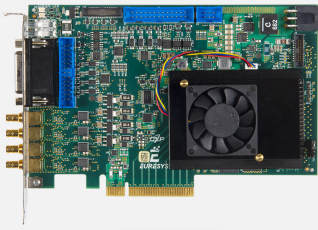


# Coaxlink Quad CXP-12 JPEG

Four-connection CoaXPress CXP-12 frame grabber with JPEG compression



## At a Glance

- Four 250 MPixels/s JPEG encoders
- Compatible with 8-bit/pixel Bayer CFA cameras
- Two streams per camera: JPEG stream and RGB preview stream
- Four CoaXPress CXP-12 connections: 5,000 MB/s camera bandwidth
- PCIe 3.0 (Gen 3) x8 bus: 6,700 MB/s bus bandwidth

## Benefits

### Applications

The Coaxlink Quad CXP-12 JPEG enables the compact implementation of a multi-channel ultra-high-resolution image acquisition and recording system. The embedded pixel processing drastically reduces the CPU workload to monitor and compress image streams.

### Description

- The 4-camera firmware variant of the Coaxlink Quad CXP-12 JPEG implements four independent image acquisition channels with, for each of them, a Bayer CFA decoder and a baseline JPEG encoder that can process up to 250 Megapixels/s, for a total of 1 billion color pixels per second.
- Each channel delivers two concurrent streams: a "JPEG" encoded stream for recording and a "Preview" stream for monitoring.
- The JPEG stream delivers, with a typical latency of only 20 lines, 4:2:2 full-resolution JFIF-compliant encoded images compatible with standard JPEG decoders. The JPEG encoding quality is configurable from 1 to 100.
- The Preview stream provides 8-bit Bayer full-resolution, 24-bit RGB full-resolution or 24-bit RGB low-resolution images.

### Support of JFIF image format

The GenICam Browser and GenTL Viewer applications now support JFIF images.

### PCIe 3.0 (Gen 3) x8 bus

- 7,800 MB/s peak bus bandwidth
- 6,700 MB/s sustained bus bandwidth

### Acquire images from the fastest and highest resolution cameras

- Highest data acquisition rate in the industry
- 50 Gbit/s (5,000 MB/s) bandwidth from camera to host PC memory

## Long cable support

- 40 meters at CXP-12 speed (12.5 Gbps)
- 72 meters at CXP-6 speed (6.25 Gbps)
- 100 meters at CXP-3 speed (3 Gbps)

## Use standard coaxial cables

- A single inexpensive cable for data transfer, camera control, trigger and power supply
- Top reliability and flexibility, performs in the harshest environments

## Robust connectors

- Micro-BNC (HD-BNC) connectors for reliable connection
- Trusted push and turn, bayonet-style positive lock
- Allows for quick and easy connects and disconnects

## Connect up to 4 cameras to a single Coaxlink card

### Memento Event Logging Tool

- Memento is an advanced development and debugging tool available for Coaxlink cards.
- Memento records an accurate log of all the events related to the camera, the frame grabber and its driver as well as the application.
- It provides the developer with a precise timeline of time-stamped events, along with context information and logic analyzer view.
- It provides valuable assistance during application development and debugging, as well as during machine operation.

## Direct GPU transfer

- Sample programs for AMD DirectGMA and NVIDIA (CUDA) available.
- Direct GPU transfer eliminates unnecessary system memory copies, lowers CPU overhead, and reduces latency, resulting in significant performance improvements in data transfer times for applications.
- Direct capture of image data to GPU memory is available using AMD's DirectGMA. Compatible with AMD FirePro W5x00 and above and all AMD FirePro S series products.

## General purpose I/O lines

- Compatible with a wide range of sensors and motion encoders.
- High-speed differential inputs: Quadrature motion encoder support up to 5 MHz.
- Isolated current-sense inputs: 5V, 12V, 24V signaling voltages accepted, up to 50 kHz, individual galvanic isolation up to 500VAC RMS.
- Isolated contact outputs.
- High-speed 5V-compliant TTL inputs/ LVTTTL outputs.

## High-performance DMA (Direct Memory Access)

- Direct transfer into user-allocated memory and hardware boards that expose PCI addresses
- Hardware scatter-gather support
- 64-bit addressing capability

## The Coaxlink driver includes the following tools:

- Genicam Browser: An application giving access to the Genicam features exposed by the GenTL Producer(s) in the system.
- GenTL Console: A command-line tool giving access to the functions and commands exposed by the Euresys GenTL Producer.

## Area-scan triggering capabilities

- A trigger is used to start the acquisition when the part is in position. Hardware triggers come from the Coaxlink's I/O lines. Software triggers come from the application.
- An optional trigger delay is available to postpone the acquisition for a programmable time.
- A trigger decimation function allows to skip some of the triggers.

- Camera exposure control allows the application to control the exposure time of the camera.
- When the acquisition starts, at the appropriate timing, the Coaxlink board generates a signal to control an illumination device connected to one of its output lines.

### Compliant with Genicam Including support for

- GenApi
- The Standard Feature Naming Convention (SFNC)
- GenTL

### Windows, Linux and macOS drivers available

- Including support for Intel 32-bit and 64-bit platforms as well as ARM 64-bit platforms

## Applications

### Video Acquisition and Recording

- High-frame-rate video acquisition for motion analysis and recording

### Video Monitoring, Surveillance & Security

- Transmission and acquisition of high-definition video over long coaxial cables for traffic surveillance, monitoring and control

## Specifications

### Mechanical

Form Factor	PCI Express card
Format	Standard profile, half length, 8-lane PCI Express card
Cooling method	Air cooling, fan-cooled heatsink
Mounting	For insertion in a standard height, 8-lane or higher, PCI Express card slot
Connectors	<ul style="list-style-type: none"> <li>• 'A', 'B', 'C', 'D' on bracket: <ul style="list-style-type: none"> <li>– 4x Micro-BNC female connectors</li> <li>– CoaXpress host interface</li> </ul> </li> <li>• EXTERNAL I/O' on bracket: <ul style="list-style-type: none"> <li>– 26-pin 3-row high-density female sub-D connector</li> <li>– I/O lines and power output</li> </ul> </li> <li>• INTERNAL I/O 1' and 'INTERNAL I/O 2' on PCB: <ul style="list-style-type: none"> <li>– 2x 26-pin 2-row 0.1" pitch pin header with shrouding</li> <li>– I/O lines and power output</li> </ul> </li> <li>• 'AUXILIARY POWER INPUT' on module: <ul style="list-style-type: none"> <li>– 6-pin PEG power socket</li> <li>– 12 VDC power input for PoCXP camera(s) and I/O power</li> </ul> </li> <li>• 'C2C-LINK' on module: <ul style="list-style-type: none"> <li>– 6-pin 2-row 0.1-in header</li> <li>– Card to card link</li> </ul> </li> </ul>

Lamp indicators	<ul style="list-style-type: none"> <li>• 'A', 'B', 'C', 'D' on bracket: <ul style="list-style-type: none"> <li>– 4x bi-color red/green LEDs</li> <li>– CoaXPress Host connector indicator lamps</li> </ul> </li> <li>• 'FPGA STATUS LAMP' on PCB: <ul style="list-style-type: none"> <li>– Bi-color red/green LED</li> <li>– FPGA status lamp</li> </ul> </li> <li>• 'BOARD STATUS LAMP' on PCB: <ul style="list-style-type: none"> <li>– Bi-color red/green LED</li> </ul> </li> </ul>
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Switches	'RECOVERY' on card PCB: <ul style="list-style-type: none"> <li>• 3-pin 1-row 0.1" header</li> <li>• Firmware emergency recovery</li> </ul>
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Dimensions	L 167.65 mm x H 111.15 mm L 6.6 in x H 4.38 in
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Weight	196 g, 6.91 oz
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## Host bus

Standard	PCI Express 3.0
Link width	<ul style="list-style-type: none"> <li>• 8 lanes</li> <li>• 1 lane, 2 lanes or 4 lanes with reduced performance</li> </ul>
Link speed	<ul style="list-style-type: none"> <li>• 8.0 GT/s (PCIe 3.0)</li> <li>• 5.0 GT/s (PCIe 2.0) with reduced performance</li> </ul>
Maximum payload size	512 bytes
DMA	32- and 64-bit
Peak delivery bandwidth	7,800 MB/s
Effective (sustained) delivery bandwidth	6,700 MB/s (Host PC motherboard dependent)
Power consumption	Typ. TBW (TBD W @ +3.3V, TBD W @ +12V), excluding camera and I/O power output

## Camera / video inputs

Interface standard(s)	CoaXPress 1.0, 1.1, 1.1.1 and 2.0
Connectors	4x Micro-BNC 75 Ohms (also known as HD-BNC™) CXP-12
Status LEDs	1 CoaXPress Host connection status per connector
Number of cameras	Four 1-connection cameras
Line-scan cameras supported	No
Maximum aggregated camera data transfer rate	50 Gbit/s (5,000 MB/s)
Supported CXP down-connection speeds	1.25 GT/s (CXP-1), 2.5 GT/s (CXP-2), 3.125 GT/s (CXP-3), 5 GT/s (CXP-5), 6.25 GT/s (CXP-6), 10.0 GT/s (CXP-10), and 12.5 GT/s (CXP-12)
Number of CXP data streams (per camera)	1 data stream per camera
Maximum CXP stream packet size	16,384 bytes
PoCXP (Power over CoaXPress)	<ul style="list-style-type: none"> <li>• PoCXP Safe Power: <ul style="list-style-type: none"> <li>– 17 W of 24V DC regulated power per CoaXPress connector</li> <li>– PoCXP Device detection and automatic power-on</li> <li>– Overload and short-circuit protections</li> </ul> </li> <li>• On-board 12V to 24V DC/DC converter</li> <li>• A +12V power source must be connected to the AUXILIARY POWER INPUT connector using a 6-pin PEG cable</li> </ul>

Camera types	Area-scan cameras: <ul style="list-style-type: none"> <li>• 8-bit Bayer CFA single-tap (1X-1Y) progressive-scan</li> <li>• Image resolution ( H x V): from 128 x 16 up to 5120 x 3840; width and height must be multiples of 8</li> </ul>
Camera pixel formats supported	Bayer (PFNC names): <ul style="list-style-type: none"> <li>• BayerGR8, BayerRG8, BayerGB8, BayerBG8</li> </ul>

## Area-scan camera control

Trigger	<ul style="list-style-type: none"> <li>• Precise control of asynchronous reset cameras, with exposure control.</li> <li>• Support of camera exposure/readout overlap.</li> <li>• Support of external hardware trigger, with optional delay and trigger decimation.</li> </ul>
Strobe	<ul style="list-style-type: none"> <li>• Accurate control of the strobe position for strobed light sources.</li> <li>• Support of early and late strobe pulses.</li> </ul>

## On-board processing

On-board memory	2 GB
Image data stream processing	<ul style="list-style-type: none"> <li>• Optional swap of R and B components</li> <li>• 1:8 image downscaling available on RGB8 output (Stream0, a.k.a. "preview stream")</li> </ul>
Data stream statistics	<ul style="list-style-type: none"> <li>• Measurement of:             <ul style="list-style-type: none"> <li>– Frame rate (Area-scan only)</li> <li>– Line rate</li> <li>– Data rate</li> </ul> </li> <li>• Configurable averaging interval</li> </ul>
Event signaling and counting	<ul style="list-style-type: none"> <li>• The application software can be notified of the occurrence of various events:             <ul style="list-style-type: none"> <li>– Standard event: the EVENT_NEW_BUFFER event notifies the application of newly filled buffers</li> <li>– A large set of custom events</li> </ul> </li> <li>• Custom events sources:             <ul style="list-style-type: none"> <li>– I/O Toolbox events</li> <li>– Camera and Illumination control events</li> <li>– CoaXPress data stream events</li> <li>– CoaXPress host interface events</li> </ul> </li> <li>• Each custom event is associated with a 32-bit counter that counts the number of occurrences</li> <li>• The last three 32-bit context data words of the event context data can be configured with event-specific context data:             <ul style="list-style-type: none"> <li>– Event-specific data</li> <li>– State of all System I/O lines sampled at the event occurrence time</li> <li>– Value of any event counter</li> </ul> </li> </ul>
Bayer CFA to RGB decoder	Advanced interpolation method

## On-board video codec

Video encoders	JPEG <ul style="list-style-type: none"> <li>• Baseline profile</li> <li>• 4 encoders</li> <li>• Up to 250 Mpixels/second per encoder</li> <li>• JFIF compliant output</li> </ul>
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## General Purpose Inputs and Outputs

Number of lines	<p>20 I/O lines:</p> <ul style="list-style-type: none"> <li>• 4 differential inputs (DIN)</li> <li>• 4 singled-ended TTL inputs/outputs (TTLIO)</li> <li>• 8 isolated inputs (IIN)</li> <li>• 4 isolated outputs (IOUT)</li> </ul> <p>NOTE: The number of I/O lines can be extended using I/O modules attached to the I/O EXTENSION connector.</p>
Usage	<ul style="list-style-type: none"> <li>• Any I/O input lines can be used by any LIN tool of the I/O Toolbox</li> <li>• Selected pairs of I/O input lines can be used by any QDC tool of the I/O toolbox to decode A/B signals of a motion encoder</li> <li>• The LIN and QDC tools outputs can be further processed by the other tools (DIV, MDV, DEL) of the I/O toolbox to generate any of the following "trigger" events: <ul style="list-style-type: none"> <li>– The "cycle trigger" of the Camera and Illumination controller</li> <li>– The "cycle sequence trigger" of the Camera and Illumination controller</li> </ul> </li> </ul>
Electrical specifications	<ul style="list-style-type: none"> <li>• DIN: High-speed differential inputs compatible with ANSI/EIA/TIA-422/485 differential line drivers and complementary TTL drivers</li> <li>• TTLIO: High-speed 5V-compliant TTL inputs or LVTTTL outputs, compatible with totem-pole LVTTTL, TTL, 5V CMOS drivers or LVTTTL, TTL, 3V CMOS receivers</li> <li>• IIN: Isolated current-sense inputs with wide voltage input range up to 30V, compatible with totem-pole LVTTTL, TTL, 5V CMOS drivers, RS-422 differential line drivers, potential free contacts, solid-state relays and opto-couplers</li> <li>• IOUT: Isolated contact outputs compatible with 30V / 100mA loads</li> </ul>
Filter control	<ul style="list-style-type: none"> <li>• Glitch removal filter available on all System I/O input lines</li> <li>• Configurable filter time constants: <ul style="list-style-type: none"> <li>– for DIN and TTLIO lines: 50 ns, 100 ns, 200 ns, 500 ns, 1 <math>\mu</math>s</li> <li>– for IIN lines: 500 ns, 1 <math>\mu</math>s, 2 <math>\mu</math>s, 5 <math>\mu</math>s, 10 <math>\mu</math>s</li> </ul> </li> </ul>
Polarity control	Yes
Power output	Non-isolated, +12V, 1A, with electronic fuse protection
I/O Toolbox tools	<p>The I/O Toolbox is a configurable interconnection of tools that generates events (usually triggers) from input lines. The composition of the toolset is product- and firmware-dependent.</p> <ul style="list-style-type: none"> <li>• Line Input tool (LIN): Edge detector delivering events on rising or falling edges of any selected input line.</li> <li>• Quadrature Decoder tool (QDC): A composite tool including: <ul style="list-style-type: none"> <li>– A quadrature edge detector delivering events on selected transitions of selected pairs of input lines.</li> <li>– An optional backward motion compensator for clean line-scan image acquisition when the motion is unstable.</li> <li>– A 32-bit up/down counter for delivering a position value.</li> </ul> </li> <li>• Divider tool (DIV): to generate an event every nth input events from any I/O toolbox event source.</li> <li>• Multiplier/divider tool (MDV): to generate m events every d input events from any I/O toolbox event source.</li> <li>• Delay tool (DEL): to delay up to 16 events from one or two I/O toolbox event sources, by a programmable time or number of motion encoder ticks (any QDC events).</li> <li>• User Actions Scheduler tool (UAS): to delegate the execution of User Actions at a scheduled time or encoder position. Possible user actions include setting low/high/toggle any bit of the User Output Register or generation of any User Events.</li> </ul>
I/O Toolbox composition	<p>Firmware-dependent I/O toolbox composition:</p> <ul style="list-style-type: none"> <li>• 4-camera: 8 LIN, 4 QDC, 4 DIV, 4 MDV, 4 DEL, 1 UAS</li> </ul>

## C2C-Link

Description	<ul style="list-style-type: none"><li>• Allows to accurately synchronize the trigger and start-of-exposure of multiple grabber-controlled area-scan and line-scan cameras.</li><li>• C2C-Link is able to synchronize cameras connected<ul style="list-style-type: none"><li>– to the same Coaxlink card</li><li>– to different cards in the same PC (requires an accessory cable such as the "3303 C2C-Link Ribbon Cable" or a custom-made C2C-Link cable)</li><li>– to different cards in different PCs (requires one "1636 InterPC C2C-Link Adapter" for each PC and one RJ 45 CAT 5 STP straight LAN cable for each adapter but the last one)</li></ul></li></ul>
Specification	<ul style="list-style-type: none"><li>• Maximum distance<ul style="list-style-type: none"><li>– 60 cm inside a PC</li><li>– 1200 m cumulated adapter to adapter cable length</li></ul></li><li>• Maximum trigger rate<ul style="list-style-type: none"><li>– 2.5 MHz for configurations using a single PC, or up to 10 PCs and 100 m total C2C-Link cable length</li><li>– 200 kHz for configurations up to 32 PCs and 1200m total C2C-Link cable length</li></ul></li><li>• Trigger propagation delay from master to slave devices<ul style="list-style-type: none"><li>– Less than 10 ns for cameras on the same Coaxlink card or on different Coaxlink cards in the same PC</li><li>– Less than 265 ns for cameras on different Coaxlink cards in different PCs (3 PCs and 40m total C2C-Link cable length)</li></ul></li></ul>

## Software

Host PC Operating System	<ul style="list-style-type: none"><li>• Microsoft Windows 10, 8.1, 7 for x86 (32-bit) and x86-64 (64-bit) processor architectures</li><li>• Linux for x86 (32-bit), x86-64 (64-bit) and aarch64 (64-bit) processor architectures</li><li>• macOS for x86-64 (64-bit) processor architecture</li></ul> <p>Refer to release notes for details</p>
APIs	<p>EGrabber class, with C++ and .NET APIs:</p> <ul style="list-style-type: none"><li>• .NET assembly designed to be used with development environments compatible with .NET frameworks version 2.0 or higher</li></ul> <p>GenICam GenTL producer libraries compatible with C/C++ compilers:</p> <ul style="list-style-type: none"><li>• x86 dynamic library designed to be used with ISO-compliant C/C++ compilers for the development of x86 applications</li><li>• x86_64 dynamic library designed to be used with ISO-compliant C/C++ compilers for the development of x86_64 applications</li><li>• aarch64 dynamic library designed to be used with ISO-compliant C/C++ compilers for the development of aarch64 applications</li></ul>
Memento	Compatible with Memento Event Logging tool

## Environmental conditions

Operating ambient air temperature	0 to +55 °C / +32 to +131 °F
Operating ambient air humidity	10 to 90% RH non-condensing
Storage ambient air temperature	-20 to +70 °C / -4 to +158 °F
Storage ambient air humidity	10 to 90% RH non-condensing

## Certifications

Electromagnetic - EMC standards	<ul style="list-style-type: none"><li>• European Council EMC Directive 2004/108/EC</li><li>• United States FCC rule 47 CFR 15</li></ul>
EMC - Emission	<ul style="list-style-type: none"><li>• EN 55022:2010 Class B</li><li>• FCC 47 Part 15 Class B</li></ul>

EMC - Immunity	<ul style="list-style-type: none"> <li>• EN 55024:2010 Class B</li> <li>• EN 61000-4-3</li> <li>• EN 61000-4-4</li> <li>• EN 61000-4-6</li> </ul>
Flammability	PCB compliant with UL 94 V-0
RoHS	European Union Directive 2011/65/EU (ROHS2)
REACH	European Union Regulation 1907/2006
WEEE	Must be disposed of separately from normal household waste and must be recycled according to local regulations

## Ordering Information

Product code - Description	<ul style="list-style-type: none"> <li>• 3620 - Coaxlink Quad CXP-12 JPEG</li> </ul>
Optional accessories	<ul style="list-style-type: none"> <li>• 1625 - DB25F I/O Adapter Cable</li> <li>• 1636 - InterPC C2C-Link Adapter</li> <li>• 3303 - C2C-Link Ribbon Cable</li> <li>• 3304 - HD26F I/O Adapter Cable</li> <li>• 3610 - HD26F I/O Extension Module TTL-RS422</li> <li>• 3612 - HD26F I/O Extension Module TTL-CMOS5V-RS422</li> <li>• 3613 - JTAG Adapter Xilinx for Coaxlink</li> </ul>





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