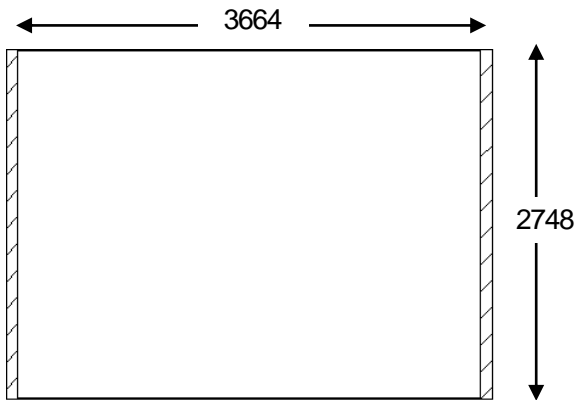
*The frame rate of sensor is 15 fps, but HDMI output can reach to 60 fps.

5-3-2 ARTCAM-1000MI-HD2 Series

In case of full resolution setting of 3664 x 2748 output

USB Output (Acquired Image from PC)

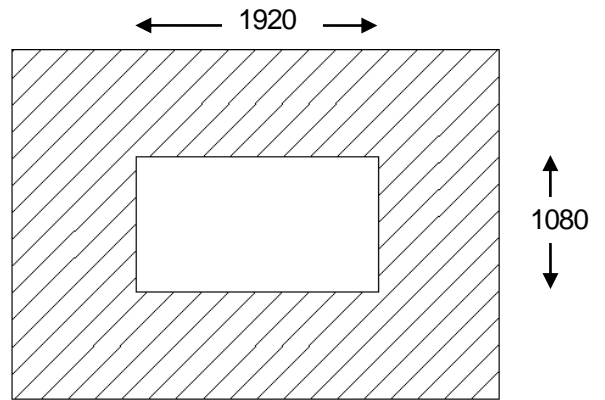
Effective pixel 3856 x 2764
 Read-only area 3664 x 2748
 Output resolution 3664 x 2748



Capture frame rate 2.2 fps
 *The frame rate of sensor is 4.4 fps, but only half of the frame rate of 2.2 fps can be achieved in this setting.

HDMI Output (Displayed image on monitor)

Effective pixel 3856 x 2764
 Read-only area 3664 x 2748
 Output resolution 1920 x 1080

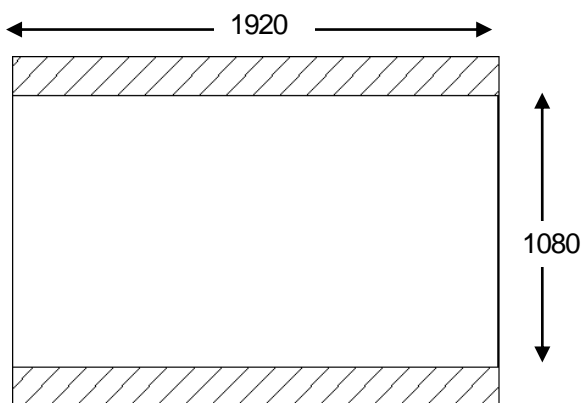


Display frame rate 60 fps
 *The frame rate of sensor is 4.4 fps, but HDMI output can reach to 60 fps.

In case of HDMI setting of 1080P output

USB Output (Acquired Image from PC)

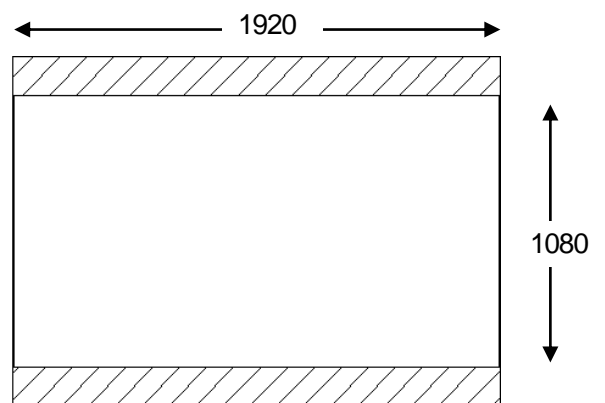
Effective pixel 3856 x 2764
 Read-only area 3840 x 2160
 Output resolution 1920 x 1080



Capture frame rate 9 fps
 *The frame rate of sensor is 45 fps, but only 9 fps can be achieved in this setting.

HDMI Output (Displayed image on monitor)

Effective pixel 3856 x 2764
 Read-only area 3840 x 2160
 Output resolution 1920 x 1080

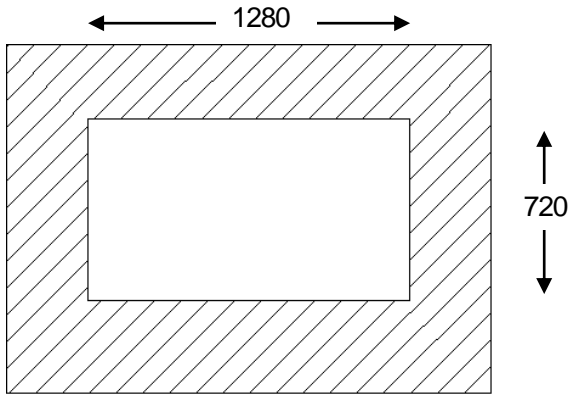


Display frame rate 60 fps
 *The frame rate of sensor is 45 fps, but HDMI output can reach to 60 fps.

In case of HDMI setting of 720P output

USB Output (Acquired Image from PC)

Effective pixel 3856 x 2764
Read-only area 2560 x 1440
Output resolution 1280 x 720

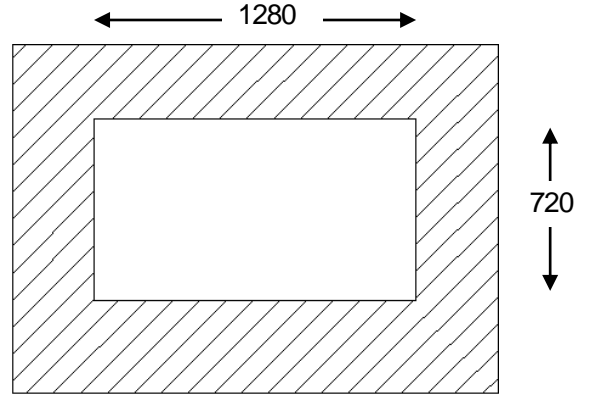


Capture frame rate 9 fps

*The sensor frame rate of sensor is 45 fps, but only 9 fps can be achieved in this setting.

HDMI Output (Displayed image on monitor)

Effective pixel 3856 x 2764
Read-only area 2560 x 1440
Output resolution 1280 x 720



Display frame rate 60 fps

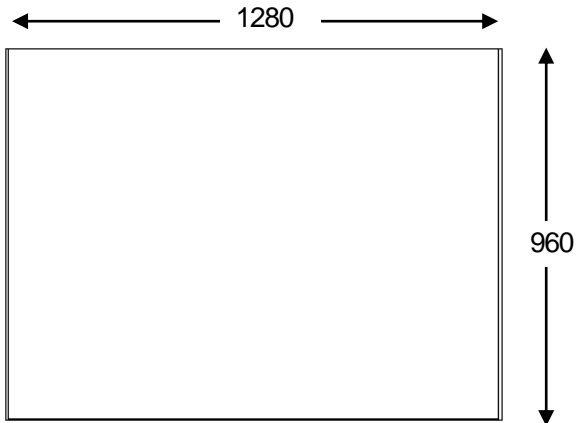
*The frame rate of sensor is 45 fps, but HDMI output can reach to 60 fps.

5-3-3 ARTCAM-445KY2-HD2 Series

In case of HDMI setting of 720P output

USB Output (Acquired Image from PC)

Effective pixel 1296 x 966
Read-only area 1296 x 966
Output resolution 1280 x 960

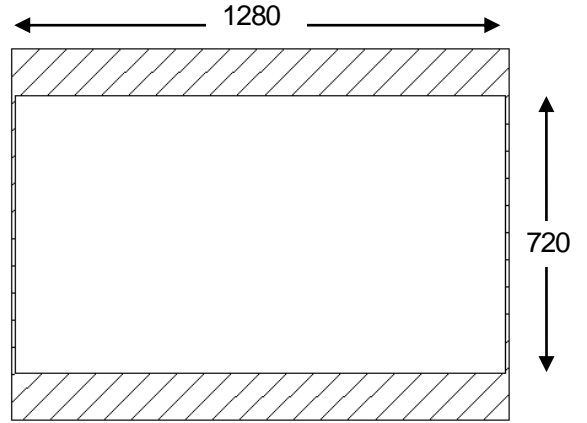


Capture frame rate 7.5 fps

*The sensor frame rate of sensor is 15 fps, but only half of the frame rate of 7.5 fps can be achieved in this setting.

HDMI Output (Displayed image on monitor)

Effective pixel 1296 x 966
Read-only area 1296 x 966
Output resolution 1280 x 720



Display frame rate 60 fps

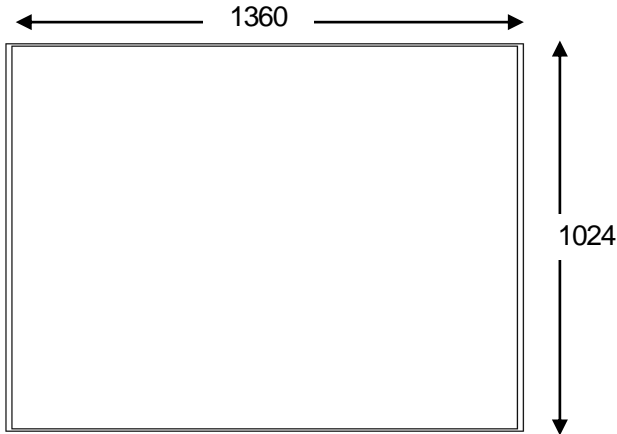
*The frame rate of sensor is 15 fps, but HDMI output can reach to 60 fps.

5-3-4 ARTCAM-150P5-HD2 Series

In case of HDMI setting of 1280 x 1024 output

USB Output (Acquired Image from PC)

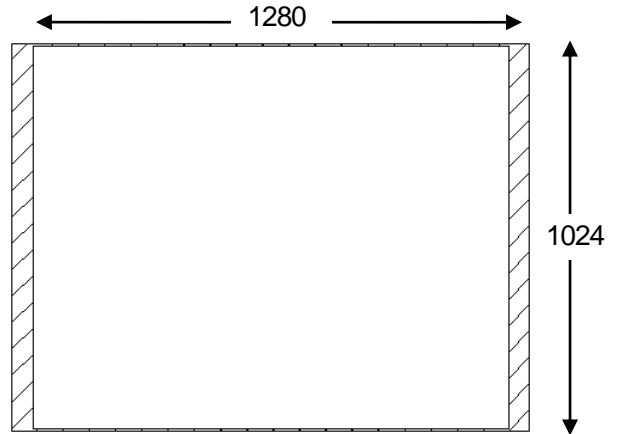
Effective pixel 1392 x 1040
 Read-only area 1392 x 1040
 Output resolution 1360 x 1024



Capture frame rate 6 fps
 *The sensor frame rate of sensor is 12 fps, but only half of the frame rate of 6 fps can be achieved in this setting.

HDMI Output (Displayed image on monitor)

Effective pixel 1392 x 1040
 Read-only area 1392 x 1040
 Output resolution 1280 x 1024

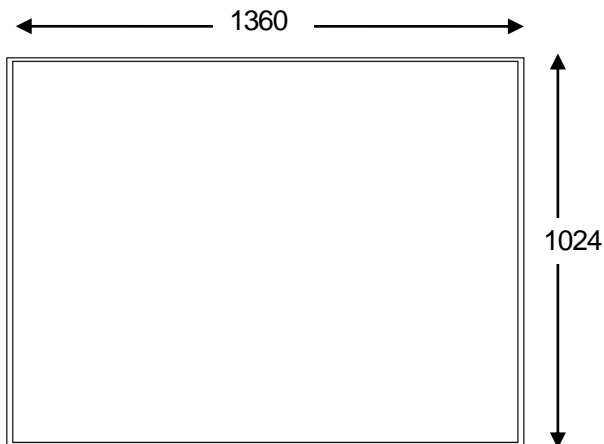


Display frame rate 60 fps
 *The frame rate of sensor is 12 fps, but HDMI output can reach to 60 fps.

In case of HDMI setting of 720P output

USB Output (Acquired Image from PC)

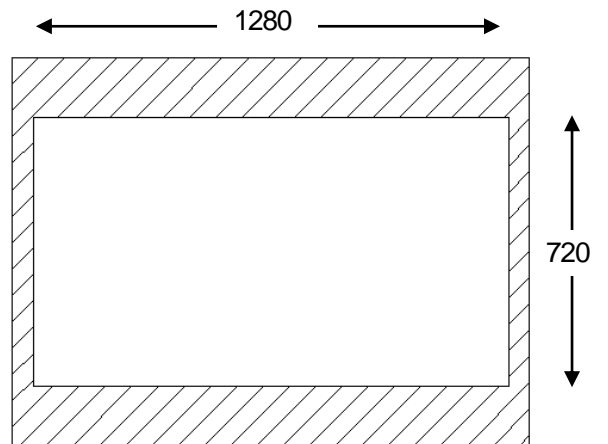
Effective pixel 1392 x 1040
 Read-only area 1392 x 1040
 Output resolution 1360 x 1024



Capture frame rate 6 fps
 *The sensor frame rate of sensor is 12 fps, but only half of the frame rate of 6 fps can be achieved in this setting.

HDMI Output (Displayed image on monitor)

Effective pixel 1280 x 1024
 Read-only area 1280 x 1024
 Output resolution 1280 x 720



Display frame rate 60 fps
 *The frame rate of sensor is 12 fps, but HDMI output can reach to 60 fps.

6. Specifications

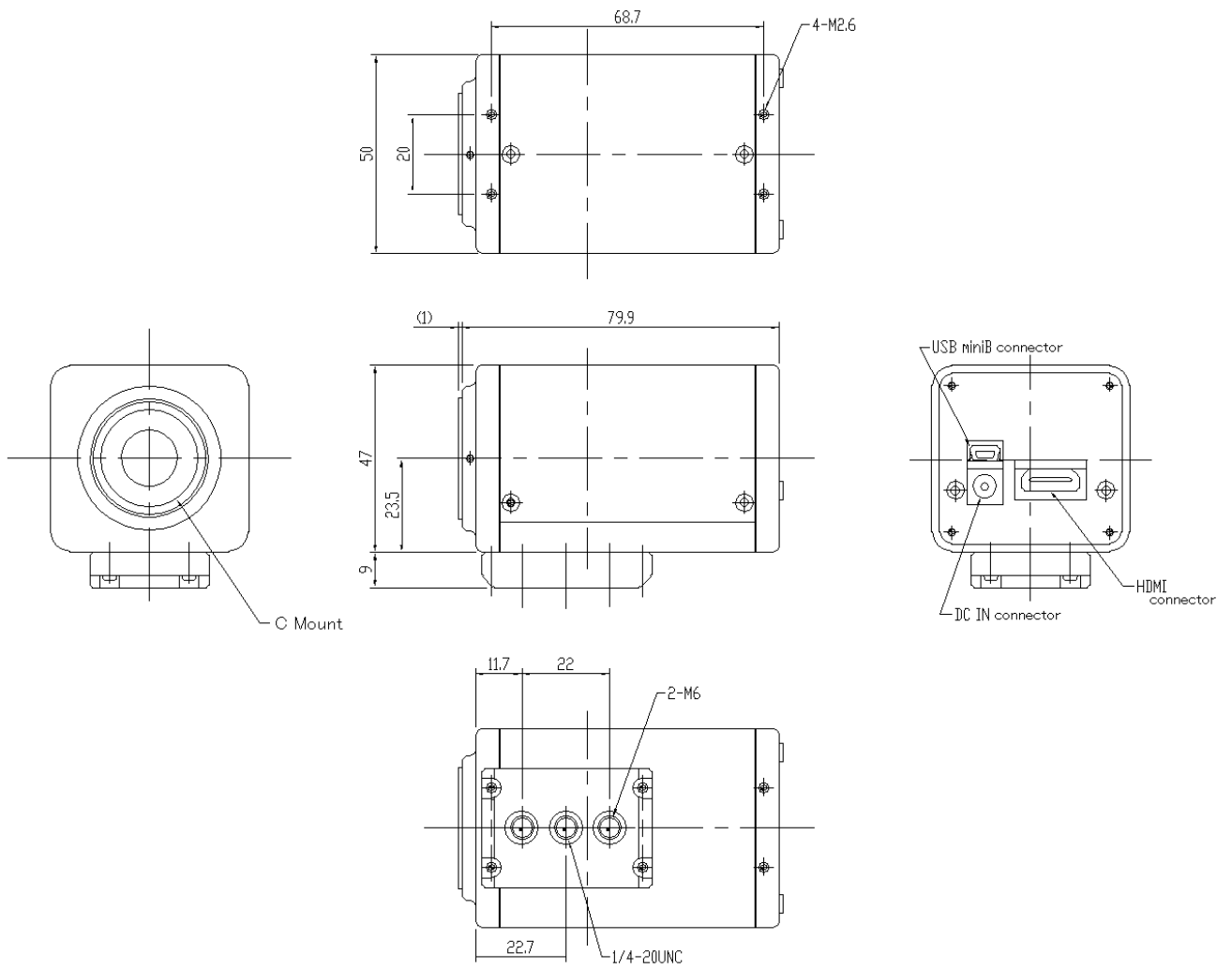
6-1 Color Model(1)

	ARTCAM-130MI-HD2	ARTCAM-1000MI-HD2	ARTCAM-445KY2-HD2	ARTCAM-150P5-HD2
Sensor Type	CMOS Color Image Sensor		CCD Color Image Sensor	
Active Pixels	1280(H) x 1024(V)	3856(H) x 2764(V)	1296(H) x 966(V)	1392(H) x 1040(V)
Active Imager Size	6.66(H) x 5.32(V)mm 1/2"	6.41(H) x 4.59(V)mm 1/2.3"	4.86(H) x 3.62(V)mm 1/3"	6.47(H) x 4.83(V)mm 1/2"
Scan Mode	Progressive Scan			
Pixel Size	5.2(H) x 5.2(V) μ m	1.67(H) x 1.67(V) μ m	3.75(H) x 3.75(V) μ m	4.65(H) x 4.65(V) μ m
Shutter Type	Rolling Shutter		Global Shutter	
Color Filter Array	RGB Bayer Pattern			
Sensor Driver Frame rate	15fps	1080P/720P : 45fps 3664 x 2748 mode : 4.4fps	15fps	12fps
USB Output Frame rate	7.5fps	1080P/720P : 9fps 3664 x 2748 mode : 2.2fps	7.5fps	6fps
HDMI Output Frame rate	60fps	60fps	60fps	60fps
Shutter Speed	1/17992~1s	1080P mode : 1/17992~1s 720P mode : 1/28958~1/4.82s Full resolution (3664 x 2748) : 1/5329~1.35s	1/7500~1/15s	1/2234~1/12.5s
Interface	USB2.0 Bulk transfer			
Video Output	HDMI Ver1.2			
HDMI Image Output Resolution	720P@60 or SXGA(1280 x 1024) *Two options are offered upon customer's request	1080P@60 / 720P@60 *Output can be switched by software	720P@60	720P@60 or SXGA(1280 x 1024) *Two options are offered upon customer's request
Synchronization System	Internal Synchronization			
Lens Mount	C Mount			
Power	DC5V			
Power Consumption	Under Approx. 2W			
Ambient Conditions	Operating Temperature / Humidity : 0~35°C / 10~80%(Non condensing) Storage Temperature / Humidity : 0~60°C / 10~95%(Non condensing)			
External Dimensions	50(W) x 47(H) x 79.9(D)mm *Lens and tripod not included.			
Weight	Approx. 190g			

6-2 Color Model (2)

	ARTCAM-130MI-BW-HD2	ARTCAM-445KY2-BW-HD2	ARTCAM-150P5-BW-HD2
Sensor Type	CMOS Monochrome Image Sensor	CCD Monochrome Image Sensor	
Active Pixels	1280(H) x 1024(V)	1296(H) x 966(V)	1392(H) x 1040(V)
Active Imager Size	6.66(H) x 5.32(V)mm 1/2"	4.86(H) x 3.62(V)mm 1/3"	6.47(H) x 4.83(V)mm 1/2"
Scan Mode	Progressive Scan		
Pixel Size	5.2(H) x 5.2(V) μ m	3.75(H) x 3.75(V) μ m	4.65(H) x 4.65(V) μ m
Shutter Type	Rolling Shutter	Global Shutter	
Sensor Driver Frame rate	15fps	15fps	12fps
USB Output Frame rate	7.5fps	7.5fps	6fps
HDMI Output Frame rate	60fps	60fps	60fps
Shutter Speed	1/17992~1s	1/7500~1/15s	1/2234~1/12.5s
Interface	USB2.0 Bulk transfer		
Video Output	HDMI Ver1.2		
HDMI Image Output Resolution	720P@60 or SXGA(1280 x 1024) *Two options are offered upon customer's request	720P@60	720P@60 or SXGA(1280 x 1024) *Two options are offered upon customer's request
Synchronization System	Internal Synchronization		
Lens Mount	C Mount		
Power	DC5V		
Power Consumption	Under Approx. 2W		
Ambient Conditions	Operating Temperature / Humidity : 0~35°C / 10~80%(Non condensing) Storage Temperature / Humidity : 0~60°C / 10~95%(Non condensing)		
External Dimensions	50(W) x 47(H) x 79.9(D)mm *Lens and tripod not included.		
Weight	Approx.190g		

7. External Dimensions



8. Recommended PC

- Intel chip set, Southbridge above ICH5
OS : Windows XP / Vista / 7

	ARTCAM-130MI-HD2/150P4-HD2	ARTCAM-1000MI-HD2/445KY2-HD2
CPU	Pentium4 Above 1.7GHz	Pentium4 Above 2.4GHz
Memory	Above 512MB	Above 768MB

*The camera may not work properly with some PCs (If USB host chips are other than AMD and Intel)



Caution

■ Please refer the restrictions below when you use ARTCAM.

(1) USB host chip

Please use Intel authorized USB2 host controller.

Make sure that you find "Intel(R) 82801DB/DBM USB2 ENHANCED HOST CONTROLLER" on USB Controller window. The direction is as below :

"Control Panel" -> "Hardware" -> "Device Manager" -> "USB Controller"

NOTE: We do not guarantee the proper operation of this camera on external USB host cards.

Based on the design, the external USB host card may have a slow transfer rate as being connected to a host via PCI bus.

(2) Hyper Thread Bios

Please disable this function in case your PC has a built-in Intel hyper thread.

(3) Use of other USB2.0 hardware

The data on our camera/converter is transferred in bulk mode. For this reason, when using our camera/converter, please avoid using other bulk transferred USB2.0 hardware such as Memory stick, External HDD, External DVD, CDROM and etc.

Especially if the PC adopts a Cypress control chip, it may not recognize the later connected bulk transfer device if the device is connected when the Artray camera is in function. This issue is hard to be solved because the problem is on the lower firmware of the control chip and the PC bios.

As a solution, we recommend to install a PCI USB host card to the PC and connect external USB hardware to this port only.

(4) USB2.0 cable Extension

We cannot guarantee the proper operation of the extension cable even it is compatible with USB2.0 unless the extension cable is confirmed by us. This is because the USB transfer frequency of this camera is 192MHz.

What may cause the problem is that the regulation of the power lines becomes not enough, and so causes impedance mismatch on data signals.

*For the recommended extension cable, please contact our sales department. (TEL : +81-3-3389-5488)

Users may encounter problems such as "Camera error", "Disappearance of Device driver", "Operation error in high-speed mode", "Unknown USB device" and etc. if an unconfirmed extension cable is used.



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