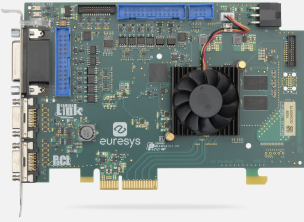


# Grablink Duo

Frame grabber for one full- or two base-configuration Camera Link cameras



## At a Glance

- For two independent Camera Link Base configuration cameras or one Camera Link Base, Medium, Full, 72-bit or 80-bit camera
- Directly compatible with hundreds of Camera Link cameras available on the market
- PoCL, Power over Camera Link
- ECCO: Extended Camera Link cable length
- PCIe Gen 2 x4 bus
- Feature-rich set of 20 digital IO lines
- Compatible with eGrabber driver and Memento Event Logging Tool

## Benefits

### Compatible with eGrabber

- eGrabber Studio: eGrabber's new interactive evaluation and demonstration application
- GenlCam Browser: An application giving access to the GenlCam features exposed by the GenTL Producer(s)
- GenTL Console: A command-line tool giving access to the functions and commands exposed by the Euresys GenTL Producer

### ECCO: Extended Camera Link Cable Operation

- Use longer, up to 15 meters long, Camera Link cables!

### Directly compatible with hundreds of Camera Link cameras available on the market

Check out our supported cameras page (in the Support menu)

### 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

### Area-scan triggering capabilities

- A trigger is used to start the acquisition when the part is in position. Hardware triggers come from the Grablink'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 Grablink board generates a signal to control an illumination device connected to one of its output lines.

### **Line-scan triggering capabilities 1/2**

Grablink supports continuous web scanning (to inspect infinite, continuously moving surfaces without losing a single line) and discrete object scanning (to acquire the image of objects moving in front of the camera).

- A trigger is used to start the acquisition when the part is in position. Hardware triggers come from the board's I/O lines. Software triggers come from the application.
- After it is started, the acquisition either:
  - Continues indefinitely (for web inspection applications)
  - Continues for a programmable number of lines (to acquire the image of objects of a known length)
  - Continues until an end trigger is received (to acquire the image of objects of a variable length)
- An optional trigger delay is available to postpone the beginning of the acquisition for a programmable number of lines.

### **Line-scan triggering capabilities 2/2**

- The Grablink frame grabber controls the camera scanning rate based on the signals received from a motion encoder. When the parts move faster, the acquisition line rate of the camera increases. When the parts move slower, the acquisition line rate of the camera decreases.
- The Grablink boards interpret A/B signals from quadrature motion encoders to know in which direction (forward or backward) the part is moving.
- Optionally, the Grablink can be instructed to acquire lines only when the object is moving forward or only when the object is moving backward.
- A feature called Backward Motion Cancellation stops the acquisition when a backward motion is detected. The line acquisition automatically resumes when the motion is again in the forward direction, at the exact place where the acquisition was interrupted.
- A Rate Converter allows the camera to acquire lines at any programmable resolution lower or higher than the resolution of the motion encoder. This gives the designer incredible freedom and flexibility during the development of the application.
- A Rate Divider allows the camera to acquire lines at a resolution lower than the resolution of the motion encoder. It divides the frequency of the incoming encoder signal by a programmable integer.

### **Flexible line-scan camera operation with the rate converter**

- The rate converter is a smart, programmable frequency multiplier/divider.
- Used with motion encoders and line-scan cameras, it allows the user to choose the aspect ratio of the pixels in the image.
- It provides a way to calibrate the acquisition chain to easily reach square (1:1 aspect ratio) pixels.

### **General purpose I/O lines**

- Compatible with a wide range of sensors and motion encoders
- Eight Isolated current-sense inputs (up to 30V, signaling up to 200 kHz, individual galvanic isolation up to 250VDC and 170 VAC RMS)
- Four high-speed differential inputs (quadrature motion encoder support up to 5 MHz)
- Four isolated contact outputs (up to 30V, 100 mA, signaling up to 100 KHz)
- Four high-speed 5V-compliant TTL inputs/ LVTTTL outputs (signaling up to 5 MHz)

### **Memento Event Logging Tool**

- Memento is an advanced development and debugging tool available for Coaxlink and Grablink 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.

### **C2C-Link camera synchronization**

Allows to accurately synchronize multiple area-scan or line-scan cameras connected

- to the same card
- to different cards in the same PC
- to different cards in different PCs

### **Compliant with GenICam**

Including support for

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

### **Windows, Linux and macOS drivers available**

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

### **Machine Vision for the Electronic Manufacturing Industry**

- High speed image acquisition for AOI, 3D SPI, 3D lead/ball inspection machines.
- Very high resolution line-scan image acquisition for Flat Panel Display inspection and solar cell inspection

### **Machine Vision for the General Manufacturing Industries**

- High frame rate image acquisition for inspection machines
- Line-scan image acquisition for surface inspection machines
- Line-scan image acquisition for textile inspection

### **Machine Vision for the Printing Industry**

- High speed line-scan image acquisition for printing inspection machines

### **Video Acquisition and Recording**

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

## **Specifications**

### **Mechanical**

Format	Standard profile, half length, 4-lane PCI Express card
Cooling method	Air cooling, fan-cooled heatsink
Mounting	For insertion in a standard height, 4-lane or higher, PCI Express card slot

## Connectors

- 'A' on bracket:
  - 26-position Shrunk Delta Ribbon (SDR) socket
  - Camera Link camera #1 Base connector
- 'B' on bracket:
  - 26-position Shrunk Delta Ribbon (SDR) socket
  - Camera Link camera #1 Medium/Full/72-bit/80-bit connector
  - Camera Link camera #2 Base connector
- 'EXTERNAL I/O' on bracket:
  - 26-pin 3-row high-density female sub-D connector
  - I/O lines and power output
- 'INTERNAL I/O 1' on PCB:
  - 26-pin 2-row 0.1" pitch pin header with shrouding
  - I/O lines and power output
- 'INTERNAL I/O 2' on PCB:
  - 26-pin 2-row 0.1" pitch pin header with shrouding
  - I/O lines and power output
- 'I/O EXTENSION' on PCB:
  - 26-pin 2-row 0.05" pitch pin header with shrouding
  - I/O extension lines and power output
- 'AUXILIARY POWER INPUT' on PCB:
  - 6-pin PEG power socket
  - 12 VDC power input for PoCL camera(s) and I/O power output
- 'C2C-LINK' on PCB:
  - 6-pin 2-row 0.1-in header
  - Card to card link

## LED indicators

- 'A', 'B' on bracket:
  - Bi-color red/green LEDs
  - Camera Link status indicator

## Switches

- 'RECOVERY' on PCB:
  - 3-pin 1-row 0.1" header or 2-way DIP switch
  - Firmware emergency recovery

## Dimensions

PCB L X H: 167.65 mm x 111.15 mm, 6.6 in x 4.38 in

## Weight

150 g, 5.29 oz

## Host bus

### Standard

PCI Express 2.0

### Link width

- 4 lanes
- 1 lane or 2 lanes with reduced performance

### Link speed

- 5.0 GT/s (PCIe 2.0)
- 2.5 GT/s (PCIe 1.0) with reduced performance

### Maximum payload size

512 bytes

### Peak delivery bandwidth

2,000 MB/s

### Effective (sustained) delivery bandwidth

1,700 MB/s (Host PC motherboard dependent)

### Power consumption

Typ. 7.1 W ( 2.7 W @ +3.3V, 4.4 W @ +12V), excluding camera and I/O power output

## Camera / video inputs

### Interface standard(s)

Camera Link 2.0

Connectors	Two Shrunk Delta Ribbon (SDR) Miniature Camera Link (MiniCL)
ECCO - Extended Camera Link Cable Operation	ECCO
Number of cameras	<ul style="list-style-type: none"> <li>• One 80-bit / 72-bit / Full / Medium / Base configuration camera</li> <li>• Or two Base configuration cameras</li> </ul>
Maximum aggregated camera data transfer rate	6.8 Gbit/s (850 MB/s)
Camera Link configuration	Base, Medium, Full, 72-bit, 80-bit
Camera Link clock frequency	From 20 MHz up to 85 MHz
PoCL (Power over Camera Link)	<ul style="list-style-type: none"> <li>• PoCL Safe Power: <ul style="list-style-type: none"> <li>– Two independent controllers</li> <li>– PoCL Device detection and automatic power-on</li> <li>– Overload and short-circuit protection</li> </ul> </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	<ul style="list-style-type: none"> <li>• Area-scan cameras: <ul style="list-style-type: none"> <li>– Grayscale and color (RGB and Bayer CFA)</li> </ul> </li> <li>• Line-scan cameras: <ul style="list-style-type: none"> <li>– Grayscale and color RGB</li> </ul> </li> </ul>
Camera pixel formats supported	<ul style="list-style-type: none"> <li>• Mono8, Mono10, Mono12, Mono14, Mono16</li> <li>• BayerXX8, BayerXX10, BayerXX12, BayerXX16 where XX = GR, RG, GB, or BG</li> <li>• RGB8</li> </ul> <p>NOTE: Refer to release notes for availability of BayerXX14, RGB10, RGB12, RGB14 and RGB16 formats</p>

## 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>

## Line-scan camera control

Scan/page trigger	<ul style="list-style-type: none"> <li>• Precise control of start-of-scan and end-of-scan triggers.</li> <li>• Support of external hardware trigger, with optional delay.</li> <li>• Support of infinite acquisition, without missing line, for web inspection applications.</li> </ul>
Line trigger	<ul style="list-style-type: none"> <li>• Support for quadrature motion encoders, with programmable noise filters, selection of acquisition direction and backward motion compensation.</li> <li>• Rate Converter tool for fine control of the pixel aspect ratio: Rate Conversion Ratio in the range 0.001 to 1000 with an accuracy better than 0.1%.</li> <li>• Rate Divider tool</li> </ul>
Line strobe	<ul style="list-style-type: none"> <li>• Accurate control of the strobe position for strobed light sources.</li> </ul>

## On-board processing

On-board memory	512 MB
Image data stream processing	<ul style="list-style-type: none"> <li>• Unpacking of 10-/12-/14-bit to 16-bit with selectable justification to LSb or MSb</li> </ul>
Input LUT (Lookup Table)	<ul style="list-style-type: none"> <li>• Monochrome 8-bit to 8-bit transformation</li> <li>• Monochrome 10-bit to 8-, 10- or 16-bit transformations</li> <li>• Monochrome 12-bit to 8-, 12- or 16-bit transformations</li> </ul>

Bayer CFA to RGB decoder	Advanced interpolation method using average and median functions on a 3x3 kernel
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> </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>

## 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> </ul>
Electrical specifications	<ul style="list-style-type: none"> <li>• DIN: High-speed differential inputs, up to 5 MHz, 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: 200 kHz isolated current-sense input with wide voltage input range up to 30V, compatible with totem-pole (push-pull) HTL drivers, 5V TTL/RS-422 differential line drivers, 5V CMOS drivers, potential free contacts, solid-state relays and opto-couplers</li> <li>• IOUT: Isolated contact outputs compatible with 30V / 100mA loads</li> </ul> <p>NOTE: IIN and IOUT lines provide a functional isolation grade for the circuit technical protection. It does not provide an isolation that can protect a human being from electrical shock!</p>
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

The I/O Toolbox is a configurable interconnection of tools that generates events (usually triggers):

- Line Input tool (LIN): edge detector delivering events on rising or falling edges of any selected input line.
- Quadrature Decoder tool (QDC): a composite tool including:
  - A quadrature edge detector delivering events on selected transitions of selected pairs of input lines.
  - An optional backward motion compensator for clean line-scan image acquisition when the motion is unstable.
  - A 32-bit up/down counter for delivering a position value.
- 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.
- 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).
- Divider tool (DIV): to generate an event every nth input events from any I/O toolbox event source.
- Multiplier/divider tool (MDV): to generate m events every d input events from any I/O toolbox event source.
- The 'Input Tools' (LIN, QDC and UAS) can be further processed by the 'Event Tools' (DEL, DIV and MDV) to generate any of the following "trigger" events:
  - The "cycle trigger" of the Camera and Illumination controller
  - The "cycle sequence trigger" of the Camera and Illumination controller
  - The "start-of-scan trigger" of the Acquisition Controller (line-scan only)
  - The "end-of-scan trigger" of the Acquisition Controller (line-scan only)

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## I/O Toolbox composition

Determined by the selected firmware variant:

- '1-camera': 8 LIN, 1 QDC, 1 UAS, 2 DEL, 1 DIV, 1 MDV, 2 C2C
- '2-camera': 8 LIN, 2 QDC, 1 UAS, 2 DEL, 2 DIV, 2 MDV, 2 C2C
- '1-camera, line-scan': 8 LIN, 1 QDC, 1 UAS, 2 DEL, 1 DIV, 1 MDV, 3 C2C
- '2-camera, line-scan': 8 LIN, 2 QDC, 1 UAS, 2 DEL, 2 DIV, 2 MDV, 3 C2C

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## C2C-Link

### Description

- Accurate synchronization of the trigger and the start-of-exposure of multiple grabber-controlled area-scan cameras.
  - Accurate synchronization of the start-of-cycle, start-of-scan and end-of-scan of multiple grabber-controlled line-scan cameras.
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## Specification

- C2C-Link synchronizes cameras connected to:
  - the same card
  - 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)
  - 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)
- Maximum distance:
  - 60 cm inside a PC
  - 1200 m cumulated adapter to adapter cable length
- Maximum trigger rate:
  - 2.5 MHz for configurations using a single PC, or up to 10 PCs and 100 m total C2C-Link cable length
  - 200 kHz for configurations up to 32 PCs and 1200m total C2C-Link cable length
- Trigger propagation delay from master to slave devices:
  - Less than 10 ns for cameras on the same card or on different cards in the same PC
  - Less than 265 ns for cameras on different cards in different PCs (3 PCs and 40m total C2C-Link cable length)

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## Software

### Host PC Operating System

- Microsoft Windows 11, 10, 8.1, 7 for x86-64 (64-bit) processor architecture
- Linux for x86-64 (64-bit) and AArch64 (64-bit) processor architectures
- macOS for x86-64 (64-bit) and AArch64 (64-bit) processor architectures

### APIs

- EGrabber class, with C++ and .NET APIs: .NET assembly designed to be used with development environments compatible with .NET frameworks version 4.0 or higher
- GenCam GenTL producer libraries compatible with C/C++ compilers:
  - 'x86\_64' dynamic library designed to be used with ISO-compliant C/C++ compilers for the development of x86-64 (64-bit) applications
  - 'aarch64' dynamic library designed to be used with ISO-compliant C/C++ compilers for the development of AArch64 (64-bit) applications
- GenCam GenCP generic control protocol (for cameras featuring GenCP)

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## Environmental conditions

Operating ambient air temperature 0 to +50 °C / +32 to +122 °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

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## Certifications

Electromagnetic - EMC standards

- European Council EMC Directive 2014/30/EU

- United States FCC rule 47 CFR 15

EMC - Emission

- EN 55032:2015 / CISPR 32:2012 Class B
- FCC 47 Part 15 Class B

EMC - Immunity

- EN 55035:2017 / CISPR 35:2016
- EN 61000-6-2:2005 / IEC 61000-6-2:2016
- EN 61000-4-2:2009
- EN 61000-4-3:2006
- EN 61000-4-4:2004
- EN 61000-4-6:2014

KC Certification

Korean Radio Waves Act, Article 58-2, Clause 3



Flammability	PCB compliant with UL 94 V-0
RoHS	European Union Directive 2015/863 (ROHS3)
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>• 1628 - Grablink Duo</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>• 3614 - HD26F I/O Extension Module - Standard I/O Set</li> <li>• 3618 - HD26F I/O Extension Module - Fast I/O</li> </ul>



## EMEA

### **Euresys SA**

Liège Science Park - Rue du Bois Saint-Jean, 20  
4102 Seraing - Belgium

Email: [sales.europe@euresys.com](mailto:sales.europe@euresys.com)

## EMEA

### **Sensor to Image GmbH**

Lechtorstrasse 20  
86956 Schongau - Germany

Email: [sales.europe@euresys.com](mailto:sales.europe@euresys.com)

## AMERICA

### **Euresys Inc.**

316 Prado Way  
Greenville, SC 29607 - United States

Email: [sales.americas@euresys.com](mailto:sales.americas@euresys.com)

## ASIA

### **Euresys Pte. Ltd.**

750A Chai Chee Road - #07-15 ESR BizPark @ Chai Chee  
Singapore 469001 - Singapore

Email: [sales.asia@euresys.com](mailto:sales.asia@euresys.com)

## CHINA

### **Euresys Shanghai Liaison Office**

Unit 802, Tower B, Greenland The Center - No.500 Yunjin Road, Xuhui District  
200232 Shanghai - China

Euresys上海联络处

上海市徐汇区云锦路500号绿地汇中心B座802室  
200232

Email: [sales.china@euresys.com](mailto:sales.china@euresys.com)

## CHINA

### **Euresys Shenzhen Liaison Office**

Room 1202 - Chinese Overseas Scholars Venture Building  
518057 Shenzhen - China

Euresys深圳联络处

深圳南山区留学生创业大厦1期1202  
518057

Email: [sales.china@euresys.com](mailto:sales.china@euresys.com)

## JAPAN

### **Euresys Japan K.K.**

Expert Office Shinyokohama - Nisso Dai 18 Building, Shinyokohama 3-7-18, Kohoku  
Yokohama 222-0033 - Japan

〒222-0033

神奈川県横浜市港北区新横浜3-7-18 日総第18ビル エキスパートオフィス新横浜

Email: [sales.japan@euresys.com](mailto:sales.japan@euresys.com)

More at [www.euresys.com](http://www.euresys.com)

