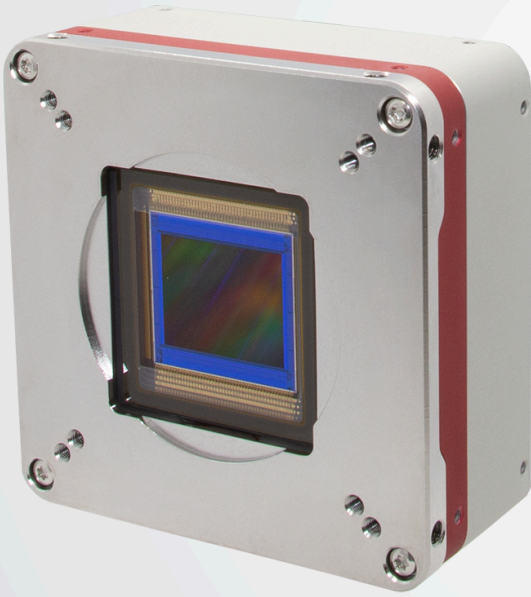


Preliminary Specification

Q-21A230x/CXP-SA



The QUARTZ Q-21A230x/CXP-SA camera, or in short the Q-21Standard, brings 5120 by 4096 high quality pixels to the image for real time metrology tasks with a reliable high speed CoaXPress interface. With 21 megapixel resolution and 227.9 frames per second of measurement speed, the Q-21A230 can greatly improve the precision and throughput of your system. All image information is preserved by Adimec's True Accurate Imaging technique and state of the art global shutter sensor technology.

The Q-21 Standard has a low power mode combined with optimal heat management, which makes it the perfect fit for a cost effective system integration in Electronic Manufacturing applications. Different operating modes which optimize for maximum dynamic range, high full well or high sensitivity, provide easy system integration with ideal performance under various demanding conditions. The camera offers Adimec Connect & Grab™ allowing engineers to start system development at camera arrival.

Typical application examples: (3D) AOI in electronic manufacturing; Digital pathology



5120 x 4096 at 227.9 fps



Active sensor alignment



Low power mode



Device-to-device repeatability



Low frequency flat field correction in bright



CXP-12 interface for 4 x 12.5 Gb/s

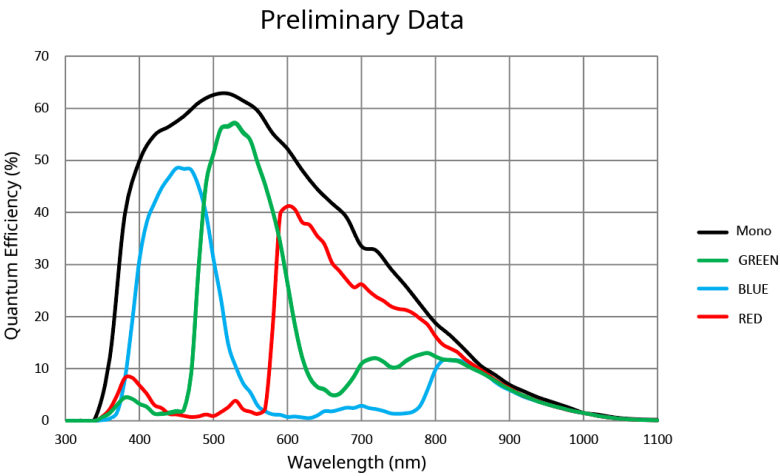
Performance

Type	GPIXEL GSPRINT4521
Architecture	CMOS progressive scan Global Shutter
Sensor diagonal	29.5 mm (23.04 x 18.43 mm)
Pixel size	4.5 μm x 4.5 μm
Active pixels	5120 (H) x 4096 (V)
Maximum framerate	227.9 in 1X_1Y tap format, 224.3 in 1X_2YE tap format
Parasitic light sensitivity	< 1/20000
Microlenses	Yes

Gain modes (typical values @ 10 bit)

Mode	Max full well	High full well	Max dynamic range	High sensitivity
Analog gain	1	1.5	2.2	4.8
Full well	33.6 ke-	22.4 ke-	15.3 ke-	7.0 ke-
Dynamic range	61.2 dB	60.8 dB	62.5 dB	60.4 dB
Temporal dark noise	29.2 e-	20.4 e-	11.4 e-	6.7 e-

Quantum Efficiency



Environmental

Operating

Sensor temperature	+5°C to +60°C
Humidity (relative)	20% - 80% non-condensing
Shock	10 g, half sine shape, 6-10ms duration in ±X, ±Y and ±Z
Vibration	3 g sinusoidal vibration sweeps 5 - 150 Hz

Storage

Ambient temperature	-25°C to +65°C
Humidity (relative)	5% - 95% non-condensing
Shock	25 g, half sine shape, 6-10 ms duration in ±X, ±Y and ±Z
Vibration	10 g sinusoidal vibration sweeps 5 - 150 Hz

High Resolution Metrology Camera

Characterization

Defect pixel limits

Defect pixel threshold in dark image ($t_{exp} = 15 \mu s$)	> 51 DN ₁₀
Defect pixel threshold in bright image ($t_{exp} < 50 ms$)	+/- 20% wrt local neighborhood pixels
Defect pixel threshold in saturated image ($t_{exp} < 100 ms$)	< -20% wrt local neighborhood pixels
Max total defect pixels	1000
Max clusters of size = 2-4 (monochrome)	25*
Max clusters of size = 4 (color)**	25*
Max clusters of size > 4	0
Defect column/row threshold in dark image ($t_{exp} = 15 \mu s$)	> 31 DN ₁₀ wrt local neighborhood columns/rows
Defect column/row threshold in bright image ($t_{exp} < 50 ms$)	+/- 5% wrt local neighborhood columns/rows
Defect column/row threshold in saturated image ($t_{exp} < 100 ms$)	+/- 5% wrt local neighborhood columns/rows
Max total defect column/row	0

These limits are applied during the factory calibration of the defect pixel map for the defect pixel correction.

Measurement conditions: No filter or lens; Light source: uniform LED; F-number = 2; Sensor temperature = 60°C

* Clusters with 4 consecutive defect pixels in a row are not allowed.

** Clusters are detected within the same Bayer color plane.



Acceptance Test Limits

Dark Signal Non-Uniformity	< 7.5 e-	
Pixel Response Non-Uniformity	< 1.75 % rms	
Sensitivity matching per gain mode	Lower limit	Upper limit
- Max full well	0.0290 DN ₁₀ /e-	0.0320 DN ₁₀ /e-
- High full well	0.0435 DN ₁₀ /e-	0.0481 DN ₁₀ /e-
- Max dynamic range	0.0637 DN ₁₀ /e-	0.0705 DN ₁₀ /e-
- High sensitivity	0.1391 DN ₁₀ /e-	0.1537 DN ₁₀ /e-

Measurement conditions: No filter or lens; Light source: uniform LED; F-number = 2; Exposure time = variable

High Resolution Metrology Camera

Functionality

Functionality			Description
Image acquisition	✓	✓	Timed, TriggerWidth, SyncControl, TimedTriggerControl
Integration time control	✓	✓	Programmable between 4 µs and 5 s in steps of 1 µs
Analog gain	✓	✓	Programmable analog gain amplifier selectable between 1x, 1.5x, 2.2x and 4.8x
Digital gain	✓	✓	Digital fine gain selectable between 1x and 32x in steps of 0.001
White balance	-	✓	Digital fine gain per color channel selectable between 1x and 4x in steps of 0.001 - manual or one-push
Programmable LUT	✓	✓	Look-up table to map the measured video level to a user defined video level
Gamma curve	✓	✓	Tone mapping on the video data to match the display image to the image perception of the human eye
Region of interest	✓	✓	Programmable size and position of readout image - Increased frame speed via ROI
Sensor binning	*	*	Sum or average small groups of pixel on sensor to increase signal-to-noise ratio and frame rate
Band ROI	*	*	Multiple regions of interest combined into a single image to increase frame rate
Mirroring	✓	✓	The output can be flipped in the horizontal and vertical direction
Defect pixel correction	✓	✓	Factory calibrated - Review and editing of defect pixel map
Uniformity correction	✓	✓	Factory calibrated uniformity correction to ensure device-to-device repeatability
Low Frequency Flat Field Correction (LF FFC)	✓	✓	Up to 50 LF FFC sets can be saved in non-volatile memory - Up to 22 out of 50 can be live switched from frame to frame
Plane matching	✓	✓	Sensor specific correction that equalizes response differences between image planes
Sensitivity matching	✓	✓	Conversion gain calibrated per camera to achieve sensitivity matching between cameras
User data storage	✓	✓	Up to 2 GB eMMC memory available for user to store data
Camera settings storage	✓	✓	1 factory set and 10 user sets for storage of camera settings
I/O	✓	✓	Programmable I/O polarity with deglitch function
Test mode	✓	✓	Internal test pattern generator available to check the complete digital image chain
Frame counter	✓	✓	Add frame number to image in meta data overlay
Temperature readout	✓	✓	Readout sensor and FPGA temperature in units of 0.1 °C
Identification	✓	✓	Camera type, build state and serial number can be read via software

* Available on request

Compliance

RoHS	Yes
ESD	Contact discharge +/- 4 kV; Air discharge +/- 8 kV
Workmanship	In accordance with IPC-J-STD-001 class 2 and inspected according IPC-A-610 class 2

Reliability

MTBF camera	> 75,000 h @ 30°C calculated according to the part stress analysis of MIL-HDBK-217F for ground fixed, uncontrolled environment.
MTBF fan (optional)	> 70,000 h @ 45°C

Interfacing

Video

Video output	CoaxPress V1.1.1 CXP3/6/10/12 - 2 and 4 lanes configurable
External Sync	I/O or CXP controlled
Output resolution	8 / 10 bit
Tap geometry	1X-1Y or 1X-2YE*
Connector	4 x Micro-BNC

* Check if the 1X-2YE tap geometry is supported by the frame grabber manufacturer.

Camera Control Protocol

Interface	GenICam (SFNC)*
Throughput	40 Mbps for CXP10 and CXP12 / 20 Mbps for CXP3 and CXP6
Protocol	GenTL*

*Conform CoaXPress standard

I/O

Output	LVDS - Fully programmable flash strobe signal (duration, delay and polarity)
Input	LVDS - Trigger signal with programmable polarity
Connector	Hirose 12 pin HR10A-10R-12P(73)

Power

Input voltage	2 x 24 Vdc nominal, range: 18.5 Vdc to 26 Vdc PoCXP
Power dissipation	Typical 12 W @ 24 Vdc full continuous operation at full ROI at maximum framespeed
Power connector	Micro-BNC master connection and extension 1

Interface connectors

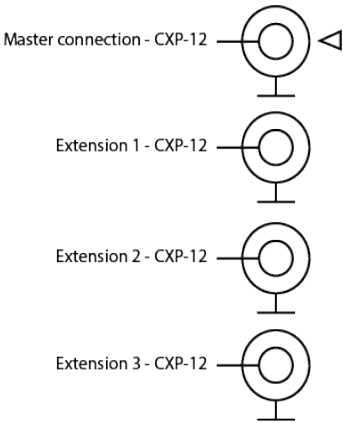


Figure 1. Quad CXP Micro-BNC

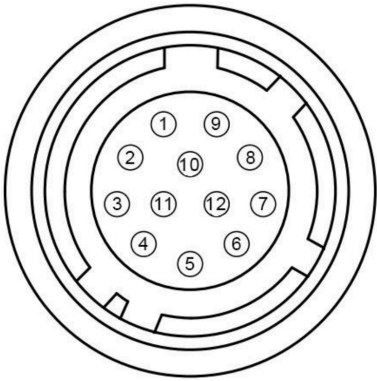


Figure 2. Hirose 12 pin HR10A-10R-12P(73) I/O connector

I/O pin connection table

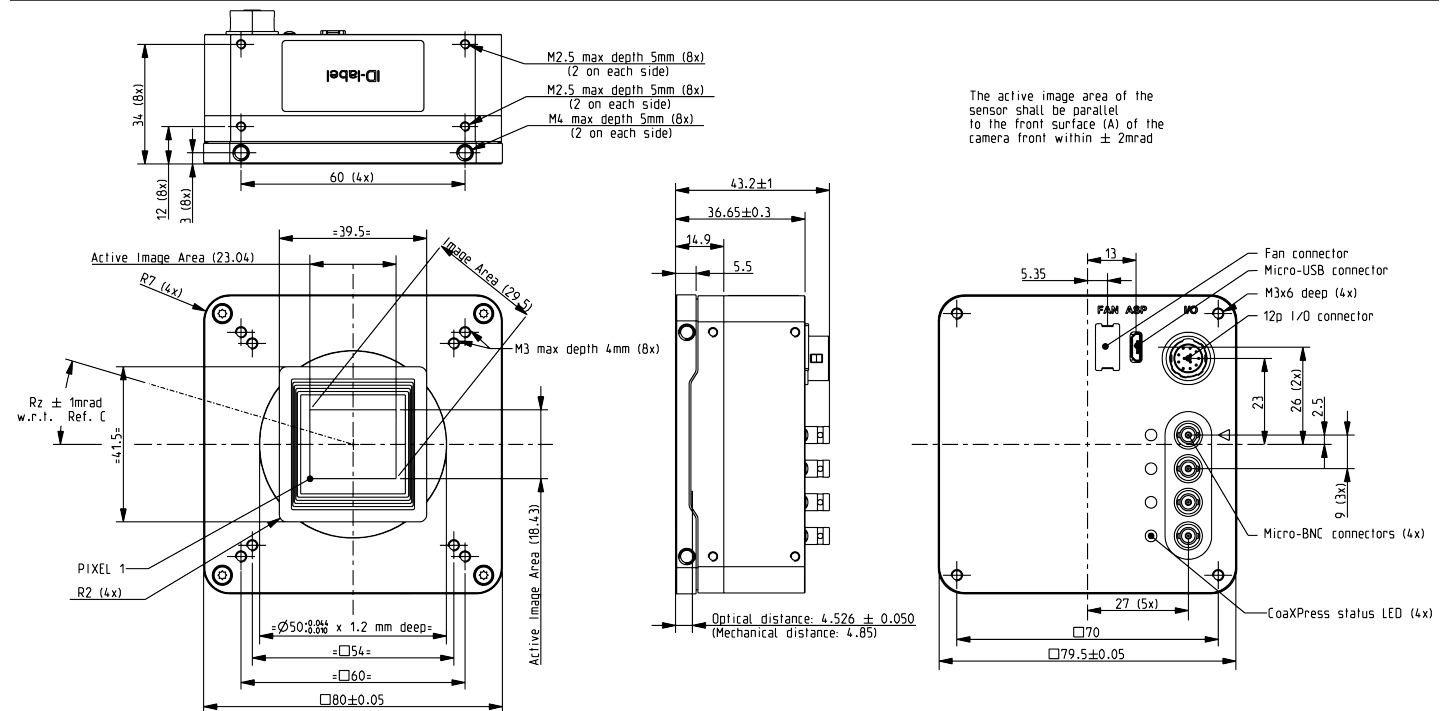
1	Ground
2	Not in use
3	Flash strobe out (LVDS -)
4	Flash strobe out (LVDS +)
5	Do not use
6	Do not use
7	Do not use
8	Do not use
9	Ground
10	Do not use
11	Trigger in (LVDS -)
12	Trigger in (LVDS +)

High Resolution Metrology Camera

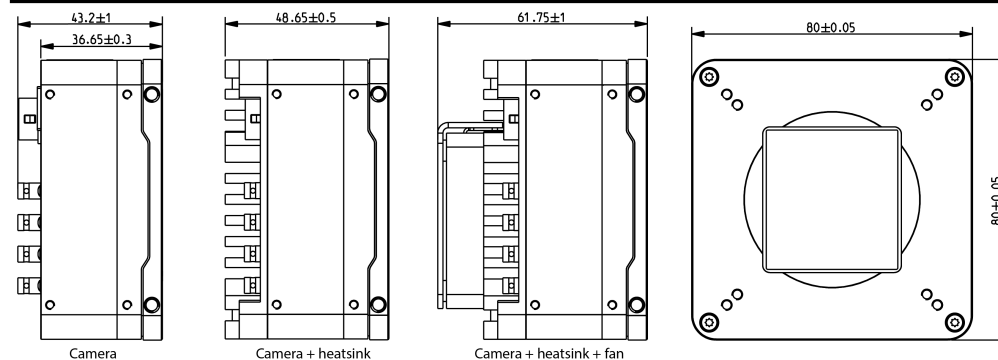
Mechanical

Mounting	2 x M4 mounting holes per side on camera front
Lensmount	4 x M3 at 60mm pitch - 4 x M3 at 54mm pitch - 50mm G7 reference (on request: F, TFL-II, T2, M42)
Camera heatsink	4 x M3 at 70mm pitch on camera backplate (on request: Heatsink with optional fan available)
Image sensor heatsink	2 x M2.5 mounting holes per camera side
Outline	See figure
Weight camera	600 g +/- 5% excl. lensmount, heatsink and fan
Weight heatsink	< 75 g
Weight heatsink and fan	< 100 g

Mechanical outline



Mechanical outline with accessories



Sensor Mounting Accuracy

XY-centering	$\pm 0.050 \text{ mm}$
Rotation	$\pm 1 \text{ mRad}$
Optical distance	$4.526 \pm 0.050 \text{ mm}$ (after removing coverglass: $4.85 \pm 0.050 \text{ mm}$)
Perpendicularity	$\pm 2 \text{ mRad}$

All specifications on the sensor alignment are with respect to the camera front without lensmount and lens

High Resolution Metrology Camera

Camera Types

Sample product name			Q -21A230 m /CXP -S A -1.1				
Series	Q	-	High speed CMOS Global Shutter cameras				
Sensor	-21A230	-	21 Mpixel at 227.95 fps				
Sensor type	m	-	Monochrome				
	c*	-	Color (Bayer output)*				
	r*	-	Removable cover glass*				
Interface	/CXP	-	CoaXPress interface at max 12.5 Gb/s				
Variant	-S	-	Standard product version				
Sensor alignment	A	-	Active alignment				
Issue No.	-1.1	-	Camera issue number				

* Available on request

NOTE: Removable coverglass imperfections (scratches, ditches, dust, etc.) are not covered under warranty.

Accessories

Heatsink with/without fan	Optional
Fn-mount	Optional
M42-mount fixed	Optional
Other lens mounts	Available on request

Adimec

Adimec is the leading supplier of high-end cameras for machine vision, medical and outdoor imaging applications. Our Adimec True Accurate Imaging® technology forms the foundation for a broad range of camera products, and brings new levels of precision and accuracy to vision systems.

Custom cameras

Adimec has the ability to offer additional camera functionality and create customer specific cameras even for small volume programs. Built from platforms, our standard line of cameras give us a flexible base that can be tailored to fit your specifications. Contact us to discuss these options in more detail. Visit: www.adimec.com for product details.



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Q-21A230x/CXP-SA Revision 1.0

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