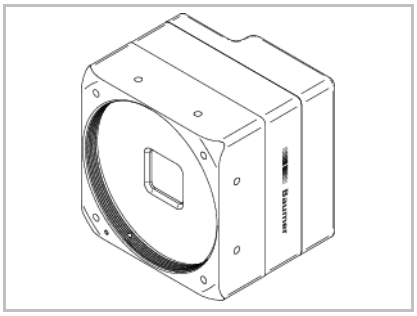
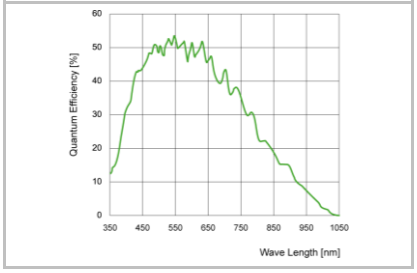
LXG-20M.3D

Technical Data

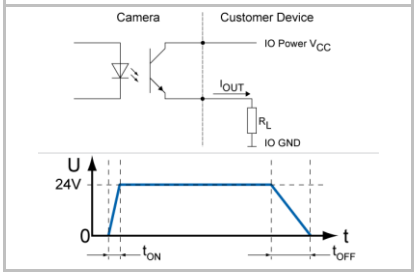
Art. No. 11174306



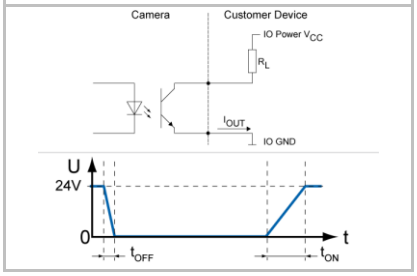
Sensor Graph: Relative Response



Digital Output: High Active



Digital Output: Low Active



Digital Monochrome Matrix Camera, Gigabit Ethernet, 3D Laser Triangulation Processing (R1.1)

Sensor Information

Model Name	CMOSIS CMV-2000 V3
Type	2/3“ progressive scan CMOS
Shutter	Global
Native Resolution	2048 x 1088 pixels
Scan Area	11.26 mm x 5.98 mm
Pixel Size	5.5 µm x 5.5 µm

Data Quality

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

Readout Noise (σ)	0.4 LSB @ 8 bit
Dynamic Range	54.5 dB (typical)

Acquisition Formats

Image Formats	Format	Resolution	Sensor/GigE	$t_{readout}$
	Full Frame	2048 x 1088	338/56 fps	2.94 msec
Pixel Formats	Mono10 (Sensor), Mono8 / Mono10Packed (GigE)			
Partial Scan	True Partial Scan, Region of Interest (ROI) arbitrary			

Image Pre-Processing

Analog Controls	Exposure Time (30 µsec … 1 sec | Step Size 1 µsec) Gain (0 ... 12 dB), Offset (0 ... 63 LSB | 10 bit)
Gamma Correction	NA
LUT	NA
Color Models	Mono
Color Tolerance	Only on Color Cameras
Color Processing	NA
Color Adjustment	NA
Binning	NA
Decimation	NA
Image Flipping	Horizontal
Defect Pixel Correction	via Defect Pixel List with up to 1000 Pixel Coordinates, 10 Lines, 10 Columns

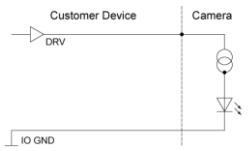
Process Synchronization

Modes	Free Running, Trigger
Free Running	Continuous or Adjustable Acquisition Frame Rate (0.01 … 19230 Hz)
Trigger Sources	line0, Software, ActionCommand, Timer1Start, eVAOutput1, All (except Timer1Start/eVAOutput1) or Off
Trigger Delay	0 ... 2 sec, Tracking and buffering of up to 256 triggers
Sequencer Characteristics	up to 128 sets of parameters, up to 65536 loop passes, up to 65536 repetitions of sets of parameters, up to 65536 images per trigger event
Sequencer Parameters	Exposure Time, Gain Factor, ROI Offset x, ROI offset y
External Flash Sync	via Exposure Active $t_{delay\ flash} \leq 3$ µsec, $t_{duration} = t_{exposure} + 18$ µsec

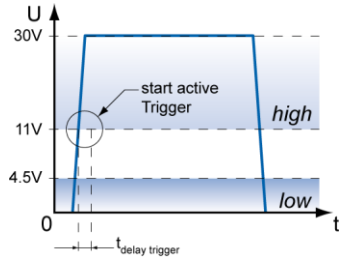
Digital I/Os

Lines	Input: Line 0, Output: Line1, Line 2, Line 3
Circuit Times	Output: t_{ON} = typ. 2 µsec t_{OFF} = typ. 30 µsec
Output Sources	Off, ExposureActive, ReadoutActive, FrameActive, TriggerReady, TriggerOverlapped, TriggerSkipped, Line 0, UserOutput{1,2,3}, Timer{1,2,3}Active, eVAOutput{1,2,3}
Line Debouncer	Low and high signal separately selectable Debouncing Time 0 … 5 msec, Step Size: 1 µsec

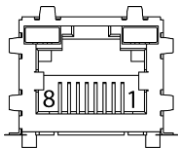
Digital Input



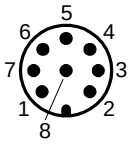
Trigger Mode: Start up time and valid Trigger



Pin Assignment Data Interface

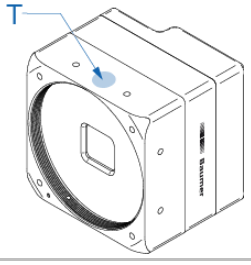


Pin Assignment Power and Process Interface



wire colors	
1	white
2	brown
3	green
4	yellow
5	grey
6	pink
7	blue
8	red

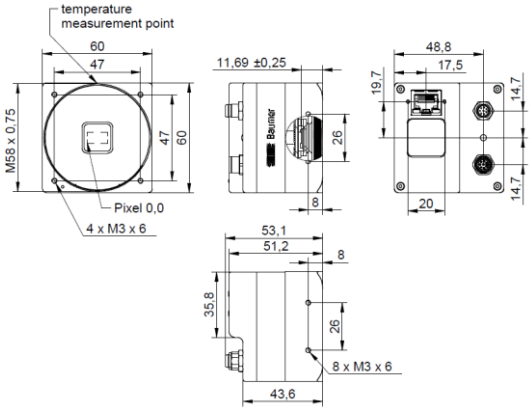
Device Temperature: Measurement Point



Interfaces and Connectors

Data Interface (lower GigE port not used)	Gigabit Ethernet Fast Ethernet Connector: Pin Assignment:	Transfer Rate 1000 Mbits/sec Transfer Rate 100 Mbits/sec 8P8C Modular Jack (RJ45), screw lock 1 – MX1+ 5 – MX3- 2 – MX1- 6 – MX2- 3 – MX2+ 7 – MX4+ 4 – MX3+ 8 – MX4-
Power and Process Interface #1 (top)	Connector: Assignment:	SACC-DSI-M8MS-8CON-M8-L180 SH 1 – OUT3 (line3) 5 – IO Power VCC 2 – Power VCC 6 – OUT1 (line1) 3 – IN1 (line0) 7 – GND 4 – IO GND 8 – OUT2 (line2)
Power and Process Interface #2 (bottom)	Connector: Assignment:	SACC-DSI-M8FS-8CON-M10-L180 SH 1 – IN2_RS485+ (line4) 2 – IN2_RS485- (line4) 3 – IN3_RS485+ (line5) 4 – IN3_RS485- (line5) 5 – OUT4_RS485+ (line6) 6 – OUT4_RS485- (line6) 7 – External Power GND 8 – External Power 5 V/200 mA

Mechanical Data

Housing	Aluminum, IP40
Dimensions	
Weight	291 g

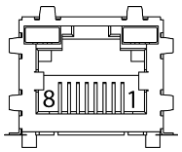
Optical Data

Lens Mount	M58-Mount, adapters available for C-Mount, and C-Mount with Scheimpflug principle
Optical Filter	Dust Protection Glass

Electrical Data

Power Supply (ext.)	VCC: I:	12 … 24 V DC ± 20% 242 … 475 mA
Power over Ethernet	Class 0 device VCC: I:	36 … 57 V DC 140 mA @ 48 VDC
Power Consumption	approx. 5,8 W @ 24 VDC and 338 fps approx. 6,7 W @ 48 VDC (PoE) and 338 fps	
Digital Input	$U_{IN(low)}$: $U_{IN(high)}$: I_{IN} : min. Impulse Length: Trigger Delay out of $t_{readout}$: max. Trigger Delay during $t_{readout}$:	0.0 … 4.5 VDC 11.0 … 30.0 VDC 6.0 … 10 mA 2.0 µsec 4.0 µsec 30.0 µsec
Digital Output	U_{EXT}: I_{OUT}:	5 … 30 V DC max. 50 mA

LED Signalling



Conformity

LED Signalling

Camera LED	Green on	Power on, link good
	Green blinking	Power on, no link
	Red on	Error
	Red blinking	Warning
	Yellow	Readout active
RJ45 LEDs	Green on	Link on
	Green blinking	Link activity
	Amber on	GigE speed
	Amber blinking	100 Mb speed

Environmental Data

Storage Temperature	-10 °C bis +70 °C
Operating Temperature	+5°C … +50°C
Device Temperature	T_{max} = 50 °C @ Measurement Point
Humidity	10 % … 90 % non-condensing
Conformity	RoHS, REACh, CE

Network Interface Data

Network Interface	Gigabit Ethernet	1000BASE-T	1000 Mbits/sec
	Fast Ethernet	100 BASE-T	100 Mbits/sec
Link Aggregation	According to 802.3ad, static configuration		
Ethernet IP Configuration	Persistent IP, DHCP, LLA		
Packet Size	576 .. 9000 Byte, Jumbo frames supported		

GigE Vision® Features (in compliance with GigE Vision® 1.2)

Events Transmission via Asynchronous Message Channel	GigEVisionError, HeartbeatTimeOut, EventLost, EventDiscarded, Line{0,1,2,3}RisingEdge, Line{0,1,2,3}FallingEdge, Action1, ExposureStart, ExposureEnd, FrameStart, FrameEnd, TriggerReady, TriggerOverlapped, TriggerSkipped, Timer{1,2,3}End
Frame Counter	up to 2^{32}
Lost Frame Counter	up to 2^{24} – 1, counts discarded images when FIFO is full
Payload Size	4 … 2.228.436 Byte
Transmission Delay	0 .. 2^{32}-1 Ticks (1 Tick = 8 nsec)
Timestamp	64 bit
Packet Delay	0 .. 2^{32}-1 Ticks (1 Tick = 8 nsec)
Packet Resend	Resend Buffer: 240 MB (16 Images)

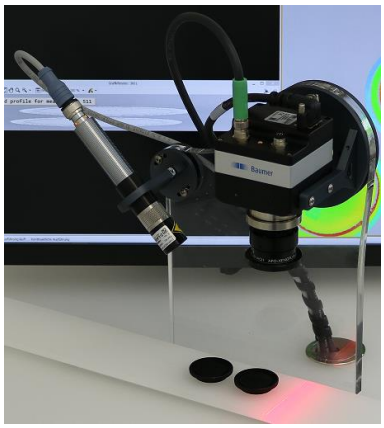
GenICam™ Features (in compliance with SFNC 2.1.0)

Timer	Timer Selector: Timer 1 … 3 TimerTriggerSource: Off, Line0, Software, Action1, TriggerSkipped ExposureStart, ExposureEnd, FrameStart, FrameEnd, TimerDelay: 0 µsec … 2 sec, Step Size: 1 µsec TimerDuration: 10 µsec … 2 sec, Step Size: 1 µsec	
User Sets	Factory Settings:	Default (read only)
	Freely Programmable:	UserSet1, UserSet2, UserSet3
	Parameters:	any user definable Parameter
Acquisition Abort	Delay up to 69 msec	

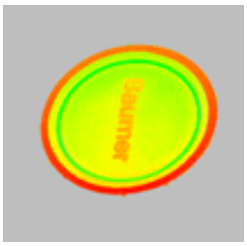
Vendor Specific Features

DSNU / PRNU (FPN) Correction	Based on offset / gain per column
High Dynamic Range (HDR)	Piecewise linear response, up to 90 dB
Burst Mode	NA
eVA Applet Enable	On / Off
eVA A. Overlapped Images	Number of images than can be processed in parallel in eVA
Temperature measurement	Internal sensor temperature range: 0 °C .. +85 °C, accuracy: ±1,0 °C

Example laser triangulation setup



Processed height map example



3D Laser Triangulation Processing R1.1

Algorithm	Center of Gravity (COG) for high speed and robust laser line detection	
Profile Speed	2048 x 1088	338 fps
	2048 x 1024	359 fps
	2048 x 768	477 fps
	2048 x 512	711 fps
	2048 x 256	1396 fps
	2048 x 128	2691 fps
	2048 x 64	5019 fps
	2048 x 32	8844 fps
Data Format	16 bit profile height information per column with 12 row bits and 4 subpixel bits (2048x1@ 16 bit). 8 bit 2D image per column (2048x1@ 8 bit). 8 bit laser line width per column (2048x1@ 8 bit). Transmitted as 8 bit data with 2048x4 @ 8 bit per profile.	
Profile Aggregation	Up to 64 profiles are combined in a frame for transmission. This reduces the frame rate and CPU load on PC and makes transmission more robust.	
Encoder Support	Evaluation of A/B lanes of RS422 based encoders.	
Meta Data Information	To simplify process monitoring and control. Includes frame counter, time stamp and encoder status embedded in the image.	
Laser Line Test Pattern	To simplify evaluation and test automation.	

Factory Settings after Start-Up

Operation Mode	Free running, overlapped mode
Analog Controls	Exposure Time: 4 msec, Gain: 0 dB, Offset: 0
Pixel Format	Mono8
Partial Scan	Off
Acquisition Frame Rate	Off
Timer	Off
Transmission Delay	Off
Defect Pixel Correction	On
FPN Correction	On
eVA Applet Enable	Off
Digital Input	Line0, invert = false, trigger source = All
Digital Output	Line1/2/3, invert = false, line source = Off