Instruction Manual

GigE Vision Series

Version 1.7

Before using this product, be sure to read this instruction manual.

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Revision history			
Rev.	Revision date	Details of revision	Prepared by
0.1	2022.10.28	Draft, new preparation	Yasuhara
1.0	2022.11.4	Issuance of first edition	Yasuhara, Azegami
1.1	2022.11.16	Correction of errors	Yasuhara, Azegami
1.2	2022.11.17	Addition of explanation of lighting control, change of I/O circuit drawing	Yasuhara, Azegami
1.5	2023.7.21	Addition of machine models, change of 12-to-8-bit compression function, addition of signal connection, addition of product specification list, and others Correction of erroneous description on page 22 (Balance White Manual Save)	Kishimura
1.6	2023.9.6	Correction due to change in notation of own viewer	Shimada
1.7	2024.1.16	Unification of words, and others	Shimada

Safety Precautions

Meaning of indication

⚠ WARNING	**Indicates a hazardous situation which, if the precaution with this indication is not observed, could result in death or serious injury.**
⚠ CAUTION	**Indicates a hazardous situation which, if the product is erroneously handled by ignoring the precaution with this indication, could result in bodily injury and/or property damage.**

Meaning of symbol

⃠	**Indicates a "prohibited action."**
⚠	**Indicates a "matter to which you should pay attention."**

⚠ WARNING	
⚠	**If an abnormality, such as smoke, strange odor, abnormal sound, or entry of water or foreign matter in the product, occurs, immediately stop using the product. Use of this product with an abnormality or failure may cause fire or electric shock.**
⃠	**Do not disassemble or modify this product. Failure to follow this instruction may cause fire, electric shock, or failure.**
⚠	**Securely fix this product. Failure to follow this instruction may cause it to fall.**
⃠	**Make sure that water and foreign matter do not enter the product. Failure to follow this instruction may cause fire, electric shock, or failure.**
⚠	**Use the specified power voltage. Connect and disconnect the connection cable with the power supply turned off. Failure to follow these instructions may cause fire, electric shock, or failure.**
⚠	**Connect cables according to the instructions. Do not damage, forcefully bend, or pull cables. Failure to follow these instructions may cause fire, electric shock, or failure.**

⚠ CAUTION	
⃠	**Do not use this product in an environment out of its operating environmental range. Failure to follow this instruction may cause the product to fail.**
⃠	**Do not drop this product or give a strong shock to it. Failure to follow this instruction may cause the product to break or fail.**

	**Do not install this product at a location subject to direct sunlight or heat for a long period. Failure to follow this instruction may cause the product to fail.**
	**Do not short-circuit the signal output. Failure to follow this instruction may cause the product to fail.**

Table of Contents

1. Applicable Cameras

	Model name	Sensor		Pixels			Pixel size [μm]	Frame rate [fps]
					H	V		
Non-waterproof GigE Camera	KC48GC4MX KC48GC4CX	B/W Color		SVGA	800	600	5.3μm(H)× 5.3μm(V)	87
	KC130GC4MX KC130GC4CX	B/W Color	EV76C560	1.3MP	1280	1024	5.3μm(H)× 5.3μm(V)	55
	KC300GC4MX KC300GC4CX	B/W Color	IMX265	3MP	2064	1544	3.45μm(H)× 3.45μm(V)	36
	KC500GC4MX KC500GC4CX	B/W Color	IMX264	5MP	2448	2048	3.45μm(H)× 3.45μm(V)	23
	KC800GC4MX KC800GC4CX	B/W Color	IMX546	8MP	2856	2848	2.74μm(H)× 2.74μm(V)	13
	KC1200GC4MX KC1200GC4CX	B/W Color	IMX545	12MP	4080	3000	2.74μm(H)× 2.74μm(V)	8
Waterproof GigE Camera	KC48GC3MX KC48GC3CX	B/W Color		SVGA	800	600	5.3μm(H)× 5.3μm(V)	87
	KC130GC3MX KC130GC3CX	B/W Color	EV76C560	1.3MP	1280	1024	5.3μm(H)× 5.3μm(V)	55
	KC300GC3MX KC300GC3CX	B/W Color	IMX265	3MP	2064	1544	3.45μm(H)× 3.45μm(V)	36
	KC500GC3MX KC500GC3CX	B/W Color	IMX264	5MP	2448	2048	3.45μm(H)× 3.45μm(V)	23
	KC800GC3MX KC800GC3CX	B/W Color	IMX546	8MP	2856	2848	2.74μm(H)× 2.74μm(V)	13
	KC1200GC3MX KC1200GC3CX	B/W Color	IMX545	12MP	4128	3008	2.74μm(H)× 2.74μm(V)	8
	KC1600GC3MX KC1600GC3CX	B/W Color	IMX542	16MP	5328	3040	2.74μm(H)× 2.74μm(V)	6
	KC2000GC3MX KC2000GC3CX	B/W Color	IMX541	20MP	4512	4512	2.74μm(H)× 2.74μm(V)	5
	KC2400GC3MX KC2400GC3CX	B/W Color	IMX540	24MP	5328	4608	2.74μm(H)× 2.74μm(V)	4

2. Overview of Specifications

This product is an industrial camera equipped with a global shutter CMOS image sensor and GigE interface. The product is vibration-resistant and shock-resistant impact-resistant and can be used in a robot system or other systems. When used with an M12 Xcode cable (waterproof type) or a cable at CAT5e or higher with RJ45 connector (non-waterproof type), transmission up to 100 m is possible. The camera can output contact signals, PWM signals for strobe, and external device control signals. The waterproof GigE camera can output a power supply (24 V DC) as well.

Waterproof GigE cameras have the additional features of being waterproof, dustproof, and oilproof, making them suitable for a wide range of environments. The power supply output from the waterproof GigE camera can be used for external lighting.

⚠ For connection between the camera and the host, a 1-Gbps network band is necessary. Use a host machine compatible with 1 Gbps and, if you are going to use a hub, use a hub with a sufficient broadband performance that is compatible with 1 Gbps.

3. Positions and Names of Components

3.1. Non-waterproof GigE Camera

KC48GC4MX, KC48GC4CX, KC130GC4MX, KC130GC4CX, KC300GC4MX, KC300GC4CX, KC500GC4MX, KC500GC4CX, KC800GC4MX, KC800GC4CX, KC1200GC4MX, KC1200GC4CX

3.1.1. External dimensions

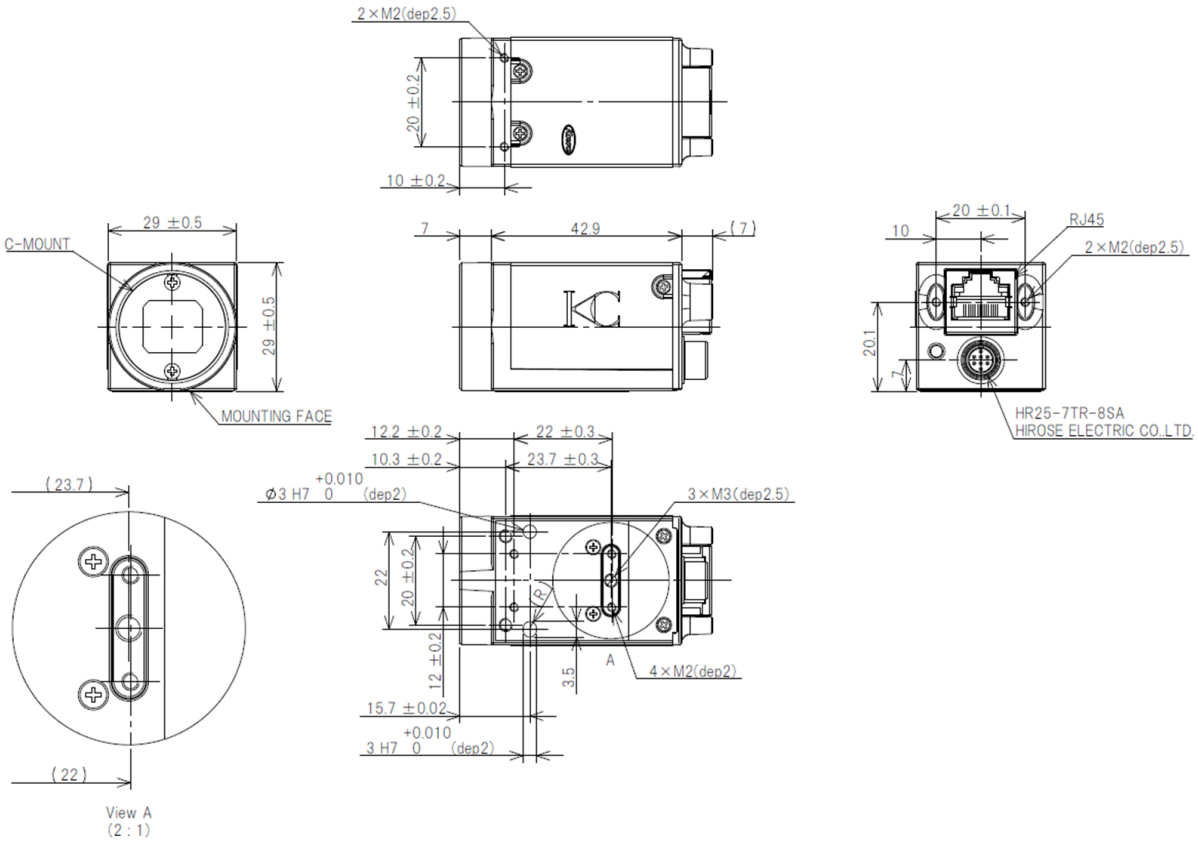


Figure 1　Dimensions (Non-waterproof GigE Camera)

3.1.2. Names of Components

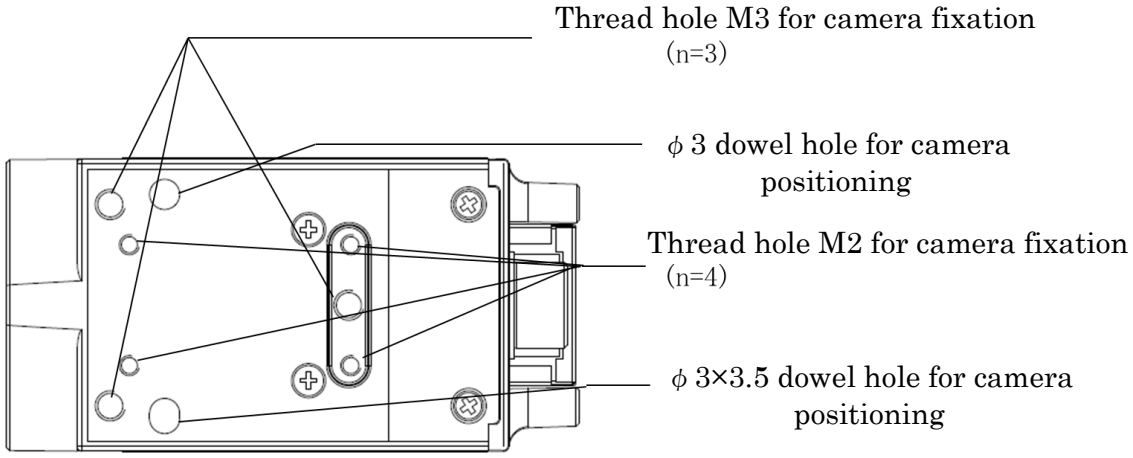


Figure 2　Camera bottom face (Non-waterproof GigE Camera)

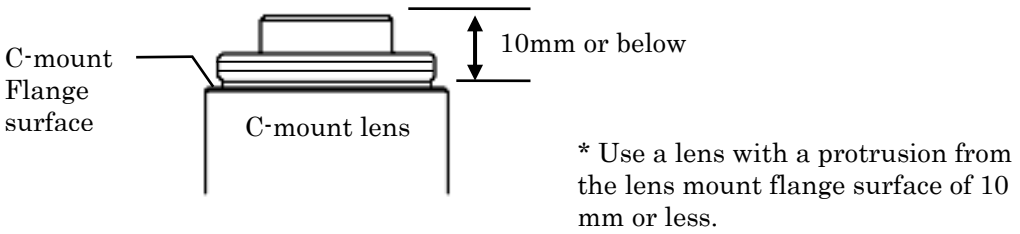


Figure 3　Lens

3.1.3. Camera rear face

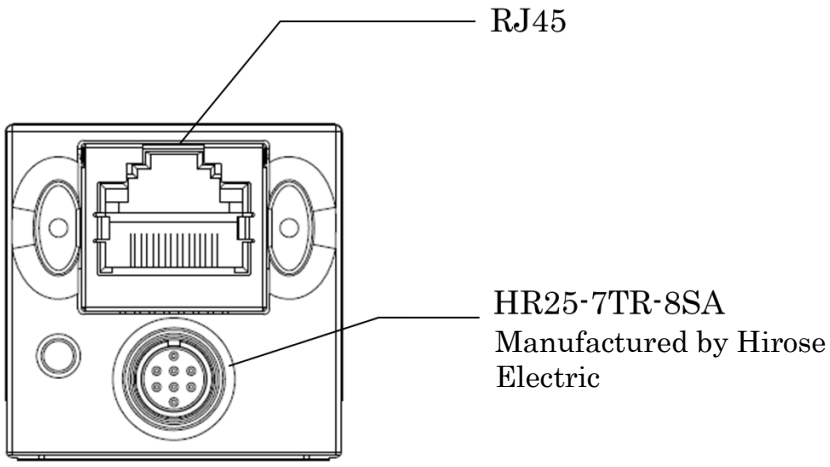
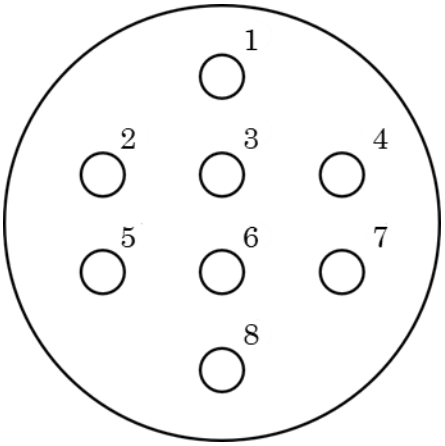


Figure 4　Camera rear face (Non-waterproof GigE Camera)

3.1.4. Connector pin assignment



1 : DC+24V IN
2 : GND
3 : GPO
4 : PWM
5 : GND
6 : I2C SCL (unused)
7 : I2C SDA (unused)
8 : DC+3.6V (unused)

Figure 5　Connector pin assignment (Non-waterproof GigE Camera)

3.2. Waterproof GigE Camera

KC48GC3MX, KC48GC3CX, KC130GC3MX, KC130GC3CX, KC300GC3MX, KC300GC3CX, KC500GC3MX, KC500GC3CX, KC800GC3MX, KC800GC3CX, KC1200GC3MX, KC1200GC3CX, KC1600GC3MX, KC1600GC3CX, KC2000GC3MX, KC2000GC3CX, KC2400GC3MX, KC2400GC3CX

3.2.1. External dimensions

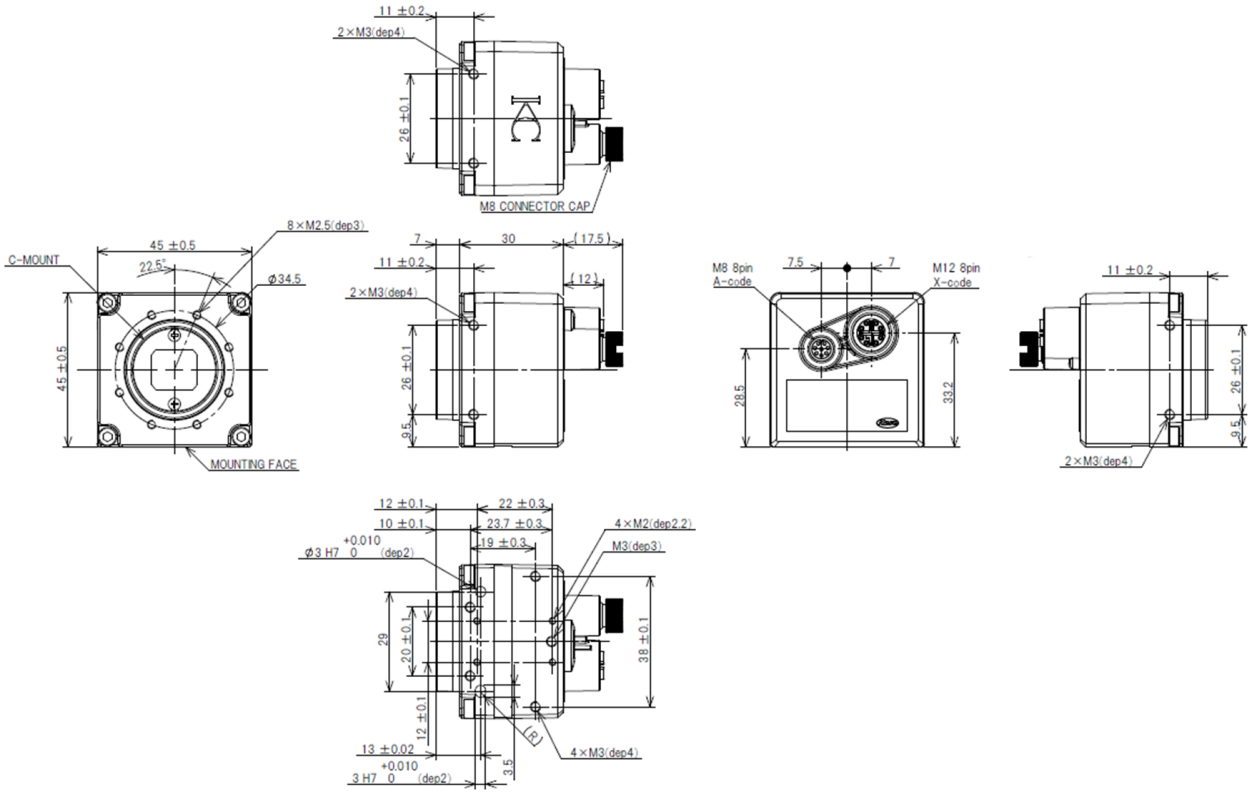


Figure 6　External dimensions (Waterproof GigE Camera)

* For KC48GC3MX, KC48GC3CX, KC130GC3MX, KC130GC3CX, KC300GC3MX, KC300GC3CX, KC500GC3MX, KC500GC3CX

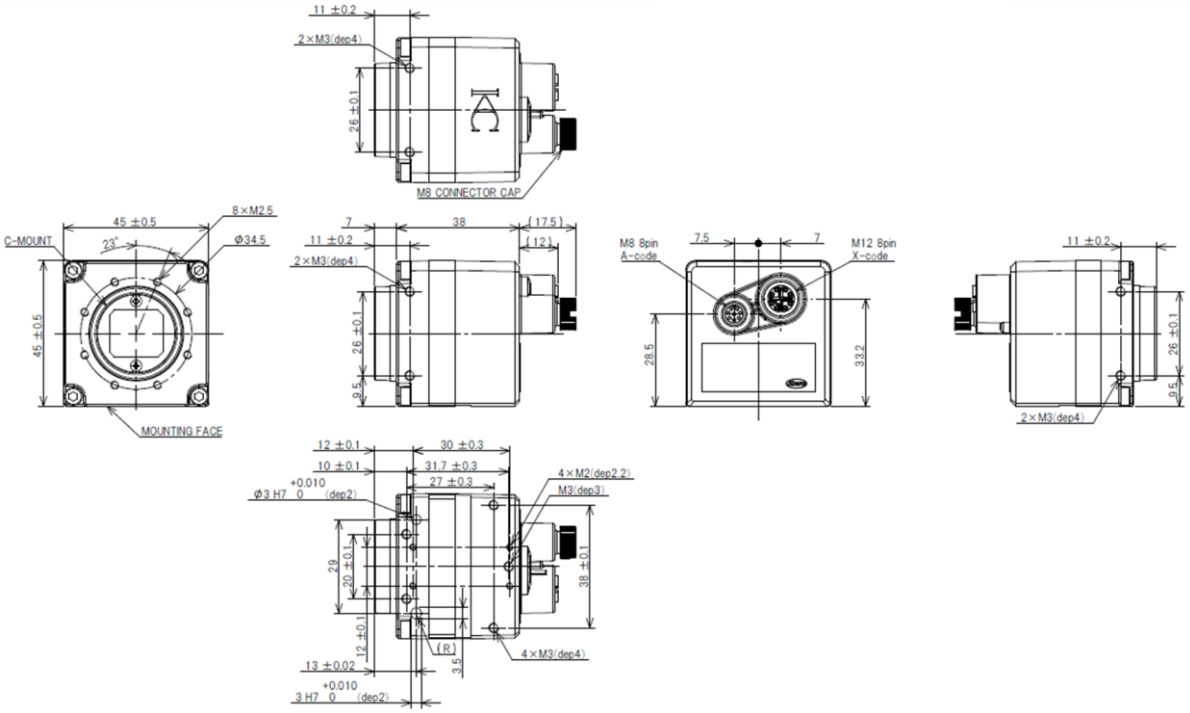


Figure 7　External dimensions (Waterproof GigE Camera)

* For KC800GC3MX, KC800GC3CX, KC1200GC3MX, KC1200GC3CX, KC1600GC3MX, KC1600GC3CX, KC2000GC3MX, KC2000GC3CX, KC2400GC3MX, KC2400GC3CX

3.2.2. Names of Components

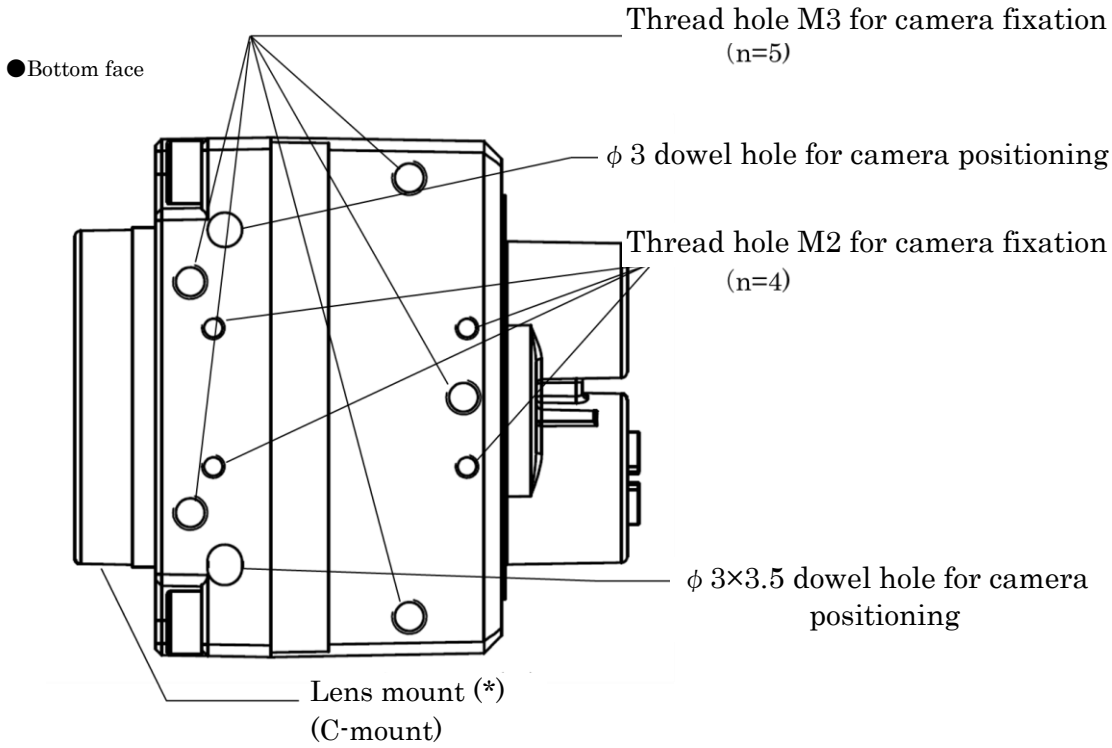


Figure 8　Camera bottom face (Waterproof GigE Camera)

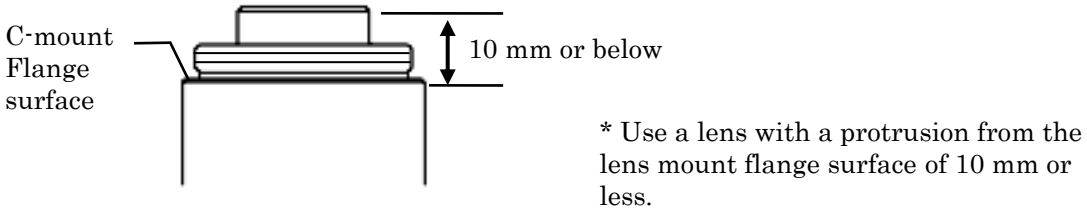


Figure 9　Lens

3.2.3. Camera rear face

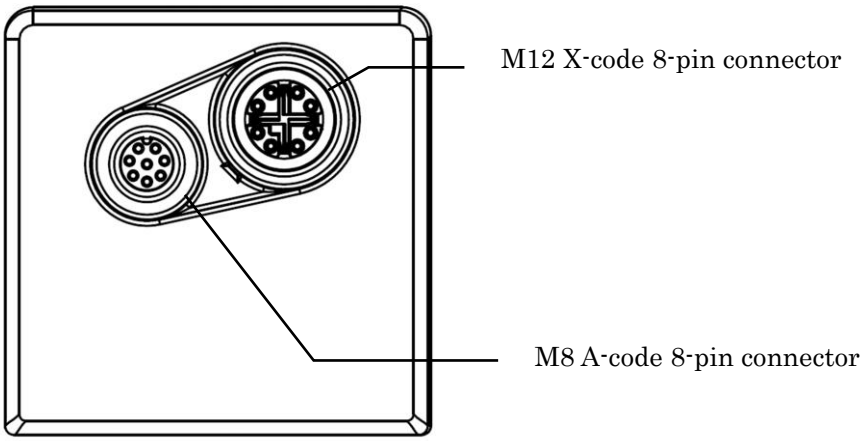


Figure 10　Camera rear face (Waterproof GigE Camera)

3.2.4. Connector pin assignment (M8 A-code)

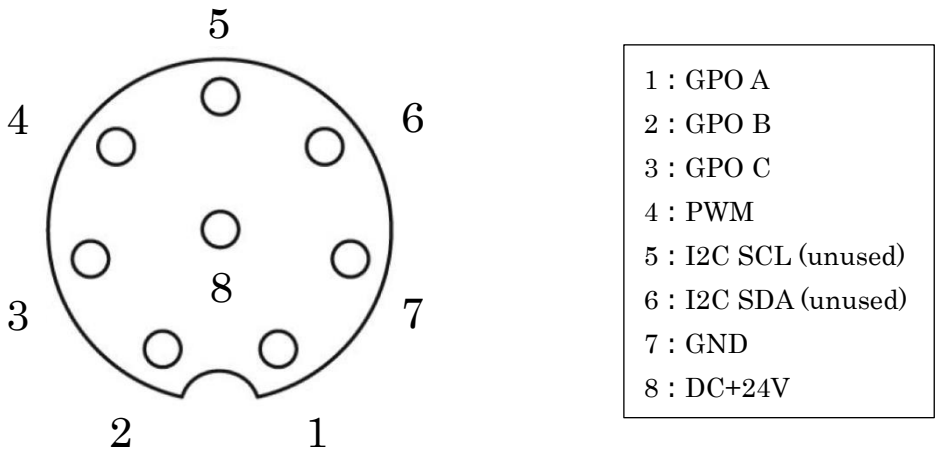


Figure 11　Connector pin assignment (Waterproof GigE Camera)

4. Signal Connection

4.1. Signal connection diagram (non-waterproof camera)

It is possible to output an external control signal from the GPO port. The signal can also be used as a trigger input.
It is also possible to output a lighting control signal (PWM).

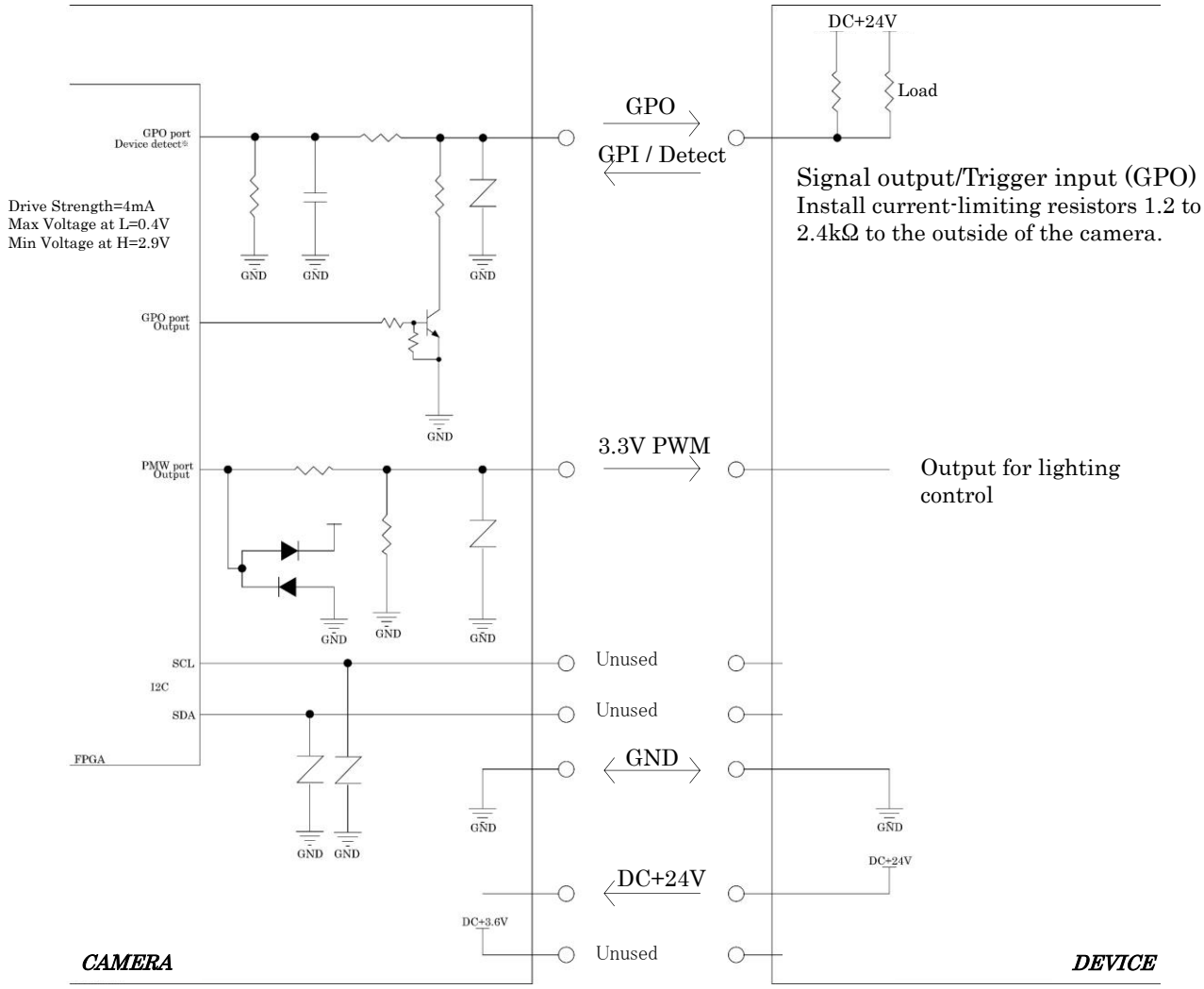


Figure 12　Schematic diagram of 8-pin connector electric circuit (non-waterproof camera)

It is possible to detect a device connected to the GPO port of the camera. To conduct device connection detection, the voltage at GPO port "Device detect" must be at "H" voltage level of the I/O standard LVTTL at the time of startup of this product. The output of the GPO port is opened at the time of startup.

H: 2.0V or higher
L: 0.8V or below

4.2. Signal connection diagrams (waterproof camera)

It is possible to output an external control signal from the GPO port. GPO A can also be used as a trigger input.

It is also possible to output a lighting control signal (PWM) and 24 V DC.

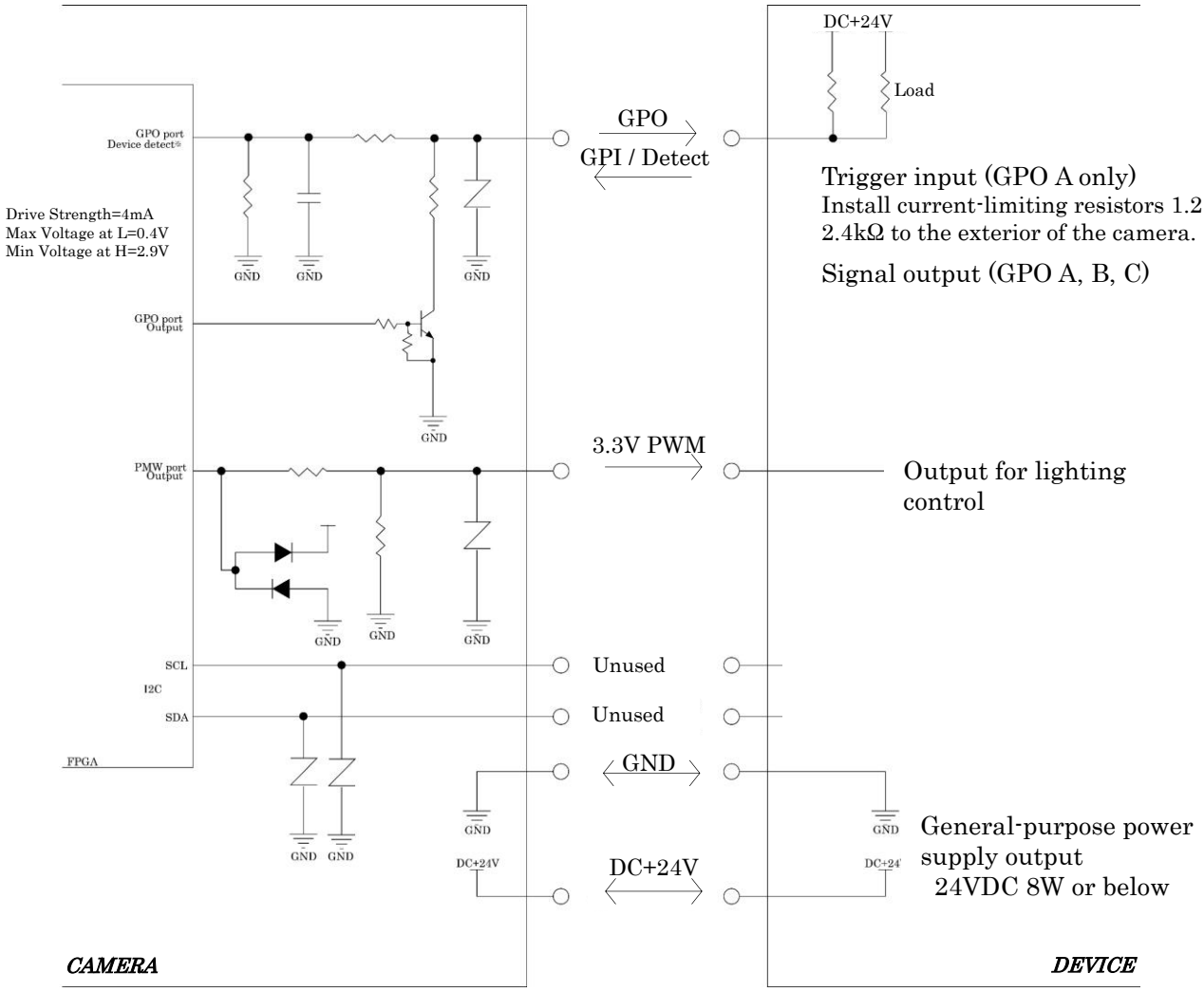


Figure 13　Schematic diagram of 8-pin connector electric circuit (waterproof camera)

It is possible to detect a device connected to the GPO port of the camera. To conduct device connection detection, the voltage at GPO port "Device detect" must be at "H" voltage level of the I/O standard LVTTL at startup of this product. The output of the GPO port is opened at startup.

H: 2.0 V or higher

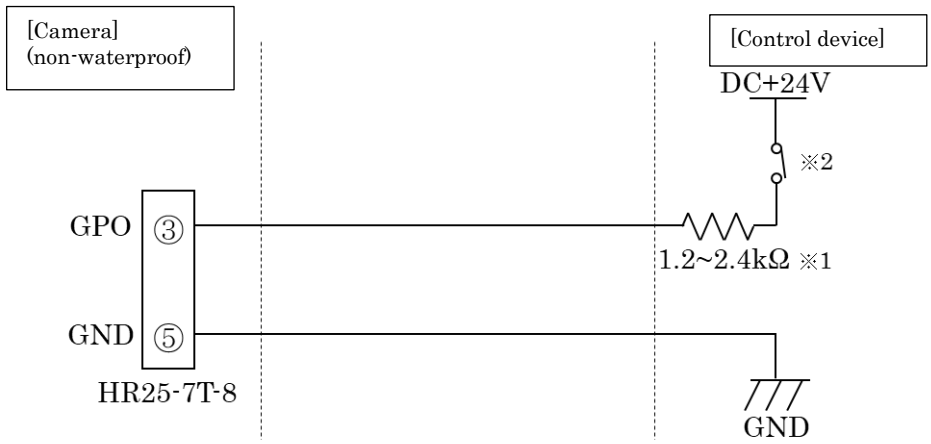
L: 0.8 V or below

4.3. Connection method of external trigger signal

When acquiring an image via an external trigger, input the trigger signal to the GPO (GPO A for waterproof camera) of the control connector.

The GPO (GPO A for waterproof camera) can be used for output and trigger input. When "External" is set to "Trigger Source," the setting is automatically switched to input.

For non-waterproof cameras



※1 : This is a resistor for protecting the camera in case of an erroneous setting causing the output from the camera and an external input (trigger) to be simultaneously input to the GPO port.

※2 : This represents a function to turn ON/OFF the output signal, such as TTL, photo coupler, transistor, and relay.

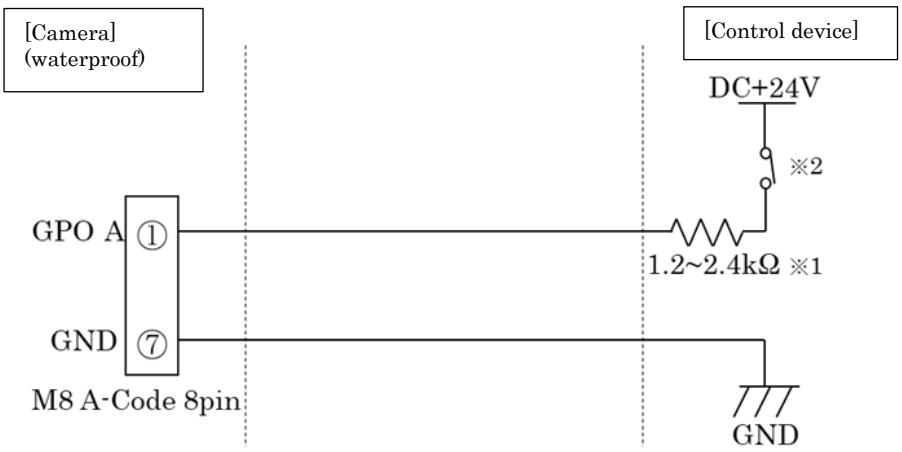
Figure 14 External trigger input to non-waterproof camera

⚠ Apply voltage from the control device while the power is supplied to the camera. If voltage is applied from the control device while the camera is yet to be started up, the camera may fail.

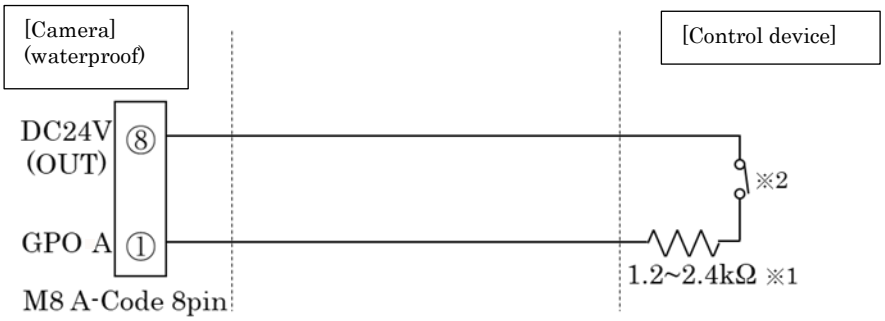
For a waterproof camera, use GPO A.

For a waterproof camera, it is possible to use the power supply to the camera. When isolating the output circuit of the control device with a photo coupler or the like, it is not necessary to pay attention to the GND levels of the camera and the control device.

When using an external power supply (waterproof)



When using a power supply on the camera side (waterproof)



※1 : This is a resistor for protecting the camera in case of an erroneous setting causing the output from the camera and an external input (trigger) to be simultaneously input to the GPO A port.

※2 : This represents a function to turn ON/OFF the output signal, such as TTL, photo coupler, transistor, and relay.

Figure 15 External trigger input to waterproof camera

⚠ Apply voltage from the control device while the power is supplied to the camera. If voltage is applied from the control device while the camera is yet to be started up, the camera may fail. For a waterproof camera, we recommend that you use the power supply on the camera side.

5. Major Camera Functions

The available functions and specification ranges partially differ depending on the model.

5.1. DeviceControl

It is possible to read information such as camera model name and serial number.

DeviceVendorName
: This is the camera manufacturer. “KOP” is indicated.

DeviceModelName or CameraType
: This is the camera model name.
Example: KC500GC3MX

DeviceManufacturerInfo
: This is the camara manufacturer information.
“KOP” is indicated.

DeviceVersion
: This is the camera internal logic version.

DeviceFirmwareVersion
: This is the camera firmware version.

DeviceSerialNumber
: This is the camera manufacture number.
Example: 00000001

DeviceUserID
: The user can arbitrarily set a character string. Up to 16 alphanumeric characters can be used.
Use this information to identify the camera when multiple cameras are connected.
Setting example: “CAM1,” “Right”
The set character string is stored non-volatile memory even after the power supply to the camera is turned off.
* To identify the camara, it is possible to use this information as well as DeviceSerialNumber and IP address.

SensorMode
: It is possible to change the sensor behavior.
In normal conditions, use the product with the mode set to “Master.”

TxIPCoreVersion
: This is the version of the camera internal logic.

FPGATemperature
: This is the temperature of FPGA (°C).

ImageSensorTemperature
: This is the temperature of the sensor (°C).

5.2. ImageFormatControl

This is the parameter group related to image output format. By using this group, matters related to image including size, subsampling, and data format are specified. If a parameter explained in this section is changed, the size of the data to be transferred will be changed. Therefore, it is necessary to stop the ongoing image transfer and then change the parameter.

SensorWidth/SensorHeight

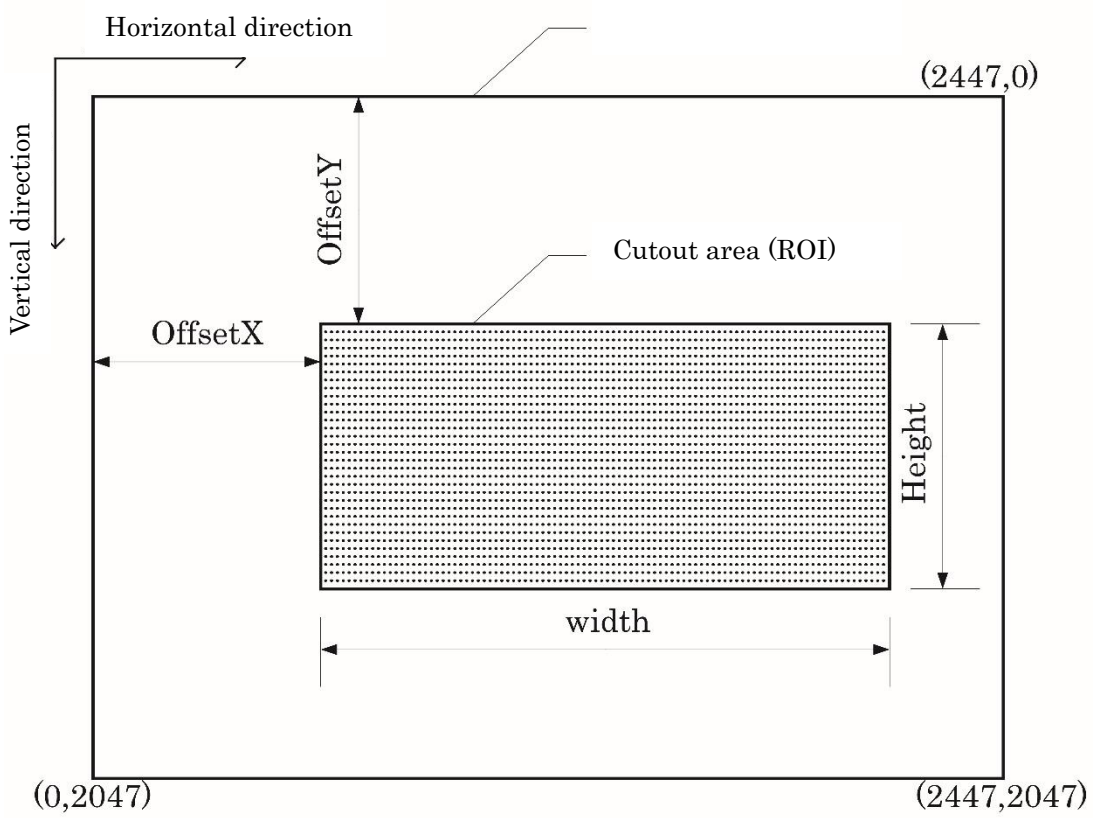
This is the maximum number of pixels that the sensor can output.

Width/Height/OffsetX/OffsetY

It is possible to set the cutout area (ROI) of an output image. Set and acquire the width and height of the area and the offsets in the horizontal and vertical directions. Figure 16 shows a schematic diagram of the ROI setting of this product. Set an output image area within the whole pixel range of the sensor.

Width：Area width [pixels]
Height：Area height [pixels
OffsetX：Left edge of area [pixels]
OffsetY：Upper edge of area [pixels]

* On a color camera, set the ROI area in 2×2 Bayer structure units.



* For KC500GC3MX

Figure16 Schematic diagram of the ROI setting

PixelFormat

This is the format of an image to be output by the camera. Major formats include Mono8 (8 bits) for black-and-white cameras and Bayer RG8 (8 bits) for color cameras.

TestPattern

This function outputs a test pattern that is generated inside the camera, instead of an image acquisition by the sensor.

BinningType

With this function, as pixels adjacent in the vertical and horizontal directions are added, it is possible to increase the sensitivity. Unlike ROI, it is possible to decrease the resolution without changing the view angle.
The setting values are as follows (Varies depending on the camera model):

OFF
BINNING2X2
BINNING3X3
BINNING4X4

With this setting, it is possible to conduct binning in 2×2, 3×3, and 4×4 patterns.

BinningDivider

With this function, an image whose brightness value is divided by "BinningDivider" is output as image data.
The setting values are as follows (Varies depending on the camera model):

DIVIDE_1
DIVIDE_2
DIVIDE_4
DIVIDE_9
DIVIDE_16

If the pixels are added, specify DIVIDE_1. To return to the original brightness, specify an option in accordance with "BinningType."

* Performing binning decreases the image data size, but does not shorten the image transfer time. When using the binning function, specify the data size to be transferred to Width and Height and for Offset X and Offset Y, specify an address on the sensor that does not take the binning into consideration.

Horizontal Subsampling/Vertical Subsampling

This sets the steps for reducing pixels in the horizontal and vertical directions.
The setting values are as follows (Varies depending on the camera model):

OFF
SUB_2
SUB_3
SUB_4
SUB_8

* In a sampling in the vertical direction, the image transfer time is shortened in proportion to the data amount. However, in a sampling in the horizontal direction, the image transfer time is not shortened. When using the subsampling function, set the size of the data to be transferred to Width and Height.

SensorLineWidth

This function changes the single output line width from the sensor (duration including blanking). When the value is increased, the image output from the sensor becomes slower.
Use the product with this setting set to the default value.

5.3. AcquisitionControl

This is the parameter group concerning image capturing.

AcquisitionMode

This specifies the image output mode.
SingleFrame : Outputs a single image, and stops the image output (AcquisitionStop).
MultiFrame : Outputs images in the number as specified in AcquisitionFrameCount, and stops the image output (AcquisitionStop).
Continuous : Continuously outputs images.

AcquisitionStart/Stop

This starts and stops image transfer.

AcquisitionFrameCount

This specifies the number of images to be output for MultiFrame mode.

AcquisitionFrameRate

This specifies the output frame rate [Hz] from the camera.
This parameter is enabled when AcquisitionFrameRateEnable is set to “true.”

AcquisitionFrameRateEnable

This enables (true) or disables (false) the set AcquisitionFrameRate.
True (ON): Enables the AcquisitionFrameRate setting.
False (OFF): Disables the AcquisitionFrameRate setting. In this setting, the camera outputs images at the fastest frame rate for the output image size.
If the image size is decreased by using ROI, the frame rate will increase.

FrameWaitLength (read only)

This is the interval between frames to be output from the camera. This value varies depending on the frame rate of the current output.

CurrentFrameRateMax (read only)

This is the maximum frame rate that can be output by the camera. This value varies depending on image acquisition parameters including ROI.

TriggerMode

This sets the mode of image acquisition trigger.
On : This is the mode for image acquisition by an external trigger [hardware (External) trigger, software trigger, action command].
Off : It is possible to perform image acquisition by an internal trigger (AcquisitionStart).

BurstFrame

A single external trigger performs image acquisition of images in the number specified by AcquisitionFrameCount and then stops image transfer.
MultiFrame will be enabled.

TriggerSource

This specifies the trigger signal source. To enable an external trigger, turn on TriggerMode.
External : Acquiring image by applying an electrical signal to the camera connector.
Software : Acquiring image by Software trigger command from host
Action1/2: Action command from the host performs image acquisition.
This is similar to SoftwareTrigger, but with ActionCommand, it is possible to make multiple cameras perform image acquisition at the same time.

TriggerSoftware

This issues a software trigger command.
To enable the software trigger, configure the setting as follows.
TriggerMode:ON TriggerSource:Software

TriggerActivation

When using the hardware (external) trigger, it is possible to select the exposure start timing at the pulse rising edge or pulse falling edge.
RisingEdge: Starts exposure at the pulse rising edge.
FallingEdge: Starts exposure at the pulse falling edge.

ExposureTime
: This specifies the exposure time [μs].

ShutterDelay
: This sets the standby time from the reception of a trigger pulse to the start of exposure [μs].

ExposureAuto
: In this mode, the exposure time is automatically adjusted such that the image to be output will have the brightness as specified in AutoFunctionTargetLevel.

ExposureAutoTargetLevel
: This specifies the target brightness of ExposureAuto.

ExposureAutoMaxTime
: This specifies the maximum value of the exposure time [μs] that can be set in the ExposureAuto mode.

ExposureAutoMinTime
: This specifies the minimum value of the exposure time [μs] that can be set in the ExposureAuto mode.

AutoFunctionTargetLevel
: This specifies the target brightness value for ExposureAuto and GainAuto.

AutoFunctionWidth
AutoFunctionHeight
AutoFunctionOffsetX
AutoFunctionOffsetY
: This specifies the measurement range (ROI) for ExposureAuto and GainAuto.

5.4. AnalogControl

This is the parameter group concerning output level including camera gain.

Gain

This sets the master gain (brightness of whole screen). Set it by magnification.

GainAuto

In this mode, the gain is automatically adjusted such that the image to be output will have the brightness as specified in AutoFunctionTargetLevel.

GainAutoMax

This specifies the maximum value of the gain that can be set in the GainAuto mode.

GainAutoMin

This specifies the minimum value of the gain that can be set in the GainAuto mode.

RedGain (color only)

This sets the brightness of the red color in the Bayer format.
Setting range: 0.25 to 3.97 times

Green1Gain (color only)

This sets the brightness of the green color in the Bayer format.
Setting range: 0.25 to 3.97 times

Green2Gain (color only)

This sets the brightness of the green color in the Bayer format.
Setting range: 0.25 to 3.97 times

BlueGain (color only)

Setting range: 0.25 to 3.97 times
This sets the brightness of the blue color in the Bayer format.

BlackLevel

This sets the black level. (3, 5, 8, 12, 16, 20, 24 MP only)

BalanceWhiteAuto (color only)

It is possible to automatically adjust the white balance.
For an acquiring image, RGB gains are automatically calculated to compensate for the image colors.
First adjust the light quantity by imaging a piece of white paper so that overexposure does not occur, and then execute “Once” for BalanceWhiteAuto.
Off : No action will be made.
Once : Performs image acquisition once, and automatically compensates the RGB gains.
Reset : Returns the RGB gains to the factor default values.

BalanceWhiteManualSave (color only)

This stores the values of RedGain, Green1Gain, Green2Gain, and BlueGain in the camera. This parameter is retained even after the power supply to the camera is turned off.

GammaValue

This parameter, referred to as “Gamma,” changes the camera input/output characteristics, and sets the γ value in the formula below.

$Y=X^{(1/\gamma)}$
Off : $\gamma = 0$
Gamma_2 : $\gamma = 2.0$
Gamma_1_414 : $\gamma = 1.414$

CompressionKneePoint

This function can change the inclination of the output characteristic with respect to input at an arbitrary point.
Set and acquire the bending point of the 12-to-8-bit compression function.
Due to the setting of this function, the output brightness signal is compressed in accordance with the following formula. A diagram of this function is shown below.
(KC300GC3MX, KC300GC3CX, KC500GC3MX, KC500GC3CX, KC300GC4MX, KC300GC4CX, KC500GC4MX, KC500GC4CX)

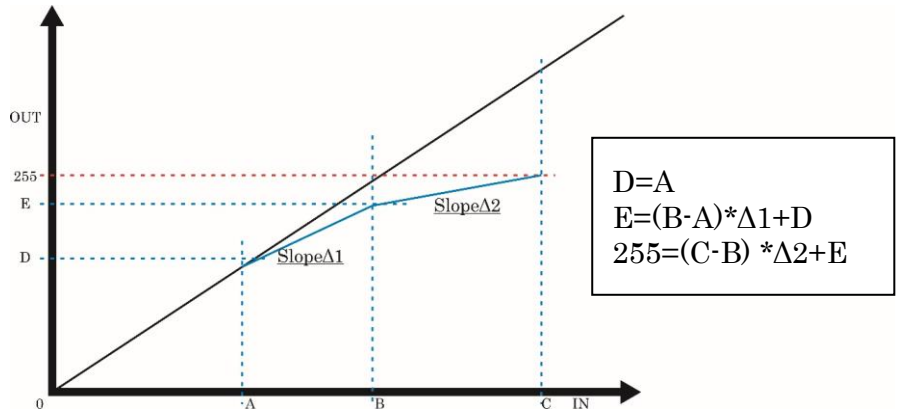


Figure 17　Diagram of 12-to-8-bit compression

A: 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048
B: 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048
Slope Δ 1: 1(1/1), 2(1/2), 4(1/4), 8(1/8), 16(1/16), 32(1/32), 64(1/64), 128(1/128), 256(1/256), 512(1/512), 1024(1/1024), 2048(1/2048)
Slope Δ 2: 1(1/1), 2(1/2), 4(1/4), 8(1/8), 16(1/16), 32(1/32), 64(1/64), 128(1/128), 256(1/256), 512(1/512), 1024(1/1024), 2048(1/2048)

Set and acquire the bending point of the 10-to-8-bit compression function. Due to the setting of this function, the output brightness signal is compressed in accordance with the following formula. A diagram of this function is shown below.
(KC48GC3MX, KC48GC3CX, KC130GC3MX, KC130GC3CX, KC48GC4MX, KC48GC4CX, KC130GC4MX, KC130GC4CX)

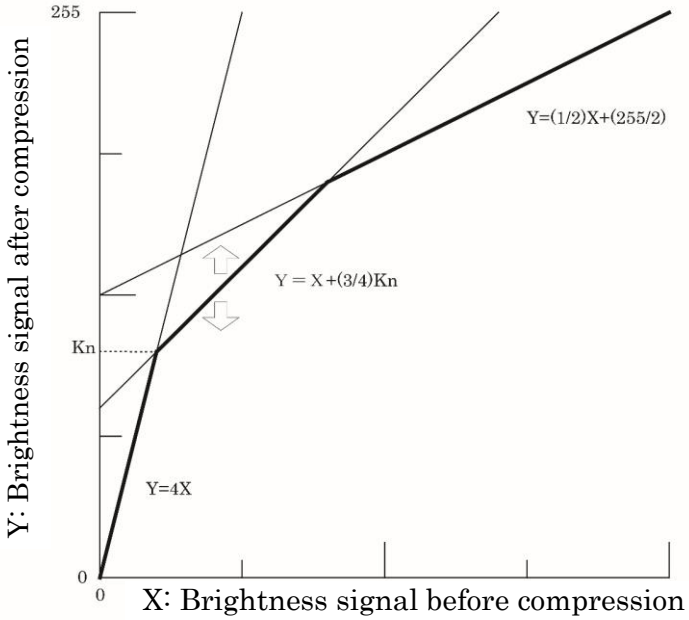


Figure 18　Diagram of 10-to-8-bit

0≦X<(1/4)Kn　　: Y=4X
(1/4)Kn≦X<255~(3/2)Kn　　: Y=X+(3/4)Kn
255-(3/2)Kn≦X≦255　　: Y=(1/2)X+(255/2)
Y: Brightness signal after compression
X: Brightness signal before compression

5.5. DigitalIOControl

This is the parameter group for controlling the I/O output from the rear face of the camera.

CameraPortFunctionA/B/C

This changes the signal output mode.
It is possible to turn ON/OFF the GPO signal output.
It is possible to output a pulse in synchronization with the strobe trigger timing and make the flash timing of the lighting.
To specify the pulse width, set “CameraStrobeSignalWidthA/B/C.” To specify the delay time from trigger, set “CameraStrobeSignalDelayA/B/C.”
The output voltage depends on the pull-up voltage.

CameraStrobeSignalDelayA/B/C

This sets the delay time [μs] of pulse output for strobe from the trigger.

CameraStrobeSignalWidthA/B/C

This sets the output time [μs] of pulse for strobe.

CameraGeneralPurposeOutputA/B/C

This can turn ON/Off the signal output to Port A/B/C.
True : ON
False : OFF
To use this function, set CameraPortFunctionA/B/C to “GPO."

CameraPWMFunction

GPO : User mode (in accordance with CameraPWMOut)
This keeps the lighting on.
Strobe : Strobe mode
This makes the lighting perform strobe flashing every time exposure occurs.
To specify the strobe flashing time, set “CameraPWMWidth.” To delay the flashing, set “CameraPWMDelay.”

CameraPWMDelay

This specifies the delay time [μs] from the exposure start to the output of PWM pulse.
This function is enabled when PWMFunction is set to “Strobe.”

CameraPWMWidth

This specifies the output duration of the PWM pulse [μs].
This function is enabled when PWMFunction is set to “Strobe.”

CameraPWMOut

This turns the PWM output ON/OFF.
The PWM signal is output at 3.3 V (LVTTL).

CameraPWMDutyRate

This specifies the duty of the PWM pulse (0 to 15).
When set to “0,” the lighting is at its dimmest. When set to “15,” the lighting is at its brightest.

DebouncerTime

This prevents erroneous signal detection caused by chattering. Set this value in units of [μs].

CameraPortDeviceDetectedA/B/C

This detects whether any device is connected to the GOP output of the camera.
To conduct device connection detection, the voltage at GPO port “Device detect” must be at “H” voltage level of the I/O standard LVTTL at the time of product startup. The output of the GPO port is opened at the time of startup.
H: 2.0 V or higher L: 0.8 V or below

Lighting control procedures
To keep the lighting on from the camera, configure settings by following the steps below.

To keep the lighting on
Set CameraPWMFunction to “GPO.”
Set CameraPWMOut to “TRUE(ON).”
Set CameraPWMDutyRate to “0 (Min) to 15 (Max)” to adjust the lighting brightness.
To turn off the lighting, set CameraPWMOut to “FALSE(OFF).”

To perform strobe flashing (performs flashing for the set duration every time exposure occurs)
Set CameraPWMFunction to “Strobe.”
Set the flashing duration [µs] (same as exposure time in normal conditions) to CameraPWMWidth.
Set the time [µs] from the start of exposure to the strobe flashing to CameraPWMDelay.
Set CameraPWMDutyRate to “0 (Min) to 15 (Max)” to adjust the lighting brightness.
When image acquisition is performed, the strobe flashes.
Note　Set CameraPWMWidth and CameraPWMDelay in such a manner that the sum of those durations does not exceed the frame rate interval.
If CameraPWMFunction is set to “Strobe,” the value of CameraPWMOut does not affect the operation.

5.6. ActionControl

This is the parameter group for ActionCommand. These parameters are used when precise trigger timing is required and when precise trigger control is conducted via a network using PTP in case contact trigger signals cannot be used.

5.7. UserSetControl

It is possible to save image acquisition conditions of the camera that have been changed by the user in the camera or read them from the camera. It is also possible to return the parameters of the camera to the factory default values.

UserSetSelector

Select the UserSet for saving and loading.
Default: This is a factory default data(read-only).
UserSet1/2/3: Selecting this allows you to save parameters that have been changed by the user.

UserSetSave

This performs saving of parameters to the UserSet specified in UserSetSelector. When Default is specified, this function is disabled.

UserSetLoad

This reads parameters from the UserSet specified in UserSetSelector.

UserSetDefault

This specifies the UserSet that the camera automatically loads at the time of startup.

5.8. TransportLayerControl

This is the parameter group for outputting image data to GigEVision and Ethernet.
Items that are frequently used are selected and explained here.

PayloadSize

This shows the size [bytes] of the image data you are going to transfer.

GevLinkSpeed

This shows the Ethernet connection speed. While there are options including 1,000 [Mbps] and 100[Mbps], when you connect a GigEVision camera, connection at 1,000 [Mbps] (1 [Gbps]) needs to be made.

GevCurrentIPConfigurationLLA

To enable LinkLocalAddress, set this item to "True (ON)."
As the setting of GevCurrentIPConfigurationPersistentIP takes precedence, always set this to "True (ON)."
If no DHCP server is available on the network, the address is solved by LLA.
The IP addresses used by LLA are as follows.
IP Address : 169. 254. ***. ***
Subnet Mask : 255. 255. 0. 0

GevCurrentIPConfigurationDHCP

To enable DHCP, set this to "True (ON)."
As the setting of GevCurrentIPConfigurationPersistentIP takes precedence, always set this to "True (ON)."

GevCurrentIPConfigurationPersistentIP

To enable a fixed IP, set this item to "True (ON)."
If you set this item to "False," the LLA or DHCP setting is reflected.
When "True" is set, GevPersistentIPAddress、GevPersistentSubnetMask、GevPersistentGateway are employed as IP addresses for the camera.

Priorities of GevCurrentIPConfiguration
The priorities of these three parameters are as follows:
GevCurrentIPConfigurationPersistentIP >
(GevCurrentIPConfigurationDHCP or GevCurrentIPConfigurationLLA)
Therefore, when all of the three parameters are set to "true," the camera operates with GevCurrentIPConfigurationPersistentIP.

GevPersistentIPAddress

This is the IP address on the camera side when the camera is operated with a fixed IP (GevCurrentIPConfigurationPersistentIP=True (ON)).

GevPersistentSubnetMask

This is the subnet mask on the camera side when the camera is operated with a fixed IP (GevCurrentIPConfigurationPersistentIP=True (ON)).

GevPersistentDefaultGateway

This is the default gateway on the camera side when the camera is operated with a fixed IP (GevCurrentIPConfigurationPersistentIP=True (ON)).
This item does not need to be set if the camera is not going to be connected to a different network.

GevSCPSPacketSize

This sets the packet size at the time of data transfer via Ethernet.
Set this size within the packet size set to the host controller.
The relationship between the number of packets and the packet size can be obtained by the following formula.
payloadSize = GevSCPSPacketSize × Number of packets
As increasing the packet size can reduce the number of packets to be transferred, it is possible to reduce the load on the host controller side.

GevSCPD

This sets the interval between packets. It is normally set to 0. However, if the load on the Ethernet controller on the host computer side is great, increasing the value of this item can increase the interval between image data packets sent by the camera.
KowaGigEVisionViewer sets the value to 500 at startup.
The setting unit is Tick, which is the reciprocal of GevTimestampTickFrequency. In our cameras, 1 tick is equal to 1 ns.
As increasing this value lengthens the data transfer time, the frame rate may be lowered.

PTPControl

This is a function to synchronize the clocks of Ethernet devices via PTP (IEEE1588).

6. Disclaimer

・We shall bear no responsibility whatsoever for any failure or damage caused by fire, earthquake, flood, lightning strike, act by third party, other accident, customer's intention or neglect, misuse, or use of the product in other abnormal conditions (including failure/damage attributable to a third party).

・We shall bear no responsibility whatsoever for any incidental damage caused by use or inability to use this product (loss of business profit, business interruption, change or loss of data in memory, etc.).

・We shall bear no responsibility whatsoever for any damage caused by failure to observe any instruction in this instruction manual.

・We shall bear no responsibility whatsoever for any damage caused by malfunction or other problems due to being combined with a connected device.

・The warranty period of this product is one (1) year from the delivery date of this product

・Do not disassemble or modify this product. If it is disassembled or modified, it will not be covered by the warranty even within one year of delivery.

・We shall bear no responsibility whatsoever for any failure or damage caused by maintenance, repair, etc. conducted by the party who purchased this product or any party other than us.

・Matters not described in the specifications of this product will not be covered by the warranty, and we shall bear no responsibility whatsoever for them.

7. Others

The product specifications are subject to change without prior notice for product improvement. The functions, designs, etc. provided in this instruction manual are subject to change without prior notice.

8. Product Specification List

	Non-waterproof GigE Vision SVGA Camera		Non-waterproof GigE Vision 1.3MP Camera		Non-waterproof GigE Vision 3MP Camera	
Model	KC48GC4MX	KC48GC4CX	KC130GC4MX	KC130GC4CX	KC300GC4MX	KC300GC4CX
Monochrome/Color	Monochrome	Color	Monochrome	Color	Monochrome	Color
Interface	GigE Vision (RJ45)					
Sensor Format	1/3”		1/1.8”			
Resolution	0.48 MP 800 (H) × 600 (V)		1.3 MP 1280 (H) × 1024 (V)		3 MP 2064 (H) × 1544 (V)	
Pixel Size	5.3 µm (H) × 5.3 µm (V)				3.45 µm (H) × 3.45 µm (V)	
Shutter	Global Shutter					
Frame Rate	87 fps		55 fps		36 fps	
Power Supply	PoE or DC 24 V					
Power Requirements	4.5 W or less					
Housing Size	29 mm (W) × 29 mm (H) × 42.9 mm (D) (Excluding projections)					
Weight	Approx. 70 g					
Operating Temperature /Humidity	0°C ~ +45°C *1 / 20% ~ 80%RH (No condensation)					
Storage Temperature /Humidity	-30°C ~ +60°C / 20% ~ 90%RH (No condensation)					
Vibration Resistance *2	10G					
Impact Resistance *3	75G					

	Non-waterproof GigE Vision 5MP Camera		Non-waterproof GigE Vision 8MP Camera		Non-waterproof GigE Vision 12MP Camera	
Model	KC500GC4MX	KC500GC4CX	KC800GC4MX	KC800GC4CX	KC1200GC4MX	KC1200GC4CX
Monochrome/Color	Monochrome	Color	Monochrome	Color	Monochrome	Color
Interface	GigE Vision (RJ45)					
Sensor Format	2/3”				1/1.1”	
Resolution	5 MP 2448 (H) × 2048 (V)		8 MP 2856 (H) × 2848 (V)		8 MP 4080 (H) × 3008 (V)	
Pixel Size	3.45 µm (H) × 3.45 µm (V)		2.74 µm (H) × 2.74 µm (V)			
Shutter	Global Shutter					
Frame Rate	23 fps		13 fps		8 fps	
Power Supply	PoE or DC 24 V					
Power Requirements	4.5 W or less		6 W or less			
Housing Size	29 mm (W) × 29 mm (H) × 42.9 mm (D) (Excluding projections)					
Weight	Approx. 70 g					
Operating Temperature /Humidity	0°C ~ +45°C *1 / 20% ~ 60%RH (No condensation)					
Storage Temperature /Humidity	-30°C ~ +60°C / 20% ~ 60%RH (No condensation)					
Vibration Resistance *2	10G					
Impact Resistance *3	75G					

*1 Appropriate heat radiation is required. *2 Complies with IEC 60068-2-6(JIS C 60068-2-6). *3 Complies with MIL-STD-810H.

	Waterproof GigE Vision SVGA Camera		Waterproof GigE Vision 1.3MP Camera		Waterproof GigE Vision 3MP Camera	
Model	KC48GC3MX	KC48GC3CX	KC130GC3MX	KC130GC3CX	KC300GC3MX	KC300GC3CX
Monochrome/Color	Monochrome	Color	Monochrome	Color	Monochrome	Color
Interface	GigE Vision (M12 X-Code)					
Sensor Format	1/3”		1/1.8”			
Resolution	0.48 MP 800 (H) × 600 (V)		1.3 MP 1280 (H) × 1024 (V)		3 MP 2064 (H) × 1544 (V)	
Pixel Size	5.3 µm (H) × 5.3 µm (V)				3.45 µm (H) × 3.45 µm (V)	
Shutter	Global Shutter					
Frame Rate	87 fps		55 fps		36 fps	
Power Supply	PoE or DC 24 V					
Power Requirements	4.5 W or less					
Housing Size	45 mm (W) × 45 mm (H) × 30 mm (D) (Excluding projections)					
Weight	Approx. 120 g					
Operating Temperature /Humidity	0°C ~ +45°C *1 / 20% ~ 80%RH (No condensation)					
Storage Temperature /Humidity	-30°C ~ +60°C / 20% ~ 90%RH (No condensation)					
Vibration Resistance *2	10G					
Impact Resistance *3	75G					
Waterproof and Dustproof	IP67					
Oilproof *4	○					

	Waterproof GigE Vision 5MP Camera		Waterproof GigE Vision 8MP Camera		Waterproof GigE Vision 12MP Camera	
Model	KC500GC3MX	KC500GC3CX	KC800GC3MX	KC800GC3CX	KC1200GC3MX	KC1200GC3CX
Monochrome/Color	Monochrome	Color	Monochrome	Color	Monochrome	Color
Interface	GigE Vision (M12 X-Code)					
Sensor Format	2/3”				1/1.1”	
Resolution	5 MP 2448 (H) × 2048 (V)		8 MP 2856 (H) × 2848 (V)		12 MP 4128 (H) × 3008 (V)	
Pixel Size	3.45 µm (H) × 3.45 µm (V)		2.74 µm (H) × 2.74µm (V)			
Shutter	Global Shutter					
Frame Rate	23 fps		13 fps		8 fps	
Power Supply	PoE or DC 24 V					
Power Requirements	4.5 W or less		6 W or less			
Housing Size	45 mm (W) × 45 mm (H) × 30 mm (D) (Excluding projections)		45 mm (W) × 45 mm (H) × 38 mm (D) (Excluding projections)			
Weight	Approx. 120 g		Approx. 140 g			
Operating Temperature /Humidity	0°C ~ +45°C *1 / 20% ~ 80%RH (No condensation)					
Storage Temperature /Humidity	-30°C ~ +60°C / 20% ~ 90%RH (No condensation)					
Vibration Resistance *2	10G					
Impact Resistance *3	75G					
Waterproof and Dustproof	IP67					
Oilproof *4	○					

*1 Appropriate heat radiation is required. *2 Complies with IEC 60068-2-6(JIS C 60068-2-6). *3 Complies with MIL-STD-810H. *4 Complies with Kowa Optronics standards.

	Waterproof GigE Vision 16MP Camera		Waterproof GigE Vision 20MP Camera		Waterproof GigE Vision 24MP Camera	
Model	KC1600GC3MX	KC1600GC3CX	KC2000GC3MX	KC2000GC3CX	KC2400GC3MX	KC2400GC3CX
Monochrome/Color	Monochrome	Color	Monochrome	Color	Monochrome	Color
Interface	GigE Vision (M12 X-Code)					
Sensor Format	1.1”				1.2”	
Resolution	16 MP 5328 (H) × 3040 (V)		20 MP 4512 (H) × 4512 (V)		24 MP 5328 (H) × 4608 (V)	
Pixel Size	2.74 µm (H) × 2.74µm (V)					
Shutter	Global Shutter					
Frame Rate	6 fps		5 fps		4 fps	
Power Supply	PoE or DC 24 V					
Power Requirements	6 W or less					
Housing Size	45 mm (W) × 45 mm (H) × 38 mm (D) (Excluding projections)					
Weight	Approx. 140 g					
Operating Temperature /Humidity	0°C ~ +45°C *1 / 20% ~ 80%RH (No condensation)					
Storage Temperature /Humidity	-30°C ~ +60°C / 20% ~ 90%RH (No condensation)					
Vibration Resistance *2	10G					
Impact Resistance *3	75G					
Waterproof and Dustproof	IP67					
Oilproof *4	○					

*1 Appropriate heat radiation is required. *2 Complies with IEC 60068-2-6(JIS C 60068-2-6). *3 Complies with MIL-STD-810H. *4 Complies with Kowa Optronics standards.