



Device Information

Model Name	VCXU.2-65C.R
Vendor Name	Baumer

Sensor Information

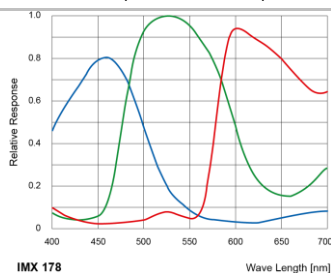
Sensor Name	Sony IMX178
Type	1/1.8" progressive scan CMOS
Shutter	Rolling Shutter, Global Reset Shutter
Resolution	3072 x 2048 pixels
Scan Area	7.37 mm x 4.91 mm
Pixel Size	2.4 μm x 2.4 μm

Data Quality

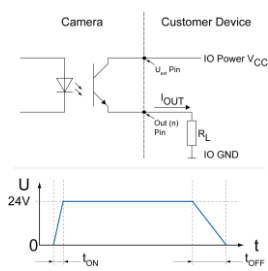
@ 20 °C, gain = 1, exposure time = 4 msec

Dark Noise (σ)	2.8 e- typical
Saturation	14500 e- typical
Dynamic Range	72 dB typical
SNR	42 dB typical
Quantum efficiency η	58% @ 465 nm, 63% @ 536 nm, 47% @ 631 nm typical

Sensor Graph: Relative Response



Digital Output: High Active



Acquisition

Resolution	3072 px x 2048 px		
Interface Frame Rate (depends on used interface performance)	Format	Resolution	max. Frame Rate (@ Trigger Mode) ²⁾
	Full Frame	3072 x 2048	47 fps
	Binning 2x2	1536 x 1024	47 fps
	Binning 2x1	1536 x 2048	47 fps
	Binning 1x2	3072 x 1024	47 fps

Acquisition Frame Rate ¹⁾	47 fps $t_{\text{readout}} = 21 \text{ msec}$ (max. Res. Full Frame) @ 10 bit
	43 fps $t_{\text{readout}} = 23.2 \text{ msec}$ (max. Res. Full Frame) @ 12 bit

Pixel Formats	BayerRG8, BayerRG10, BayerRG12, BayerRG12p Mono8, Mono10, Mono12, Mono12p, RGB8, BGR8
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Partial Scan	True Partial Scan with increasing Frame Rate on Y direction, Region of Interest (ROI) arbitrary Width: minimum 16, increment 16 Height: minimum 4, increment 4
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Adjustable Acquisition Frame Rate	Off or 0.79 ... 65535 Hz
Acquisition Mode	Continuous, Single Frame and Multi Frame
Acquisition Status	AcquisitionActive, AcquisitionTrigger Wait
Exposure Mode	Timed
Shutter Mode	Rolling, Global Reset
Readout Mode	not available

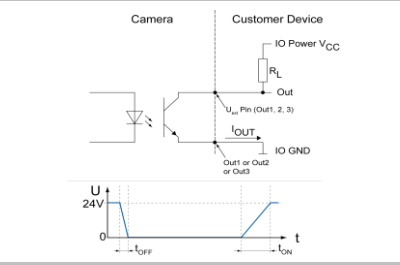
Image Pre-Processing

Analog Controls	Exposure Time (22 μsec ... 60 sec Step Size 1 μsec) Gain (0...48 dB), Offset (0 ... 255 LSB 12 bit)
Auto Function	ExposureAuto and GainAuto with BrightnessAutoPriority based on BrightnessAuto ROI BalanceWhiteAuto and ColorTransformationAuto based on BalanceWhiteAuto ROI
Gamma Correction	Gamma (0.1 ... 2 available if LUT is enabled)
LUT	Luminance (12 bit)
Color Models	Mono, Raw Bayer, RGB and BGR
Color Processing	Integrated color processor for high quality color calculation
Color Enhancement	Color Transformation to sRGB color space by optimized Matrix for 3000 K, 5000 K, 6500 K and 9500 K Lightsource or User defined Matrix

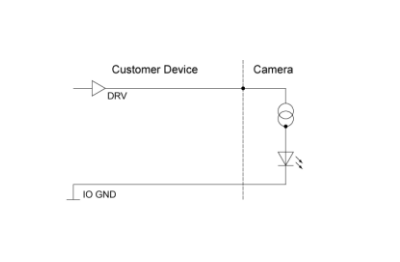
¹⁾ Sensor readout, different from pixel format

²⁾ depends on the used interface

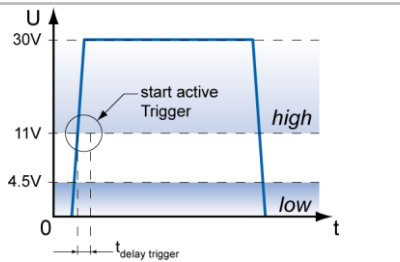
Digital Output: Low Active



Digital Input



Trigger Mode: Start up time and valid Trigger



GPIO

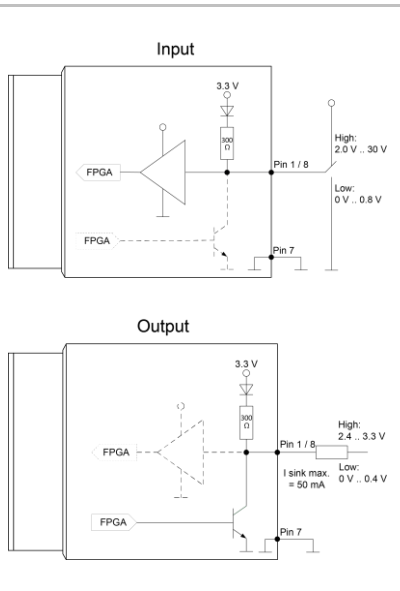


Image Pre-Processing

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	Trigger Mode On: Off Trigger Mode Off: Not available
Trigger Sources	Hardware (Line0, 1, 2), Software, Counter 1, 2 End, All or Off max. Trigger Delay out of t_readout: ¹⁾ 1702.2 µsec / 9.7 µsec @ 10 bit (Rolling / Global Reset) 1316.2 µsec / 10.7 µsec @ 12 bit (Rolling / Global Reset) max. Trigger Delay during t_readout: ¹⁾ -
Trigger Delay	0 ... 2 sec, Tracking and buffering of up to 256 triggers
External Flash Sync	via Exposure Active t_delay flash ≤ 3 µsec, t_duration = t_exposure
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	450 MB 25 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

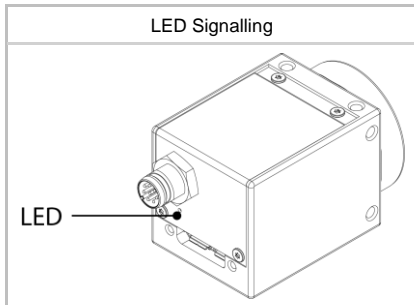
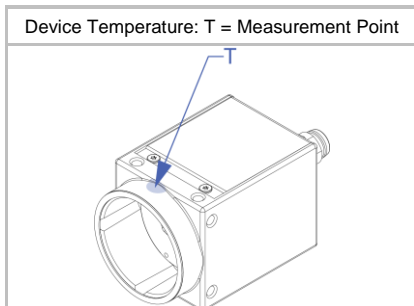
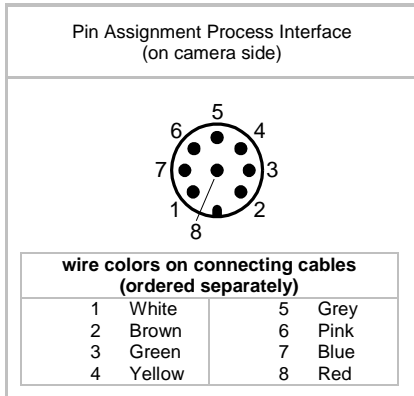
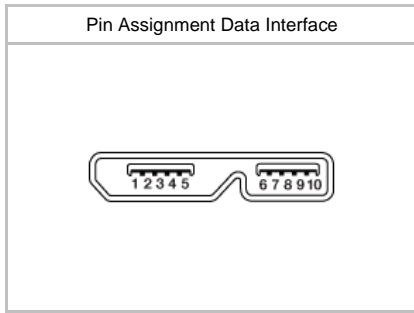
USB 3 Vision® Features

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 ³²
Payload Size	0 ... 18874580 Byte
Timestamp	64 bit, resolution in nsec, increment = 10
USB Vision	v1.0.1

Interfaces and Connectors

Data and Power Interface	USB 3.0 Transfer Rate 5000 Mbits/sec	USB 2.0 Transfer Rate 480 Mbits/sec
Connector:	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+

¹⁾ Sensor readout, different from pixel format



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



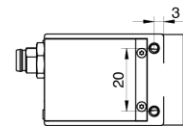
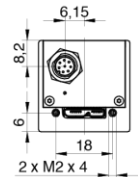
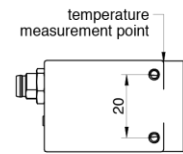
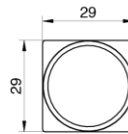
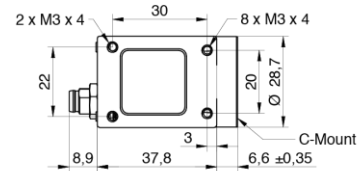
* Note GPIOs: Ground loops are to be avoided and can lead to destruction of the device.

Optical Data

Lens Mount	C-Mount
Optical Filter	IR cut 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 ... +65 °C @ T = Measurement Point or 0 °C ... +72 °C @ internal Temperature Sensor *)
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 51 °C @ Measurement Point or up to 57 °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. 2.4 W @ 47 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 μ sec
Digital Output	Optocoupler U_{EXT} : 5 ... 30 V DC I_{OUT} : max. 50 mA t_{ON} = typ. 3 μ sec t_{OFF} = typ. 40 μ 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 μ 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	64 years @ T = 45 °C / 42 years @ T = 60 °C T = Measurement Point

GeniCam™ Features

Short Exposure Range	-
Timer	Timer Selector: Timer Selector: Timer 1 TimerTriggerSource: Line0, SoftwareTrigger, ExposureStart, ExposureEnd, FrameTransferSkipped, TriggerSkipped, Off TimerDelay: 0 μ sec ... 2 sec, Step Size: 1 μ sec TimerDuration: 4 μ sec ... 2 sec, Step Size: 1 μ 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	no

GenICam™ Features

User Sets	Factory Settings: UserSet0 (read only) Freely Programmable: UserSet1, UserSet2, UserSet3 Parameters: any user definable Parameter
Acquisition Abort	Delay up to 23.2 msec
Chunk Data	yes, Chunk Selector: Binning, BlackLevel, CounterValue, DeviceTemperature, ExposureTime, FrameID, Gain, Height, Image, ImageControl, LineStatusAll, OffsetX, OffsetY, PixelFormat, , 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	BayerRG8
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 ²⁾
Full HD	1920 x 1080	86,0	86,0
SXGA	1280 x 1024	90,3	90,3
HD720	1280 x 720	122,9	122,9
XGA	1024 x 768	116,2	116,2
SVGA	800 x 600	143,5	143,5
VGA	640 x 480	172,2	172,2
CIF	352 x 288	237,2	237,1
QVGA	320 x 240	237,2	237,2
QCIF	176 x 144	237,2	237,2
LineScan	3072 x 2048	47,6	47,6
	3072 x 1024	90,3	90,3
	3072 x 512	163,5	163,5
	3072 x 256	237,2	237,1
	3072 x 128	237,2	237,2
	3072 x 64	237,2	237,2
	3072 x 32	237,2	237,2
	3072 x 16	237,2	237,2
	3072 x 8	237,2	237,2
	3072 x 4	237,2	237,2
	3072 x 2	-	-
	3072 x 1	-	-

²⁾ depends on the used interface