

Digital Color Super High Resolution  
Area Scan Camera

System: IEEE1394a

## Baumer FQX80c NeuroCheck Edition

Art. No: OD107408

- IEEE1394a (FireWire™) interline transfer CCD camera
- 3264 x 2448 pixel
- Outstanding image quality and color fidelity
- High quality slow scan mode for lowest readout noise
- Up to 3 full frames per second
- Nearly 1 million pixel progressive scan preview mode with up to 17 frames per second
- True horizontal color binning modes with double readout speed
- True partial scan on full frame mode
- Simultaneous shutter operation for moved objects
- External synchronisation via asynchronous trigger and flash sync function
- Integrated 16 MByte RAM for temporarily image data buffering
- Compact robust aluminium housing
- Standard 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 and cable needs to be ordered separately

### 1. Overview

<b>Sensor</b>	CCD technology 2/3" interline transfer frame readout
Shutter / readout mode	global shutter / interlaced readout / 3 field readout method
Number of pixel	3264 x 2448
Scan area	8.81 mm x 6.61 mm
Pixel size	2.7 µm x 2.7 µm
Color filter	RGB Bayer mosaic
<b>Operation modes</b>	
Trigger mode	yes, sequential / simultaneous shutter operation (see <a href="#">application note</a> )
Free running mode	yes, overlapped / simultaneous shutter operation (see <a href="#">application note</a> )
<b>Signal processing</b>	real-time software programmable
Pixel clock	29.5 MHz 8 bit fast scan / 14.75 MHz 12 bit high quality (HQ) scan
A/D converter	12 bit
Exposure control (t <sub>exp</sub> )	261 µsec .. 60 sec ****) technical base: 261 µsec .. 17.1 sec: step 261 µsec 10 msec .. 60 sec: step 10 msec
Gain control	0 .. 20 dB ***)
Offset (black level)	0 .. 255 LSB (12 bit)
Image data buffer	16 MByte

Image acquisition		raw image data from camera						
Camera image format modes (see item 3)		Format (pixel)	Interlaced mode	Binning	Bits per pixel	Pixel clock MHz	Frames per sec *)	Frame t <sub>readout</sub>
Full frame **)	fast	3264 x 2448	yes	no	8	29.5	3.1	325 msec
	slow				12	14.75	1.5	650 msec
Subsample **)	fast	2176 x 1632	yes	no	8	29.5	4.6	215 msec
	slow				12	14.75	2.3	435 msec
Progressive subsample	fast	1088 x 816	no	horizontal	8	29.5	18	55 msec
	slow			2 pixel	12	14.75	9	110 msec
Color binning 2x2	fast	544 x 408	no	horizontal	8	29.5	37	27 msec
	slow			vertical 2 lines	12	14.75	18	55 msec
Partial scan function	yes, format freely programmable in full frame mode							
Test pattern function	yes, in all modes with vertical and / or horizontal binning							
Data quality	at 20 °C, gain = 1, exposure time = 10 msec, full frame mode, slow scan							
Readout noise	$\sigma < 7$ LSB (12 bit) typical							
Dynamic range	typ. > 55 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							
Flash sync	yes, external signal and software flag							
Readout active	yes, external signal and software flag							
Software reset	yes, in free running mode delay up to 650 msec							
Asynchronous reset	yes, delay up to 8 msec slow scan 12 msec fast scan							
Image data header	yes							
Electrical interface								
Data / control / power	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 <sub>min</sub> ): 1 µsec max. trigger delay (t <sub>delay</sub> ): 4 µsec							
Digital output	1: flash sync signal, 12 V / 20 mA low active *****)							
LED	green: power on / yellow: data transmission active							
Power consumption	app. 4 Watt							
Environmental								
Storage temperature	-10 °C .. +70 °C							
Operating temperature	+5 °C .. +50 °C							
Humidity	10 % .. 90 % non condensing							
Housing	aluminium							
Dimensions	73 x 56 x 61 mm <sup>3</sup>							
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 rates depending on SDK video mode settings

\*\*) exposure time < 2 sec: sequential half frame exposure; > 2 sec: simultaneous half frame exposure, 200 msec exposure time delay 2<sup>nd</sup> half frame will be corrected in the Baumer software

\*\*\*) gain limited by software

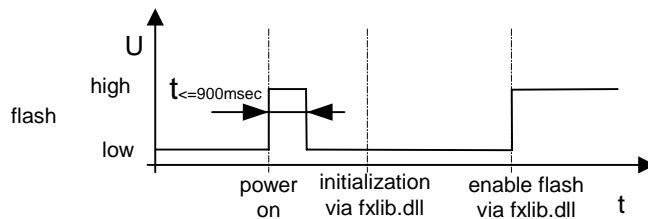
\*\*\*\*) NOTE: to be limited by Software to achieve the best image quality

\*\*\*\*\*) can be inverted via software

2. Camera Factory Settings after Camera Start-Up

	Camera factory settings after camera start-up
<b>Operation modes</b>	free running mode
<b>Signal processing</b>	
Exposure control	55.3 msec
Gain control	factor 1 = 0 dB
Offset (black level)	0
<b>Image acquisition</b>	
Camera image format mode	mode ID = 24: progressive subsample (see item 3)
Partial scan function	not active
<b>Electrical interface</b>	
Flash sync signal / readout active	flash sync default, disabled, digital output set to low status *)

\*) Electrical interface: flash sync signal



### 3. SDK Supported Image Formats

Camera name	FQX80c NC Edition				
Camera mode	SDK image mode				
	Mode ID	Description	Image format	Color coding	Functions / State
Full Frame fast	20	Full Frame	3264 x 2448	RawBayer8, Mono8, Color3x8, 3xColor8	T, F, Si, Color, PS
Full Frame slow	21	Full Frame HQ	3264 x 2448	RawBayer8, Mono8, Color3x8, 3xColor8 RawBayer12, Mono12, Color3x12, 3xColor12	T, F, Si, Color, PS
Subsample fast	22	Subsample	2176 x 1632	RawBayer8, Mono8, Color3x8, 3xColor8	T, F, Si, Color
Subsample slow	23	Subsample HQ	2176 x 1632	RawBayer8, Mono8, Color3x8, 3xColor8 RawBayer12, Mono12, Color3x12, 3xColor12	T, F, Si, Color
Progressive Subsample fast	24	Progressive Subsample	1088 x 816	RawBayer8, Mono8, Color3x8, 3xColor8	T, F, Color, BRC
Progressive Subsample slow	25	Progressive Subsample HQ	1088 x 816	RawBayer8, Mono8, Color3x8, 3xColor8 RawBayer12, Mono12, Color3x12, 3xColor12	T, F, Color, BRC
Color Binning fast	26	Color Binning	544 x 408	RawBayer8, Mono8, Color3x8, 3xColor8	T, F, Color, BRC
Color Binning slow	27	Color Binning HQ	544 x 408	RawBayer8, Mono8, Color3x8, 3xColor8 RawBayer12, Mono12, Color3x12, 3xColor12	T, F, Color, BRC

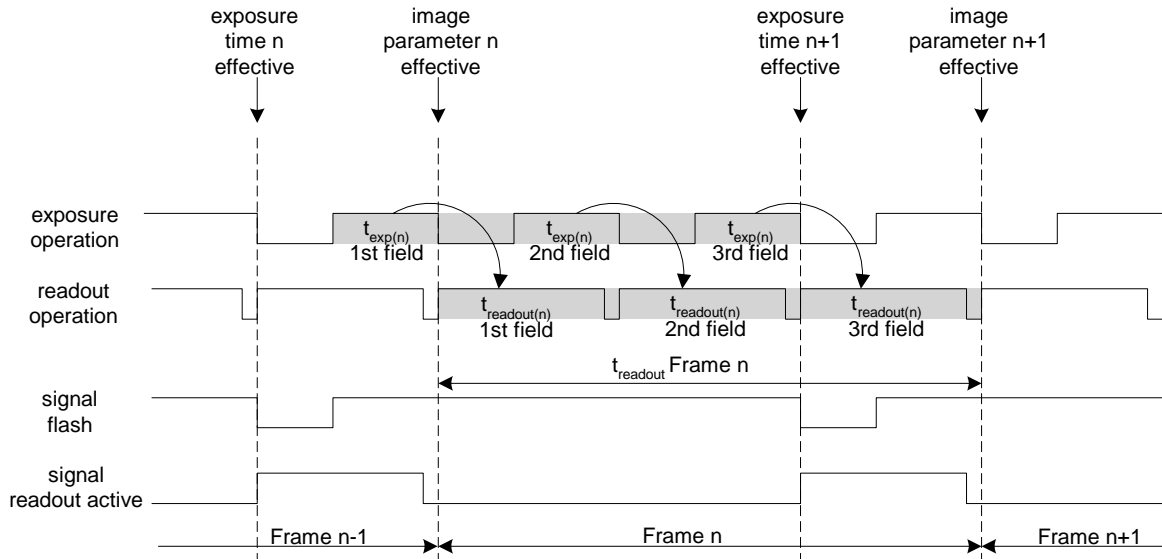
- SDK - Software Development Kit
- HQ - high quality
- BRC - brightness correction
- PS - partial scan
- Si - select simultaneous shutter
- T - trigger
- F - flash
- Color - color mode

- RawBayer8[12] - unmanipulated pixel data in Bayer filter pattern in 8[12] bit
- RawMono8[12] - unmanipulated pixel data for monochrome camera modes in 8[12] bit
- Color3x8[12] - software corrected image data for color camera modes in the color data arrangement RGB...RGB in 8[12] bit
- 3xColor8[12] - software corrected image data for color camera modes in the color data arrangement RRR...GGG...BBB in 8[12] bit
- Mono8[12] - software corrected image data for monochrome camera modes in 8[12] bit

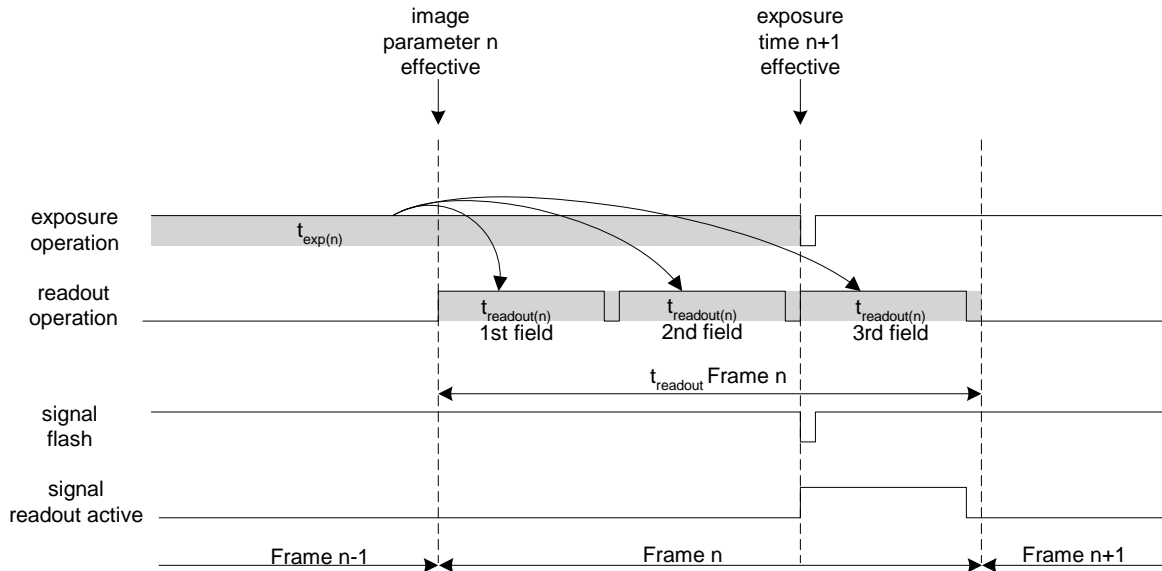
4. Timing Operation Modes

4.1 Full Frame (sequential / overlapped shutter operation)

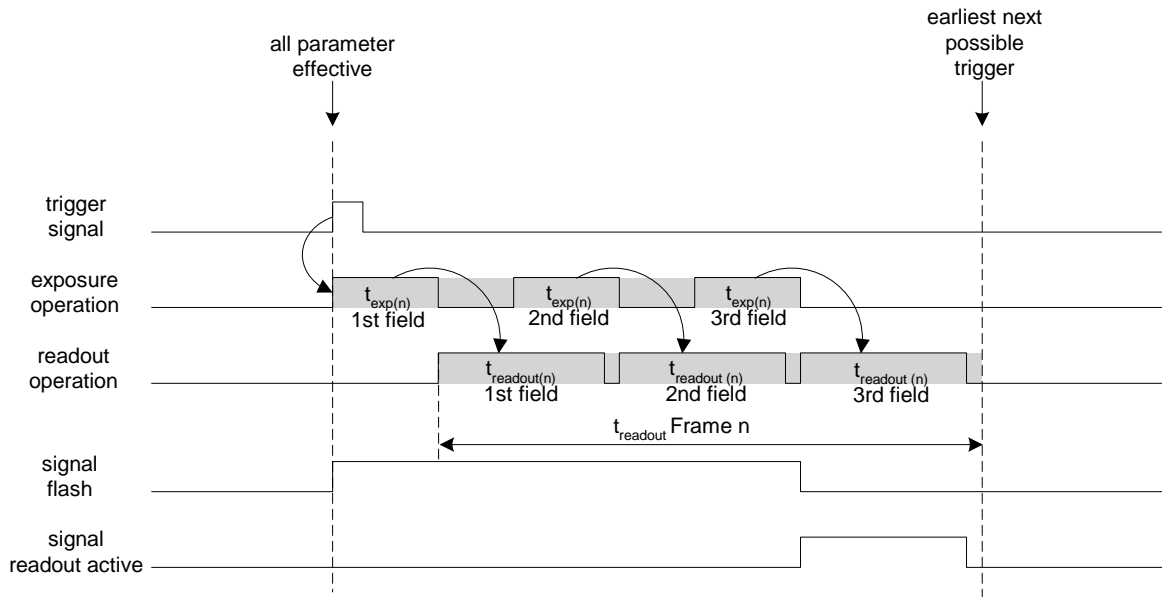
4.1.1 Free Running Mode, Overlapped Shutter, Exposure Time < 2 sec.



4.1.2 Free Running Mode, Overlapped Shutter, Exposure Time >= 2 sec.

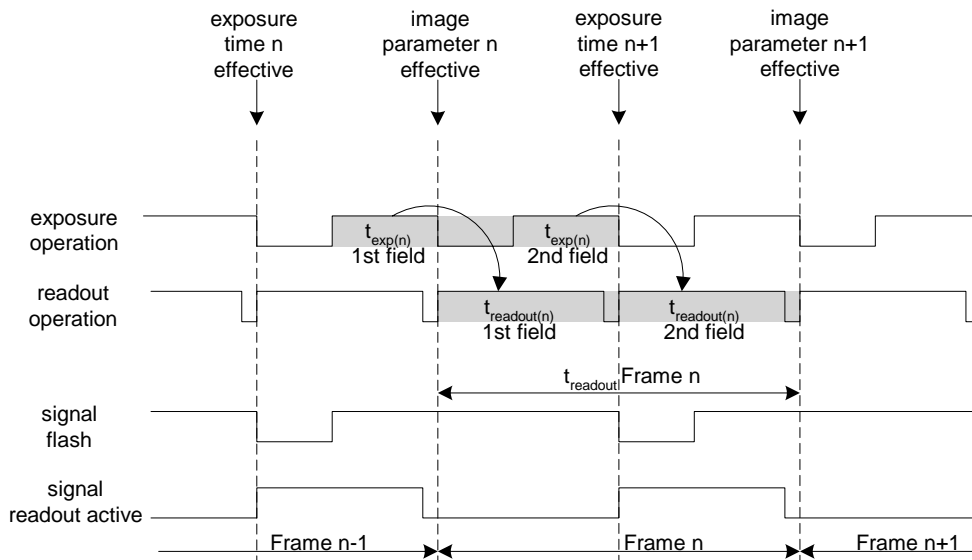


4.1.3 Trigger Mode, Sequential Shutter

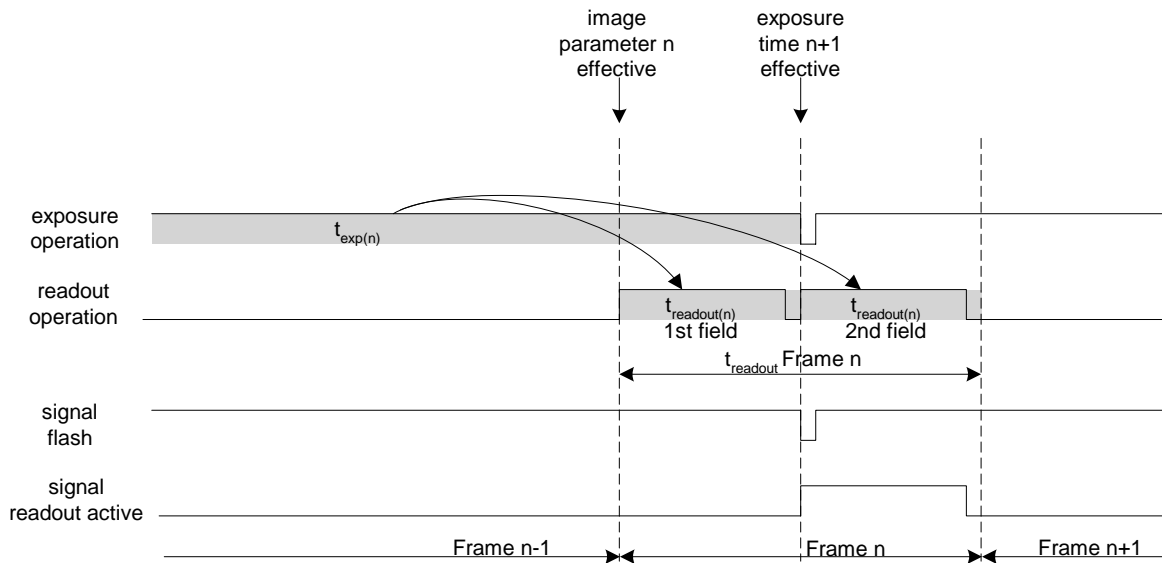


4.2 Subsample Mode (sequential / overlapped shutter operation)

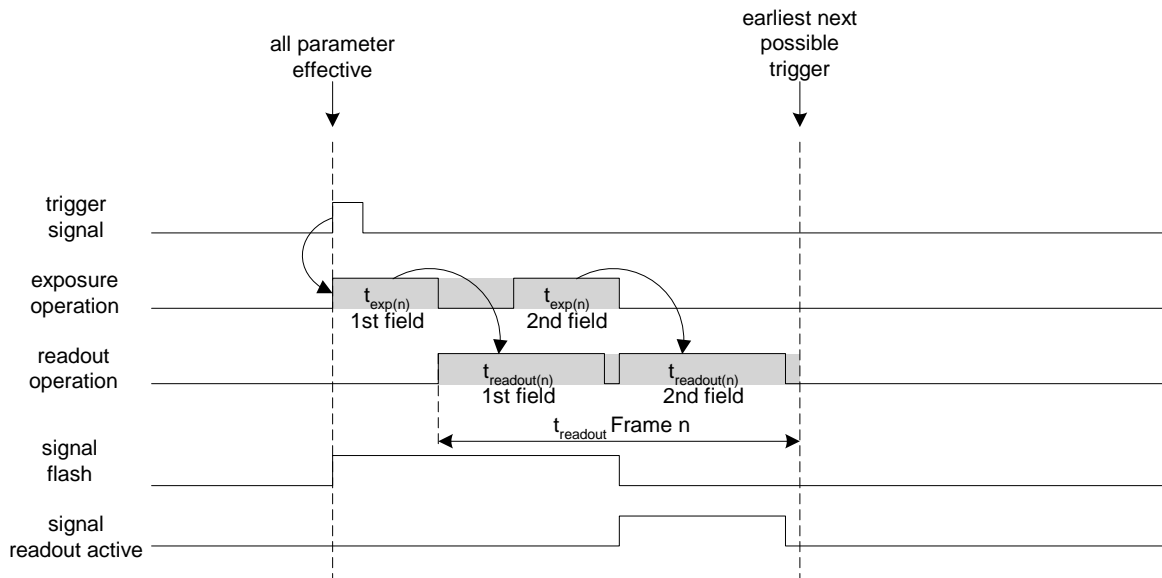
4.2.1 Free Running Mode, Overlapped Shutter, Exposure Time < 2 sec.



4.2.2 Free Running Mode, Overlapped Shutter, Exposure Time  $\geq 2$  sec.



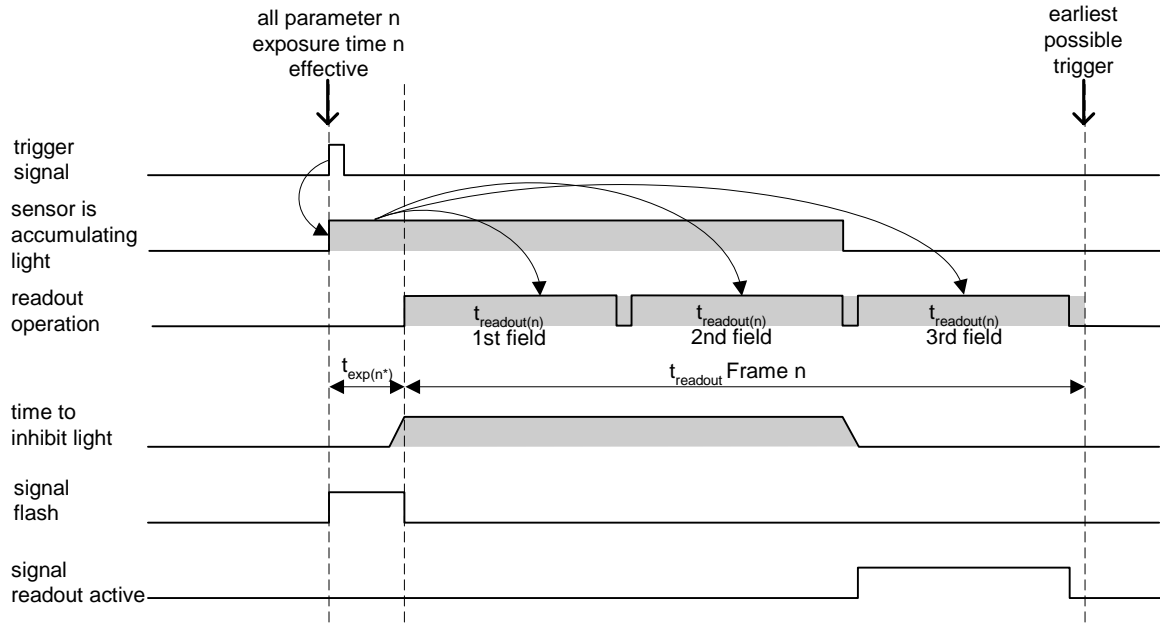
4.2.3 Trigger Mode, Sequential Shutter



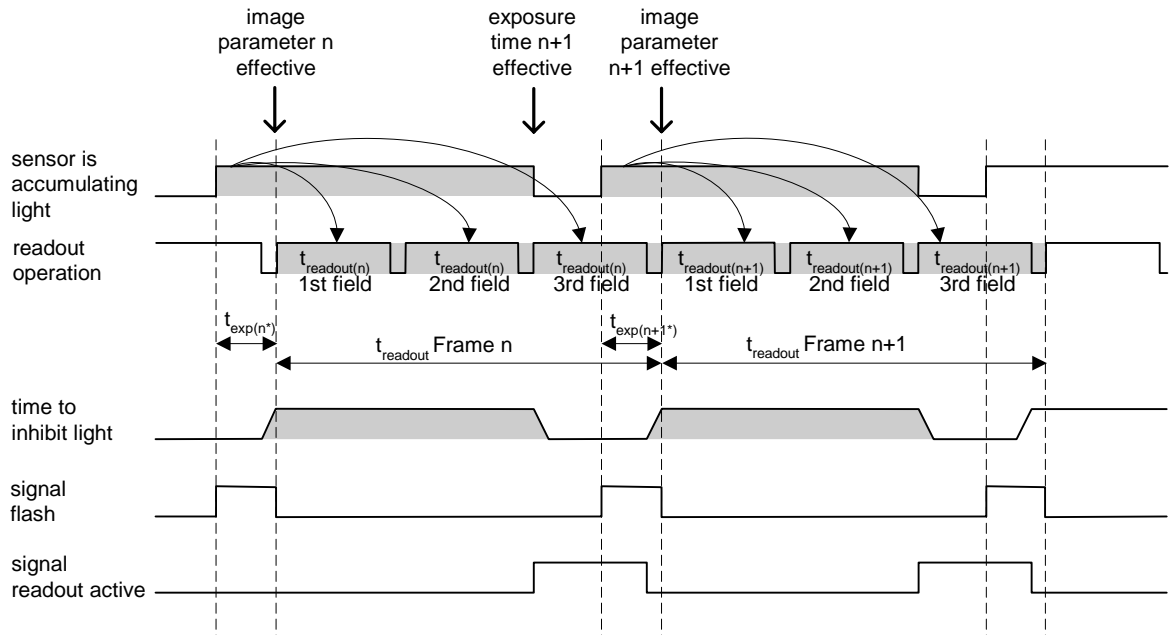
4.3 Full Frame, Subsample Modes (simultaneous shutter operation)

4.3.1 Exposure time  $t_{exp} = 261 \mu\text{sec} \dots 60 \text{ sec}$

Trigger Mode: simultaneous shutter



Free Running Mode: simultaneous shutter



\*) for simultaneous shutter operation 3 part frames

image parameter: offset  
global gain  
mode  
color gain



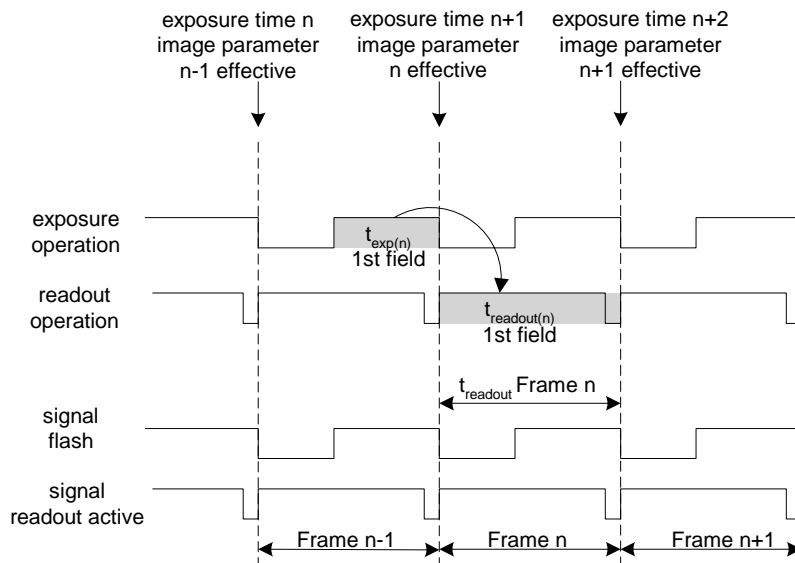
**Application Note:**

When using the simultaneous shutter operation mode, all 3 fields from CCD sensor are exposed simultaneously. After exposure has been completed the first field is read out. During the readout time (e.g.:  $t_{readout(n)}$  1<sup>st</sup> field) of the first and second field still the second and third field are accumulating light. Therefore the sensor need to be protected against ambient light during this time (time **to inhibit** light)

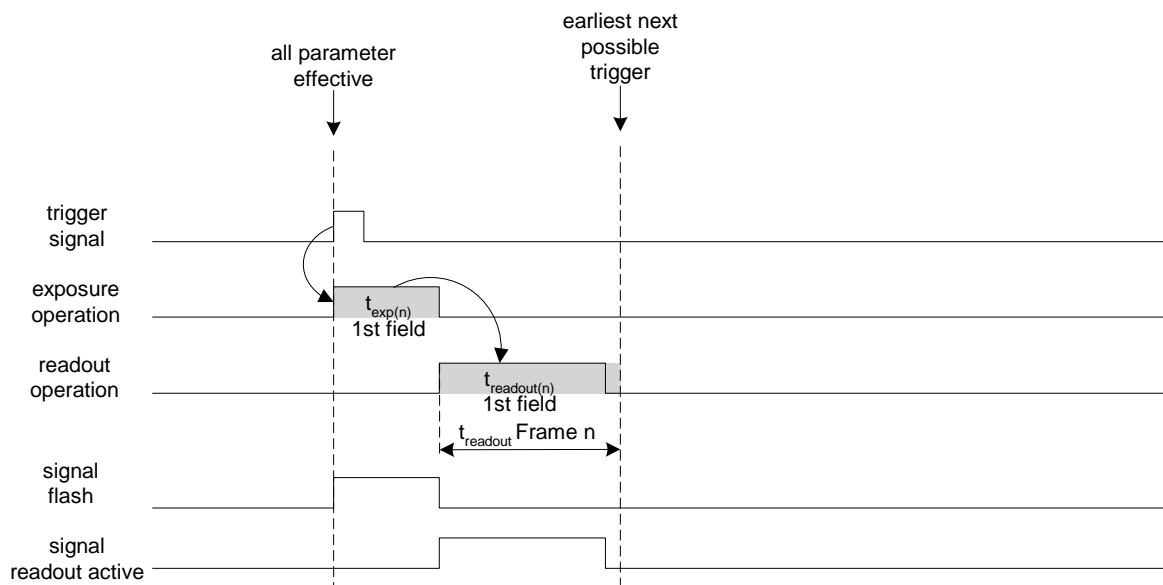
For best operation, the use of a flash light and closed housing is recommended – in result the timing behavior will be the same like using a progressive scan camera.

**4.4 Progressive Subsample Mode and Color Binning Mode**

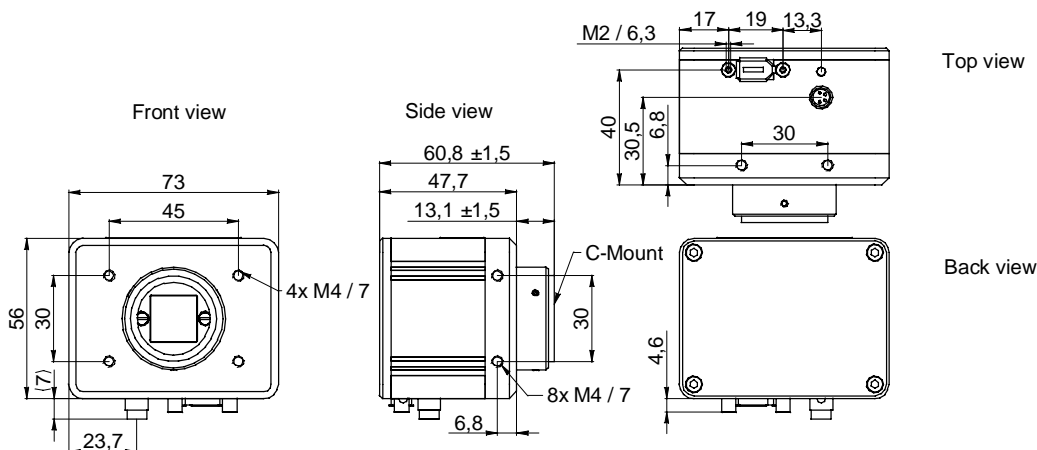
4.4.1 Free Running Mode, Overlapped Shutter



4.4.2 Trigger Mode, Sequential Shutter



5. Housing



6. Connectors / Electrical Interfaces

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

Trigger / Flash (Read Out Active)	Typ: Lumberg RSMF 4/0.5M
	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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