



## Device Information

Model Name	VCXU.2-241M
Vendor Name	Baumer

## Sensor Information

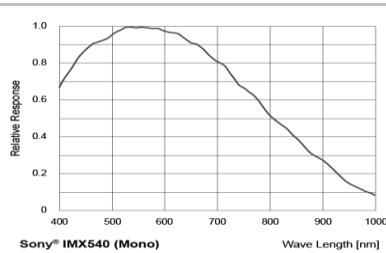
Sensor Name	Sony IMX540 Gen4
Type	4/3" progressive scan CMOS
Shutter	Global Shutter
Resolution	5312 x 4592 pixels
Scan Area	14.55 mm x 12.58 mm
Pixel Size	2.74 $\mu\text{m}$ x 2.74 $\mu\text{m}$

## Data Quality

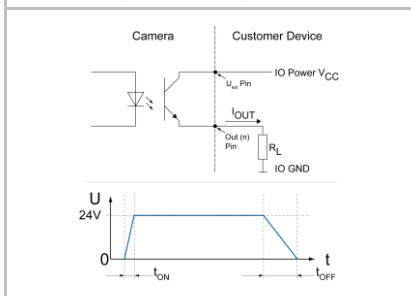
@ 20 °C, gain = 1, exposure time = 4 msec

Dark Noise ( $\sigma$ )	2.3 e- typical
Saturation	9300 e- typical
Dynamic Range	70 dB typical
SNR	40 dB typical
Quantum efficiency $\eta$	70% @ 536 nm typical

Sensor Graph: Relative Response



Digital Output: High Active



## Acquisition

Resolution	5312 px x 4592 px		
Interface Frame Rate (depends on used interface performance)	Format	Resolution	max. Frame Rate (@ Trigger Mode) <sup>2)</sup>
	Full Frame	5312 x 4592	15 fps
	Binning 2x2	2656 x 2296	61 fps
	Binning 2x1	2656 x 4592	15 fps
	Binning 1x2	5312 x 2296	15 fps
Acquisition Frame Rate <sup>1)</sup>	15 fps   $t_{\text{readout}} = 63.3 \text{ msec}$ (max. Res. Full Frame) @ 10 bit		
	14 fps   $t_{\text{readout}} = 67.2 \text{ msec}$ (max. Res. Full Frame) @ 12 bit		
	61 fps   $t_{\text{readout}} = 16.3 \text{ msec}$ (max. Res. Binning 2x2) @ 10 bit		
	54 fps   $t_{\text{readout}} = 18.3 \text{ msec}$ (max. Res. Binning 2x2) @ 12 bit		
Pixel Formats	Mono8, Mono10, Mono12, Mono12p		
Partial Scan	True Partial Scan with increasing Frame Rate on Y direction, Region of Interest (ROI) arbitrary		
	Width: minimum 32, increment 32		
	Height: minimum 1, increment 1		
Adjustable Acquisition Frame Rate	Off or 0.01 ... 65535 Hz		
Acquisition Mode	Continuous, Single Frame and Multi Frame		
Acquisition Status	AcquisitionActive, AcquisitionTrigger Wait		
Exposure Mode	Timed		
Shutter Mode	Global		
Readout Mode	Sequential		

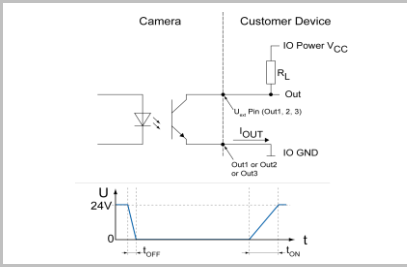
## Image Pre-Processing

Analog Controls	Exposure Time (1 $\mu\text{sec}$ ... 60 sec   Step Size 1 $\mu\text{sec}$ ) Gain (0...48 dB), Offset (0 ... 255 LSB   12 bit)
Auto Function	ExposureAuto and GainAuto with BrightnessAutoPriority based on BrightnessAuto ROI
Gamma Correction	Gamma (0.1 ... 2   available if LUT is enabled)
LUT	Luminance (12 bit)
Color Models	Mono
Color Processing	-
Color Enhancement	-

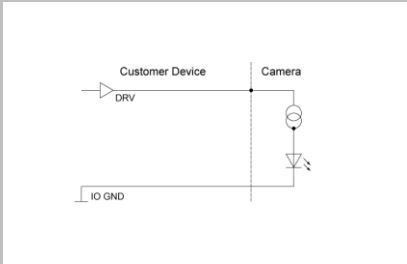
<sup>1)</sup> Sensor readout, different from pixel format

<sup>2)</sup> depends on the used interface

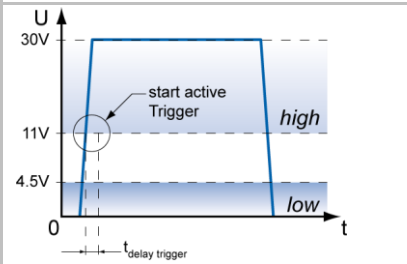
### Digital Output: Low Active



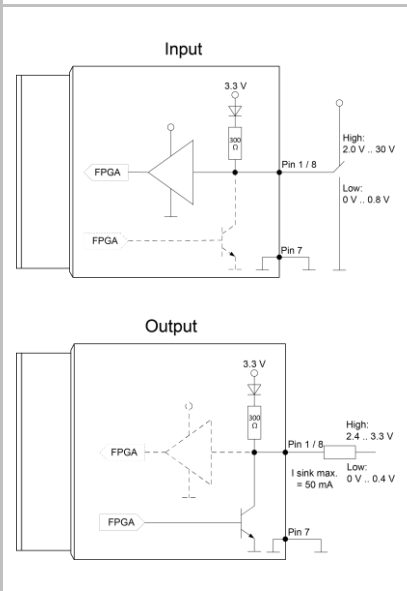
### Digital Input



### Trigger Mode: Start up time and valid Trigger



### GPIO



<sup>1)</sup> Sensor readout, different from pixel format

## Image Pre-Processing

Color Tolerance	-
Binning Horizontal	1 or 2
Binning Vertical	1 or 2
Defect Pixel Correction	via Defect Pixel List with up to 512 Pixel Coordinates
Image Flipping	Horizontal, vertical
Fix Pattern Noise Correction	-

## Process Synchronization

Trigger Mode	Off (Free Running), On (Trigger)
Trigger Overlap Type	Readout
Trigger Sources	Hardware (Line0, 1, 2), Software, Counter 1, 2 End, All or Off fixed Trigger Delay out of treadout: <sup>1)</sup> 162.4 µsec @ 8 bit 162.4 µsec @ 10 bit 141.9 µsec @ 12 bit max. Trigger Delay during treadout: <sup>1)</sup> 162.4 µsec @ 8 bit 162.4 µsec @ 10 bit 141.9 µsec @ 12 bit
Trigger Delay	0 ... 2 sec, Tracking and buffering of up to 256 triggers
External Flash Sync	via Exposure Active t <sub>delay flash</sub> ≤ 3 µsec, t <sub>duration</sub> = t <sub>exposure</sub>
Encoder Function	yes, via Counter and Trigger Source
PTP Function	-

## Digital I/Os

Lines	Input: Line 0, Output: Line3, GPIO: Line 1, Line 2
Line Sources (Output)	Off, ExposureActive, Timer1, ReadoutActive, UserOutput 1-3 and TriggerReady
Line Debouncer (Input)	Low and high signal separately selectable Debouncing Time 0 ... 5 msec, Step Size: 1 µsec

## Memory

Image Buffer	978 MB 14 Images (Trigger Mode) / 1 Image (Free Running Mode)
Non-volatile Memory	128 kb

## Interface Data

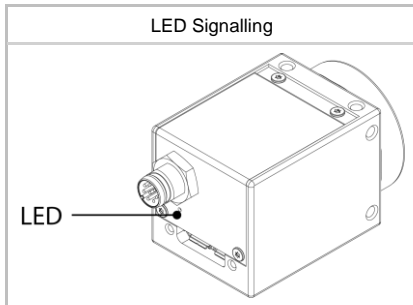
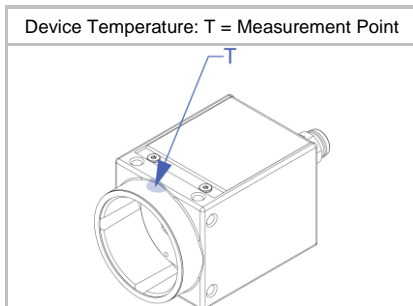
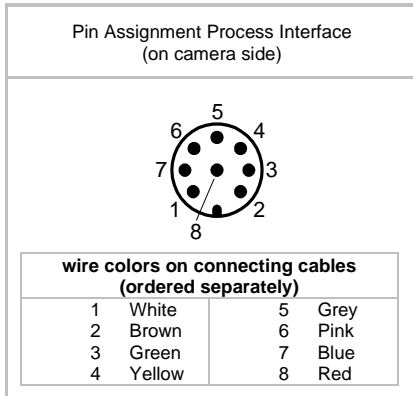
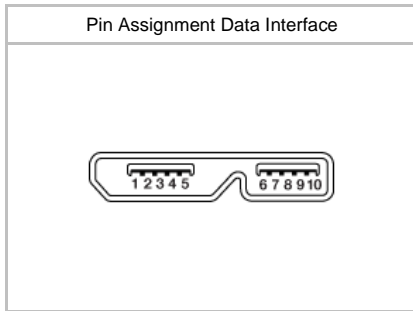
Interface	USB3.0 (5000 Mbits/sec)
USB Vendor ID / Product ID	0x2825 / 0x0171

## USB 3 Vision® Features

Events Transmission via Asynchronous Message Channel	DeviceTemperatureStatusChanged, EventLost, ExposureEnd, ExposureStart, FrameEnd, FrameStart, FrameTransferSkipped, Line0..2 FallingEdge, Line0..2 RisingEdge, TransferBufferFull, TransferBufferReady, TriggerOverlapped, TriggerReady, TriggerSkipped
Frame Counter	up to 2 <sup>32</sup>
Payload Size	0 ... 48785632 Byte
Timestamp	64 bit, resolution in nsec, increment = 8
USB Vision	v1.0.1

## Interfaces and Connectors

Data and Power Interface	USB 3.0 USB 2.0 Connector:	Transfer Rate 5000 Mbits/sec Transfer Rate 480 Mbits/sec USB 3.0 Micro B
Pin Assignment:	1 - VBUS 3 - D+ 5 - GND 7 - MicB_SSTX+ 9 - MicB_SSRX-	2 - D- 4 - ID 6 - MicB_SSTX- 8 - GND_DRAIN 10 - MicB_SSRX+



## Interfaces and Connectors

Process Interface	Connector:	M8/8-pin (SACC-DSI-M8MS-8CON-M8-L180)
	Assignment:	1 - GPIO (Line2)    2 - not connected 3 - IN1 (Line0)    4 - GND IN1 5 - Power VCC    6 - OUT1 (Line3) OUT1    8 - GPIO (Line1) 7 - GND GPIO

Caution



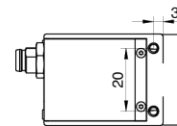
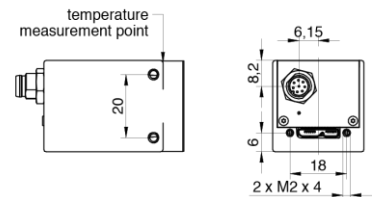
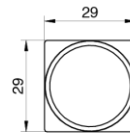
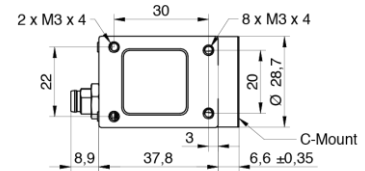
\* Note GPIOs: Ground loops are to be avoided and can lead to destruction of the device.

## Optical Data

Lens Mount	C-Mount
Optical Filter	-

## Mechanical Data

Housing	Zinc die casting, baked varnish
Protection Class	IP40 (with mounted lens and USB 3.0 cable)
Weight	90 g
Dimensions	



## Environmental Data


Storage Temperature	-20 °C ... + 70 °C
Operating Temperature	0 °C ... +60 °C @ T = Measurement Point or *) 0 °C ... +75 °C @ internal Temperature Sensor Note: Ambient temperature above 30 °C requires heat dissipation measures.
Int. Temperature Sensor	yes, accuracy: ±1 °C (typ) 0 °C ... +85 °C
Humidity	10 % ... 90 % non-condensing

\*) the maximum temperature for Sony sensor characteristics (sensor performance) are guaranteed up to 47 °C @ Measurement Point or up to 58 °C @ internal temperature sensor

## LED Signalling

LED	Green flash	Power on, no link active
	Green	Link active USB 3.0
	Red	Error or Link active USB 2.0
	Yellow	Sensor Readout activity
	Red flash	Update

## Electrical Data

Power Supply	bus powered via USB3.0 interface
Power Consumption	approx. 3.2 W @ 15 fps (Factory Setting "Default")
Digital Input	Optocoupler $U_{IN(low)}$ : 0.0 ... 4.5 VDC $U_{IN(high)}$ : 11.0 ... 30.0 VDC $I_{IN}$ : 3.0 ... 10.0 mA min. Impulse Length: 2.0 $\mu$ sec
Digital Output	Optocoupler $U_{EXT}$ : 5 ... 30 V DC $I_{OUT}$ : max. 50 mA $t_{ON}$ = typ. 3 $\mu$ sec $t_{OFF}$ = typ. 40 $\mu$ sec
GPIO	direct, without optocoupler
GPIO used as Input:	$U_{IN(low)}$ : 0.0 ... 0.8 VDC $U_{IN(high)}$ : 2.0 ... 30.0 VDC min. Impulse Length: 2.0 $\mu$ sec
GPIO used as Output:	$U_{Out(low)}$ : 0.0 ... 0.4 VDC ( $I_{sink\ max}$ : 50 mA) $U_{Out(high)}$ : 2.4 ... 3.3VDC ( $I_{max}$ : 1 mA)
Caution 	* The General Purpose I/Os (GPIOs) are not potential-free and do not have an overrun cut-off. Incorrect wiring (overvoltage, undervoltage or voltage reversal) can lead to defects in the electronic system. Ground loops are to be avoided and can lead to destruction of the device.

## Conformity

Conformity	CE, RoHS, REACH
KC Registration No. / Date	- / -
MTBF	48 years @ T = 45 °C / 31 years @ T = 60 °C T = Measurement Point

## GeniCam™ Features

Short Exposure Range	yes, ShortExposureTimeEnable Short Exposure Range 1 ... 3 $\mu$ sec - 17 $\mu$ sec ... 60 sec Default Exposure Range 17 $\mu$ sec ... 60 sec
Timer	Timer Selector: Timer Selector: Timer 1 TimerTriggerSource: Line0, SoftwareTrigger, ExposureStart, ExposureEnd, FrameTransferSkipped, TriggerSkipped, Off TimerDelay: 0 $\mu$ sec ... 2 sec, Step Size: 1 $\mu$ sec TimerDuration: 4 $\mu$ sec ... 2 sec, Step Size: 1 $\mu$ sec
Counter	Counter Selector: Counter 1, Counter 2 CounterValue: 0 ... 65535 Counter Event Source: Counter1End or Counter2End, ExposureActive, FrameTransferSkipped, FrameTrigger, TriggerSkipped, Line0..2 and Off Counter Reset Source: Counter1End, Counter2End, Line0..2 and Off
Sequencer	Sequencer Characteristics: up to 128 sets, up to 4 possible pathes for triggered set transitions, 6 trigger sources: Counter1End, Counter2End, ExposureActive, Line0..2, ReadoutActive, Timer1End Sequencer Parameters for Exposure, Gain, Trigger, ROI and Output: ExposureTime, CounterDuration, CounterEventActivation, CounterEventSource, CounterResetSource, ExposureMode, ExposureTime, Gain, Height, OffsetX, OffsetY, TriggerMode, UserOutputValue, UserOutputValueAll, Width

## GenICam™ Features

User Sets	Factory Settings: UserSet0 (read only) Freely Programmable: UserSet1, UserSet2, UserSet3 Parameters: any user definable Parameter
Acquisition Abort	Delay up to 67.2 msec
Chunk Data	yes, Chunk Selector: Binning, BlackLevel, CounterValue, DeviceTemperature, ExposureTime, FrameID, Gain, Height, Image, ImageControl, LineStatusAll, OffsetX, OffsetY, PixelFormat, SequencerSetActive, Timestamp, Width
Device Temperature	InHouse Event generation for Normal to High, High to Exceeded and Exceeded to Normal Exceeded (no image transfer) = max. internal temperature sensor + 1 °C
Device Link Throughput Limit	yes, up to max. Device Link Speed
Custom Data	yes, 128 Byte with CustomDataKonfiguration Mode
Calibration Data	yes, camera calibration values can stored: CalibrationMatrix, CalibrationMatrixNew, CalibrationFocalLenght, CalibrationAngularAperture, GeometryDistortionValue: k1, k2, p1, p2, k3, CalibrationVector: tvec, rvec and CalibrationDataVersion
SFNC Version	2.4.0

## Factory Settings after Start-Up

Trigger Mode	Off (Free Running)
Analog Controls	Exposure Time: 4 msec, Gain: 0 dB, Offset: 0
Pixel Format	Mono8
Partial Scan	Off
Acquisition Frame Rate	Off
Timer/Counter/Sequencer	Off
Defect Pixel Correction	ON
Fixed Pattern Noise Correction	-
Digital Input	Line0, invert = false
Digital Output	Line3, invert = false, line source = Off
GPIO 1/2	Line1, Line2, invert = false, LineMode = Input
TriggerSource	All

**Partial Scan** @ FullFrame, min Exposure, Mono8 (monochrome camera) or BayerRG8 (color camera)

	Resolution	max. fps acquisition	max. fps interface <sup>2)</sup>
HXGA	4096 x 3072	23	23
UHD (4K)	3840 x 2160	32	32
Full HD	1920 x 1080	62	62
SXGA	1280 x 1024	65	65
HD720	1280 x 720	89	89
XGA	1024 x 768	84	84
SVGA	800 x 600	104	104
VGA	640 x 480	125	125
CIF	352 x 288	185	185
QVGA	320 x 240	210	210
QCIF	176 x 144	288	288
LineScan	5312 x 4096	17	17
	5312 x 2048	34	34
	5312 x 1024	65	65
	5312 x 512	118	118
	5312 x 256	201	201
	5312 x 128	307	307
	5312 x 64	417	417
	5312 x 32	509	509
	5312 x 16	571	571
	5312 x 8	609	609
	5312 x 4	609	609
5312 x 2	609	609	
5312 x 1	609	609	

<sup>2)</sup> depends on the used interface