

¹⁾ Sensor readout, different from pixel format

²⁾ Depends on the used interface



Sensor Information

| | |
|------------|--------------------------|
| Model Name | Gpixel GMAX3249 |
| Type | 2" progressive scan CMOS |
| Shutter | Global Shutter |
| Resolution | 7008 x 7000 pixels |
| Scan Area | 22.4 mm x 22.4 mm |
| Pixel Size | 3.2 μm x 3.2 μm |

Data Quality

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

| | |
|---------------------------|----------------------|
| Dark Noise (σ) | 5 e- typical |
| Saturation | 11000 e- typical |
| Dynamic Range | 66 dB typical |
| SNR | 40 dB typical |
| Quantum efficiency η | 61% @ 536 nm typical |

Acquisition

| | | | |
|---|-------------------|-------------|---|
| Resolution | 7008 px x 7000 px | | |
| Interface Frame Rate (depends on used interface performance) | Format | Resolution | max. Frame Rate (@ Trigger Mode) ²⁾ |
| | Full Frame | 7008 x 7000 | 11 fps |
| | Binning 2x2 | 3504 x 3500 | 11 fps |
| | Binning 2x1 | 3504 x 7000 | 11 fps |
| | Binning 1x2 | 7008 x 3500 | 11 fps |

Acquisition Frame Rate¹⁾ 11 fps | $t_{\text{readout}} = 86.74$ 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 256, increment 16
Height: minimum 8, increment 1

Multi ROI Up to 8 non-overlapping regions

Ad. Acquisition Frame Rate Off or 0,01 ... 65535 Hz

Acquisition Mode Continuous, Single Frame and Multi Frame

Acquisition Status AcquisitionActive, AcquisitionTrigger Wait

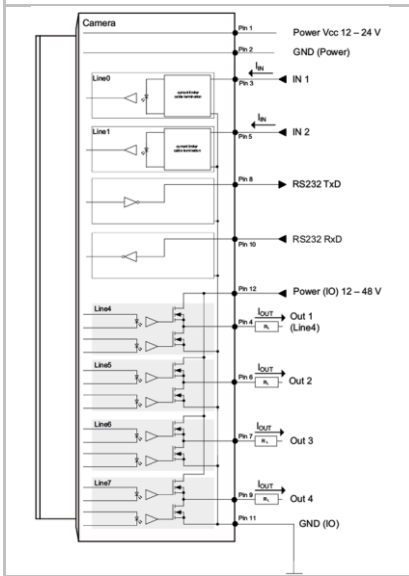
Exposure Mode Timed

Readout Mode Overlapped, Sequential

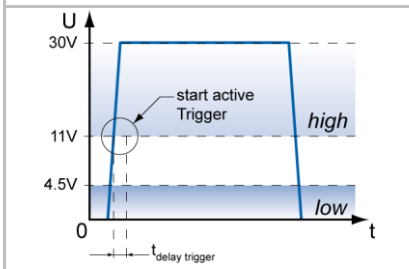
Image Pre-Processing

| | |
|-------------------------|---|
| Analog Controls | Exposure Time (20 μsec ... 60 sec Step Size 1 μsec) Gain (0...30 dB), Offset (-256 ... 255 LSB 12 bit) |
| Auto Functions | 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 | - |
| Color Tolerance | - |
| Binning | Horizontal: 1 or 2, Vertical: 1 or 2 |
| Image Flipping | Horizontal, vertical |
| Defect Pixel Correction | via Defect Pixel List with up to 512 Pixel Coordinates |
| Shading Correction | Brightness correction per tile of 64x64 pixels |
| Sharpening | - |
| HDR | Yes, up to +25 dB, non-linear output with tone mapping |
| Image Compression | Baseline JPEG (ISO/IEC 10918-1) |

Digital Input / Output: principle circuit diagram



Trigger Mode: Start up time and valid Trigger



Process Synchronization

| | |
|--|---|
| Trigger Mode | Off (Free Running), On (Trigger) |
| Trigger Overlap Type | Readout |
| Trigger Sources | Hardware (Line0,1), Software, All, ActionCMD (Action 1) or Off fixed Trigger Delay out of t _{readout} : ¹⁾ 17,7 µsec @ 12 bit max. Trigger Delay during t _{readout} : ¹⁾ 41,2 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} ≤ 1 µsec, t _{duration} = t _{exposure} |
| Encoder Function | yes, via Counter and Trigger Source |
| Precision Time Protocol (PTP) Function | IEEE1588-2008 clock synchronization, default profile 1.0, master and slave mode |

Digital I/Os

| | |
|---------------------|---|
| Lines | Input: Line 0 .. 1, Output: Line 4 .. 7, GPIO: no, RS232: Line 2 .. 3 |
| 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

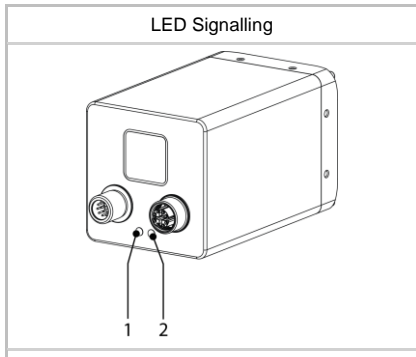
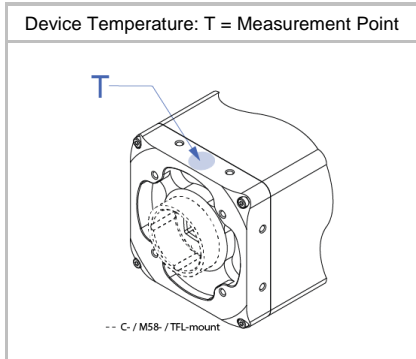
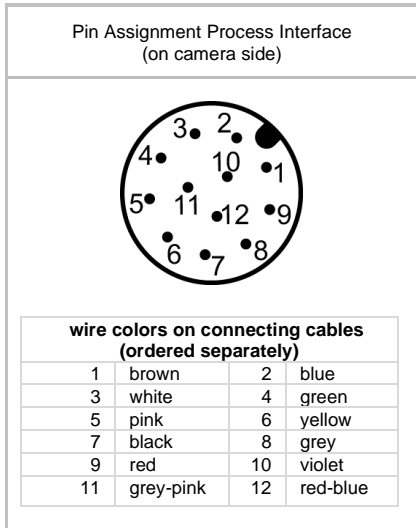
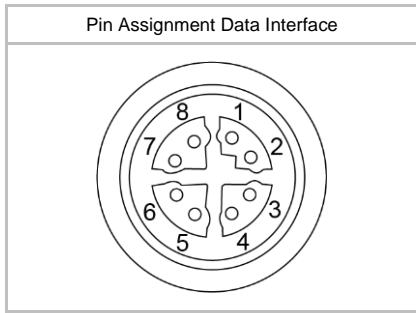
| | |
|---------------------|---|
| Image Buffer | 1024 MB no image buffer (Trigger Mode) / 1 Image (Free Running Mode) |
| Non-volatile Memory | 128 kb |

Network Interface Data

| | |
|---------------------------|---|
| Interface | 10 Gigabit Ethernet 10GBASE-T 10.000 Mbits/sec |
| | 5 Gigabit Ethernet 5GBASE-T 5.000 Mbits/sec |
| | 2.5 Gigabit Ethernet 2.5GBASE-T 2.500 Mbits/sec |
| | Gigabit Ethernet 1000BASE-T 1.000 Mbits/sec |
| | Fast Ethernet 100BASE-T 100 Mbits/sec |
| Ethernet IP Configuration | Persistent IP, DHCP, LLA |
| Packet Size | 576 ... 9000 Byte, Jumbo Frames supported |

GigE Vision® Features

| | |
|---|---|
| Events | DeviceTemperatureStatusChanged, EventLost, ExposureEnd, ExposureStart, FrameEnd, FrameStart, FrameTransferSkipped, Error, GigEVisionHeartbeatTimeOut, Line0..3 FallingEdge, Line0..3 RisingEdge, PrimaryApplicationSwitch, TransferBufferFull, TransferBufferReady, TriggerOverlapped, TriggerReady, TriggerSkipped |
| Transmission via Asynchronous Message Channel | |
| Action CMD | yes, Action 1 for Trigger |
| Frame Counter | up to 2 ³² |
| Payload Size | 0 ... 98112642 Byte |
| Timestamp | 64 bit, resolution in nsec, increment = 8 |
| Packet Delay | 0 .. 2 ³² - 1 nsec |
| Packet Resend | |
| GigE Vision | v2.0 |



Interfaces and Connectors

| Data and Power Interface | 10 Gigabit Ethernet | Transfer Rate | 10.000 Mbits/sec |
|--------------------------|---|---------------|------------------|
| | 5 Gigabit Ethernet | Transfer Rate | 5.000 Mbits/sec |
| | 2.5 Gigabit Ethernet | Transfer Rate | 2.500 Mbits/sec |
| | Gigabit Ethernet | Transfer Rate | 1.000 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 - RS232 TxD (Line2) |
| | 9 - OUT4 (Line7) | 10 - RS232 RxD (Line3) |
| | 11 - GND (IO) | 12 - Power (IO) |

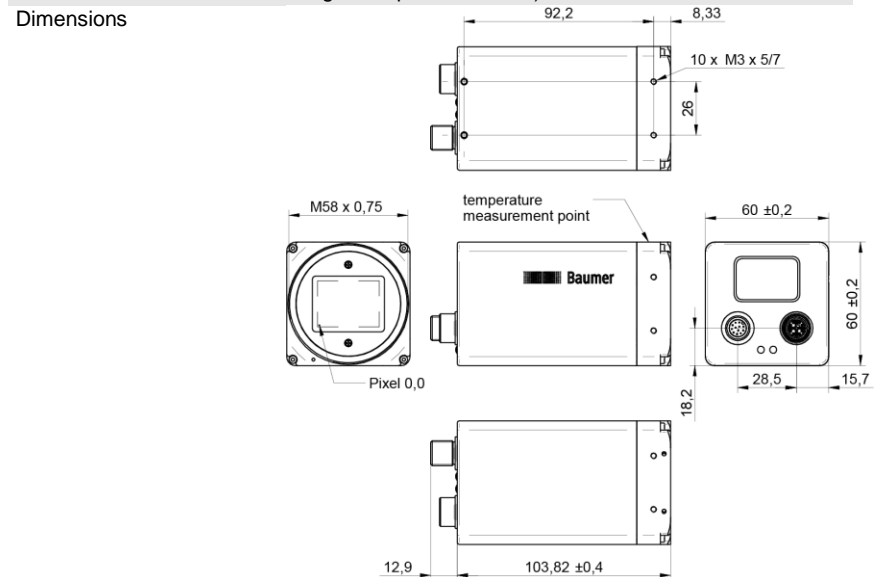
| Lens Control Interface (located within support) | NA |
|---|----|
|---|----|

Optical Data

| Lens Mount | M58-Mount |
|----------------|-----------|
| Optical Filter | - |

Mechanical Data

| Housing | aluminum, hard anodized, IP40 (with mounted lens and 5 GigE, Integrated JPEG Image Compression cable) |
|---------|---|
|---------|---|



| Weight | 485 g |
|--------|-------|
|--------|-------|

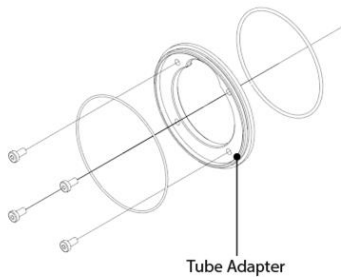
Environmental Data

| | |
|----------------------------|---|
| Storage Temperature | -30 °C ... + 70 °C |
| Operating Temperature | -30 °C ... +70 °C @ T = Measurement Point or -30 °C ... +70 °C @ internal Temperature Sensor Ambient temperature above 25 °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 |

LED Signaling

| | | |
|-----|--------------|-----------|
| LED | Green flash | RX active |
| | Green | Link ON |
| | Yellow | Error |
| | Yellow flash | TX active |

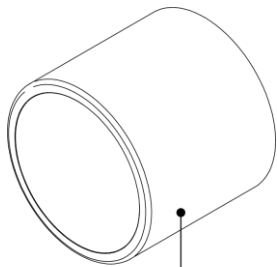
Optional accessories for IP65/67 protection (ordered separately)



Tube Adapter

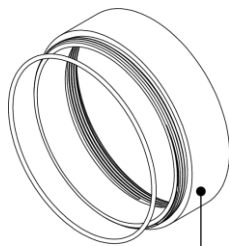
including seals and screws

| Article Number | Diameter | Length |
|----------------|----------|--------|
| 11193125 | Ø 65 mm | 2 mm |



tube

| Article Number | Diameter | Cover Glass | Length |
|----------------|----------|---------------------------------|--------|
| 11185374 | Ø 65 mm | Acryl | 58 mm |
| 11195426 | Ø 65 mm | Tempered laminated safety glass | 58 mm |



distance ring

including seal

| Article Number | Diameter | Length |
|----------------|----------|--------|
| 11185376 | Ø 65 mm | 6 mm |
| 11185375 | Ø 65 mm | 12 mm |
| 11198906 | Ø 65 mm | 36 mm |

Electrical Data

| | |
|---------------------|--|
| Power Supply (ext.) | bus powered via USB3.0 interface |
| Power over Ethernet | NA |
| Power Consumption | approx. 10.6 W @ 24VDC and 11 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 sumery of all outputs) $t_{ON} = < 0.2 \mu\text{sec}$ $t_{OFF} = < 0.2 \mu\text{sec}$ max. Frequency: 500 kHz |
| GPIO | NA |
| RS232 | RS232 compatible, not optically isolated Baud Rate: up to 115200, data bits: 8, stop bits: 1, Parity: none, flow control: none |
| Liquid lens control | NA |

Conformity

| | |
|----------------------------|--|
| Conformity | CE, RoHS, REACH, UL recognized, EAC |
| KC Registration No. / Date | - / - |
| MTBF | 24 years @ T = 45 °C / 15 years @ T = 60 °C T = Measurement Point |

GenICam™ Features

| | |
|----------------------|--|
| Short Exposure Range | - |
| 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 and Off Counter Reset Source: Counter1End, Counter2End, Line0 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, 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 86.8 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 |
| Custom Data | yes, 128 Byte |
| SFNC Version | v2.4.0 |

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 .. 1, invert = false, line format = Tri State |
| Digital Output | Line4 .. 7, invert = false, line source = Off, line format = Open Source |
| GPIO | NA |
| TriggerSource | All |

ROI Frame Rates, min Exposure, 8 bit sensor readout, Mono8 or BayerRG8

| | Resolution | max. fps acquisition | max. fps interface ²⁾ |
|-----------|-------------|----------------------|----------------------------------|
| HXGA | 4096 x 3072 | 26 | 26 |
| UHD (4K) | 3840 x 2160 | 37 | 37 |
| Full HD | 1920 x 1080 | 73 | 73 |
| SXGA | 1280 x 1024 | 76 | 76 |
| XGA | 1024 x 768 | 101 | 101 |
| SVGA | 800 x 600 | 128 | 128 |
| VGA | 640 x 480 | 159 | 159 |
| CIF | 352 x 288 | 255 | 255 |
| QCIF | 176 x 144 | 469 | 469 |
| Full Line | 7008 x 4096 | 19 | 16 |
| | 7008 x 2048 | 39 | 32 |
| | 7008 x 1024 | 76 | 64 |
| | 7008 x 512 | 149 | 128 |
| | 7008 x 256 | 284 | 257 |
| | 7008 x 128 | 517 | 515 |
| | 7008 x 64 | 876 | 876 |
| | 7008 x 32 | 1339 | 1339 |
| | 7008 x 16 | 1823 | 1823 |
| | 7008 x 8 | 2225 | 2225 |
| | 7008 x 4 | 2497 | 2497 |
| | 7008 x 2 | 2663 | 2663 |
| | 7008 x 1 | 2663 | 2663 |

²⁾ depends on the used interface speed

Integrated JPEG Image Compression

| | | | | |
|---|--|-------------------|-----------|------------|
| JPEG compression | Compression of 8 bit monochrome images with configurable compression rate / image quality based on "JPEG still image data compression standard" from William B. Pennebaker and Joan L. Mitchell (1993) | | | |
| Image format | According to GigE Vision standard 2.x payload type JPEG Transmitted image can be directly saved to JPEG file | | | |
| Compression quality | Selectable, 10 (highest) .. 95% (lowest compression rate) | | | |
| Compression examples (depends on actual image) | Resolution 9344 x 7000 pixels, Frame rate 11 fps | | | |
| | JPEG quality | Compression ratio | File size | Bandwidth |
| | 90% | 1:8 | 7.8 MB | 686 Mbit/s |
| | 80% | 1:13 | 4.8 MB | 422 Mbit/s |
| | 70% | 1:18 | 3.5 MB | 308 Mbit/s |
| | 50% | 1:27 | 2.3 MB | 246 Mbit/s |
| Rate control | Yes, fixed bit rate or fixed quality | | | |
| Preview image | Obtained with 8x8 subsampling of sensor image, Uncompressed transmission on Stream1 if activated | | | |