Gigabit Ethernet
Progressive scan CCD color camera
HV-F203GV
Specifications

RoHS Compliant
Directive 2002/95/EC

1. General

The HV-F203GV is an UXGA high precision 3CCD progressive scan color camera, which has a digital processing, a C mount prism, three 1/1.8-inch 2,000,000 pixels square CCDs.

Our original digital image signal processing technology performs the high picture quality signal processing and the picture compensating functions, beyond the capability of the other conventional analog cameras.

By adoption of Gigabit Ethernet interface, high-speed connection of maximum of 1 Gbps for the 100m distance can be possible.

2. Outstanding features

(1) High resolution and color fidelity

The 1/1.8-inch 2,000,000 pixels square lattice progressive scan CCD and the dichroic prism for RGB color achieve a high resolution of UXGA(1600(H) x 1200(V)) picture and good color reproduction.

(2) Small-sized camera

The camera is given new externals. Therefore, the camera has the realization of small-sized shape of 55 (W) x 55 (H) x 89 (D) mm.

(3) Gigabit Ethernet interface

Gigabit Ethernet IEEE802.3ab (1000BASE-T) support

High-speed serial interface Gigabit Ethernet is supported and direct connection is possible to PC by the diameter cable of thin as compared with parallel output. It is possible to 100m.

GigE Vision (Ver. 1.2) support

Based on Industrial camera interface standard GigE Vision, a maximum of 1Gbps high speed data transmission is available and suitable for image processing.

GenICam (SFNC Ver. 2.3) support

The control of the camera is based on GenICam of camera control API for the industry that EMVA (European Machine Vision Association) leads. Therefore development of the camera control software is easy.

PoE support

Power supply can be input via Ethernet cable (Power over Ethernet).

When not connected to PoE, the power supply can be input from the DC IN/SYNC connector.

SYMBOL	DATE	DESCRIPTION	(DRAWN)	DESIGNED
-	May.7.2018	(first edition)		

MODEL HV-F203GV		TOLERANCE	Prod. Code - Order No.	
DESIGNED DATE	APPROVED DATE	UNIT	TITLE HV-F203GV Specifications	REV. 0
CHECKED DATE	STORED DATE	SCALE		
Hitachi Kokusai Electric			DWG. No. E400624516	SHEET 1/15

(4) C mount lens adapter

The de facto industry standard C mount lens adapter allows choosing from a various type of lenses and optical systems.

(5) Digital processing for various picture quality enhancements

- Independent six colors masking is the Hitachi innovation for optimizing color balance. The saturation and the hue of 6 colors (Red, blue, green, cyan, magenta and yellow) are adjusted independently to deliver the best color in image capture, microscope and other applications.
- It is equipped with the in out gradation control function using LUT. Other than normal gamma 0.45 conversion, the function can set the conversion of in out gradation using look up table (LUT) as a user option.

(6) Auto shading correction (ASC)

Color shading due to the aberration of C mount lens is automatically compensated (reduced).

(7) Versatile CCD drive functions

・Video frame capture on demand using external trigger signal.
・Long integration mode.
・Variable shutter mode
・Auto electronic shutter (AES) mode for stabilized video level.

(8) Versatile imaging functions

・Four application files.
User settings provided for sharpness(detail), masking etc.
・Scene color temperature is detected in dynamic for automatic white balance adjustment.
By varying the detection area in a scene, the whole white balance can be controlled in only the area. Thus, even if a light source of a different color temperature enters the scene (e.g., situation often occurs in a retail showroom suddenly exposed to outdoor lighting when the entrance door opens), white balance is not severely disturbed.
・Auto exposure (ALC : auto level control)
It can respond the changes in extremely high light by the digital measurement and AGC (Automatic gain control), AES control using micro computer. In addition, AUTO EXPOSURE (ALC) setting level and the peak/average of the AUTO EXPOSURE(ALC) characteristics can be set through menu screen.
・Gain control
AGC(Automatic gain control) and manual gain control are available to select.
・Master black, R/B black, and R/B gain are variable.

(9) LED indicator on rear frame

A power supply status and a communication status can be checked on LED.

3. Specifications

(1) Imaging device (sensor type)	1/1.8-inch progressive scan interline CCD (x 3 sensors)
Effective pixels (Active area)	1600 (H) x 1200 (V) (x 3 sensors for RGB) : Resolution
Pixel size	4.4 μm square lattice
- scanning area (Pixel area)	7.04mm (H) x 5.28mm (V), Diagonal 8.80mm (1/1.8 inch)
- Readout type, Transfer type	progressive scan, Interline transfer
(2) scanning mode	full pixel sequential scan
(3) scanning frequency	Horizontal : 23.4375kHz / Vertical : 18.75Hz / Pixel : 45MHz
(4) Optical system	1/1.8-inch F2.8 prism with IR cut filter
(5) Lens mount	C mount Mount surface projection less than 4.0mm

(Lens selection guideline)

Use the lens less than 4.0mm as the projection item from the lens flange surface.

To obtain a good picture image by high resolution and few chromatic aberration, it is necessary to choose an appropriate high resolution 3CCD type lens.

When using lens other than 1/1.8 type, there may be vignetting or insufficiency of light around the image or occurrence of flare in the image, in this case combinational lens selection is necessary.

(6) Flange focal distance	17.526 mm (Air conversion)
(7) Sensitivity	2000 lx, F8, light source halogen lamp temp.: 3200K Shutter : 1/30s, Gain 0dB
(8) Gamma	0.45 / 1.0 / LUT (Look Up Table : user customizable)
(9) Gain	Manual : 0 to 12 dB / AGC : 0 to 12 dB (with limit setting)
(10) White balance	Manual / One-push Auto / Continuance Auto
(11) Video output	Gigabit Ethernet IEEE802.3ab(1000BASE-T) standard GigE Vision Camera Interface Standard for Machine Vision Version 1.2 support Control : GenICam SFNC Version 2.3 support
(12) Video output format	24bit (R:8bit, G:8bit, B:8bit) : 18FPS Table is described later.

(13) Quantization level information

Video signal level	Quantization level of Digital video signal		
	8bit RGB, BGR, YUV, MONO	10bit RGB, MONO	12bit MONO
Maximum data level	255	1023	4095
Video level 100% (White)	255	1023	4095
Video level 0% (Black)	0	0	0
Minimum signal level	0	0	0

(14) Electric shutter speed	OFF / Auto (AES) / Manual (VARIABLE)
Variable shutter mode	Exposure time : approx. 1/100,000 to 1/18 second
AES mode	Exposure time : approx. 1/100,000 to 1/18(shutter OFF) second
Long time integration mode	Exposure time : approx. 1/18 to 10 seconds in 1 frame steps
(15) Sync system	Internal
(16) External trigger shutter	
Input mode	Fixed shutter : adjustable for polarity and delay
	One trigger : adjustable for polarity and delay
Input path	Via Gigabit Ethernet cable (Software trigger)
	DC IN / SYNC connector (Hardware trigger)
Input level	5Vp-p ± 0.5V
Output	strobe signal
	VD output : negative, frequency Approx. 30.01Hz
Synchronous output	DCIN/SYNC connector
Output level	5Vp-p
(17) Registration	Full screen 0.05% (not including lens response)
(18) Vertical contour correction	2H
(19) Sharpness (DTL)	Level, WIDTH
(20 Color masking	OFF / ON (6 color independent masking)
(21) Paint black	Adjustable
(22) Black level	Adjustable
(23) Knee	Adjustable (Knee point and Knee slope)
(24) Power supply	DC+12V ± 1V (input from DC IN / SYNC connector)
	48 V (PoE)
(25) Power consumption	DC+12V Approx. 750mA (Approx. 9W) : All pixel read out
(26) Ambient temperature	(without dew condensation)
Performance	0 to +40℃ (+32 to +104 F), less than 90 % RH
Operation	-10 to +40℃ (+14 to 104 F), less than 90 % RH
Storage	-20 to +60℃ (-4 to 140 F), less than 70 % RH
	(without dew condensation)
(27) External dimensions	55(W) x 55(H) x 89 (D) mm
	(not including protrusions)
(28) Mass	Approx.370g (without lens)

(29) Remote control

(a) Control system

Gigabit Ethernet IEEE802.3ab(1000BASE-T) support

(b) Communications control system

GenICam SFNC Version 2.3 support

(c) Control items

1. Variable shutter	10 to 1/100,000 second
2. Trigger Mode	Fixed shutter, One trigger
3. Gain	
4. AUTO EXPOSURE	
5. White balance	
6. Gamma	
7. 6 vector independent masking	
8. Paint black	
9. Sharpness	
10. Brightness	
11. 16bit/24bit /32bit	Factory setting: 24bit
12. Trigger pulse polarity	Factory setting: POS
13. Trigger input	Software or DCIN/SYNC connector Factory setting: DC IN / SYNC
14. Output signal	OFF, FLASH OUT and VD OUT Factory setting: OFF
15. Application files	

4. Composition

(1) Camera
(2) Lens mount sheet
(3) DCIN/SYNC connector (HR10A-10P-12S)
(4) Installation guide

5. Optional accessories

(1) Junction box JU-F30,
(2) 12pin plug HR10A-10P-12S(01)
(3) Camera cable

	Molded type	Shield type
2 m	C-201KSM	C-201KSS
5 m	C-501KSM	C-501KSS
10 m	C-102KSM	C-102KSS

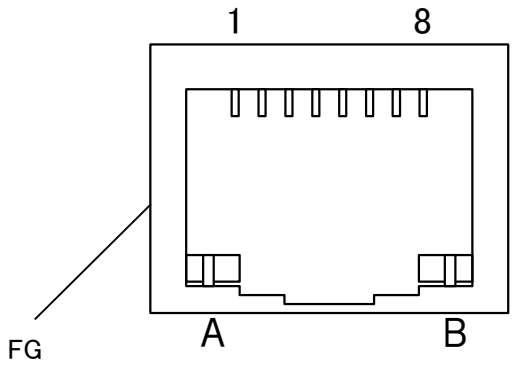
In the CE Marking region, use the shield type and install clamp filter （ZCAT2035-0930A: TDK） at both ends of the cable.

(4) LAN cable (Commercial item) CAT5E Straight cable
CAT5E Cross cable
CAT6 Straight cable
CAT6 Cross cable

6. Specification of Digital output connector

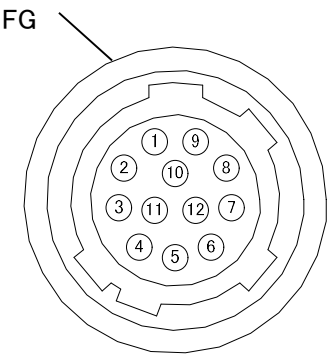
(1) Gigabit Ethernet connector

PIN NO.	Signal
1	TRP1+
2	TPR1-
3	TRP2+
4	TPR3+
5	TRP3-
6	TRP2-
7	TRP4+
8	TRP4-
A	N.C.
B	N.C.
FG	GND



Connector : RJ-45

(2) DC IN / SYNC connector



PIN NO.	Signal	PIN NO.	Signal
1	GND (+12V)	7	TRIG (H) IN
2	+12V	8	N.C.
3	GND	9	N.C.
4	N.C.	10	FLASH / VD OUT
5	GND	11	N.C.
6	N.C.	12	TRIG (C) IN
		FG	GND

Connector (camera side) : SAMWOO SNH-10-12 (RPCB) or equivalent
Plug (matching cable plug) : Hirose HR10A-10P-12S (01) or equivalent

Please do not unplug and insert cable (camera cable) with a power supplied to a camera.
Install clamp filter (ZCAT 2035-0930A: TDK) at both ends (camera and video processor ends) in the CE marking region.

Please do not connect 1 pin and 3/5 pin when using PoE. When connecting it, PoE may stop the power supply. And do not use PoE with power supply on 12-pin connector.
TRIG-A/VD are photo coupler input, 12 pin is isolated with 1/3 pin.
When 12 pin is connected to GND, please connect to 3 pin.

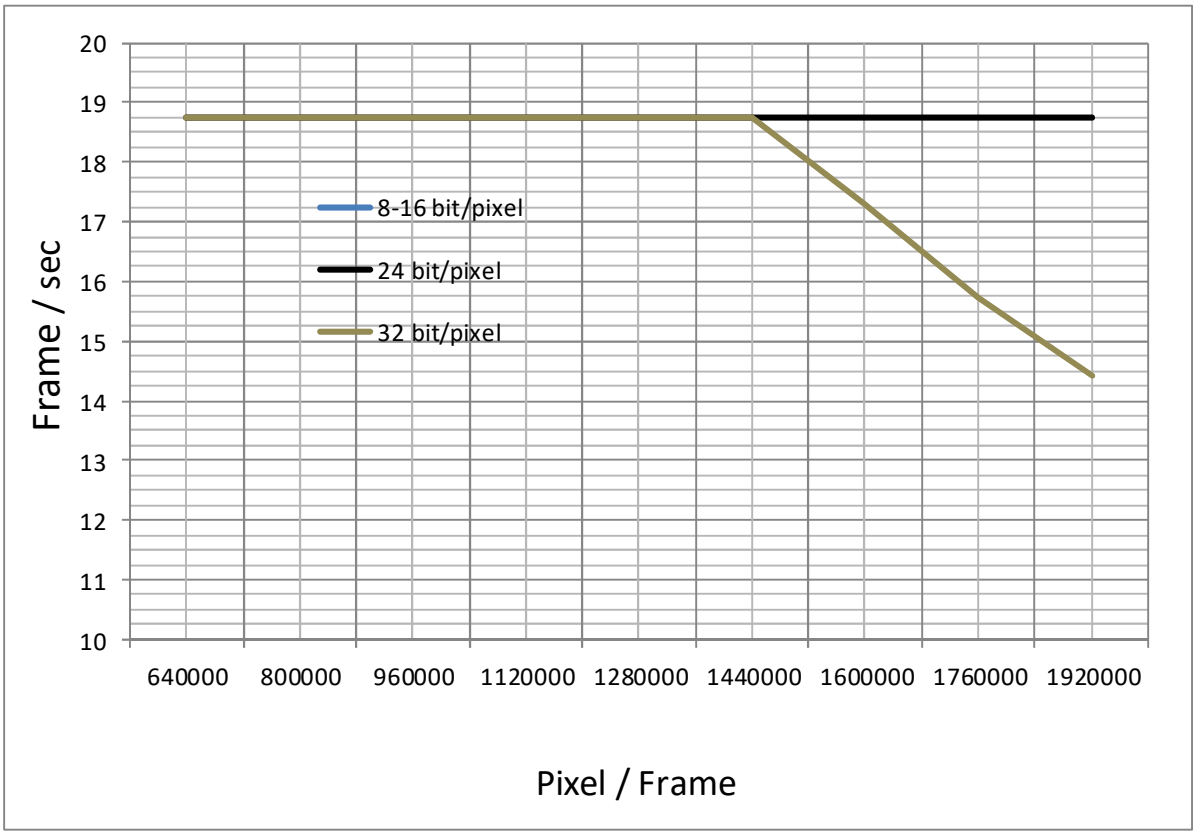
Note: Please do not input any signal to N.C. pin because machine may break down.

7. Video output format (main format pattern)

Data length	Horizontal Pixels	Vertical Pixels	FRAME RATE	support standard format
24bit(R:8bit, G:8bit, B:8bit)	1600 (R,G,B)	1200 (R,G,B)	Approximately 18FPS	GVSP_PIX_RGB8_PACKED, GVSP_PIX_BGR8_PACKED
32bit(R:10bit, G:10bit, B:10bit)	1600 (R,G,B)	1200 (R,G,B)	Approx.14FPS	GVSP_PIX_BGR10V1_PACKED
16bit(Y:8bit, U:8bit, V:8bit)	1600(Y)	1200 (Y)	Approx.18FPS	GVSP_PIX_YUV422_PACKED

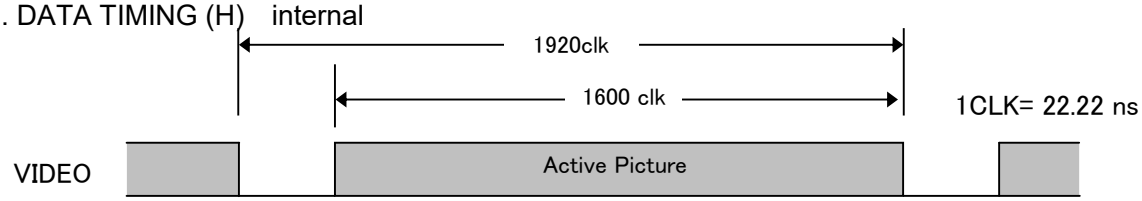
Frame rate can not be output until the multiplied data of frame rate, horizontal pixels, vertical pixels and data length is less than 1GByte(The maximum amount of data depends on how to use the band of Gigabit Ether Net).

Number of pixel is per frame is obtained by set image width and set image height. Frame rate of each model are as follows.



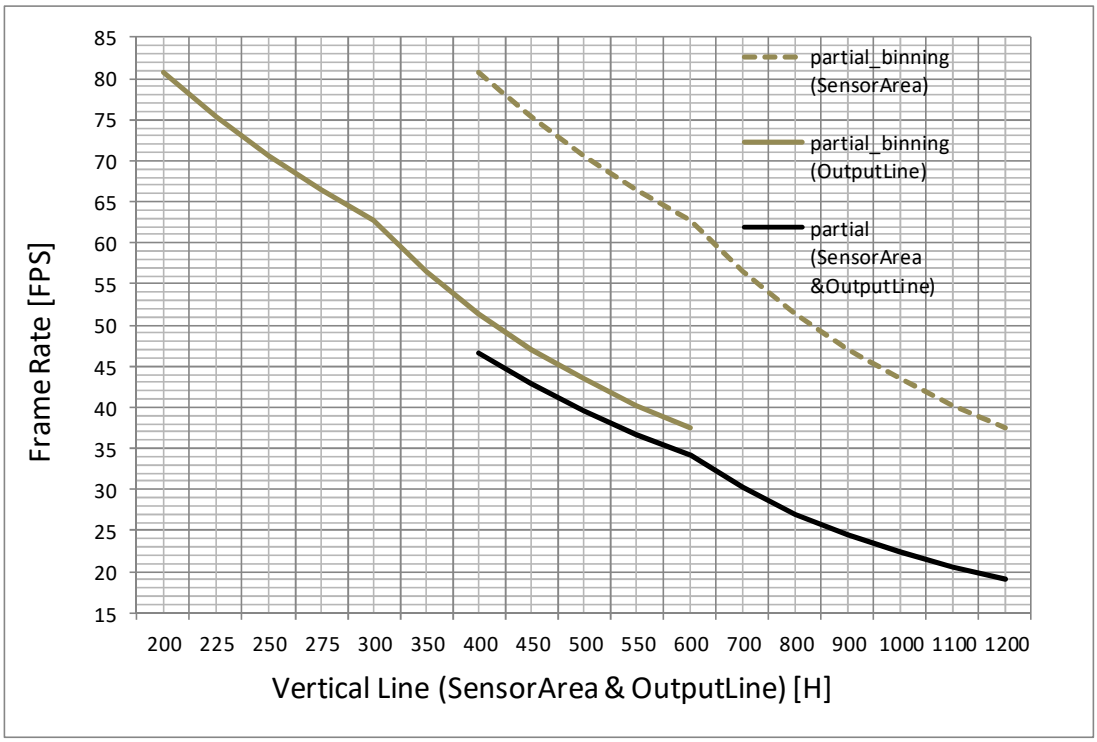
8. Timing chart

8-1. DATA TIMING (H) internal



8-2. DATA TIMING (V)

The relationship between maximum frame rate and vertical lines for partial scan mode and partial scan and binning mode are shown in following graph.



Equation below is the formula for the "total number of lines by capture width (the decimal point is truncated)" and the "frame rate".

(1) Equation of total number of line for partial scan mode

The total number of line = 33+[OFFSET/12]+ HEIGHT+[(1207−HEIGHT−OFFSET)/12]

([x] is Ceiling function)

(2) Equation of total number of line for partial scan and binning mode

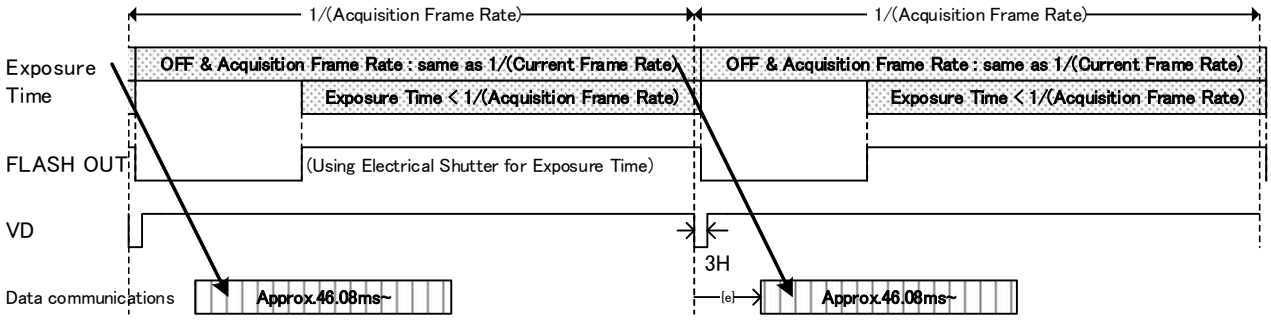
The total number of line = 22+[(8+OFFSET)/12]+[HEIGHT/2]+[(1202− HEIGHT− OFFSET)/12]

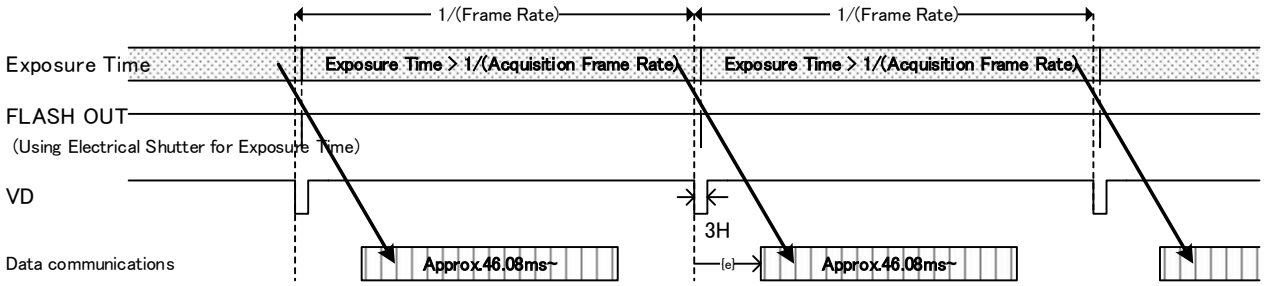
([x] is Ceiling function)

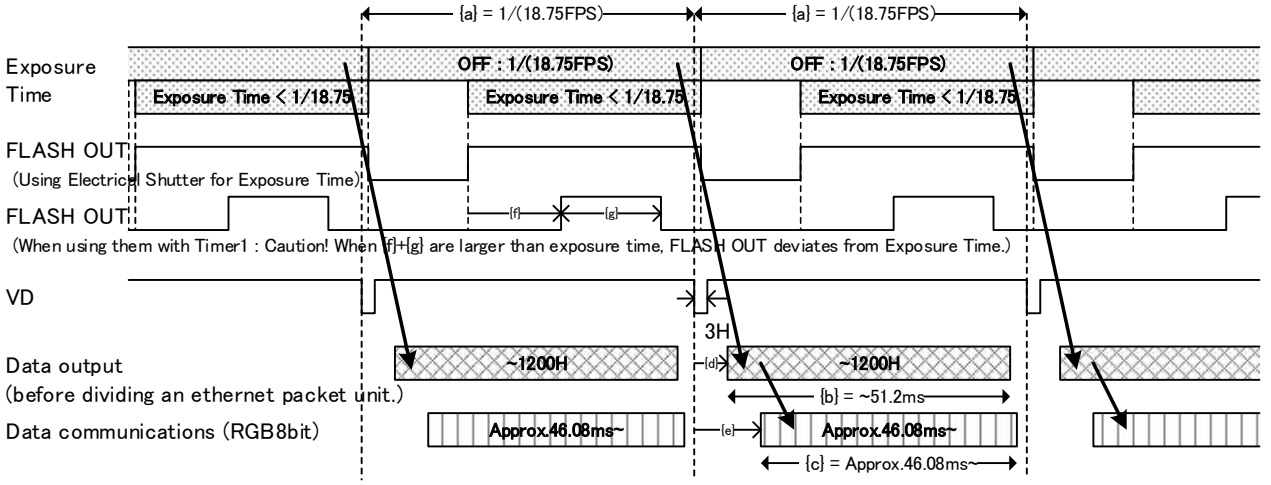
Frame rate = (45000000 / 1920) / The total number of line

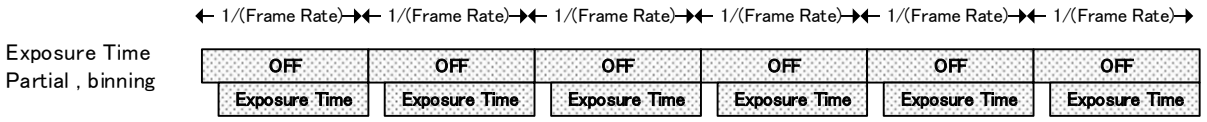
*Notes on partial scan use
The capture start position + capture width, please use 1200 H or less.

TriggerMode is set to OFF



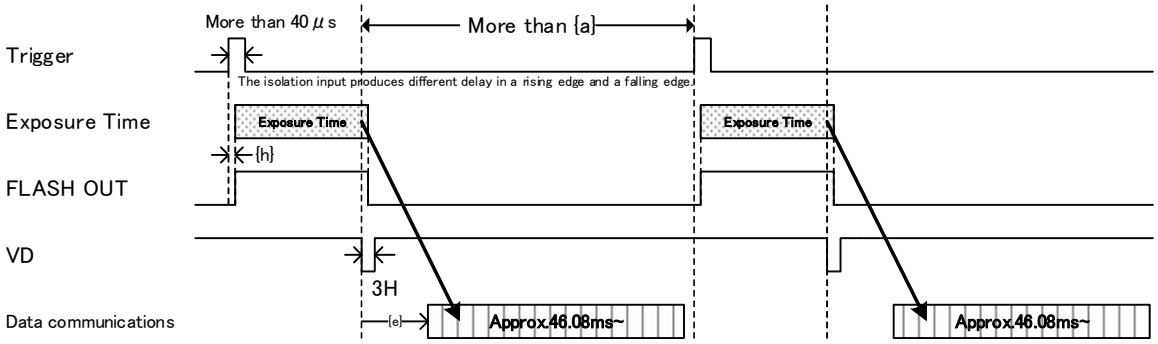






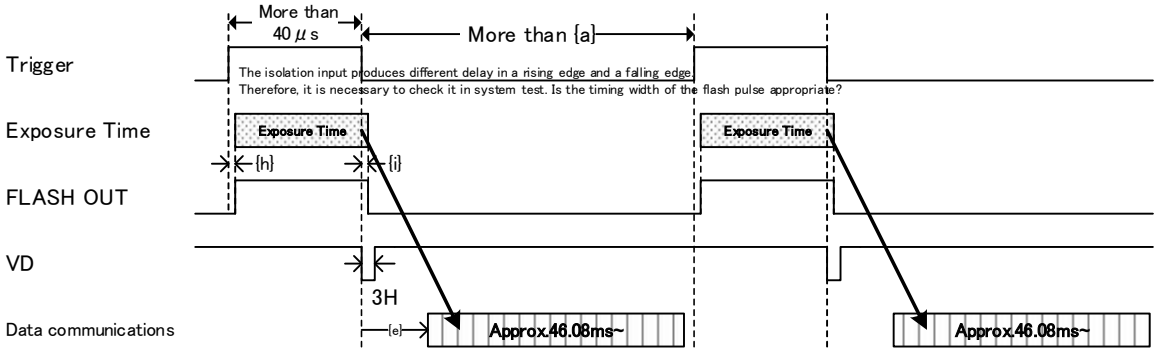
	Partial scan OFF (H = 42.67 μs)		Partial scan ON ([x] is Ceiling function)	
	Binning Vertical OFF	Binning Vertical ON	Binning Vertical OFF	Binning Vertical ON
{a}	1250H	625H	(4+[(OFFSET)/12] +28+HEIGHT +[(1219-HEIGHT-OFFSET)/12]) H	(3+[(8+OFFSET)/12] +18+[HEIGHT/2] +[(1214-HEIGHT-OFFSET)/12]) H
{b}	1200H	600H	(HEIGHT)H	[HEIGHT/2] H
{c}	Approx.46.08ms	Approx.23.04ms	Approx. {b}*1600*3*8/10^6 ms	
{d}	Approx.43H	Approx.26H	Approx. (4+[(OFFSET)/12]) +28H	Approx. (3+[(8+OFFSET)/12]) +18H
{e}	Approx.7ms	Approx.4ms	Using {e} > {b} - {c} + {d}	

TriggerMode is set to ON and ExposureTime is set to Timed or PresetTimed mode.



	Partial scan OFF (H = 42.67 μs)		Partial scan ON ([x] is Ceiling function)	
	Binning Vertical OFF	Binning Vertical ON	Binning Vertical OFF	Binning Vertical ON
{a}	1250H	625H	(4+[(OFFSET)/12] +28+HEIGHT +[(1219-HEIGHT-OFFSET)/12]) H	(3+[(8+OFFSET)/12] +18+[HEIGHT/2] +[(1214-HEIGHT-OFFSET)/12]) H
{b}	1200H	600H	(HEIGHT)H	[HEIGHT/2] H
{e}	Using {e} > {a} - ({b}*1600*3*8/10^6)ms			
{h}	Approx. riging10 μs~ falling30 μs~ + AcquisitionControl.TriggerDelay * 1.0 μs			

TriggerMode is set to ON and ExposureTime is set to TriggerWidth.



	Partial scan OFF (H = 42.67 μs)		Partial scan ON ([x] is Ceiling function)	
	Binning Vertical OFF	Binning Vertical ON	Binning Vertical OFF	Binning Vertical ON
{a}	1250H	625H	(4+[(OFFSET)/12] +28+HEIGHT +[(1219-HEIGHT-OFFSET)/12]) H	(3+[(8+OFFSET)/12] +18+[HEIGHT/2] +[(1214-HEIGHT-OFFSET)/12]) H
{b}	1200H	600H	(HEIGHT)H	[HEIGHT/2] H
{e}	Using {e} > {a} - ({b}*1600*3*8/10^6)ms			
{h}	Approx. riging10 μs~ falling30 μs~ + AcquisitionControl.TriggerDelay * 1.0 μs			
{i}	Approx. falling35 μs~ riging15 μs~ + AcquisitionControl.TriggerDelay * 1.0 μs			

(Note)

(a) When AcquisitionControl.AcquisitionFrameRate is smaller than 1/Shutter width and AcquisitionControl.AcquisitionFrameRate is smaller than the frame rate of partial scan, Frame rate is represented by following equation.
Frame rate = AcquisitionControl.AcquisitionFrameRate

(b) AcquisitionControl.AcquisitionFrameRate is smaller than 1/Shutter width and AcquisitionControl.AcquisitionFrameRate is larger than the frame rate of partial scan,Frame rate is represented by following equation.
Frame rate = Frame rate of partial scan

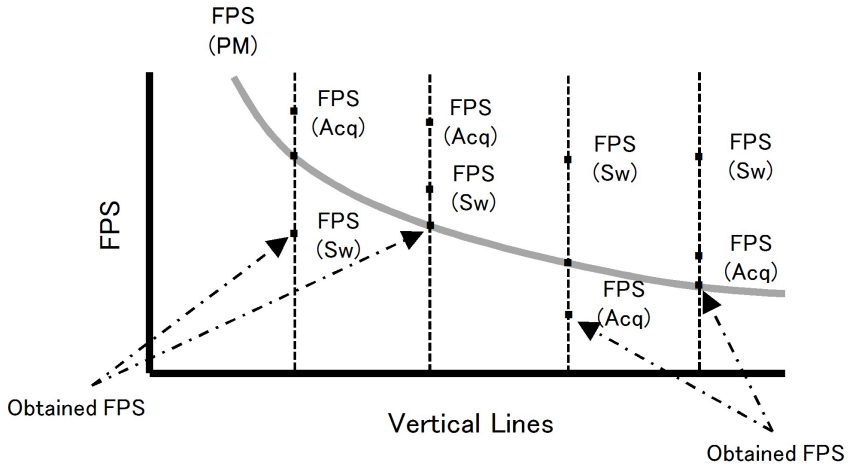
(c) Shutter width is larger than 1/AcquisitionControl.AcquisitionFrameRate and 1/Shutter width is smaller than the frame rate of partial scan,
Frame rate is represented by following equation.
Frame rate = 1/Shutter width

(d) Shutter width is larger than 1/AcquisitionControl.AcquisitionFrameRate and 1/Shutter width is larger than the frame rate of partial scan,
Frame rate is represented by following equation.
Frame rate = Frame rate of partial scan

These relationships are shown in following table and graph.

	(a)	(b)
Condition 1	AcquisitionControl.AcquisitionFrameRate ＞ 1/Shutter width	
Condition 2	1/Shutter width ＜ Partial Max Frame rate	1/Shutter width ≧ Partial Max Frame rate
Obtained FPS	1/Shutter width	Partial Max Frame rate

	(c)	(d)
Condition 1	AcquisitionControl.AcquisitionFrameRate ＜ 1/Shutter width	
Condition 2	AcquisitionControl.AcquisitionFrameRate ≦ Partial Max Frame rate	AcquisitionControl.AcquisitionFrameRate ＞ Partial Max Frame rate
Obtained FPS	AcquisitionControl.AcquisitionFrameRate	Partial Max Frame rate

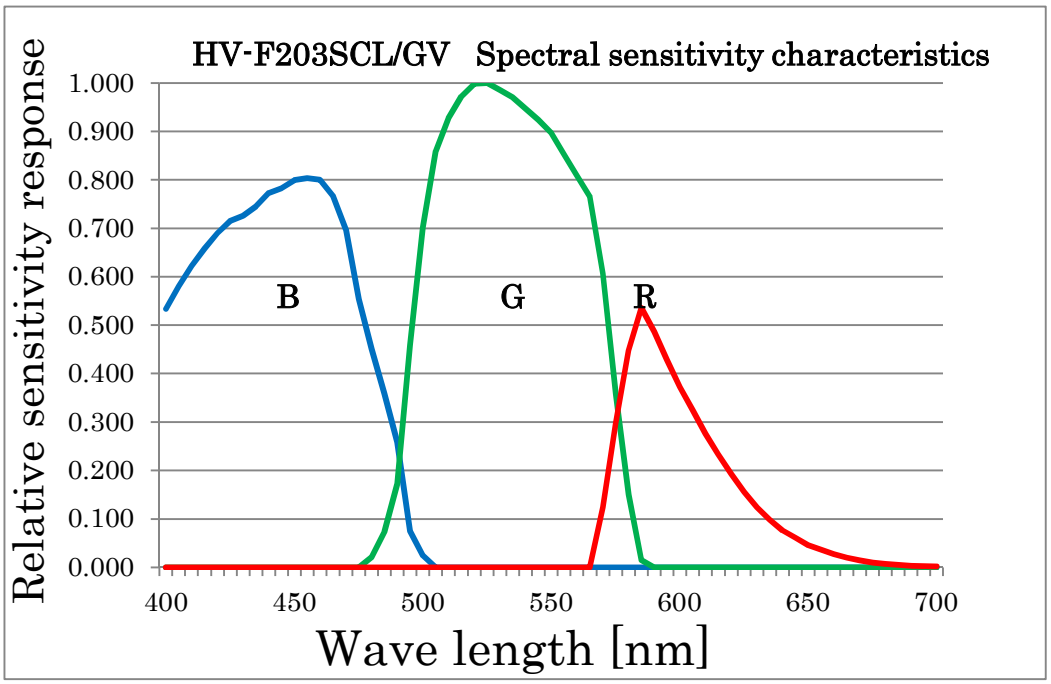


(PM) Maximum frame rate of partial scan mode : Partial Max Frame rate

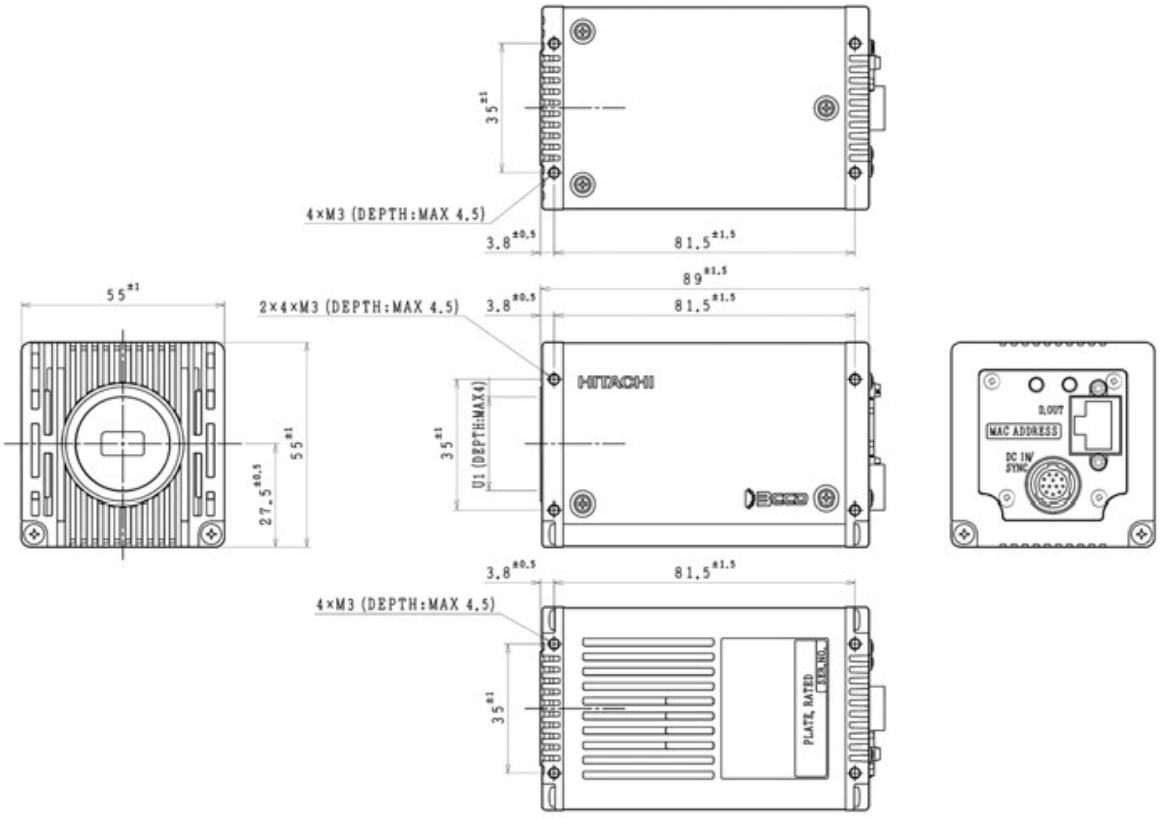
(Sw) Maximum frame rate required for exposure : 1/Shutter width

(Acq) Frame rate set by AcquisitionControl.AcquisitionFrameRate by User

9. Spectral sensitivity characteristics



10. External view



DWG. No. **E400624516**

SHEET 13/15

Notice:
These specifications are subject to change without prior notice due to product improvement. Confirm the most recent specifications at time of order.
Hitachi Kokusai Electric certifies this product complies with the standard warranty conditions of Hitachi Kokusai Electric, and that quality control is implemented to the extent required to comply with these conditions.

Warranty and service:

1) The guarantee period is two year after the data purchase. However, the defects due to erroneous use or intentional act are excluded.
2) As the defect after expiration of the guarantee period, where product repair is possible, repair will be performed at charge.
3) The present Warranty pertains only to the camera unit. Secondary malfunctions attributable to camera failure as well as expenses incurred by disassembly and reassembly of the related system, are beyond the scope of this Warranty.
4) Compensation for loss of business, loss or damage to software, database and other contingent losses are beyond the scope of this Warranty.
5) Hitachi Kokusai Electric Inc. is not liable for the losses caused when the equipment is used in a system, use for business trades, production process, medical fields, crime prevention applications, etc.

Modification history

SIMBLE	DATE	CORRECTION AND REASONS		DESIGNED

DWG. No. **E400624516**

DF022-4PE-S1