Digital Color
Progressive Scan Camera

System: **Gigabit Ethernet**

Baumer TXG06c-I7

Revision 2

Art. No: OD108709

- Gigabit Ethernet progressive scan CCD camera
- 776 x 578 pixel
- Up to 64 full frames per second
- GigE Vision™ standard compliant
- 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
- IP67 camera housing design based on EHEDG recommendation
- Standard M12 industrial connector
- Baumer-GAPI: Flexible, generic software interface for Windows / Linux

shown lens and tubes need to be ordered separately

1. Overview

Model Name	**TXG06c**
Sensor	1/2“ interline progressive scan CCD
Shutter / readout mode	global shutter / progressive scan readout
Number of pixel	776 x 578
Scan area	6.44 mm x 4.80 mm
Pixel size	8.3 µm x 8.3 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	40 MHz fast scan / 20 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. 15 images

Image acquisition								
Camera image format modes		**Format (pixel)**	**GenICam standard**	**Format ID**	**Pixel format**	**Pixel clock MHz**	**Frames per sec. *)**	**$t_{readout}$**
Full frame HQ	slow	776 x 578	Vendor specific	00	BayerRG8	20	32	31 msec
					BayerRG12			
					Mono8			
					YUV411 Packed			
					YUV422 Packed **)			
					YUV444 Packed			
					RGB8 Packed			
					BGR8 Packed			
Full frame	fast	776 x 578	yes	01	BayerRG8	40	64	15.5 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 .. 1.345.856 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} + 49 µsec fast mode = t_{exp} + 25 µsec		
User Output	yes, ON / OFF		
Software reset	yes, delay up to 102 msec		
Asynchronous reset	Full frame	slow fast	delay up to 6.8 msec 3.5 msec
Image info header	yes		
Electrical interface			
Data / control	standard single cable 1000 Base-T with M12 connector, Cat6 recommended / minimum Cat5e		
Power	VCC: 8 VDC .. 30 VDC I: 450 mA .. 135 mA		
Power consumption	approx. 4 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 = 49 µsec fast mode = 25 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 Phy (1 GBit) green flash: Ethernet RX yellow: Ethernet TX yellow/red flash: Ethernet RX/TX		
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	∅ 65 mm x 50 mm			
Weight camera	< 360 g			
Weight tube	52 mm	62 mm	71 mm	94 mm
	< 120 g	< 140 g	< 150 g	< 200 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			

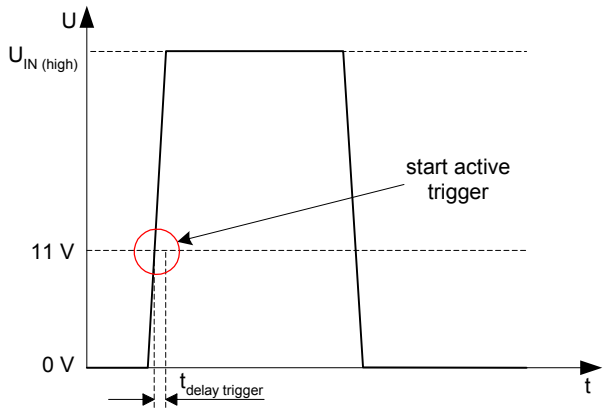
*) maximum frame rate in free running mode, effective frame rate depending on camera image format mode settings and set exposure time ($t_{exp} < t_{readout}$)
**) default pixel format
***) can be inverted via software
****) housing temperature is limited by CCD sensor specification

2. Camera Factory Settings after Camera Start-up

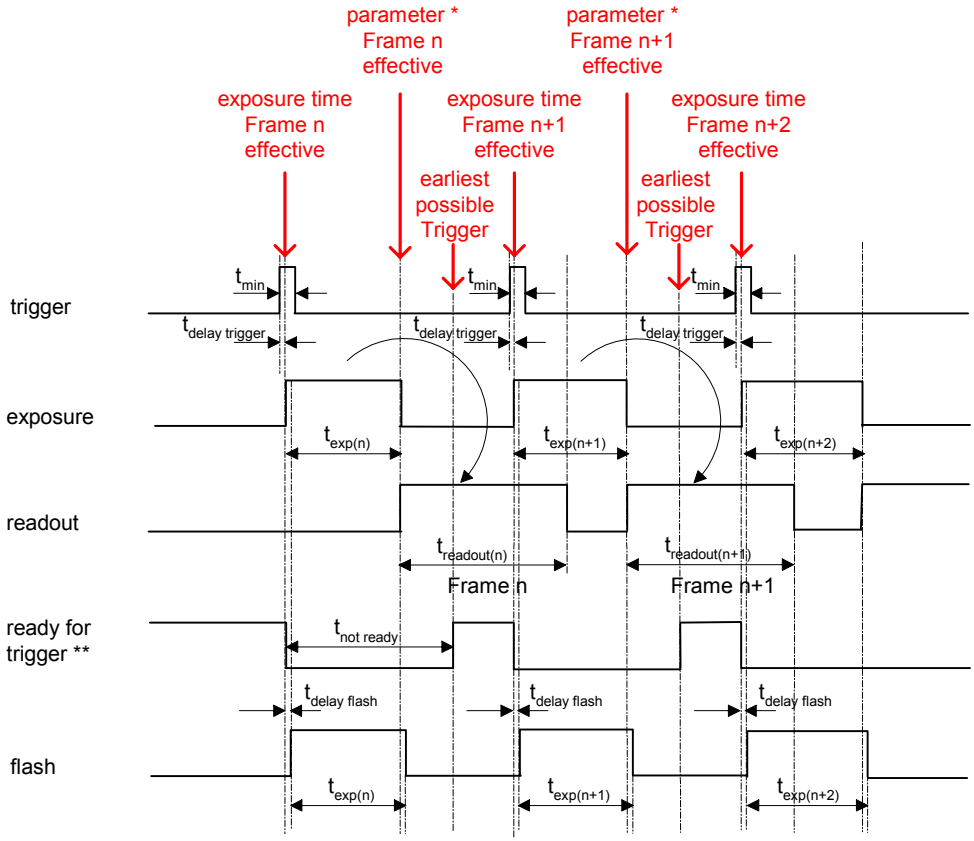
	Camera factory settings after camera start-up
Operation modes	free running mode
Signal processing	
Exposure control	32 msec
Gain control	factor 1 = 0 dB
Offset (black level)	0
Image acquisition	
Camera image format mode	mode id = 01, full frame YUV422 Packed
Partial scan function	not active
Test image 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



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

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

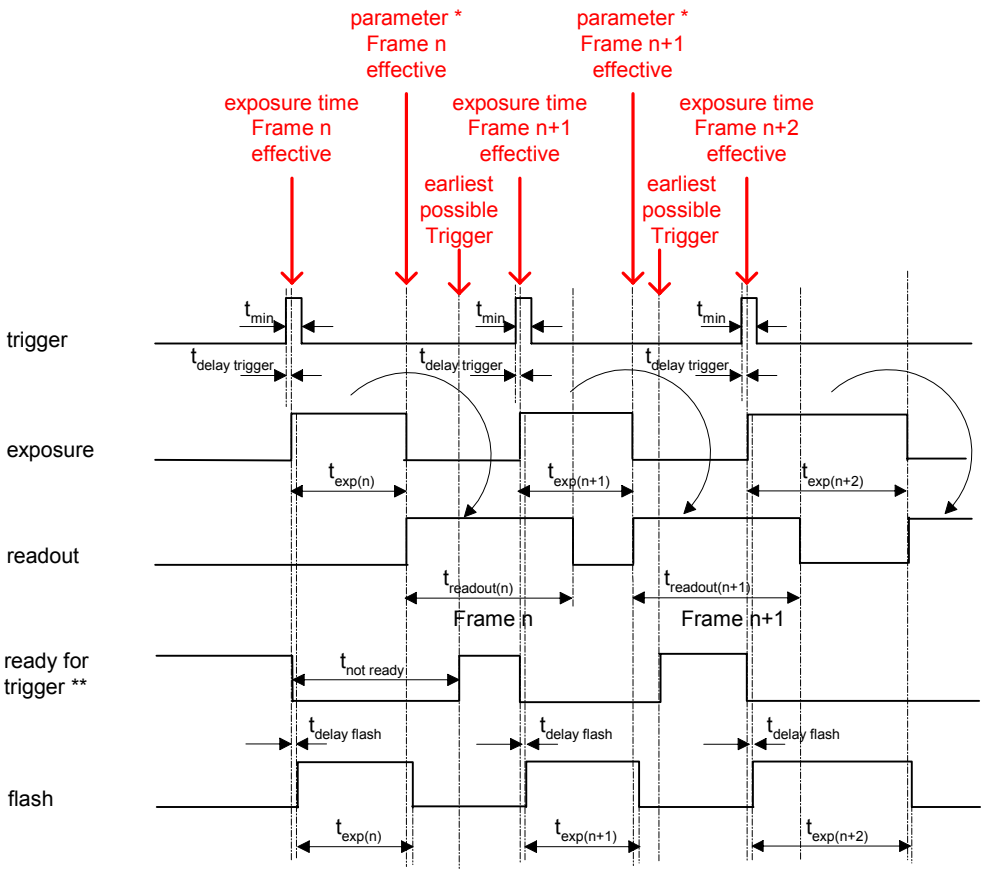
$t_{exp} < t_{readout}$: $t_{not\ ready\ (n+1)} = t_{exp(n)} + t_{readout(n)} - t_{exp(n+1)}$

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

* 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 $t_{exp\ (n+2)} > t_{exp\ (n+1)}$



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

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

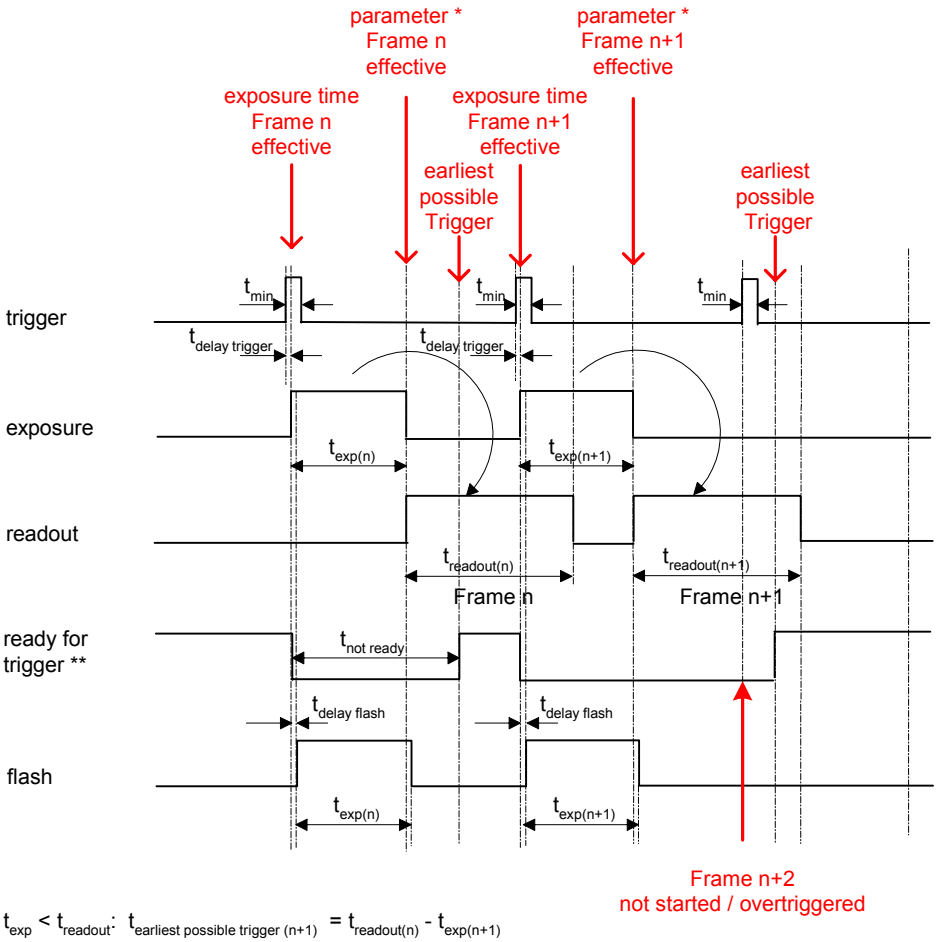
$t_{exp} < t_{readout}$: $t_{not\ ready\ (n+1)} = t_{exp(n)} + t_{readout(n)} - t_{exp(n+1)}$

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

* 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 $t_{exp\ (n+2)} < t_{exp\ (n+1)}$



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

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

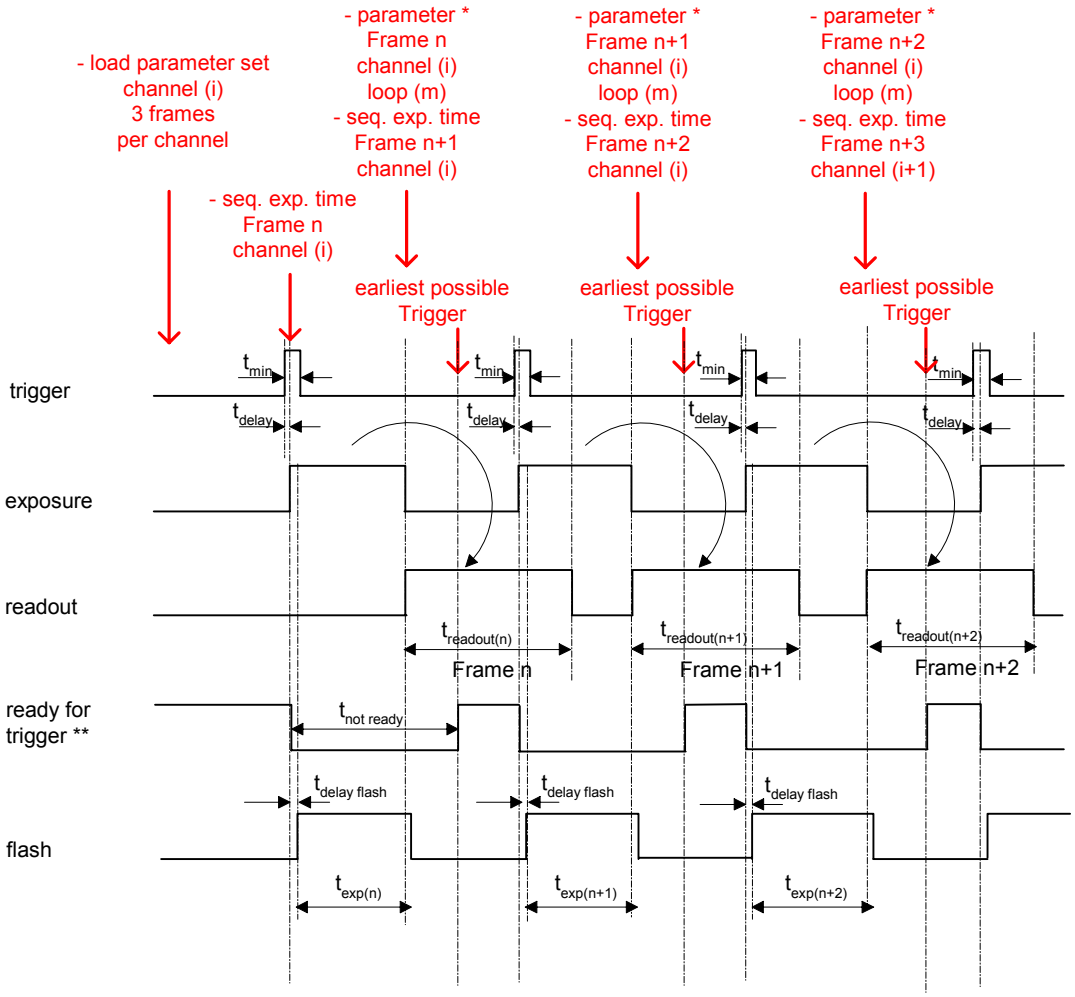
$t_{exp} < t_{readout}$: $t_{not\ ready\ (n+1)} = t_{exp(n)} + t_{readout(n)} - t_{exp(n+1)}$

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

* 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)



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

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

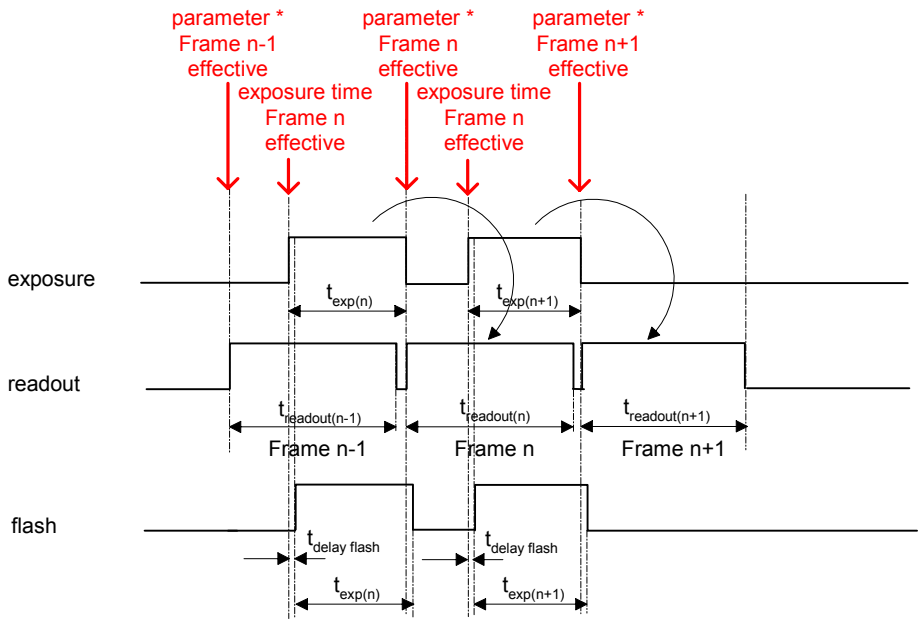
$t_{exp} < t_{readout}$: $t_{not\ ready\ (n+1)} = t_{exp(n)} + t_{readout(n)} - t_{exp(n+1)}$

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

* image parameter: offset
sequence global gain
mode

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

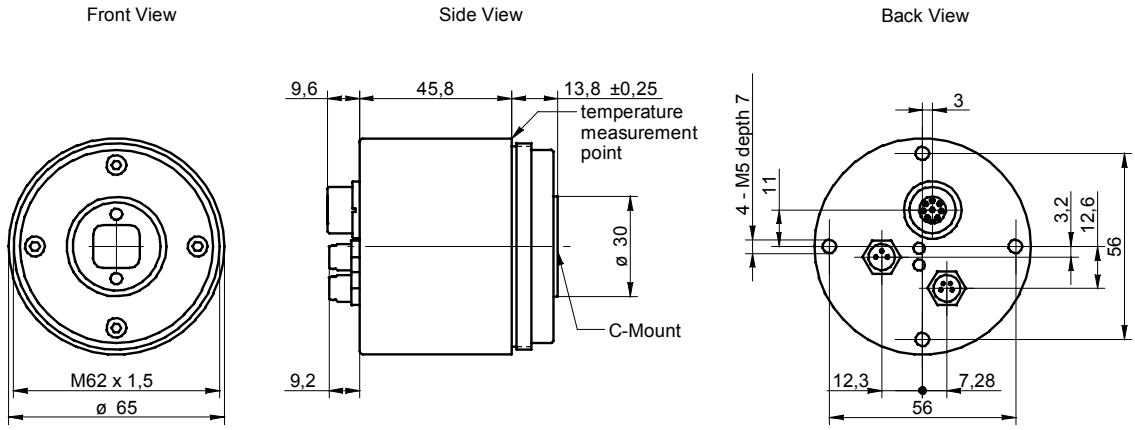
Free Running Mode: overlapped operation



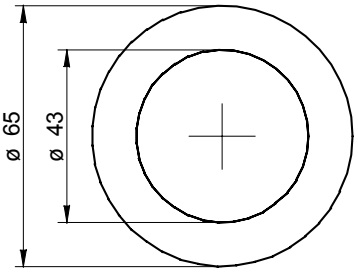
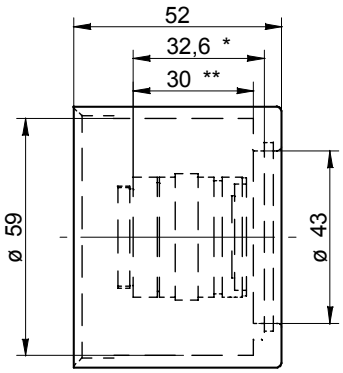
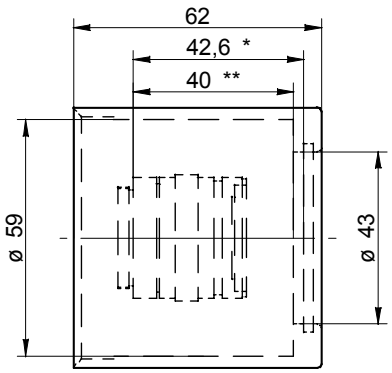
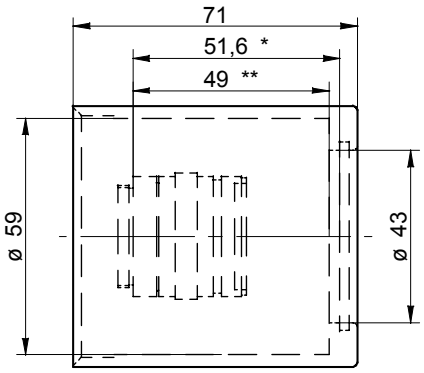
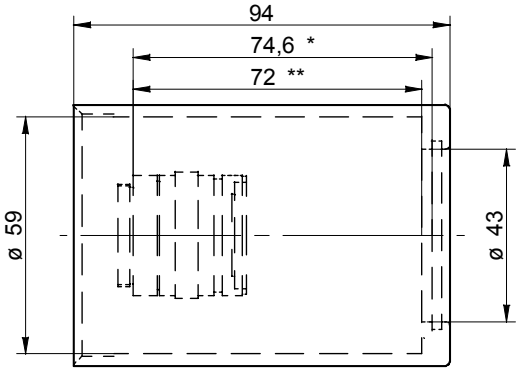
* image parameter: offset
global gain
mode
partial scan

4. Housing

4.1 Camera



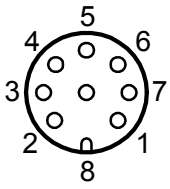
4.2 Tube

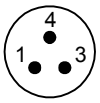
Front View	Side View	Item Number
		OD108571
		OD108568
		OD108569
		OD108570

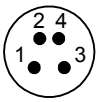
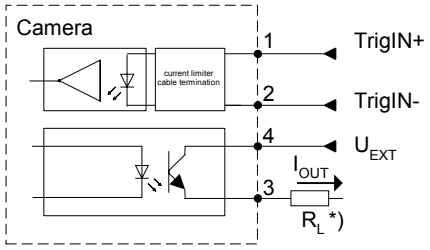
* max. installation space between C-mount and glass
** max. installation space between C-mount and cylinder bottom

5. Connectors / Electrical Interfaces

5.1 Pin assignment:

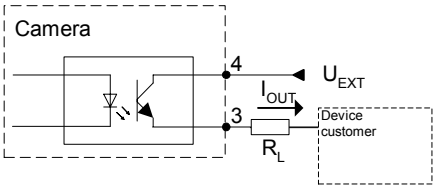
Data / Control 1000 Base-T	Type: female M12 / 8 pin A cod.
	1: MX3- 2: MX4+ 3: MX4- 4: MX1- 5: MX2+ 6: MX1+ 7: MX3+ 8: MX2-

Power	Type: Lumberg RSMESD / 3 pin
	1: Power VCC+ 3: GND 4: not used
	Power cable wires color: 1 = brown 3 = blue 4 = black

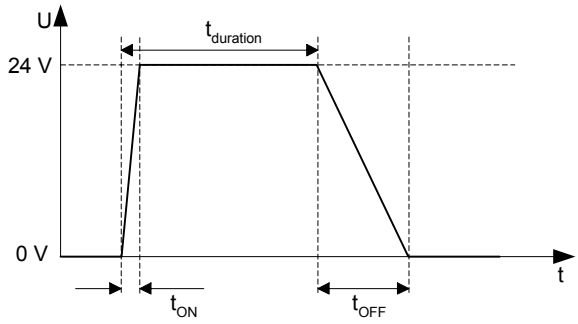
Trigger / Flash	Type: Lumberg RSMESD 4pin.
	 *) resistor must be used, I_{OUT} = 16 mA by U_{EXT} = 24 VDC recommended, drawing shown above example for using high active signal
	Trigger / Flash cable wires color *): 1 = brown 2 = white 3 = blue 4 = black

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

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

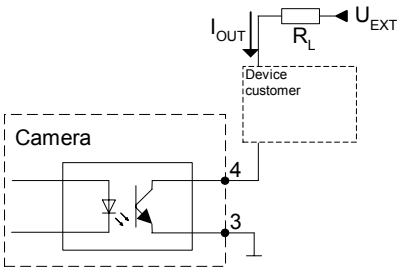


Timing example:
measurement condition U_{EXT} = 24 VDC / I_{OUT} = 16 mA
R_L = 1.5 kOhm

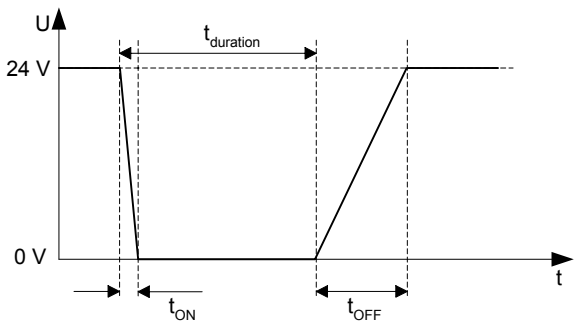


t_{ON} time = typ. 2 µsec
t_{OFF} time = typ. 40 µsec

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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