

Sensor Information

Model Name	Sony IMX304
Type	1.1" progressive scan CMOS
Shutter	Global Shutter
Resolution	4096 x 3000 pixels
Scan Area	14.13 mm x 10.35 mm
Pixel Size	3.45 μm x 3.45 μm

Data Quality

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

Dark Noise (σ)	2 e- typical
Saturation	9500 e- typical
Dynamic Range	71 dB typical
SNR	40 dB typical
Quantum efficiency η	67,3% @ 536 nm typical

Acquisition

Resolution	4096 px x 3000 px		
Interface Frame Rate (depends on used interface performance)	Format	Resolution	max. Frame Rate (@ Trigger Mode) ²⁾
	Full Frame	4096 x 3000	9 fps
	Binning 2x2	2048 x 1500	15 fps
	Binning 2x1	2048 x 3000	15 fps
	Binning 1x2	4096 x 1500	15 fps

Acquisition Frame Rate ¹⁾ 15 fps | $t_{\text{readout}} = 65.8 \text{ msec}$ (max. Res. Full Frame) @ 12 bit (Burst Mode)

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 1, increment 1

Adjustable Acquisition Frame Rate	Off or Off or 0.01 ... 65535 Hz
Acquisition Mode	Continuous, Single Frame and Multi Frame
Acquisition Status	AcquisitionActive, AcquisitionTrigger Wait
Exposure Mode	Timed
Readout Mode	Overlapped, Sequential

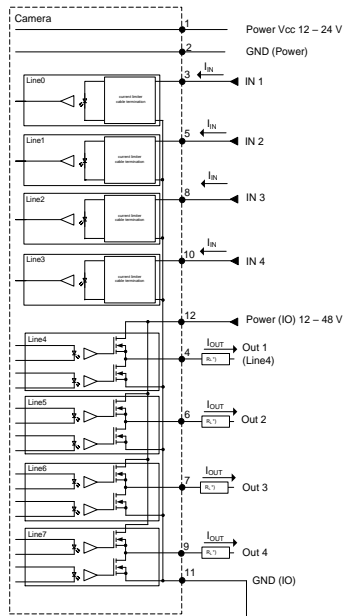
Image Pre-Processing

Analog Controls	Exposure Time (1 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
LUT	Luminance (12 bit)
Color Models	Mono
Color Processing	-
Color Adjustment	-
Color Enhancement	-
Color Tolerance	-

¹⁾ Sensor readout, different from pixel format

²⁾ depends on the used interface

Digital Input / Output: principle circuit diagram



Trigger Mode: Start up time and valid Trigger

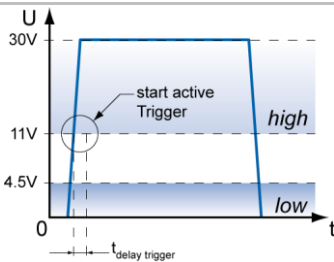


Image Pre-Processing

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	-

Process Synchronization

Trigger Mode	Off (Free Running), On (Trigger)
Trigger Overlap Type	Readout
Trigger Sources	Hardware (Line0, 1, 2, 3), Software, Action CMD (Action 1), All or Off fixed Trigger Delay out of t _{readout} : ¹⁾ 97.7 µsec @ 12 bit max. Trigger Delay during t _{readout} : ¹⁾ 114.1 µsec @ 12 bit
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 .. 3, Output: Line 4 .. 7, GPIO: no
Output Sources	Off, ExposureActive, Timer1, ReadoutActive, UserOutput 1-3 and TriggerReady
Output Line Mode	yes, Tri-State, PushPull, OpenDrain, OpenSource
Output PWM function	yes, Line 4 .. 7 PWM Mode: Off, One Pulse, FixedFrequency PWM feature: PWMDuration, PWMDutyCycle Configuration Mode for lightning protection: MaxPWMDuration, MaxPWMDutyCycle
Line Debouncer	Low and high signal separately selectable Debouncing Time 0 ... 5 msec, Step Size: 1 µsec

Memory

Image Buffer	36 MB 1 Images (Trigger Mode) / 1 Image (Free Running Mode)
Non-volatile Memory	128 kb

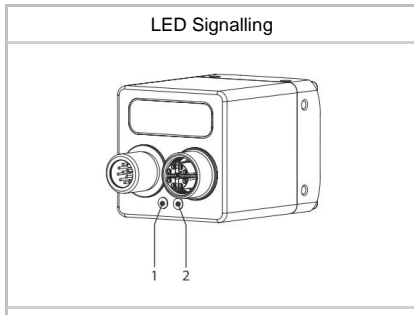
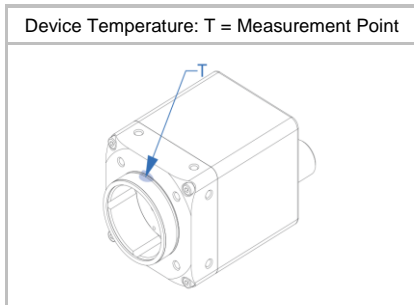
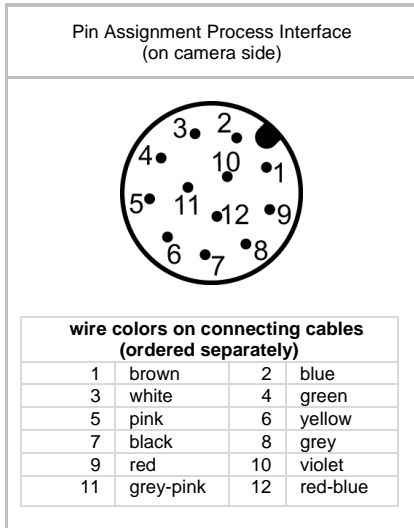
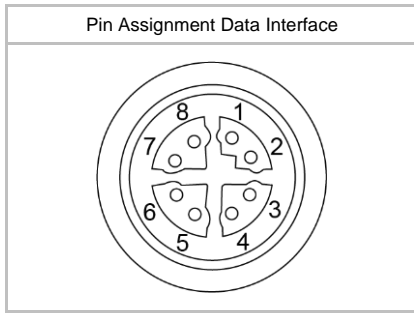
Network Interface Data

Interface	Gigabit Ethernet 1000BASE-T 1000 Mbits/sec Fast Ethernet 100 BASE-T 100 Mbits/sec
Ethernet IP Configuration	Persistent IP, DHCP, LLA
Packet Size	576 ... 9000 Byte, Jumbo Frames supported

GigE Vision® Features

Events Transmission via Asynchronous Message Channel	DeviceTemperatureStatusChanged, EventLost, ExposureEnd, ExposureStart, FrameEnd, FrameStart, FrameTransferSkipped, GigE VisionError, GigE VisionHeartbeatTimeOut, PrimaryApplicationSwitch, Line0..7 FallingEdge, Line0..7 RisingEdge, TransferBufferFull, TransferBufferReady, TriggerOverlapped, TriggerReady, TriggerSkipped
Action CMD	yes, Action 1 for Trigger
Frame Counter	up to 2 ³²
Payload Size	0 ... 24576224 Byte
Timestamp	64 bit, resolution in nsec, increment = 8
Packet Delay	0 .. 2 ³² - 1 nsec
Packet Resend	Resend Buffer: 47 MB (2 Images)
GigE Vision	v2.0 (v1.2 backward compatible)

¹⁾ Sensor readout, different from pixel format



Interfaces and Connectors

Data and Power Interface	Gigabit Ethernet	Transfer Rate	1000 Mbits/sec
	Fast Ethernet	Transfer Rate	100 Mbits/sec
	Connector:	M12 / 8-pol x-coded (SACC-CI-M12FS-8CON-L180-10G)	
	Assignment:	1 - MX1+	2 - MX1-
		3 - MX2+	4 - MX2-
		5 - MX4+	6 - MX4-
		7 - MX3-	8 - MX3+
Process Interface	Connector:	M12/12-pin a-coded (SACC-CI-M12MS-12CON-L180)	
	Assignment:	1 - Power Vcc	2 - GND (Power)
		3 - IN1 (Line0)	4 - OUT1 (Line4)
		5 - IN2 (Line1)	6 - OUT2 (Line5)
		7 - OUT3 (Line6)	8 - IN3 (Line2)
		9 - OUT4 (Line7)	10 - IN4 (Line3)
		11 - GND (IO)	12 - Power (IO)

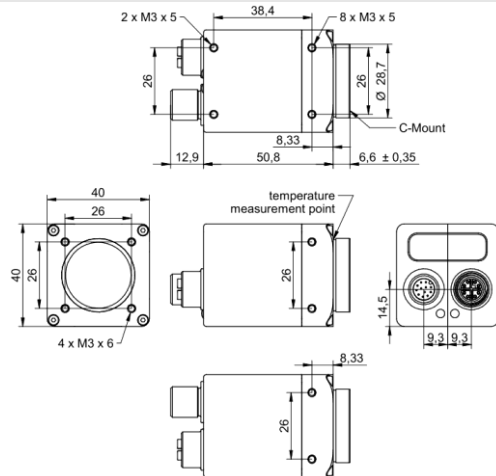
Optical Data

Lens Mount	C-Mount
Optical Filter	-

Mechanical Data

Housing	aluminum, hard anodized
Protection Class	IP40 (with mounted lens and GigE cable) IP54 (with mounted lens and GigE cable) IP65/67 (with mounted tube and cable) IP69k (with stainless steel housing system)
Weight	137 g

Dimensions



Environmental Data

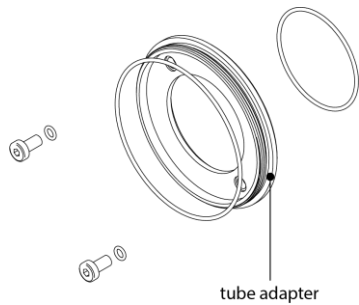
Storage Temperature	-10 °C ... +70 °C
Operating Temperature	0 °C ... +65 °C @ T = Measurement Point or *) 0 °C ... +75 °C @ internal Temperature Sensor Ambient temperature above 0 °C requires heat dissipation measures.
Int. Temperature Sensor	yes, accuracy: ±2 °C (typ) -40 °C ... 0 °C ±1 °C (typ) 0 °C ... +85 °C
Humidity	10 % ... 90 % non-condensing

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

LED Signalling

LED	LED 1	Yellow static	Error
		Yellow flash	TX active
	LED 2	Green static	Link ON
		Green flash	RX active

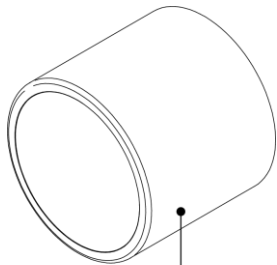
Optional accessories for IP65/67 protection (ordered separately)



tube adapter

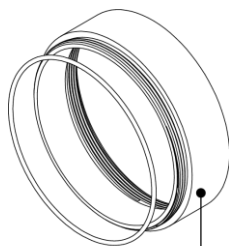
including seals and screws

Article Number	Diameter	Length
11185373	Ø 49,5 mm	5,25 mm
11185377	Ø 65 mm	5,25 mm



tube

Article Number	Diameter	Cover Glass	Length
11185370	Ø 49,5 mm	Acryl	44 mm
11185374	Ø 65 mm		58 mm
11195425	Ø 49,5 mm	Tempered laminated safety glass	44 mm
11195426	Ø 65 mm		58 mm



distance ring

including seal

Article Number	Diameter	Length
11185372	Ø 49,5 mm	6 mm
11185371	Ø 49,5 mm	12 mm
11211571	Ø 49,5 mm	36 mm
11185376	Ø 65 mm	6 mm
11185375	Ø 65 mm	12 mm
11198906	Ø 65 mm	36 mm

Electrical Data

Power Supply (ext.)	VCC: 12 ... 24 V DC ± 20% I: 103 ... 207 mA
Power over Ethernet	Class 1 device VCC: 36 ... 57 V DC I: 67 mA @ 48 VDC
Power Consumption	approx. 2.5 W @ 12VDC and 9 fps approx. 3.2 W @ 48 VDC (PoE) and 9 fps (Factory Setting "Default")
Digital Input	Isolated, short circuit protection 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 µsec
Digital Output	Isolated, short circuit protected U _{EXT} : 12 ... 48 V DC [Power (IO)] I _{OUT} : Continuously: max. 1.5 A PWM t _{ON} max 1s / Duration max 40%: max. 2.5 A (Max. current for each output itself or summery of all outputs) t _{ON} = < 0.2 µsec t _{OFF} = < 0.2 µsec max. Frequency: 500 kHz
GPIO	no

Conformity

Conformity	CE, RoHS, REACH, EAC
KC Registration No. / Date	- / -
MTBF	44 years @ T = 45 °C / 29 years @ T = 60 °C T = Measurement Point

GenICam™ Features

Short Exposure Range	yes, ShortExposureTimeEnable Short Exposure Range 1 µsec ... 60 sec Default Exposure Range 15 µsec ... 60 sec
Timer	Timer Selector: Timer 1 TimerTriggerSource: Line0, SoftwareTrigger, ExposureStart, ExposureEnd, FrameTransferSkipped, TriggerSkipped, Action 1 and Off TimerDelay: 0 µsec ... 2 sec, Step Size: 1 µsec TimerDuration: 4 µsec ... 2 sec, Step Size: 1 µsec
Counter	Counter Selector: Counter 1, Counter 2 CounterValue: 0 ... 65535 Counter Event Source: Counter1End or Counter2End, ExposureActive, FrameTransferSkipped, FrameTrigger, TriggerSkipped, Line0..3 and Off Counter Reset Source: Counter1End, Counter2End, Line0..3
Sequencer	Sequencer Characteristics: up to 128 sets, up to 4 possible paths for triggered set transitions, 6 trigger sources: Counter1End, Counter2End, ExposureActive, Line0..3, 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 65.8 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
SFNC Version	v2.4

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 .. 3, invert = false, line format = Tri State
Digital Output	Line4 .. 7, invert = false, line source = Off, line format = Open Source
GPIO 1/2	no
TriggerSource	All

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

	Resolution	max. fps acquisition	max. fps interface ²⁾
UHD (4K)	3840 x 2160	20	14
Full HD	1920 x 1080	40	40
SXGA	1280 x 1024	43	43
HD720	1280 x 720	59	59
XGA	1024 x 768	56	56
SVGA	800 x 600	70	70
VGA	640 x 480	86	86
CIF	352 x 288	135	135
QVGA	320 x 240	157	157
QCIF	176 x 144	232	232
LineScan	4096 x 2048	22	14
	4096 x 1024	43	29
	4096 x 512	81	58
	4096 x 256	149	117
	4096 x 128	252	235
	4096 x 64	387	387
	4096 x 32	529	529
	4096 x 16	646	646
	4096 x 8	728	728
	4096 x 4	776	776
	4096 x 2	803	803
	4096 x 1	817	817

²⁾ depends on the used interface