Digital Color
Progressive Scan Camera

System: **Gigabit Ethernet**

Baumer TXG08c-P

Revision 2

Art. No: OD108720

- Gigabit Ethernet progressive scan CCD camera
- 1028 x 772 pixel
- Up to 28 full frames per second
- GigE Vision™ standard compliant
- Supported Power over Ethernet
- On board integrated color processor for high quality color calculation
- Outstanding image quality
- High sensitivity and dynamic range
- High quality slow scan mode for lowest readout noise
- True partial scan function (ROI) for increased frame rates
- External synchronization via industrial compliant process interface (trigger / flash)
- Integrated supplementary function for flexible integration
- Jumbo frames supported
- Integrated 32 MByte RAM for temporarily image data buffering
- Camera parameter programmable in real-time
- Ultra compact and lightweight aluminum housing
- Standard RJ45 connector
- Screw-lock type industrial connector
- Baumer-GAPI: Flexible, generic software interface for Windows / Linux

shown lens needs to be ordered separately

1. Overview

Model Name	**TXG08c**
Sensor	1/3“ interline progressive scan CCD
Shutter / readout mode	global shutter / progressive scan readout
Number of pixel	1028 x 772
Scan area	4.78 mm x 3.59 mm
Pixel size	4.65 µm x 4.65 µm
Color filter	RGB Bayer mosaic
Operation modes	
Trigger mode	yes, overlapped operation
Free running mode	yes, overlapped operation
Signal processing	real-time software programmable
Pixel clock	29.75 MHz fast scan / 14.87 MHz high quality (HQ) scan
A/D converter	12 bit
Exposure control (t_{exp})	total: 4 µsec .. 60 sec step: 1 µsec
Gain control	0 .. 20 dB
Offset (black level)	0 .. 255 LSB (12 bit)
Image data buffer	max. 7 images

Image acquisition								
Camera image format modes	**Format (pixel)**	**Gen<t>Cam standard**	**Format ID**	**Pixel format**	**Pixel clock MHz**	**Frames per sec. *)**	**$t_{readout}$**
Full frame HQ slow	1028 x 772	Vendor specific	00	BayerRG8	14.87	14	71 msec
				BayerRG12			
				Mono8			
				YUV411 Packed			
				YUV422 Packed **)			
				YUV444 Packed			
				RGB8 Packed			
				BGR8 Packed			
Full frame fast	1028 x 772	yes	01	BayerRG8	29.75	28	36 msec
				BayerRG12			
				Mono8			
				YUV411 Packed			
				YUV422 Packed **)			
				YUV444 Packed			
				RGB8 Packed			
				BGR8 Packed			
Standard features							
Image size controls							
Pixel format	BayerRG8, BayerRG12, Mono8, YUV411 Packed, YUV422 Packed, YUV444 Packed, RGB8 Packed, BGR8 Packed						
Test image selector	yes, in all modes Off, GreyHorizontalRamp, GreyVerticalRamp, HorizontalLineMoving, VerticalLineMoving HorizontalAndVerticalLineMoving						
Partial scan	yes, format freely programmable in all modes						
Analog controls							
Gain	yes						
Black Level (Off set)	yes						
Gamma	no						
Acquisition and Trigger							
Acquisition mode	Continuous						
Trigger source	HardwareTrigger (Line0), SoftwareTrigger, CommandTrigger (ActionCommand), All or Off						
Trigger delay	0 .. 2 sec, 512 trigger can be tracked, step: 1 µsec						
Sequencer	no						
Digital I/O							
Lines	Line0 (Input), Line1 (Output)						
Line source (outputs only)	Line1: Off, ExposureActive or UserOutput						
Line debouncer	yes, low and high signal separately selectable 0 .. 5 msec step: 1µsec						
Event Generation							
Events	GigEVisionError, EventLost, Line0RisingEdge, Line0FallingEdge, Line1RisingEdge, Line1FallingEdge, ExposureStart, ExposureEnd, FrameStart, FrameEnd, TriggerReady, TriggerOverlapped, TriggerSkipped						
Event Notification	yes, ON / OFF						
Counters and Timers							
Framecounter	yes, 2^{32} can be set by user						
LUT Controls							
LUT selector	no						
Defect pixel correction (custom)	yes, ON / OFF						
Defect pixel list (custom)	yes, max. 256 pixel coordinates (x, y) can be stored						
GigEVisionTransportLayer							
PayLoadsize	4 Byte .. 2.390.384 Byte						
UserSets							
User set selector	Default (factory settings / read only) UserSet1, UserSet2, UserSet3 (read and write)						
UserSetDefaultSelector	yes, define the start up “UserSet”						

Advanced features			
Time stamp function	yes, 64 bit tick = 32 nsec		
Asynchronous message channel	yes		
Concatenation function	yes		
User defined identifier	yes, user programmable permanent identifier		
ActionCommand	yes, ID 0 = Trigger		
Data quality	at 20 °C, gain = 1, exposure time = 32 msec, full frame mode, slow scan		
Readout noise	σ < 0.5 LSB (8 bit) typical		
Dynamic range	typical > 54 dB		
Optical interface	C-Mount on request: CS-Mount		
Optical filter	Hoya E-CM500S on request: dust protection, daylight filter or no filter		
Process interface functions			
Async. Trigger	yes, trigger mode operation, “Off”, “software trigger”, “hardware trigger”, “command trigger” or “all” separately selectable (overtriggered signals and trigger signals during the readout time will be notified in the received image header)		
Exposure Active (External flash sync)	yes, delay_value ($t_{delay\ flash}$) ≤ 4 µsec, duration_value ($t_{duration}$): slow mode = t_{exp} + 100 µsec fast mode = t_{exp} + 50 µsec		
User Output	yes, ON / OFF		
Software reset	yes, delay up to 102 msec		
Asynchronous reset	Full frame	slow fast	delay up to 13.9 msec 7.2 msec
Image info header	yes		
Electrical interface			
Data / control	standard single cable 1000 Base-T, Cat6 recommended / minimum Cat5e option: screw lock type connector		
Power	VCC: Power over Ethernet (PoE), Class 0 device (via 1000 Base-T cable) VCC: 20 VDC .. 57 VDC ***) I: 190 mA .. 61 mA		
Power consumption	approx. 3.7 Watt		
Digital input	Line 0: trigger signal, opto decoupled $U_{IN(low)}$ = 0 .. 4.5 VDC, $U_{IN(high)}$ = 11 .. 30 VDC I_{IN} = max. 10 mA rising edge (invert = false) ****) min. impulse length (t_{min}): 2 µsec trigger delay out of $t_{readout}$ ($t_{delay\ trigger}$): 4 µsec max. trigger delay during $t_{readout}$ ($t_{delay\ trigger}$): slow mode = 100 µsec fast mode = 50 µsec		
Digital output	Line 1: opto decoupled U_{EXT} = 5 .. 30 VDC / 24 VDC typical, I_{OUT} = max. 16 mA high active (invert = false) ****)		
LED	1: green: Power on yellow: Readout active 2: green: Link active green flash: Receiving 3: red: Transmitting		
Environmental			
Storage temperature	-10 °C .. +70 °C		
Operating temperature	+5 °C .. +50 °C *****) between +39 °C .. +50 °C, note the max. housing temperature		
Housing operating temperature	max. +50 °C		
Humidity	10 % .. 90 % non condensing		
Conformity	CE, FCC Part 15 class B, RoHS compliant		

Housing	aluminum
Dimensions	36 x 36 x 58 mm^3
Weight	< 110 g
1000 Base-T interface	1000 Mbit / sec
Ethernet IP configuration	persistent IP / DHCP / LLA
Stream channel packet size	576 Byte (default) .. 16 kByte jumbo frames supported
Interpacketgap	0 .. 2^{32}-1 ticks
Resend function	yes
Software	Baumer-GAPI SDK with supported OS socket driver and Baumer filter driver / SDK for Windows XP (32 bit) / Windows Vista (32 bit / 64bit) Linux Kernel 2.6.xx (64 bit / 32 bit)
	GigE Vision™ compatible programs and image processing libraries supported Windows / Linux depending on the actually driver software is used

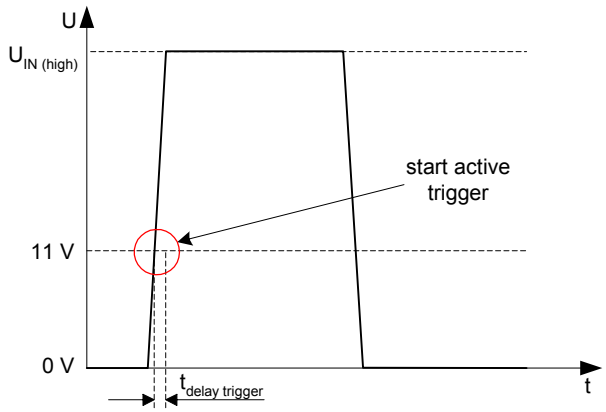
*) maximum frame rate in free running mode, effective frame rate depending on camera image format mode settings and set exposure time ($t_{exp} < t_{readout}$)
**) default pixel format
***) between 38 VDC and 57 VDC IEEE802.3 clause 33 conform
****) can be inverted via software
*****) housing temperature is limited by CCD sensor specification

2. Camera Factory Settings after Camera Start-up

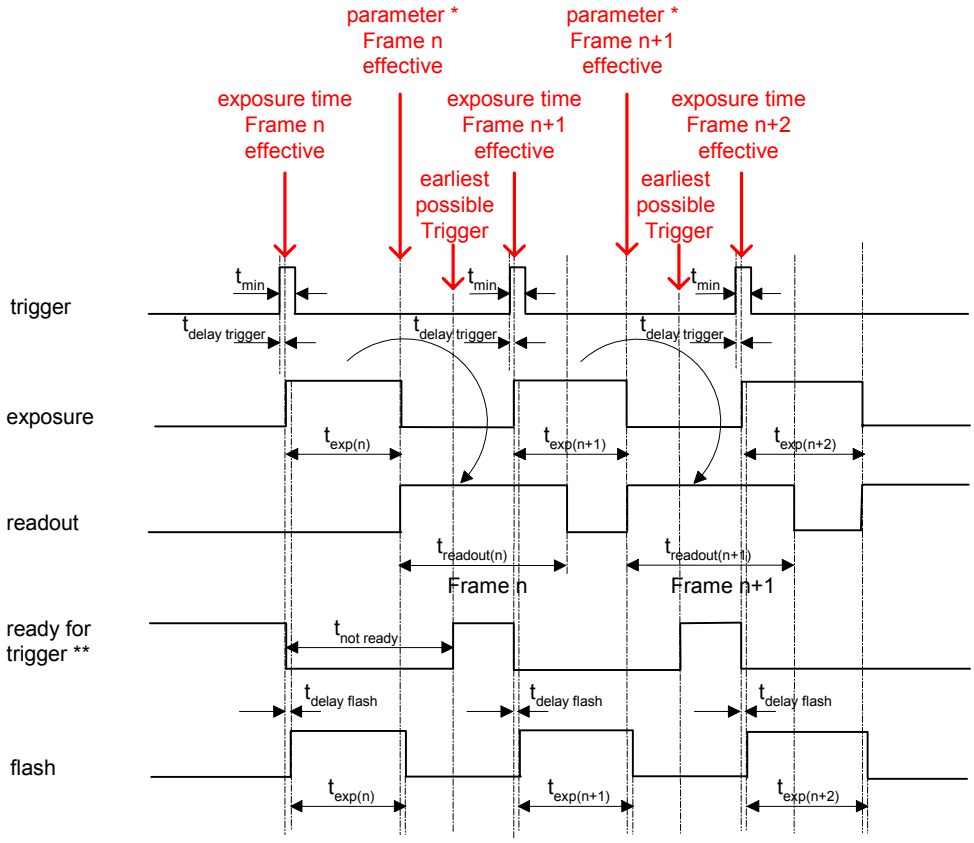
	Camera factory settings after camera start-up
Operation modes	free running mode
Signal processing	
Exposure control	32 msec
Gain control	factor 1 = 0 dB
Offset (black level)	0
Image acquisition	
Camera image format mode	mode id = 01, full frame YUV422 Packed
Partial scan function	not active
Test image selector	Off
Defect pixel correction	On
Electrical interface	
Exposure Active (External flash sync)	disabled, digital output set to low status (high impedance) invert = false line source = Exposure Active
Async. Trigger	disabled invert = false trigger source = Line0

3. Timing Operation Modes

Trigger Mode: start up time



Trigger Mode: trigger mode 0, overlapped trigger



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

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

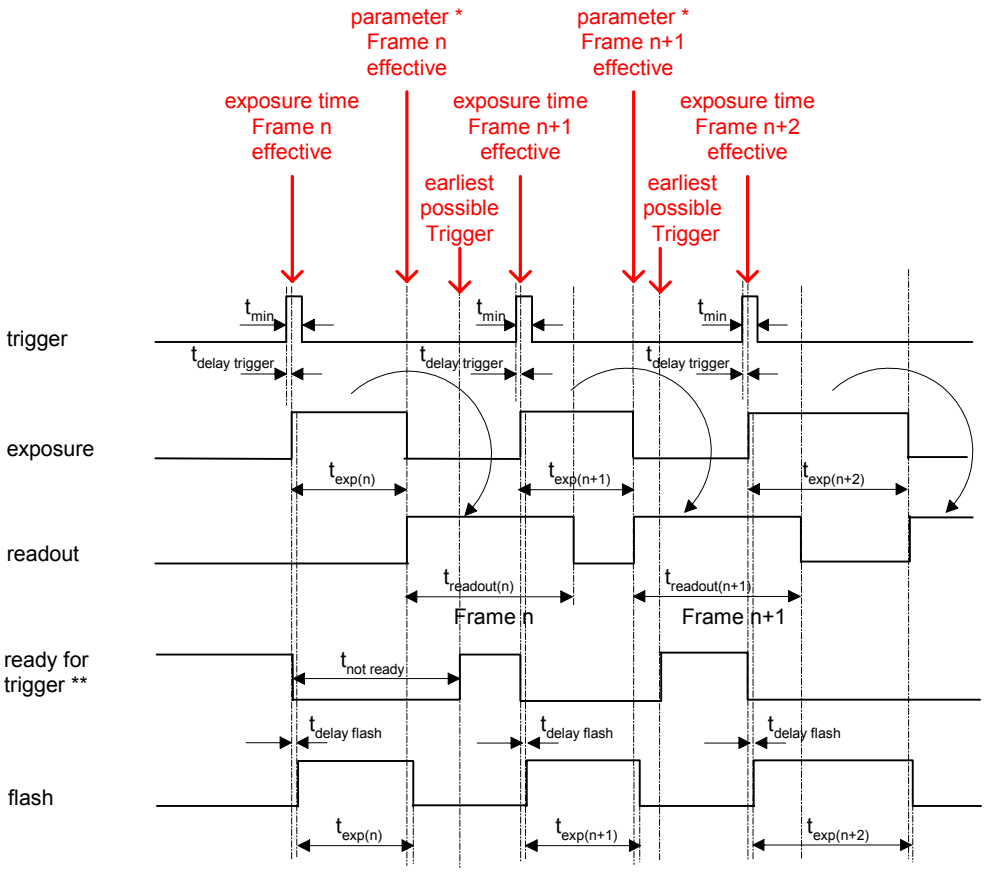
$t_{exp} < t_{readout}$: $t_{not\ ready\ (n+1)} = t_{exp(n)} + t_{readout(n)} - t_{exp(n+1)}$

$t_{exp} > t_{readout}$: $t_{not\ ready\ (n+1)} = t_{exp(n)}$

* image parameter: offset
global gain
mode
partial scan

** signal will be notified as event “TriggerReady” and is not available as digital output

Trigger Mode: trigger mode 0, overlapped trigger , when $t_{exp\ (n+2)} > t_{exp\ (n+1)}$



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

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

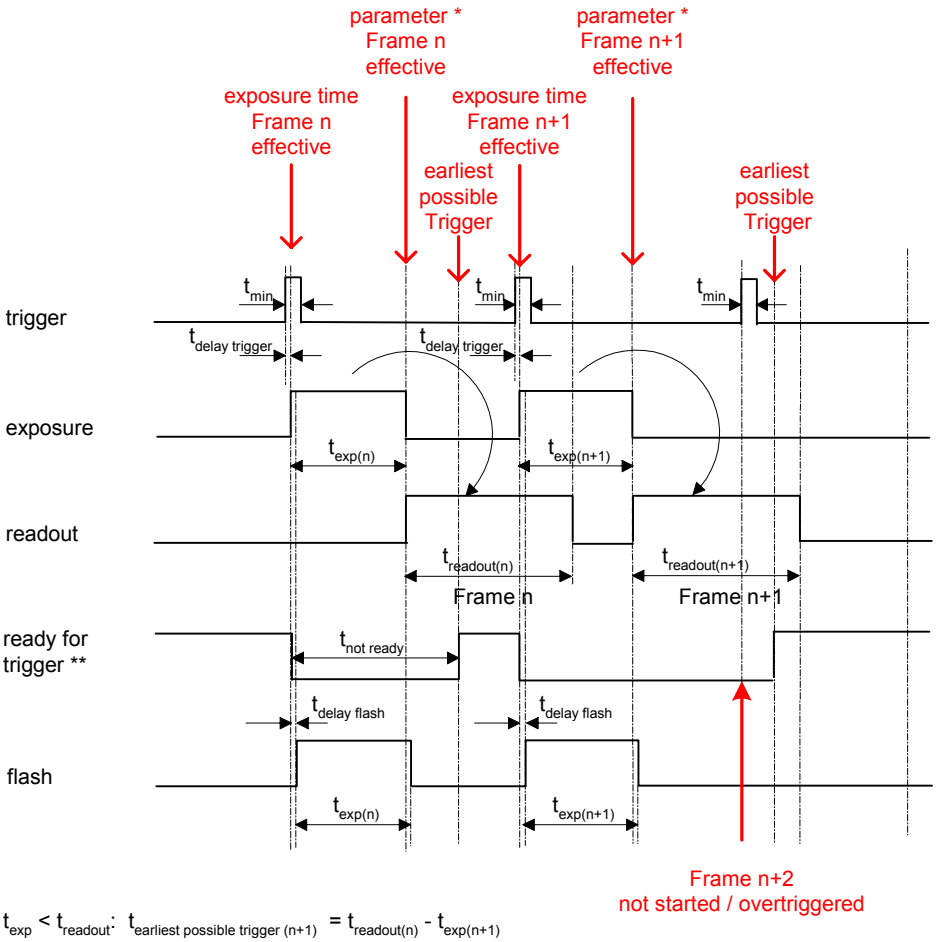
$t_{exp} < t_{readout}$: $t_{not\ ready\ (n+1)} = t_{exp(n)} + t_{readout(n)} - t_{exp(n+1)}$

$t_{exp} > t_{readout}$: $t_{not\ ready\ (n+1)} = t_{exp(n)}$

* image parameter: offset
global gain
mode
partial scan

** signal will be notified as event “TriggerReady” and is not available as digital output

Trigger Mode: trigger mode 0, overlapped trigger , when $t_{exp\ (n+2)} < t_{exp\ (n+1)}$



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

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

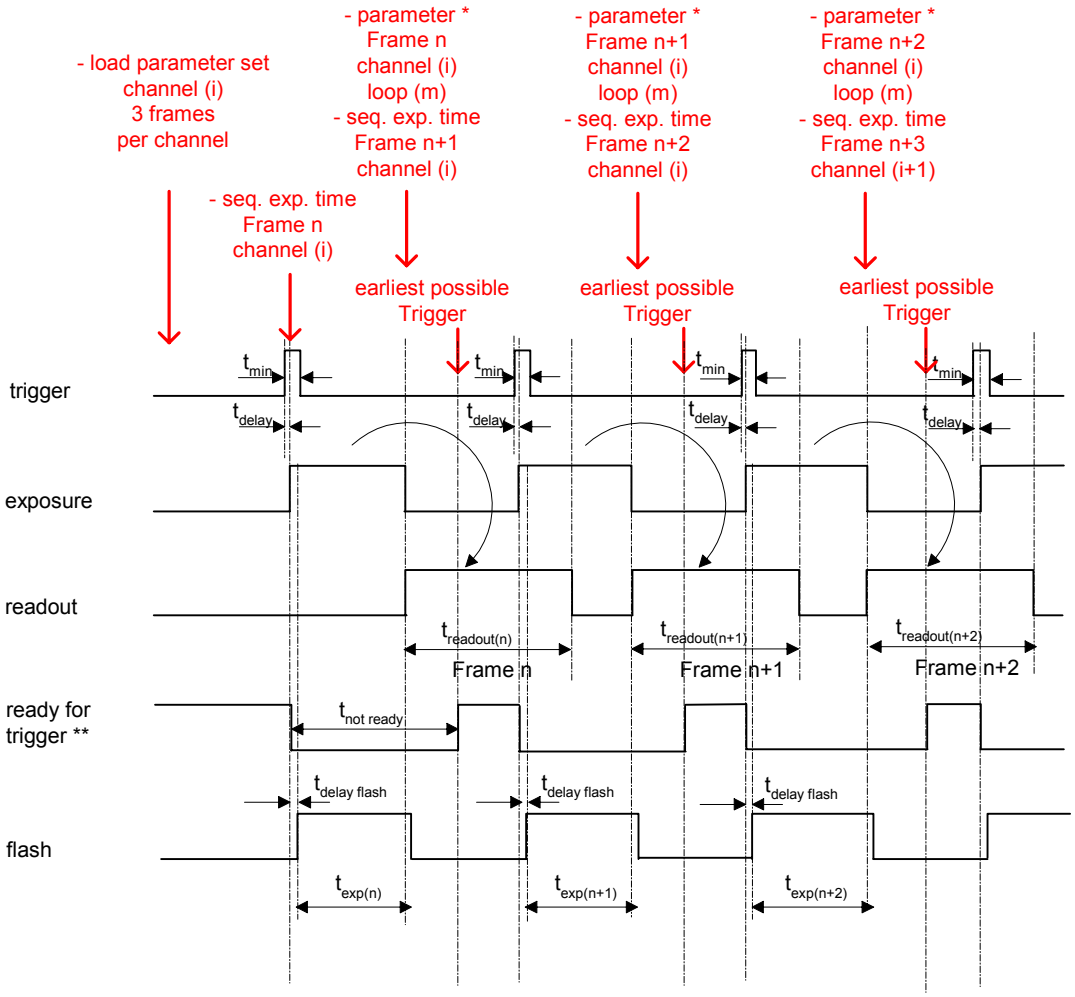
$t_{exp} < t_{readout}$: $t_{not\ ready\ (n+1)} = t_{exp(n)} + t_{readout(n)} - t_{exp(n+1)}$

$t_{exp} > t_{readout}$: $t_{not\ ready\ (n+1)} = t_{exp(n)}$

* image parameter: offset
global gain
mode
partial scan

** signal will be notified as event “TriggerReady” and is not available as digital output

Trigger Mode: overlapped trigger sequence (example for 3 frames per channel with hardware trigger)



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

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

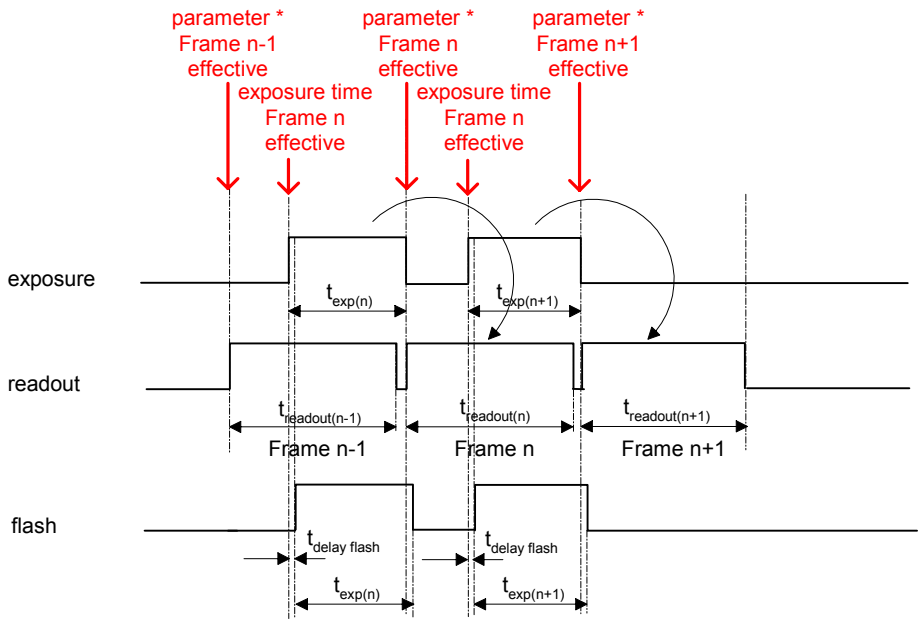
$t_{exp} < t_{readout}$: $t_{not\ ready\ (n+1)} = t_{exp(n)} + t_{readout(n)} - t_{exp(n+1)}$

$t_{exp} > t_{readout}$: $t_{not\ ready\ (n+1)} = t_{exp(n)}$

* image parameter: offset
sequence
global gain
mode

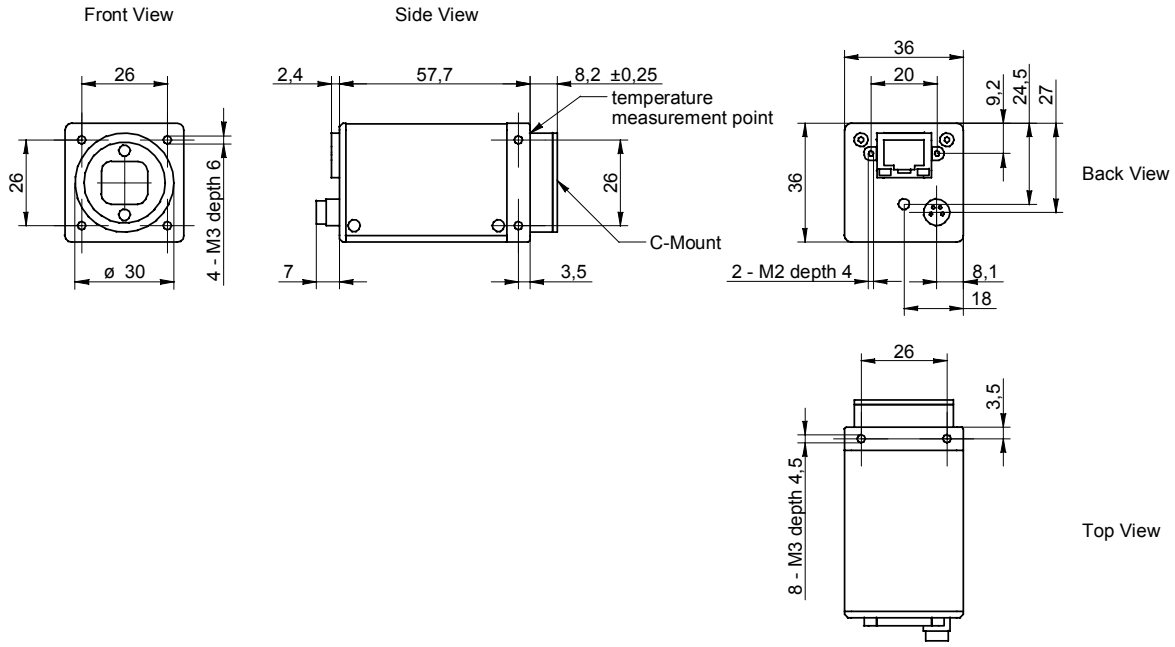
** signal will be notified as event “TriggerReady” and is not available as digital output

Free Running Mode: overlapped operation



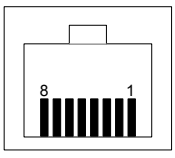
* image parameter: offset
global gain
mode
partial scan

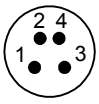
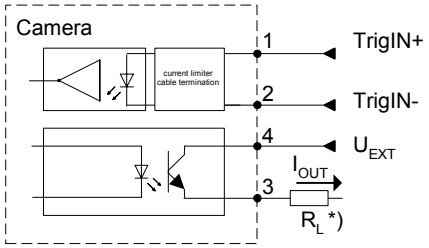
4. Housing



5. Connectors / Electrical Interfaces

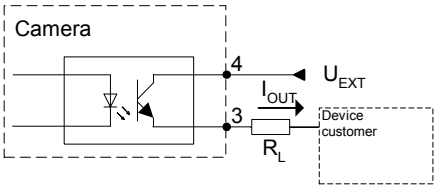
5.1 Pin assignment:

Data / Control 1000 Base-T	Type: RJ45 8P8C mod jack
	1: MX1+ (negative / positive V_{port}) 2: MX1- (negative / positive V_{port}) 3: MX2+ (positive / negative V_{port}) 4: MX3+ 5: MX3- 6: MX2- (positive / negative V_{port}) 7: MX4+ 8: MX4-

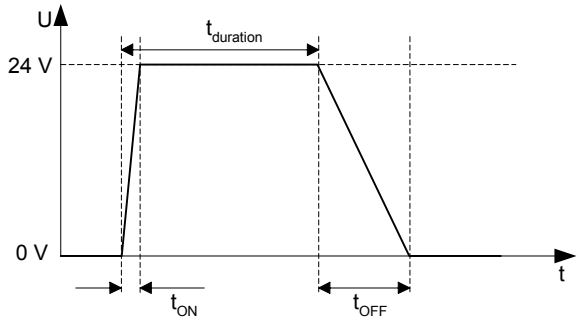
Trigger / Flash	Type: Lumberg RSMESD 4pin.
	 *) resistor must be used, I_{OUT} = 16 mA by U_{EXT} = 24 VDC recommended, drawing shown above example for using high active signal
	Trigger / Flash cable wires color *): 1 = brown 2 = white 3 = blue 4 = black

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

5.2 Flash sync sample U_{EXT} = 24 VDC high active:



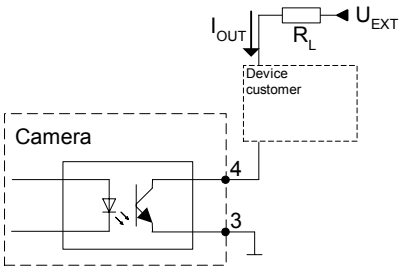
Timing example:
measurement condition U_{EXT} = 24 VDC / I_{OUT} = 16 mA
R_L = 1.5 kOhm



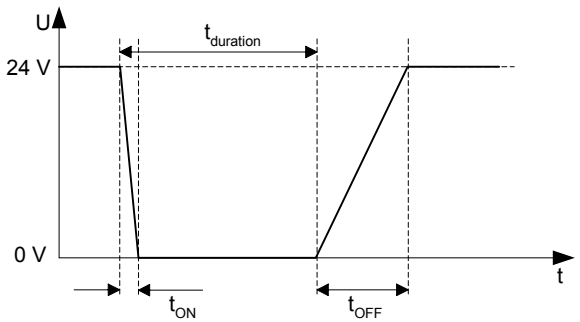
t_{ON} time = typ. 2 µsec

t_{OFF} time = typ. 40 µsec

5.3 Flash sync sample U_{EXT} = 24 VDC low active:



Timing example:
measurement condition U_{EXT} = 24 VDC / I_{OUT} = 16 mA
R_L = 1.5 kOhm



t_{ON} time = typ. 2 µsec

t_{OFF} time = typ. 40 µsec

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