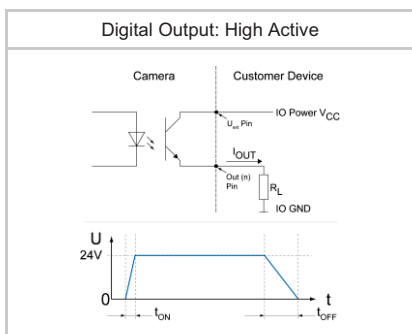
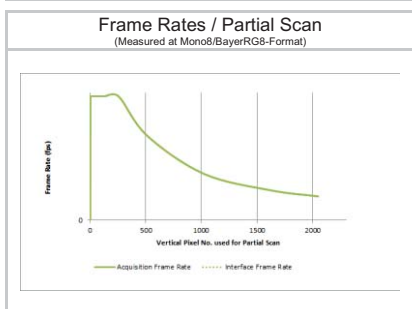
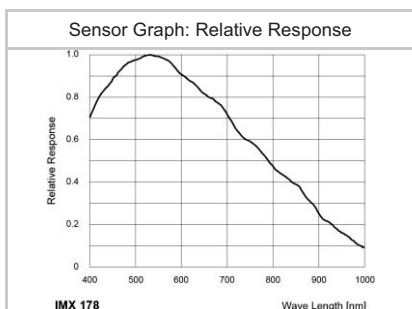




Sensor Information

Model Name	Sony IMX178
Type	1/1.8" progressive scan CMOS
Shutter	Rolling Shutter
Resolution	3072 x 2048 pixels
Scan Area	7.37 mm x 4.91 mm
Pixel Size	2.4 μ m x 2.4 μ m

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	75 % @ 536 nm typical

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 43 fps
	Binning 2x1 1536 x 2048 43 fps
	Binning 1x2 3072 x 1024 43 fps
Acquisition Frame Rate ¹⁾	47 fps $t_{\text{readout}} = 20.9$ msec (max. Res. Full Frame) @ 10 bit 43 fps $t_{\text{readout}} = 23$ msec (max. Res. Full Frame) @ 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 16, increment 16 Height: minimum 2, increment 2
Adjustable Acquisition Frame Rate	Off or 1.65 ... 243 Hz
Acquisition Mode	Continuous, Single Frame and Multi Frame
Acquisition Status	AcquisitionActive, AcquisitionTrigger Wait
Exposure Mode	Timed
Shutter Mode	Rolling
Readout Mode	not available

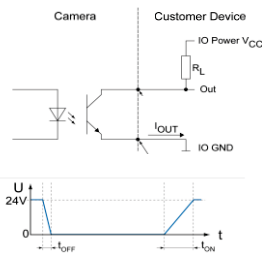
Image Pre-Processing

Analog Controls	Exposure Time (14 μ sec ... 60 sec Step Size 1 μ sec) Gain (0...26 dB), Offset (0 ... 255 LSB 12 bit)
Gamma Correction	Gamma (0.1 ... 2 available if LUT is enabled)
LUT	Luminance (12 bit)
Color Models	Mono
Color Processing	-
Color Adjustment	-
Color Enhancement	-
Color Tolerance	-
Binning Horizontal	1 or 2
Binning Vertical	1 or 2
Image Flipping	Horizontal, vertical
Defect Pixel Correction	via Defect Pixel List with up to 512 Pixel Coordinates
Fix Pattern Noise	-
Correction	-

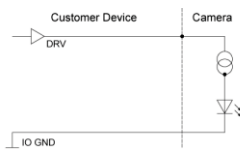
¹⁾ Sensor readout, different from pixel format

²⁾ depends on the used interface

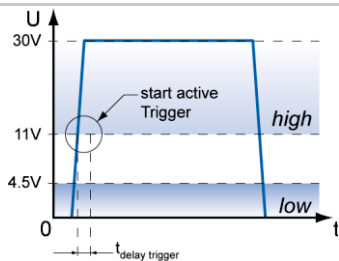
Digital Output: Low Active



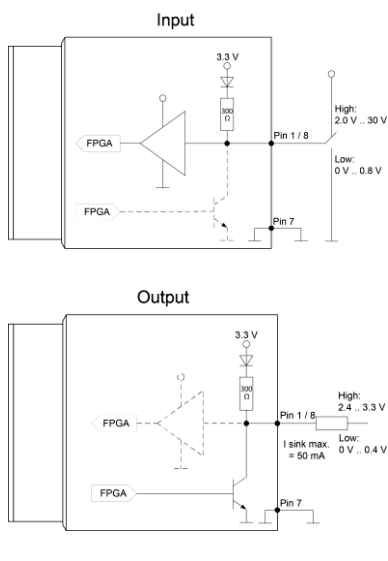
Digital Input



Trigger Mode: Start up time and valid Trigger



GPIO



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, All or Off max. Trigger Delay out of $t_{readout}$: ¹⁾ 22983 μ sec @ 12 bit 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 $t_{delay flash} \leq 3 \mu$ sec, $t_{duration} = t_{exposure}$

Digital I/Os

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

Memory

Image Buffer	450 MB 25 Images (Trigger Mode) / 1 Image (Free Running Mode)
Non-volatile Memory	128 kb

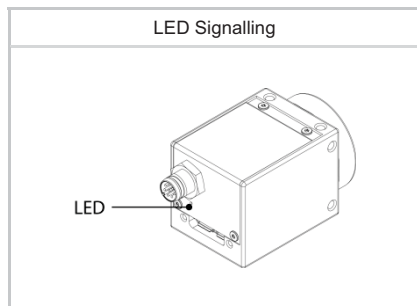
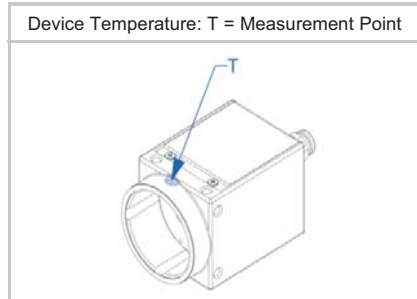
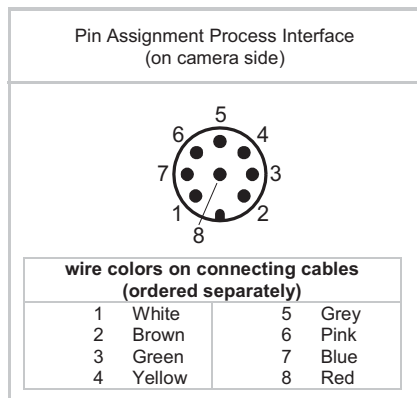
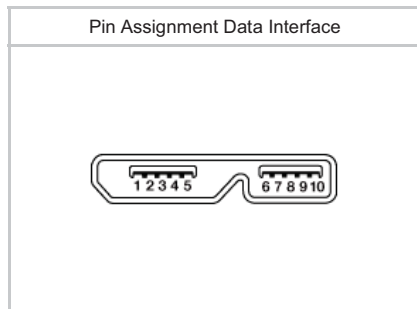
Interface Data

Interface	USB3.0 (5000 Mbits/sec)
USB Vendor ID / Product ID	0x2825 / 0x13F

USB 3 Vision® Features

Events	DeviceTemperatureStatusChanged, EventLost, ExposureEnd, ExposureStart, FrameEnd, FrameStart, FrameTransferSkipped, Line0..3 FallingEdge, Line0..3 RisingEdge, TransferBufferFull, TransferBufferReady, TriggerOverlapped, TriggerReady, TriggerSkipped
Transmission via Asynchronous Message Channel	
Frame Counter	up to 2^{32}
Payload Size	0 ... 12583112 Byte
Timestamp	64 bit, resolution in nsec, increment = 10
USB Vision	v1.0.1

¹⁾ Sensor readout, different from pixel format



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

Caution



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

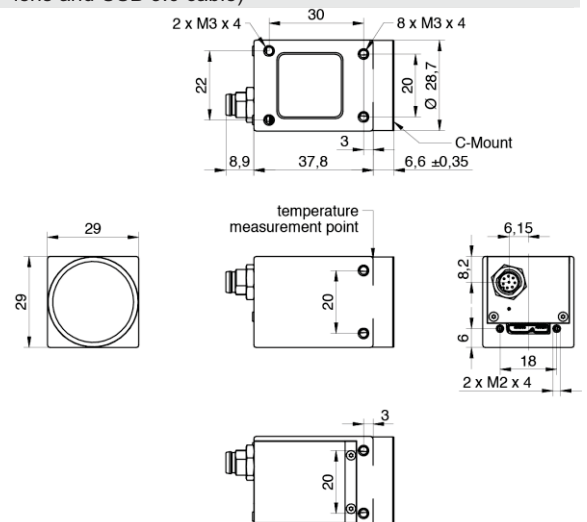
Optical Data

Lens Mount	C-Mount
Optical Filter	-

Mechanical Data

Housing	Zinc die casting, nickel-chrome-plated, IP40 (with mounted lens and USB 3.0 cable)
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Dimensions



Weight	90 g
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Environmental Data

Storage Temperature	-10 °C ... + 70 °C
Operating Temperature ^{*)}	+5 °C ... +65 °C @ T = Measurement Point or +5 °C ... +72 °C @ internal Temperature Sensor Ambient temperature above 35 °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 50 °C @ Measurement Point or 56 °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. 2.9 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	76 years @ T = 45 °C / 47 years @ T = 60 °C T = Measurement Point

GenlCam™ 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 and Off Counter Reset Source: Counter1End, Counter2End, Line0 and Off
Sequencer	no

GenlCam™ Features

User Sets	Factory Settings: UserSet0 (read only) Freely Programmable: UserSet1, UserSet2, UserSet3 Parameters: any user definable Parameter
Acquisition Abort	Delay up to 23 msec
Chunk Data	yes, Chunk Selector: Binning, Black Level, DeviceTemperature, ExposureTime, FrameID, Gain, Height, Image, ImageControl, LineStatusAll
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
SFNC Version	v2.3

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 or BayerRG8

	Resolution	max. fps acquisition	max. fps interface ²⁾
Full HD	1920 x 1080	87,0	86,9
SXGA	1280 x 1024	91,3	91,3
XGA	1024 x 768	118,1	118,1
SVGA	800 x 600	146,1	146,1
VGA	640 x 480	176,0	176,0
CIF	352 x 288	243,4	243,4
QCIF	176 x 144	243,3	243,3
LineScan	3072 x 2048	47,8	47,8
	3072 x 1024	91,3	91,3
	3072 x 512	166,9	166,9
	3072 x 256	243,4	243,4
	3072 x 128	243,3	243,3
	3072 x 64	243,3	243,3
	3072 x 32	243,3	243,3
	3072 x 16	243,3	243,3
	3072 x 8	243,3	243,3
	3072 x 4	243,3	243,3
	3072 x 2	243,3	243,3
	3072 x 1	-	-

²⁾ depends on the used interface

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