

**Digital Color
Progressive Scan CMOS Camera**

 System: **IEEE1394a**
Baumer FWXC30c

 Art. No: **OD106714**

- IEEE1394a (FireWire™) progressive scan CMOS camera
- 2048 x 1536 pixel
- Up to 10 frames per second in full frame mode
- Binning and true partial scan function (ROI) for increased frame rates
- External synchronization via asynchronous trigger and flash sync function
- Integrated 16 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 / Linux
- User-friendly Baumer TWAIN compatible image capture and camera control software



shown lens needs to be ordered separately

1. Overview

Sensor	1/2" progressive scan CMOS technology				
Shutter / readout mode	rolling curtain type shutter / progressive scan readout sequential shutter with global reset all lines				
Number of pixel	2048 x 1536				
Scan area	6.55 mm x 4.92 mm				
Pixel size	3.2 µm x 3.2 µm				
Color filter	RGB Bayer mosaic				
Operation modes					
Trigger mode	yes, rolling / sequential shutter operation (see application note)				
Free running mode	yes, rolling shutter operation				
Signal processing					
real-time software programmable					
Pixel clock / scan speed	40 MHz fast scan				
A/D converter	10 bit				
Exposure control (t _{exp})	total: 128 µsec .. 2 sec 128 µsec .. 2 sec: step 128 µsec				
Gain control	0 .. 9 dB				
Offset (black level)	permanent automatic analog offset correction, digital offset correction 0 .. 1023 LSB (10 bit)				
Image data buffer	16 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	2048 x 1536	8	40	10	100 msec
Binning 2x2 **)	1024 x 768	8	40	27	37 msec
Binning 3x3 **)	640 x 480	8	40	40	25 msec
Partial scan function ***)	yes, format freely programmable in full frame				
Brightness correction function **)	no				

Technical specifications subject to change

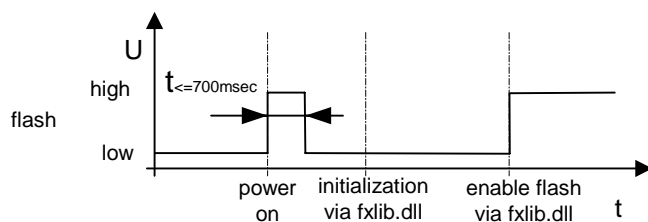
Test pattern function	yes, in all modes
Data quality	at 20 °C, gain = 1, exposure time = 32 msec full frame mode, fast scan
Readout noise	$\sigma < 0.45$ (8 bit) typical
Dynamic range	typical > 55 dB
Optical interface	C-Mount
Optical filter	Hoya CM500S option: dust protection or no filter
Process interface 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, delay up to 500 msec
Asynchronous reset	no
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}): 4 μ sec max. trigger delay (t_{delay}): 4 μ sec
Digital output	1: flash sync signal or readout active signal selectable, output 12 V / 20 mA low active ****)
LED	green: power on / yellow: data transmission active
Power consumption	approx. 4 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 50 mm ³
Weight	285 g
IEEE1394a interface	400 Mbit / sec
Software	Baumer FCAM1394 driver (OHCI standard compliant) SDK for Windows 2000 / Windows XP / Linux Kernel 2.4.>22, 2.6.xx Baumer TWAIN image capture and camera control software

- *) maximum frame rate in free running mode, effective frame rates depending on SDK image mode settings and set exposure time
 **) increased brightness is not available due to the brightness is permanent corrected in the camera
 ***) when using partial scan in full frame mode the exposure time might be reduced depending on the set region of interest
 ****) 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	rolling shutter / 100 msec
Gain control	factor 1 = 0 dB
Offset (black level)	-
Image acquisition	
Camera image format mode	mode ID = 20: full frame (see item 3)
Partial scan function	not active
Electrical interface	
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	FWXC30c				
Camera mode	SDK image mode				
	Mode ID	Description	Image format	Color coding	Functions / State
Full Frame fast	20	Full Frame	2048 x 1536	RawBayer8, Mono8, Color3x8	PS, T, F, SM, Color
	42	Center Scan VGA	640 x 480	RawBayer8, Mono8, Color3x8	T, F, SM, Color
	44	Center Scan SVGA	800 x 600	RawBayer8, Mono8, Color3x8	T, F, SM, Color
	46	Center Scan XGA	1024 x 768	RawBayer8, Mono8, Color3x8	T, F, SM, Color
	48	Center Scan SXGA	1280 x 1024	RawBayer8, Mono8, Color3x8	T, F, SM, Color
	50	Center Scan UXGA	1600 x 1200	RawBayer8, Mono8, Color3x8	T, F, SM, Color
Binning 2x2 fast	22	Binning 2x2	1024 x 768	RawBayer8, Mono8, Color3x8	T, F, SM, Color
Binning 3x3 fast	24	Binning 3x3	640 x 480	RawBayer8, Mono8, Color3x8	T, F, SM, Color

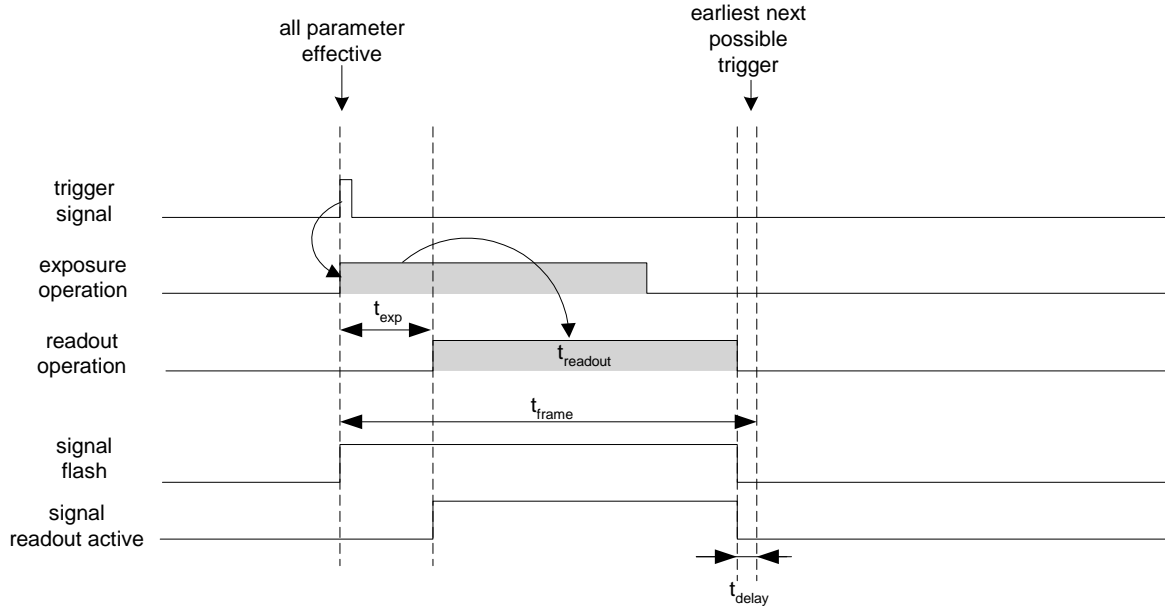
SDK - Software Development Kit
 PS - partial scan
 T - trigger
 F - flash
 SM - shutter mode
 Color - color mode

RawBayer8 - unmanipulated pixel data in Bayer filter pattern 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

4.1 Trigger Mode

4.1.1 Rolling Shutter



$$t_{frame} = t_{exp} + t_{readout} + t_{delay}$$

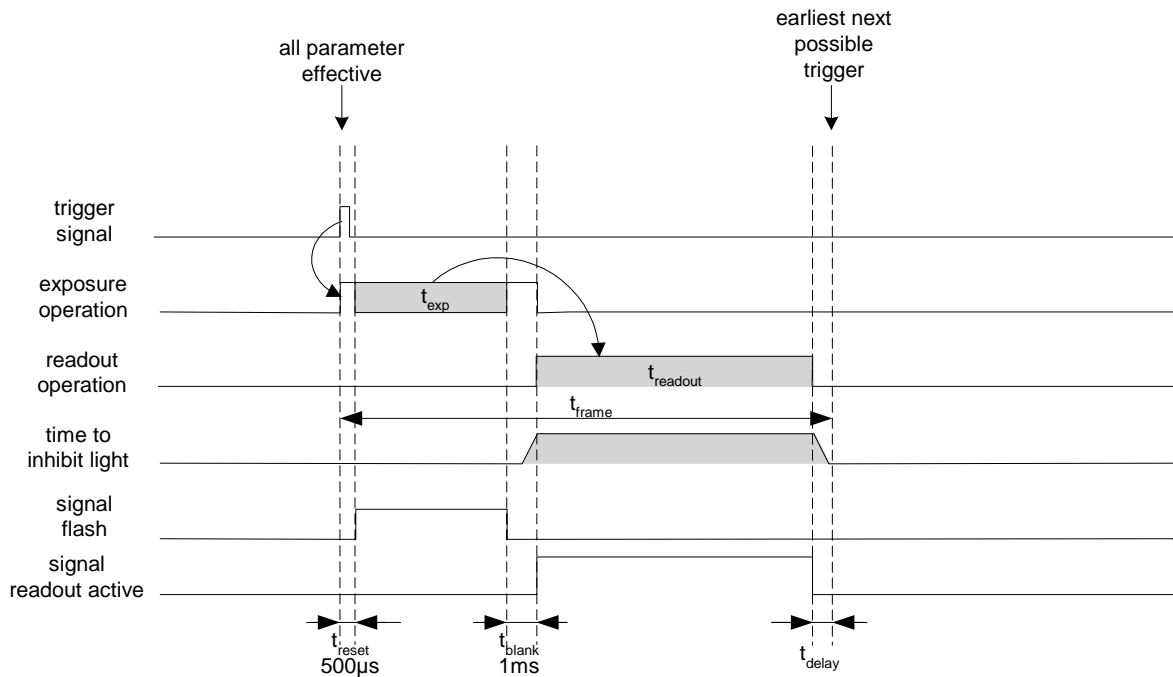
$$\begin{aligned} t_{exp} < t_{readout}: & \quad t_{delay} = t_{readout} \\ t_{exp} > t_{readout}: & \quad t_{delay} = t_{exp} \end{aligned}$$

Maximum trigger frequency:

$$\text{Frames per second}_{max} = \frac{1}{t_{exp} + t_{readout} + t_{delay}}$$

* image parameter: exposure time
mode
color gain
partial scan

4.1.2 Sequential Shutter (see [application note](#))



$$t_{frame} = 1.5 \text{ msec} + t_{exp} + t_{readout} + t_{delay}$$

$$\begin{aligned} t_{exp} < t_{readout}: & \quad t_{delay} = t_{readout} \\ t_{exp} > t_{readout}: & \quad t_{delay} = t_{exp} \end{aligned}$$

- * image parameter: exposure time
- mode
- color gain
- partial scan

Application Note:

When using the mode sequential shutter operation, the sensor is still accumulating light during the readout time ($t_{readout}$). Therefore the sensor need to be protected against ambient light during this time (time **to inhibit** light).

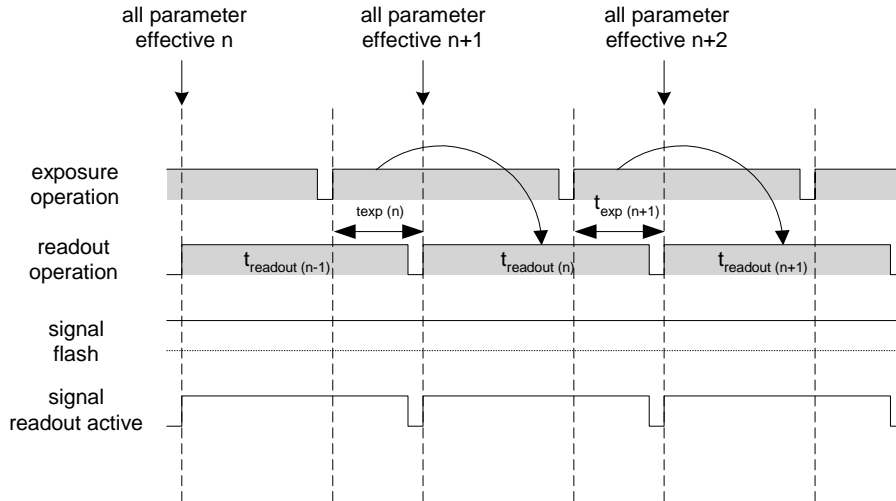
For best operation the use of a flash light and closed housing is recommended.

Maximum trigger frequency:

$$\text{Frames per second}_{max} = \frac{1}{1.5 \text{ msec} + t_{exp} + t_{readout} + t_{delay}}$$

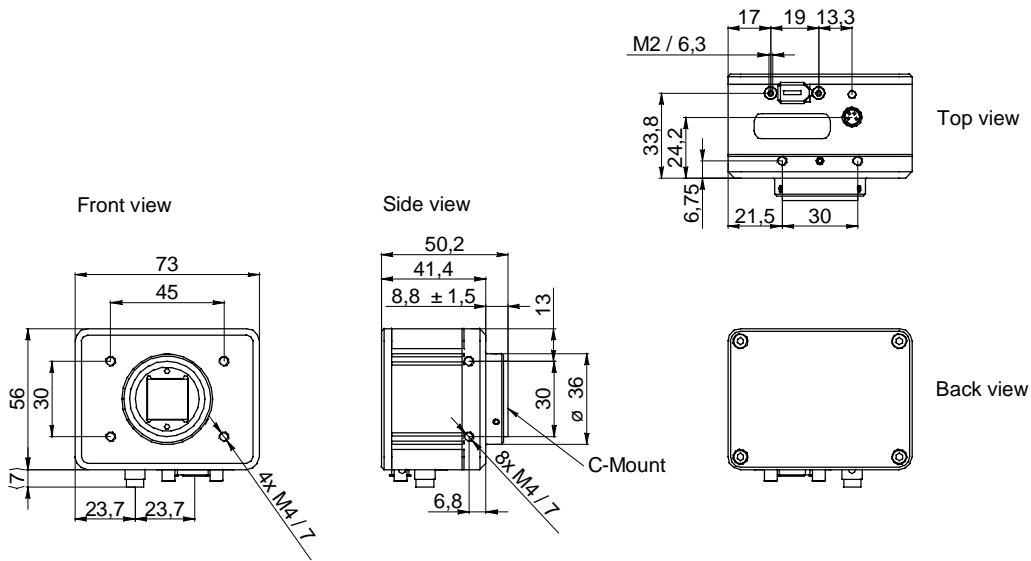
4.2 Free Running Mode

4.2.1 Rolling Shutter



* image parameter: exposure time
mode
color gain
partial scan

5. Housing



6. Connectors / Electrical Interfaces

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

Trigger / Flash	Type: 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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