

**Digital Color
Progressive Scan Camera**

 System: **IEEE1394a**
Baumer FWX131c

 Art. No: **OD107243**

- IEEE1394a (FireWire™) progressive scan CCD camera
- 1392 x 1040 pixel
- Outstanding color fidelity
- Overlapped shutter mode
- High quality slow scan mode for lowest readout noise
- Up to 20 full frames per second
- True partial scan function (ROI) for increased frame rates
- External synchronization via asynchronous trigger and flash sync function
- Integrated 8 MByte RAM for temporarily image data buffering
- Compact robust aluminum housing
- Industrial IEEE1394a connector
- Camera parameter in real-time programmable
- Powerful Baumer FCAM1394 driver (OHCI standard compliant) / Software Development Kit for Windows
- User-friendly Baumer TWAIN compatible image capture and camera control software



shown lens needs to be ordered separately

1. Overview

Sensor	½" interline progressive scan CCD					
Shutter / readout mode	global shutter / progressive scan readout					
Number of pixel	1392 x 1040					
Scan area	6.4 mm x 4.8 mm					
Pixel size	4.65 µm x 4.65 µm					
Color filter	RGB Bayer mosaic					
Operation modes						
Trigger mode	yes					
Free running mode	yes, overlapped shutter operation					
Signal processing						
real-time software programmable						
Pixel clock	40 MHz fast scan / 20 MHz high quality (HQ) scan					
A/D converter	12 bit					
Exposure control (t _{exp})	total: 30 µsec .. 6 sec technical base: step 92 µsec					
Gain control	0 .. 20 dB					
Offset (black level)	0 .. 255 LSB (12 bit)					
Image data buffer	8 MByte					
Image acquisition						
Data format	raw image data from camera					
Camera image format modes (see item 3)	Format (pixel)	Bit per pixel	Pixel clock MHz	Frames per sec. *)	t_{readout}	
Full frame	slow	1392 x 1040	8	20	10	100 msec
	fast					
Partial scan function	yes, format freely programmable					
Test pattern function	yes, in all modes					

Technical specifications subject to change

Data quality	at 20 °C, gain = 1, exposure time = 32 msec, full frame mode, slow scan
Readout noise	$\sigma < 0.7$ LSB (8 bit) typical
Dynamic range	typical > 51 dB
Optical interface	C-Mount
Optical filter	Hoya CM500S option: dust protection or no filter
Process interface functions	
Async. Trigger	yes, trigger mode operation, software trigger and external trigger signal
External flash sync	yes
Software reset	yes, in free running mode, delay up to 100 msec
Asynchronous reset	yes, delay up to: 20 msec slow scan 15 msec fast scan
Image data header	yes
Electrical interface	
Data / control / power	standard single cable IEEE1394a / 6 pins option: screw lock type connector
Digital input	1: trigger signal, opto decoupled, 3 V .. 14 V / 20 mA trailing edge **) min. trigger impulse length (t_{min}): 1 μ sec max. trigger delay (t_{delay}): 92 μ sec
Digital output	1: flash sync signal, 12 V / 20 mA low active **)
LED	green: power on / yellow: data transmission active
Power consumption	approx. 3 Watt
Environmental	
Storage temperature	-10 °C .. +70 °C
Operating temperature	+5 °C .. +50 °C
Humidity	10 % .. 90 % non condensing
Housing	aluminum
Dimensions	73 x 56 x 57 mm ³
Weight	340 g
IEEE1394a interface	400 Mbit / sec
Software	Baumer FCAM1394 driver (OHCI standard compliant) / SDK for Windows 2000 / Windows XP Baumer TWAIN image capture and camera control software

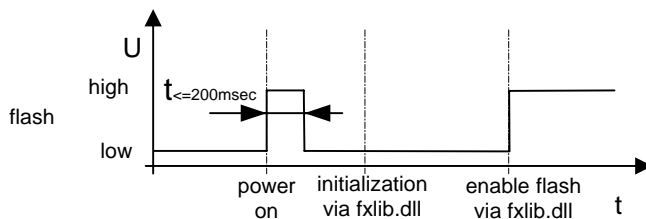
*) maximum frame rate in free running mode, effective frame rate depending on SDK image mode settings and set exposure time

**) can be inverted via software

2. Camera Factory Settings after Camera Start-Up

	Camera factory settings after camera start-up
Operation modes	free running mode
Signal processing	
Exposure control	32 msec
Gain control	factor 1 = 0 dB
Offset (black level)	0
Image acquisition	
Camera image format mode	mode ID = 0: full frame HQ (see item 3)
Partial scan function	not active
Electrical interface	
Flash sync signal	disabled, digital output set to low status *)

*) Electrical interface: flash sync signal



3. SDK Supported Image Formats

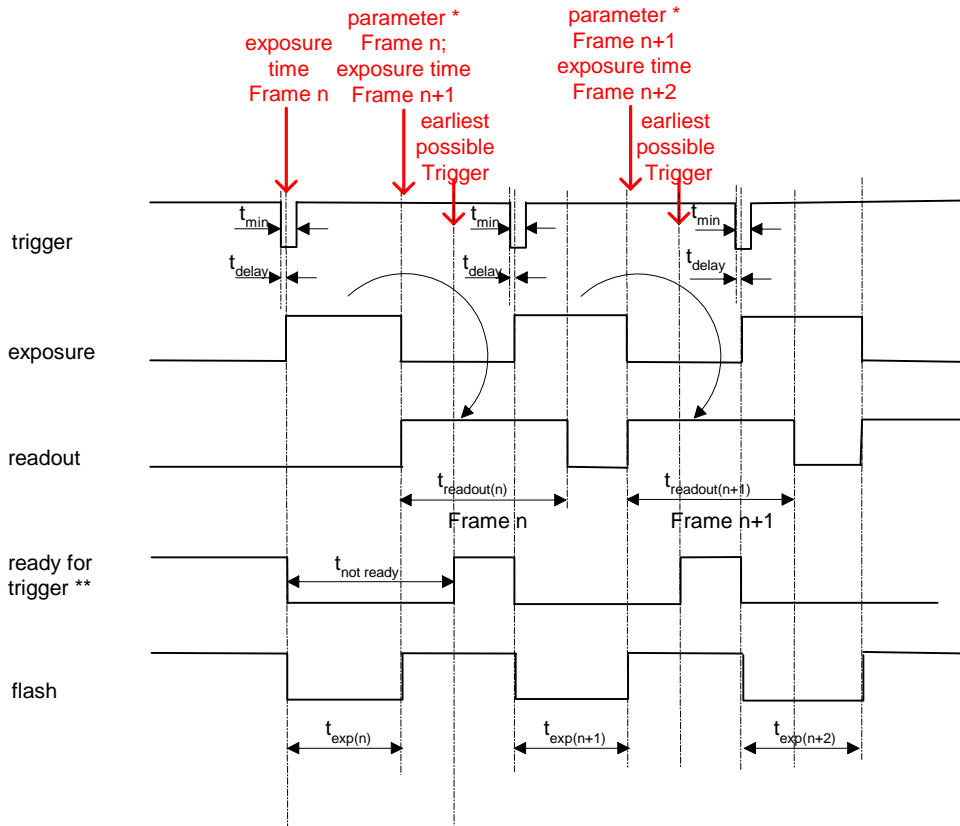
Camera name	FWX131c				
Camera mode	SDK image mode				
	Mode ID	Description	Image format	Color coding	Functions / State
Full Frame slow	0	Full Frame HQ	1392 x 1040	RawBayer8, Mono8, Color3x8	PS, T, F, Color
Full Frame fast	1	Full Frame	1392 x 1040	RawBayer8, Mono8, Color3x8	PS, T, F, Color

SDK - Software Development Kit
 HQ - high quality
 PS - partial scan
 T - trigger
 F - flash
 Mono - monochrome mode
 Color - color mode

RawBayer8 - unmanipulated pixel data in Bayer filter pattern in 8 bit
 RawMono8 - unmanipulated pixel data for monochrome camera modes in 8 bit
 Color3x8 - software corrected image data for color camera modes in the color data arrangement RGB...RGB in 8 bit
 Mono8 - software corrected image data for monochrome camera modes in 8 bit

4. Timing Operation Modes

Trigger Mode: overlapped trigger



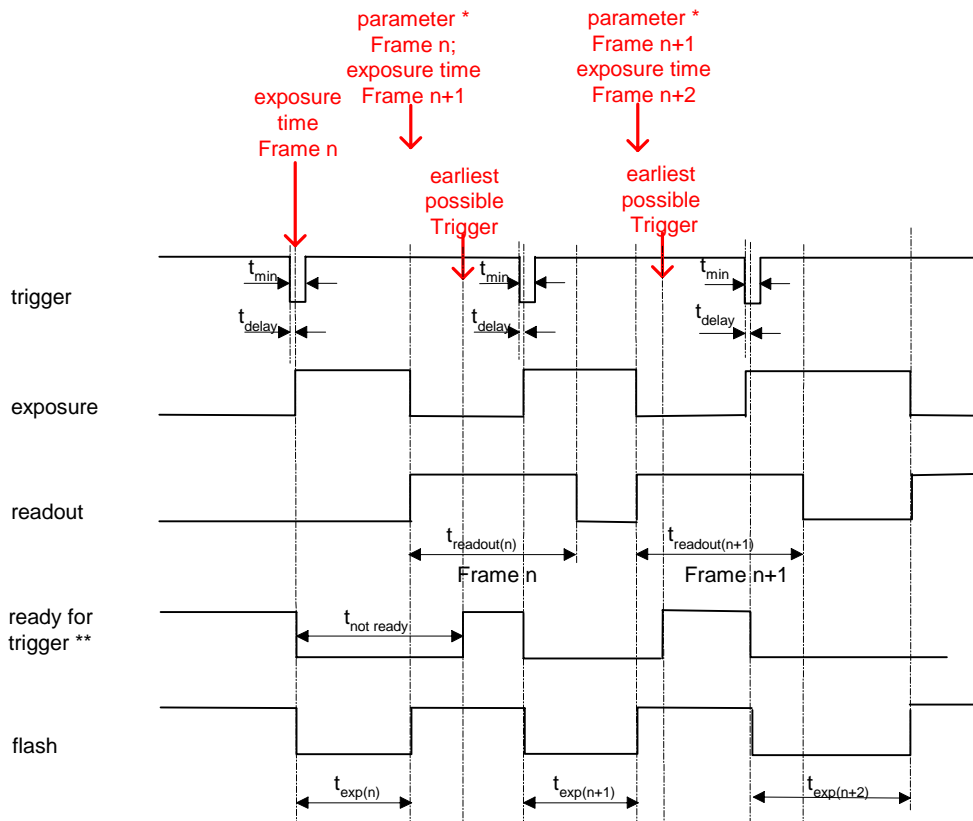
$$t_{\text{earliest possible trigger (n+1)}} = t_{\text{readout(n)}} - t_{\text{exp(n+1)}}$$

$$t_{\text{not ready (n+1)}} = t_{\text{exp(n)}} + t_{\text{readout(n)}} - t_{\text{exp(n+1)}}$$

* image parameter: offset
global gain
mode

** signal is not available as digital output

Trigger Mode: overlapped trigger, when $t_{exp(n+2)} > t_{exp(n+1)}$



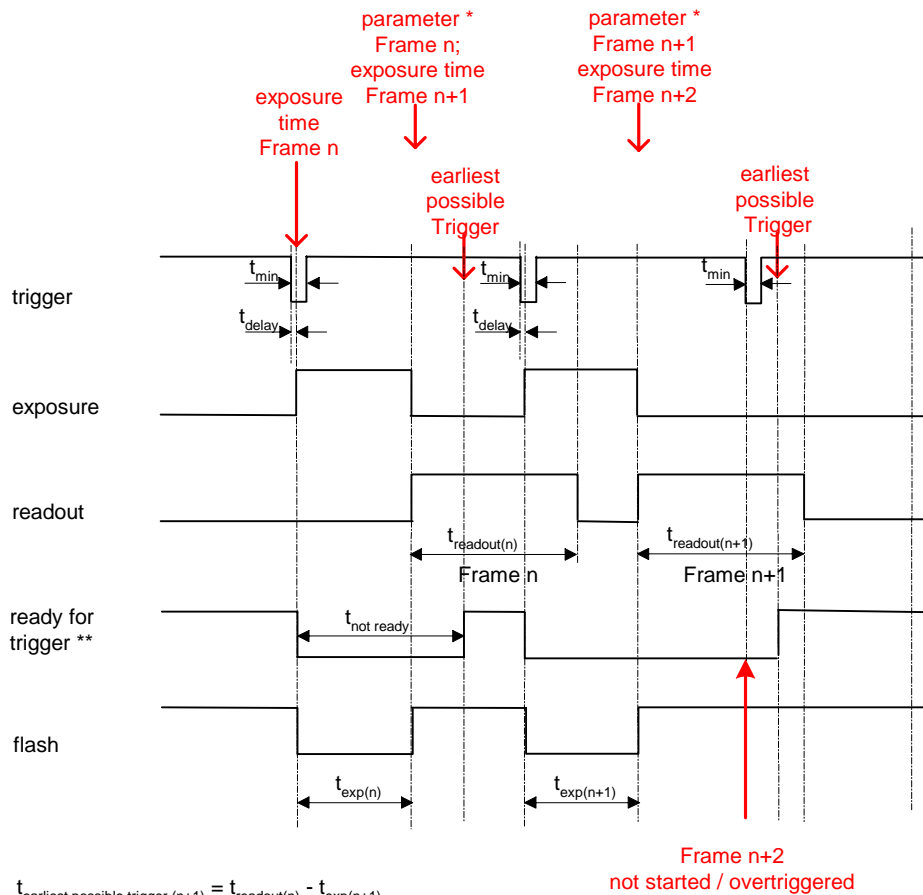
$$t_{\text{earliest possible trigger (n+1)}} = t_{\text{readout(n)}} - t_{\text{exp(n+1)}}$$

$$t_{\text{not ready (n+1)}} = t_{\text{exp(n)}} + t_{\text{readout(n)}} - t_{\text{exp(n+1)}}$$

* image parameter: offset
global gain
mode

** signal is not available as digital output

Trigger Mode: overlapped trigger, when $t_{exp(n+2)} < t_{exp(n+1)}$



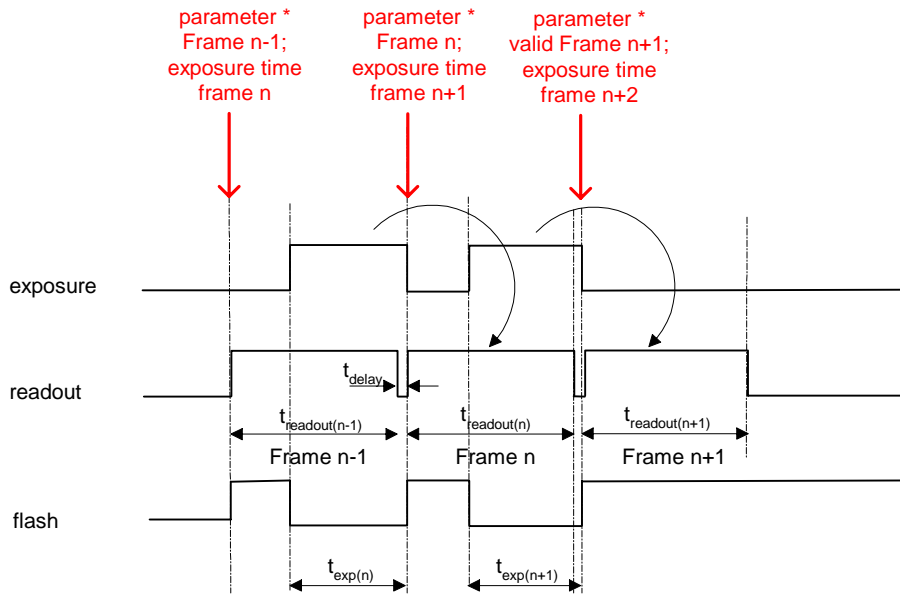
$$t_{\text{earliest possible trigger (n+1)}} = t_{\text{readout(n)}} - t_{\text{exp(n+1)}}$$

$$t_{\text{not ready (n+1)}} = t_{\text{exp(n)}} + t_{\text{readout(n)}} - t_{\text{exp(n+1)}}$$

* image parameter: offset
global gain
mode

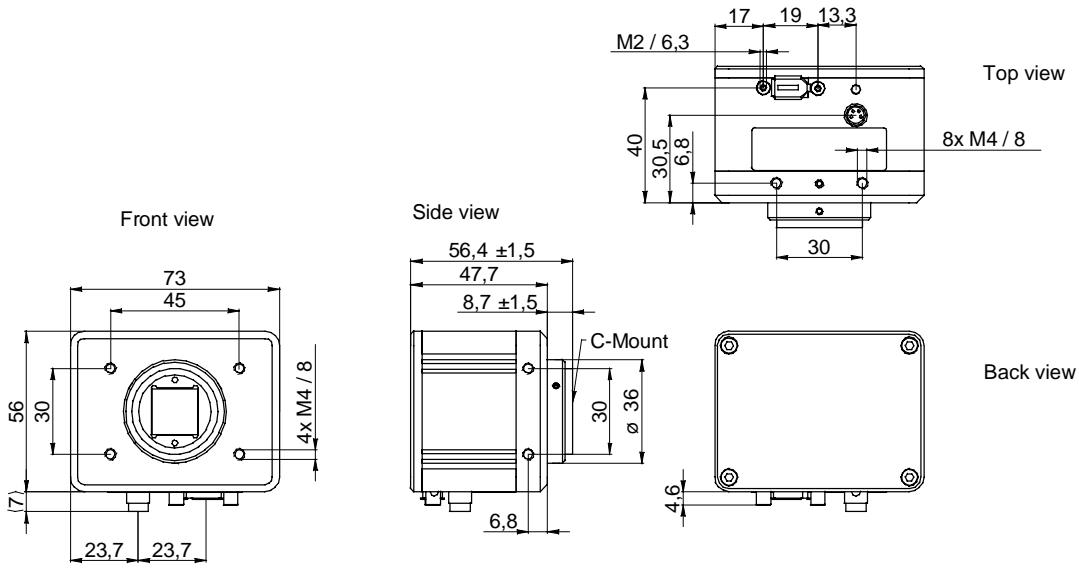
** signal is not available as digital output

Free Running Mode: overlapped operation



* image parameter: offset
global gain
mode

5. Housing



6. Connectors / Electrical Interfaces

IEEE1394a	Pin
	1: Power 2: GND 3: TPB- 4: TPB+ 5: TPA- 6: TPA+

Trigger / Flash	Typ: Lumberg RSMESD 4pin.
Trigger / Flash cable wires color *): 1 = brown 2 = white 3 = blue 4 = black	

*) shielded trigger / flash cable needs to be used and ordered separately

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