

Datasheet

Features

- CMOS Color LineScan Sensors:
 - 4096 pixels, 5x5µm
 - 2048, 1024 or 512 pixels, 10x10µm
- Interface : CameraLink® (Base or Medium)
- Line Rate :
 - Up to 40 kl/s for the Base Version
 - Up to 100 kl/s for the High-Speed Version
 - Data Rate : 40, 42.5, 60 and 85MHz
 - Bit Depth : 24 bits RGB
 - Flat Field Correction
 - Color Correction Matrix
 - Automatic White Balance
 - Power Supply : 10 – 15V. PoCI Compliant.
 - Low Power Consumption : < 3.5W
 - M42x1 Native and F-Mount, C-Mount adapters available
 - GenCP Compliant (xml file embedded)



Description

e2v's UNiiQA+ line scan cameras family has been specifically designed to overcome the limitations of your current inspection system: make cost savings, improve your throughput, inspect larger areas or identify smaller defects. Three UNiiQA+ product ranges are offered:

- UNiiQA+ Essential: low speed cameras for cost effective equipment or with modest speed requirement
- UNiiQA+ High-Speed: high speed cameras to help improve the performance of your system

The UNiiQA+ family has also been designed to be highly modular to enable engineers to reuse the same camera in multiple equipment, simplify logistics and reduce development cycle time. All UNiiQA+ cameras feature e2v's proprietary CMOS sensors : a single line of highly sensitive pixels of either 5µm or 10µm size.

Application

- On-line quality control
 - Raw material inspection (plastic film, glass, wood...)
 - Print and paper inspection
- Sorting
 - Food sorting (Belt sorting, Lane sorting, Free fall sorting)
 - Parcel and postal sorting
 - Barcode reading



Key Specifications

Characteristics	Typical Value				Unit
Sensor Characteristics at Maximum Pixel Rate					
Resolution	4096	2048	1024	512	Pixels
pixel size (square)	5 x 5	10 x 10	10 x 10	10 x 10	µm
Max Line Rate (Essential Version)					
CameraLink Base (1 x RGB channel at 85MHz)	20	40	40	40	kHz
Max Line Rate (High Speed version)					
CameraLink® Base (1 x RGB channel at 85MHz)	20	40	80	80	kHz
CameraLink® Medium (2 x RGB channels at 85MHz)	40	80	100	100	kHz
Radiometric Performance at Maximum Pixel Rate and minimum camera gain					
Bit depth	24 RGB				Bits
Peak Response (B/G/R)	2.8 / 3.8 / 4.1				LSB _{8bits} /(nJ/cm²)
Camera Gain	1.1 ^(*)				e-/LSB _{12bits}
Full Well Capacity	23,7 ^(*)				Ke-
Response non linearity (Max)	1				%
Readout Noise	7,5 ^(*)				e-
Dynamic range	56				dB
SNR Max (3/4 Sat)	39.5				dB
PRNU HF Max	3				%

Note : All values in LSB are given in 8 bits format

Functionality (Programmable via Control Interface)		
Analog Gain	Up to 12 (x4)	dB
Offset	-4096 to +4096	LSB
Trigger Mode	Timed (Free run) and triggered (Ext Trig, Ext ITC) modes	
Mechanical and Electrical Interface		
Size (w x h x l)	60 x 60 x 33.65	mm
Weight	<150	g
Lens Mount	F, C and M42x1 (on the Front Face)	-
Sensor alignment (see chapter 2.1)	±100	µm
Sensor flatness	50	µm
Power supply	Single 10 DC to 15 DC	V
Power dissipation	< 3,6 (PoCL compliant)	W
General Features		
Operating temperature	0 to 50 (front face), 70 (internal)	°C
Relative Humidity for Operation	85%	%
Storage temperature	-40 to 70	°C
Regulatory	CE, FCC , Reach, RoHS and Chinese RoHs compliant	

- ^(*) Values per ADC (per color)
- ^(**) Blue/Green/Red in LSB_{8bits}/(nJ/cm²)
- Figures in LSB are for a 8bits format.
- Measured at Max Exposure Time and Nominal Gain (No Gain)
- Maximum data rate
- Stabilized temperature 30/40/55 °C (Room/Front Face/Internal)
- SNR Calculated at 75% Saturation with minimum Gain.

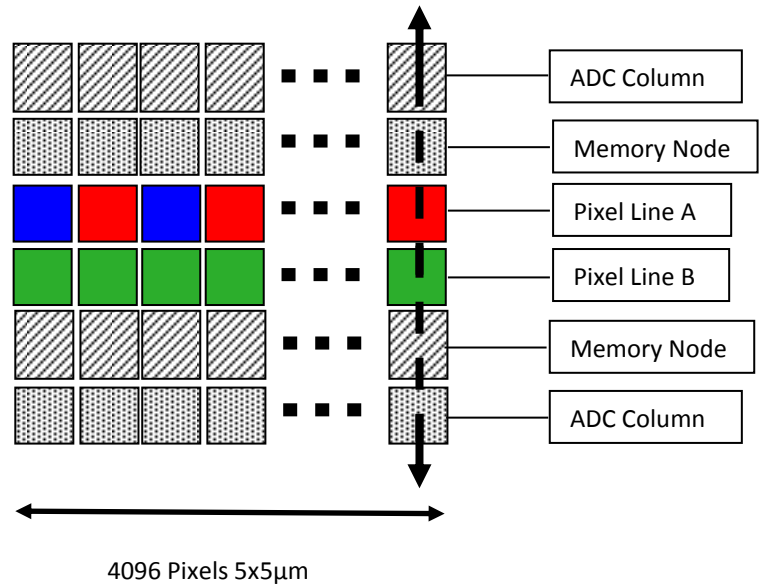
Image Sensor

The Uniiqa+ sensor is composed of two sensitive lines of 4096 pixels of 5µm square : One composed of Green pixels only, the second one composed alternatively of Red/Blue Pixels.

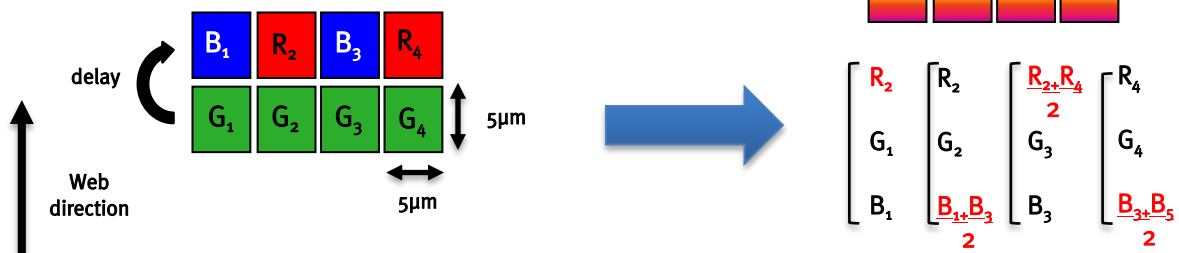
Each pixel on the same column uses its own Analog to Digital Column converter (ADC Column).

This structure allows several definitions :

- 4k pixels 5x5µm (Full Definition) :
- The 2 color lines are exposed with a delay of one line in order to match the same position between the green line and the red/blue line
- 2k Pixels 10x10µm (True Color) :
- The colored pixel is composed of 2x Green pixels, one red and one blue exposed in the same time.
- Then, 1k or 0,5k 10x10µm are achieved by applying an ROI on the centre of the sensor from the 2k 10x10µm

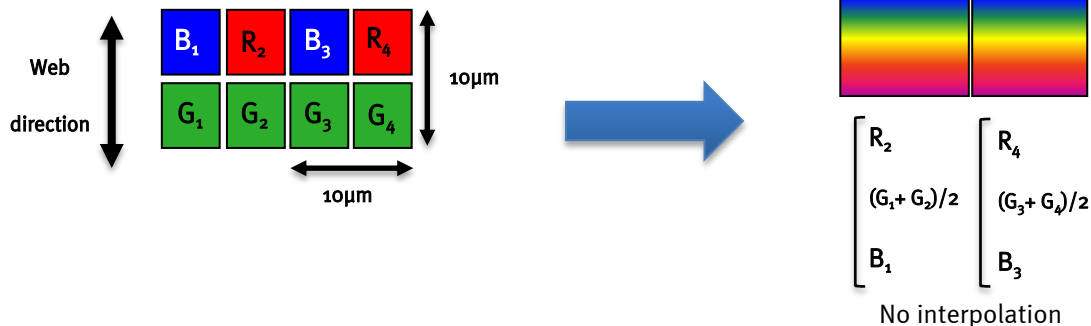


4k pixels 5x5µm (Full Definition)



This color mode (5µm) requires the indication of "Forward/Reverse" to the camera in order to manage the delay between the two colored lines.

2k, 1k or 512 pixels 10x10µm (True Color)



These color modes don't require any Reverse/Forward indication if no interpolation is used (or only the "column interpolation")

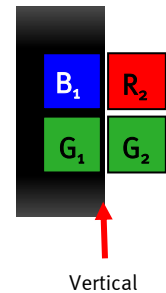
Column Interpolation Correction (True Color only)

This interpolation is used to compensate the color error in the Red or the Blue in case of a vertical transition on the web : The Red of the blue value of each colored pixel is corrected if the variation between two neighbour green pixels is significant.

$B_1' = \alpha_B \times B_1$ and α_B is the blue correction, calculated with the variation ($G_1 - G_2$)

$R_2' = \alpha_R \times R_2$ and α_R is the red correction, calculated with the variation ($G_1 - G_2$)

- This interpolation is available for all pixel sizes : 5x5µm but also 10x10µm
- It can be disabled by the customer. By default, it is enabled.



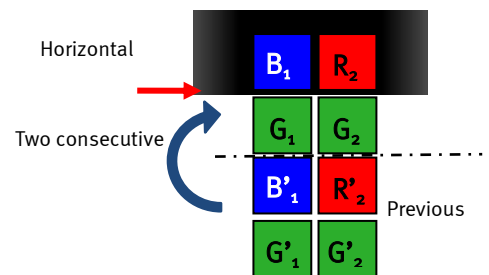
Line Interpolation Correction (True Color only)

This interpolation is used to compensate the color error in the Red or the Blue in case of a horizontal transition on the web in the same "True Color" pixel : A line is memorized and the Red of the blue value of each colored pixel is corrected if the variation between two consecutive green values (previous to next line) is significant :

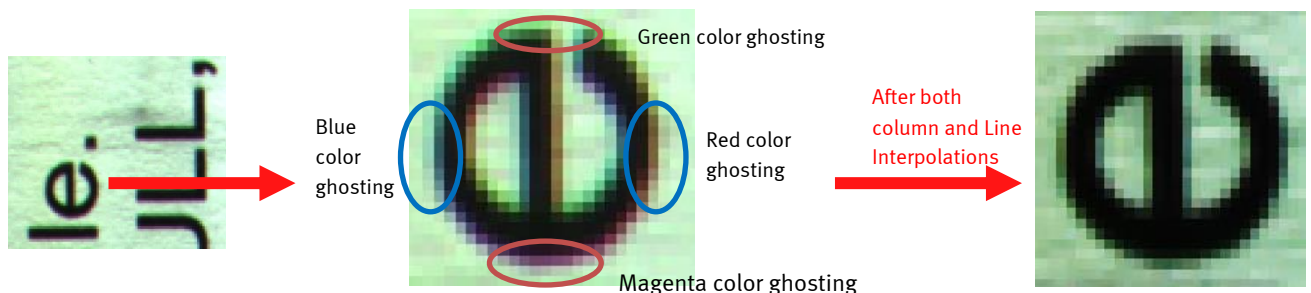
$B_1' = \alpha_B \times B_1$ and α_B is the blue correction, calculated with the variation ($G_1 - G'_1$)

$R_2' = \alpha_R \times R_2$ and α_R is the red correction, calculated with the variation ($G_2 - G'_2$)

- This interpolation is available only for pixel size 10x10µm (True Color)
- It can be enabled by the customer. By default, it is disabled
- This interpolation requires the Forward/Reverse indication sent to the camera for the memorized line.



Effects of the interpolations



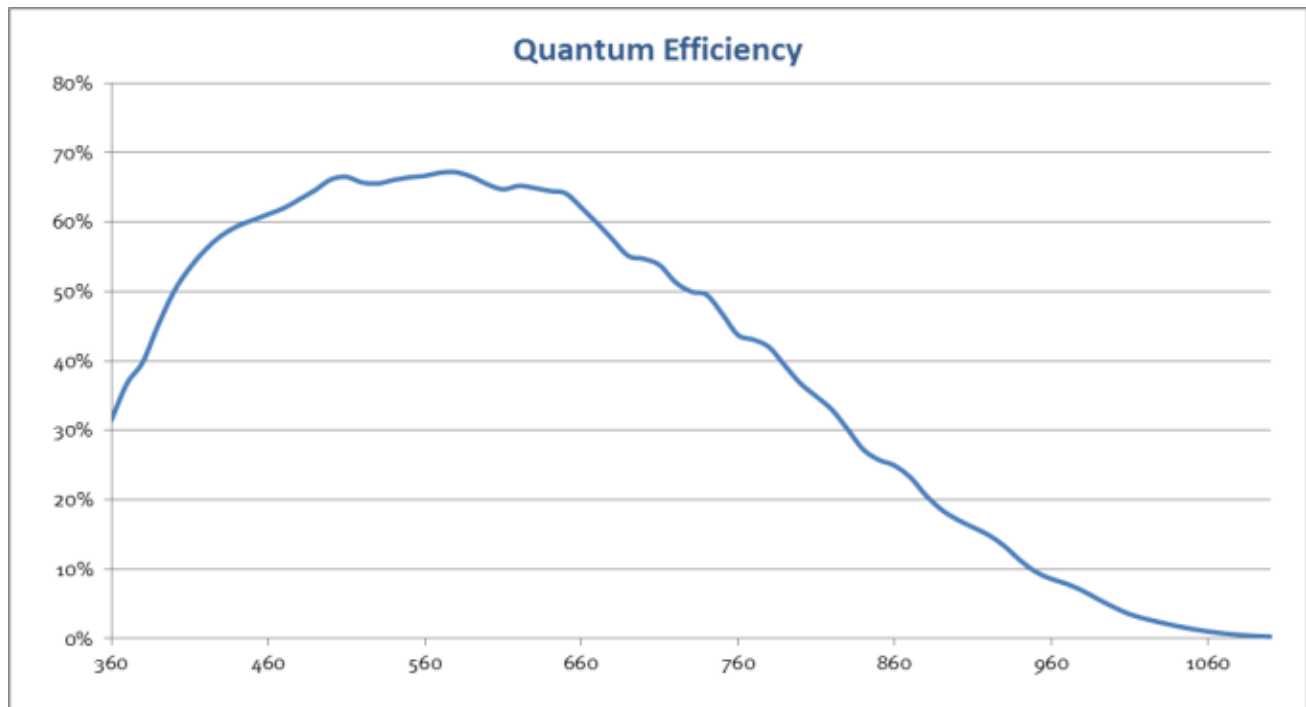
Horizontal transition effect reduced by the "Line Interpolation"



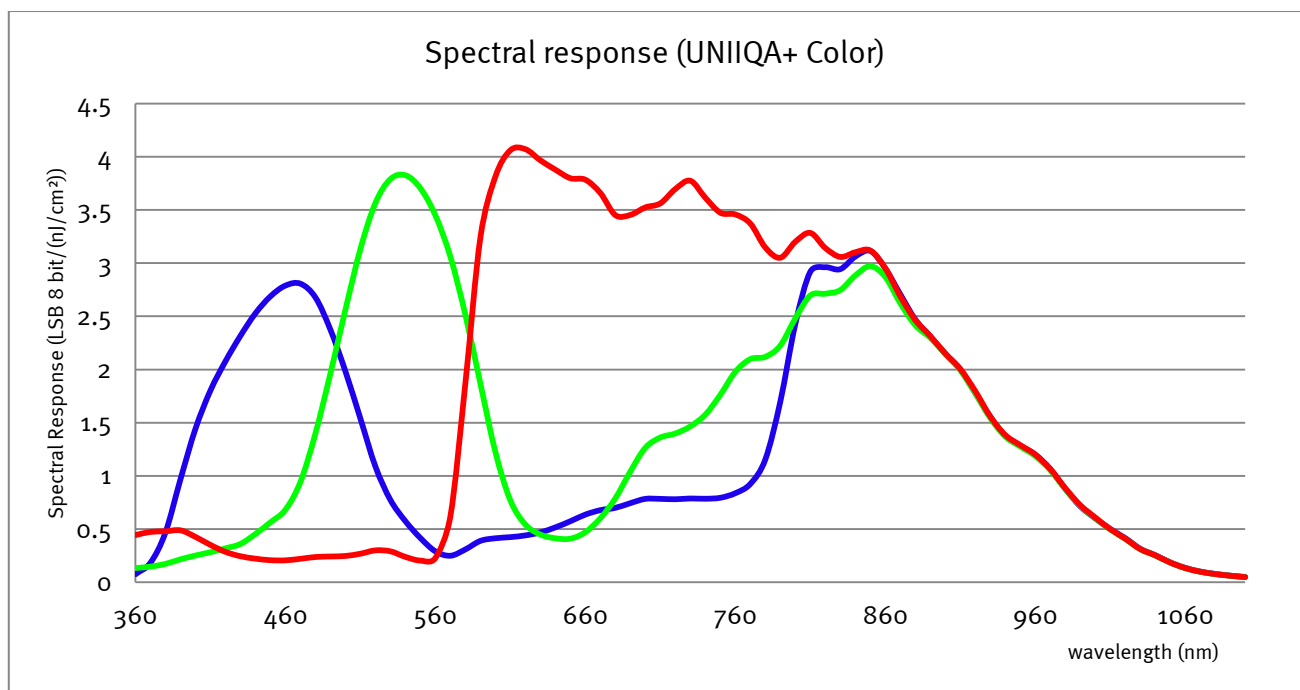
Vertical transition effect reduced by the "Column Interpolation"

Response & QE curves

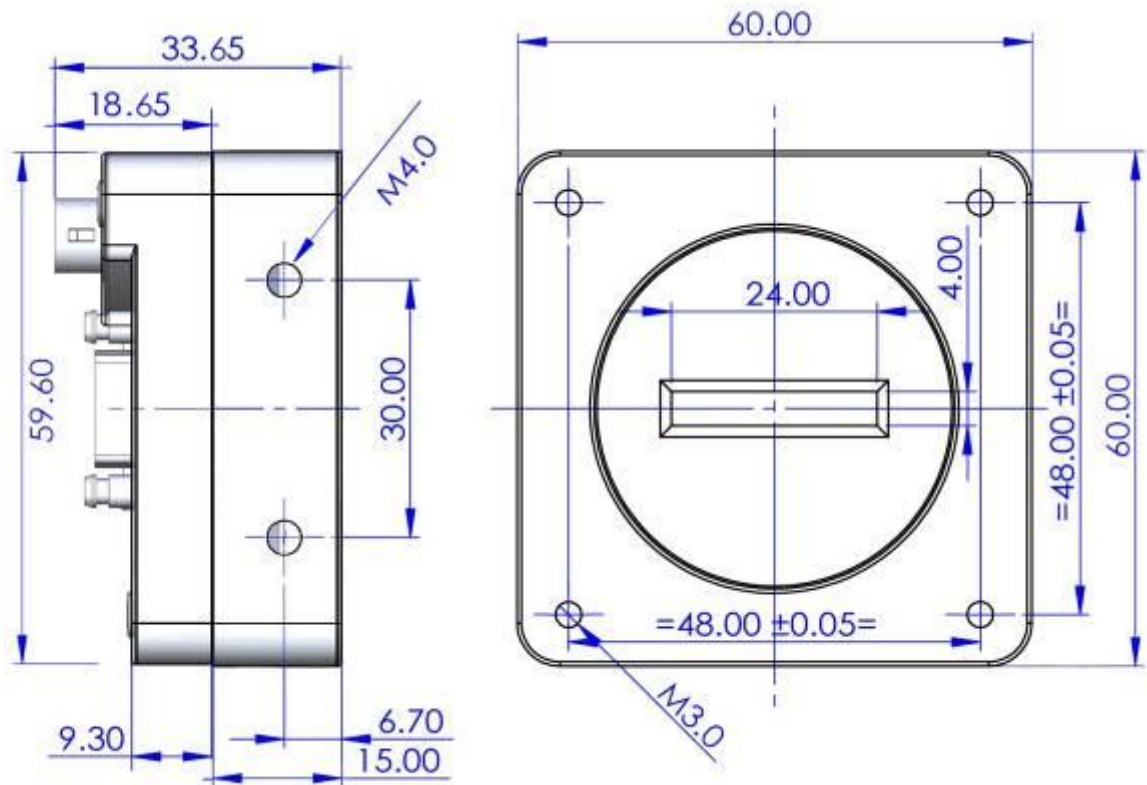
Quantum Efficiency



Spectral Response Curve



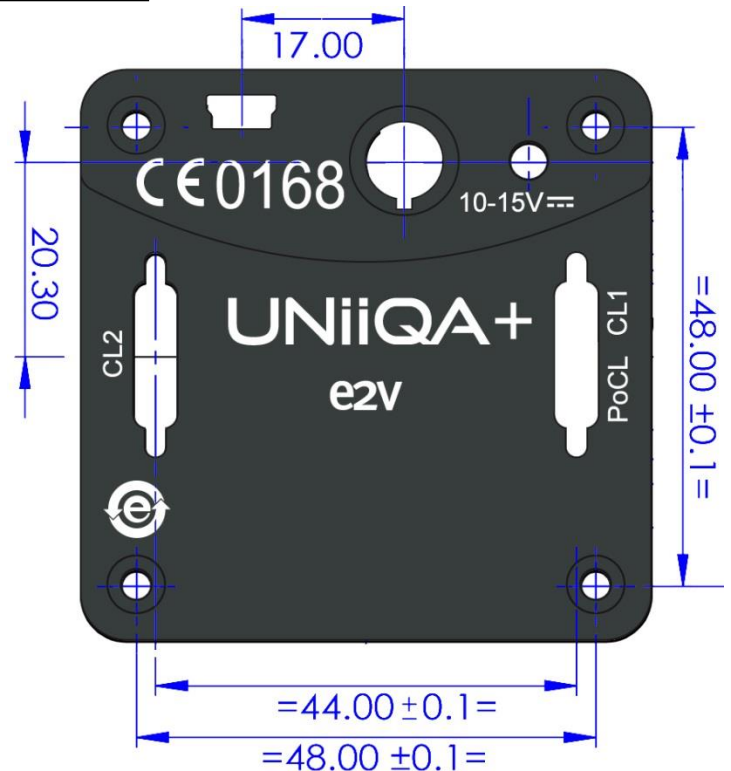
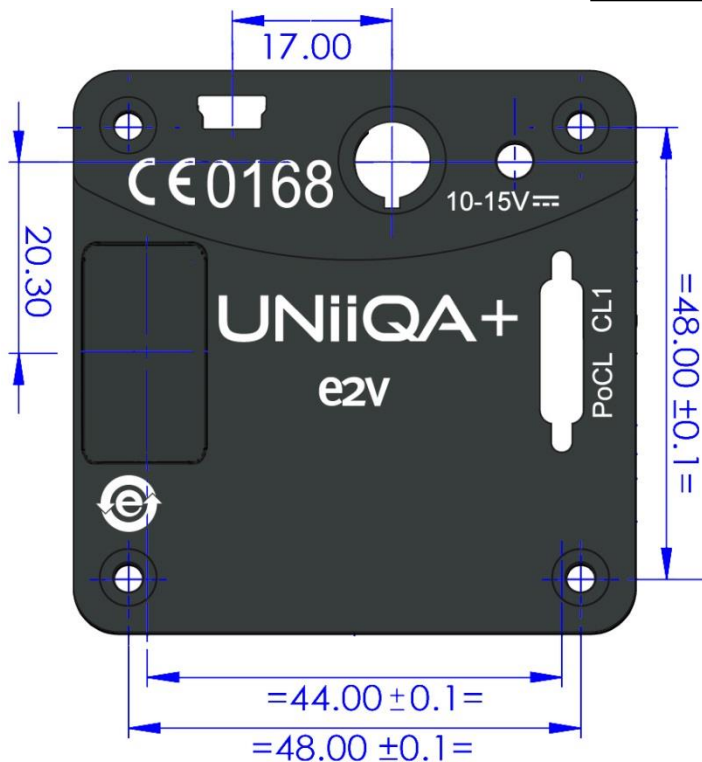
Camera Hardware and Interface



Essential Model

The Step file is available
on the web :
www.e2v.com/cameras

High Speed Model



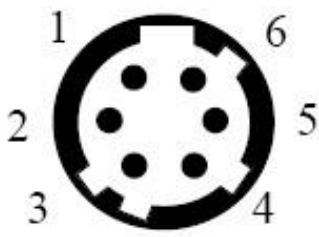
Input/output Connectors and LED



Power Connector

Camera connector type: Hirose HR10A-7R-6PB (male)

Cable connector type: Hirose HR10A-7P-6S (female)

 <p>Camera side description</p>	Signal	Pin	Signal	Pin
	PWR	1	GND	4
	PWR	2	GND	5
	PWR	3	GND	6
Power supply from 10 to 15v Power 3,5W max with an typical inrush current peak of 0,32A during power up				

CameraLink Output Configuration

	Adjacent Channels	RGB Pixels per Channel			
Version "Essential" and "High Speed"		4k	2k	1k	0,5k
Base : 1 Channel 24 bits RGB	1 x 85MHz (60/42.5MHz)	1 x 4096	1 x 2048	1 x 1024	1 x 512
Version "High Speed" only					
Base : 2 Channels 24 bits RGB	2 x 85MHz (60/42.5MHz)	2 x 2048	2 x 1024	2 x 512	2 x 256

Standard Conformity

The UNIIQA+ cameras have been tested using the following equipment:

- A shielded power supply cable
- A Camera Link data transfer cable ref. 1MD26-3560-00C-500 (3M), 1SF26-L120-00C-500 (3M)
- A linear AC-DC power supply

e2v recommends using the same configuration to ensure the compliance with the following standards.

CE Conformity

The UNIIQA+ cameras comply with the requirements of the EMC (European) directive 2004/108/EC (EN 50081-2, EN 61000-6-2).

CE 0168

FCC Conformity

The UNIIQA+ cameras further comply with Part 15 of the FCC rules, which states that: Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation

This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference



Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

RoHS / Chinese RoHS

RoHS per EU Directive 2011/65/EC and WEEE per EU Directive 2002/96/EC
China Electronic Industry Standard SJ/T11364-2006



GenICam / GenCP

GenICam/GenCP XML Description File, Superset of the GenICam™ Standard Features Naming Convention specification

V1.5, Camera Link Serial Communication : GenICam™ Generic Control Protocol (Gen CP V1.0)



Models

	Camera Part Number	Description	Details
UNIIQA+ Essential	EV71YC1CCL4005-BA2	Versatile Base CameraLink	4k pixels 5x5µm up to 20kHz 2k, 1k and 0,5k pixels 10x10µm up to 40kHz
	EV71YC1CCL4005-BA0	4k Pixels Base CameraLink	4k pixels 5x5µm up to 20kHz
	EV71YC1CCL2010-BA0	2k pixels Base CameraLink	2k pixels 10x10µm up to 40kHz
UNIIQA+ High Speed	EV71YC1CCL4005-BA3	Versatile Full CameraLink	4k pixels 5x5µm up to 40kHz 2k, 1k and 0,5k pixels 10x10µm up to 80kHz
	EV71YC1CCL4005-BA1	4k Pixels Full CameraLink	4k pixels 5x5µm up to 40kHz
	EV71YC1CCL2010-BA1	2k pixels Full CameraLink	2k pixels 10x10µm up to 80kHz

Datasheet

Features

- Cmos Colour Sensor :
 - 4096 RGB Pixels 5x5µm (Full Definition)
 - 2048 RGB Pixels 10x10µm (True Colour)
- Interface : NBASE-T™ (up to 5Gb/s)
- Line Rate :
 - 50 000 l/s In 4k Full Definition Mode
 - 100 000 l/s in 2k True Colour Mode
- Bit Depth : 24bits (RGB 8bits)
- Scan Direction
- Flat Field Correction
- Cycling Preset Modes and Memories
- Multi ROI
- Metadata
- Rotary Encoder



Description

To maintain their competitive advantage, industrial leaders in the machine vision market have a continuous requirement to improve defect detection accuracy and reduce the cost of imaging. The availability of the UNiiQA+ cameras with an NBASE-T™ connection offer a straightforward solution, providing:

- High throughput - enabling high resolution and colour imaging without a frame grabber at speeds of up to 5 Gigabits per second (Gbps) over Category 5e standard Ethernet cable.
- Easy integration – compatible with GigE Vision protocol.
- Long-length (100 meters+), field terminable, inexpensive cabling - reduces costs and enables easier integration in imaging systems compared with optic fibre cabling

Applications

- Raw material surface inspection
- Parcel and postal sorting
- High resolution document scanning
- Print and paper inspection
- Industrial Inspection



Key Specifications

Characteristics	Typical Value		Unit
Sensor Characteristics at Maximum Pixel Rate			
Resolution	4096	2048	RGB Pixels
pixel size (square)	5	10	μm
Max Line Rate	50	100	kHz
Radiometric Performance at Maximum Pixel Rate and minimum camera gain			
Bit depth	3 x 8		Bits
Response non linearity	< 1		%
PRNU HF Max	3		%
Dynamic range	65		dB
Peak Response (All Modes)			
Red	11.8		LSB 8bits/(nJ/cm²)
Green	11.2		LSB 8bits/(nJ/cm²)
Blue	7.8		LSB 8bits/(nJ/cm²)

Test conditions :

- All values are given at Nominal Gain (0dB) : Preamp Gain x1, Amp Gain 0dB
- Figures in LSB are for a 8bits format
- Measured at exposure time = 400µs and line period = 400µs in Ext Trig Mode (Max Exposure Time)
- Maximum data rate

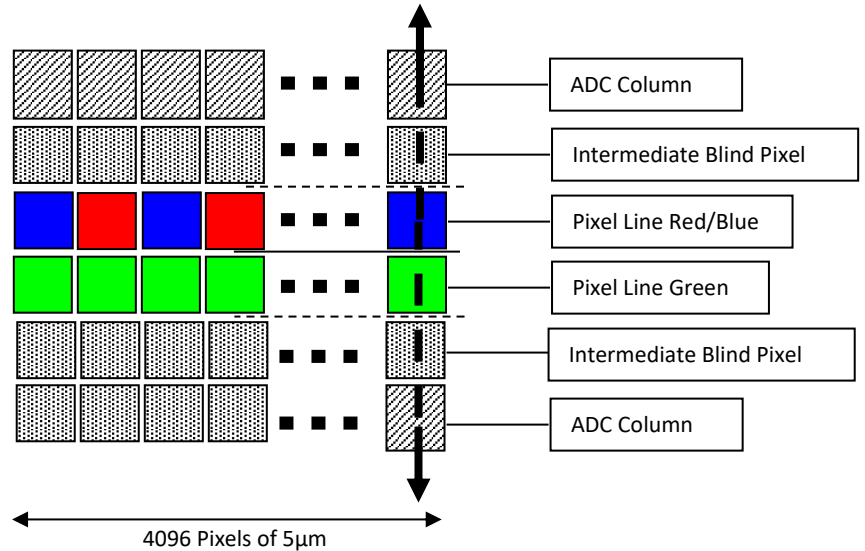
Functionality (Programmable via GenICam Control Interface)		
Analog Gain	Up to 12 (x4)	dB
Offset	-4096 to +4096	LSB
Trigger Mode	Timed (Free run) and triggered (Ext Trig, Ext ITC) modes	
Sensor Modes	<ul style="list-style-type: none">• True Colour Single : 2048 RGB Pixels of 10x10µm• Full Definition Single : 4096 RGB Pixels 5x5µm	
Mechanical and Electrical Interface		
Size (w x h x l)	60 x 60 x 55	mm
Weight	247/335 without/with Heat Sinks	g
Lens Mounts	C, F, T2, M42 (embedded in the Front Face)	-
Sensor alignment	±100	µm
Sensor flatness	±50	µm
Power supply	12 - 24	V
Power dissipation	< 11	W
General Features		
Operating temperature	0 to 60 (front face) or 85 (Internal)	°C
Storage temperature	-40 to 70	°C
Regulatory	CE, FCC and RoHS compliant	

Image Sensor and colour modes

The UNiQA+ Colour 4k/2k sensor is composed of 2 sensitive lines.

The Colour version has been completed with RGB colour Filter and disposed as detailed beside.

Each line uses a different Analog to Digital Column converter (ADC Column). An appropriate (embedded) Time delay in the exposure between each line this allows to fit green and Red/Blue in Full definition as well as the “binning” or synchronized exposure is used for the True Colour mode.



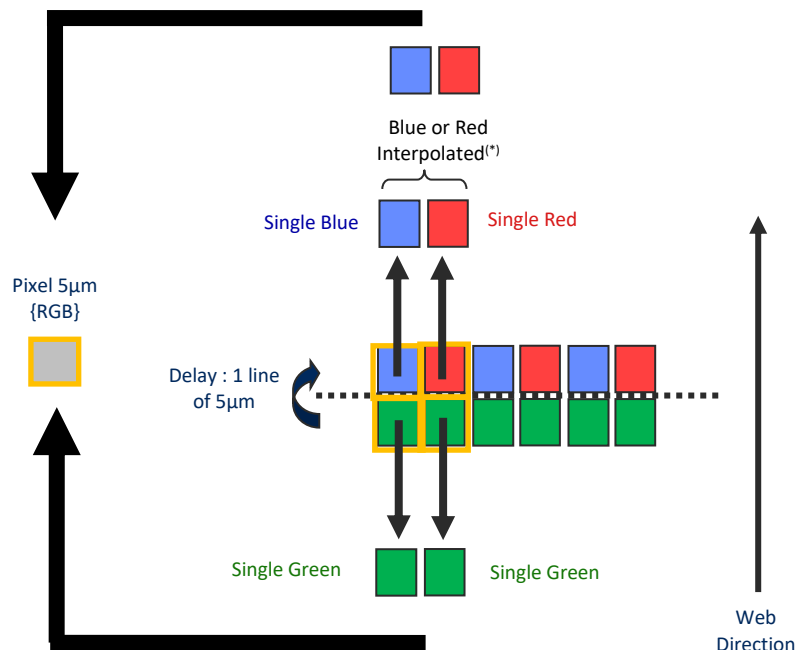
Full Definition Single Mode (FDS) or 4k 5µm

5µm Pixels (R,G,B)

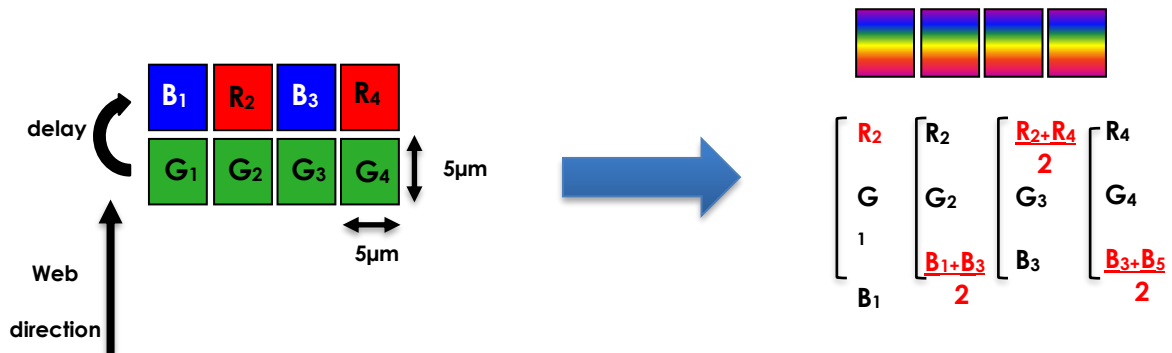
Same definition than B&W

Requires x3 the data flow of the B&W

- Sensitivity is equivalent to the True Colour mode: Equivalent to 3 x Pixels of 5µm (with their respective colour filters).



Colour Interpolation in Full Definition mode.

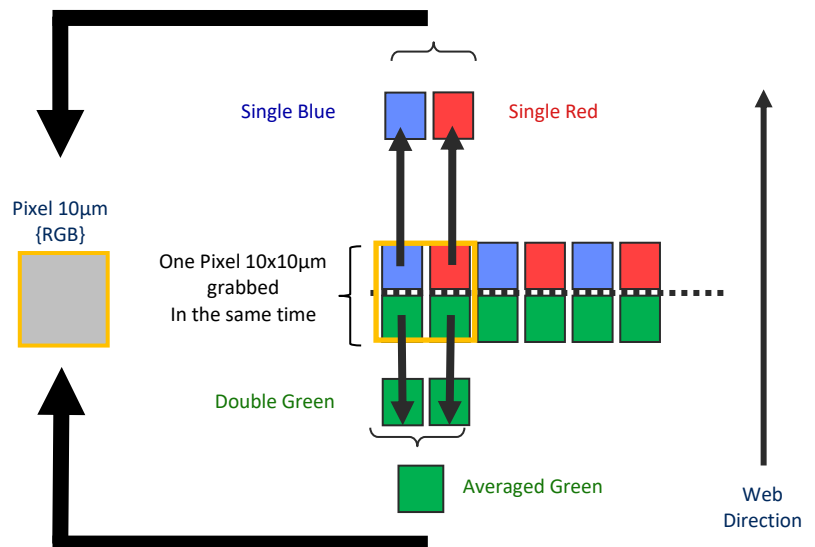


This colour mode (5µm) requires the indication of “Forward/Reverse” to the camera in order to manage the delay between the two coloured lines.

True Colour Single Mode (TCS) or 2k 10µm

10µm Pixels (R,G,B)
 Twice less pixels than B/W
 Requires x3/2 the data flow of B&W

- Sensitivity Half of the Full definition mode: Equivalent to 3 x Pixels of 5µm (with their respective colour filters).
- Not sensitive to the Scanning direction and the variation of the aspect ratio of the image.



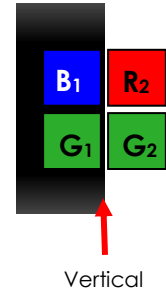
Column Interpolation Correction in True Colour

This interpolation is used to compensate the colour error in the Red or the Blue in case of a vertical transition on the web : The Red of the blue value of each coloured pixel is corrected if the variation between two neighbour green pixels is significant.

$B_1' = \alpha_B \times B_1$ and α_B is the blue correction, calculated with the variation $(G_1 - G_2)$

$R_2' = \alpha_R \times R_2$ and α_R is the red correction, calculated with the variation $(G_1 - G_2)$

- This interpolation is available only for pixel size 10x10µm (True Colour only)
- It can be disabled by the customer. By default, it is enabled.



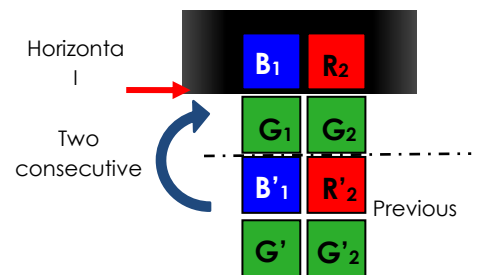
Line Interpolation Correction in True Colour

This interpolation is used to compensate the colour error in the Red or the Blue in case of a horizontal transition on the web in the same "True Colour" pixel : A line is memorized and the Red of the blue value of each coloured pixel is corrected if the variation between two consecutive green values (previous to next line) is significant :

$B_1' = \alpha_B \times B_1$ and α_B is the blue correction, calculated with the variation $(G_1 - G'_1)$

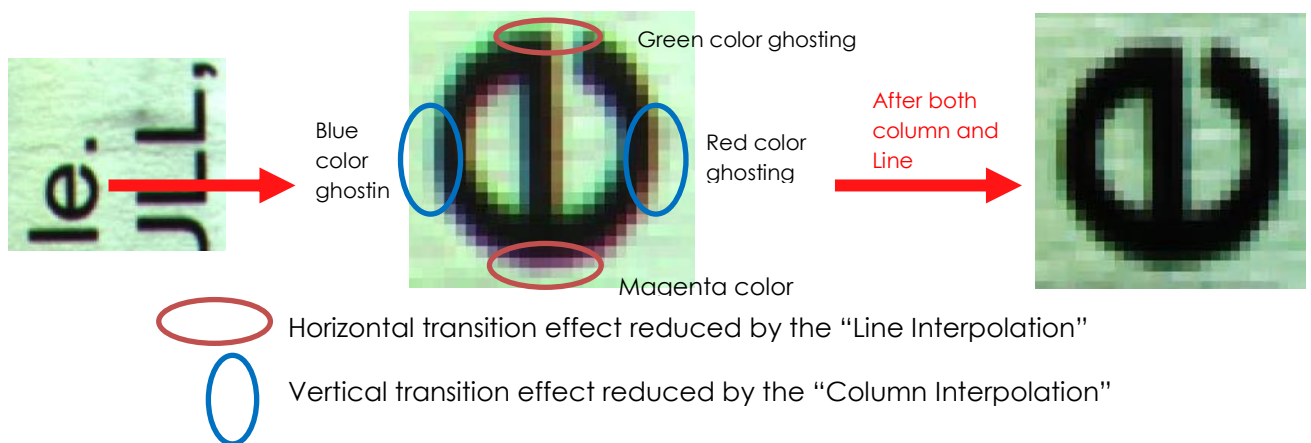
$R_2' = \alpha_R \times R_2$ and α_R is the red correction, calculated with the variation $(G_2 - G'_2)$

- This interpolation is available only for pixel size 10x10µm (True Colour only)
- It can be enabled by the customer. By default, it is disabled
- This interpolation requires the Forward/Reverse indication sent to the camera for the memorized line.



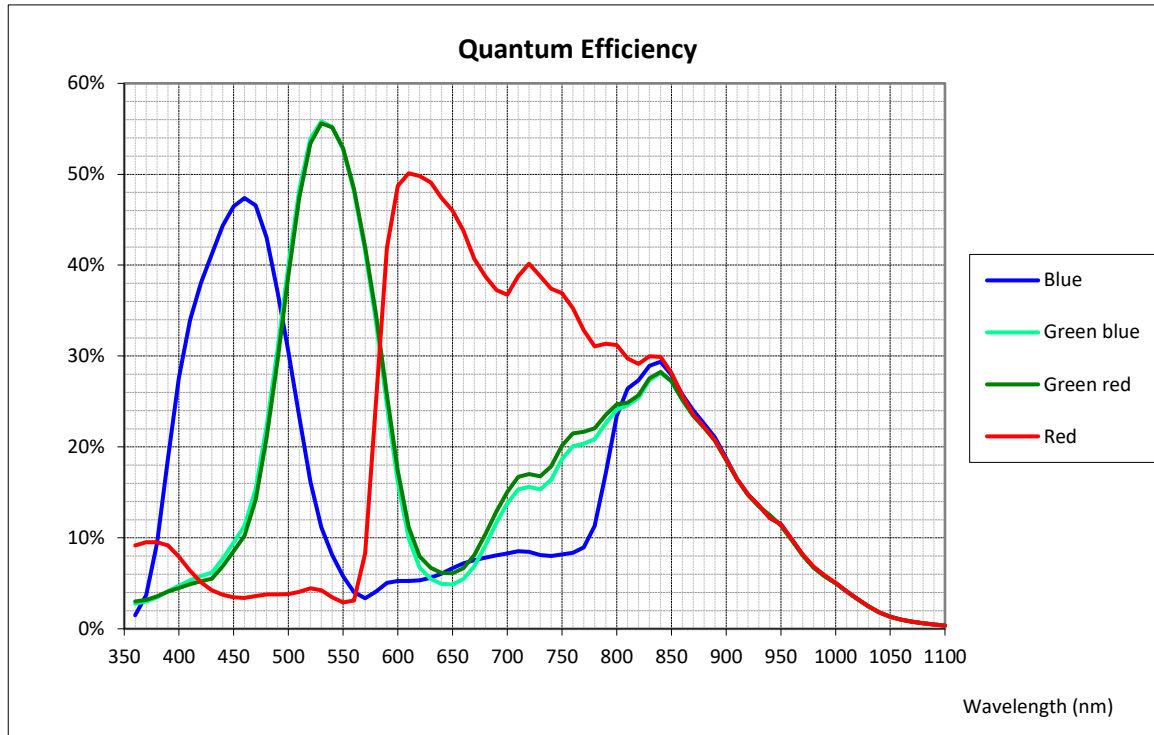
The Line Interpolation **has to be disabled** if the light is changing for each Line (typically for pulsed Light source with different spectrum) or for any reason the Green component of the light source changes significantly from one line to the next one.

Effects of the interpolation Corrections

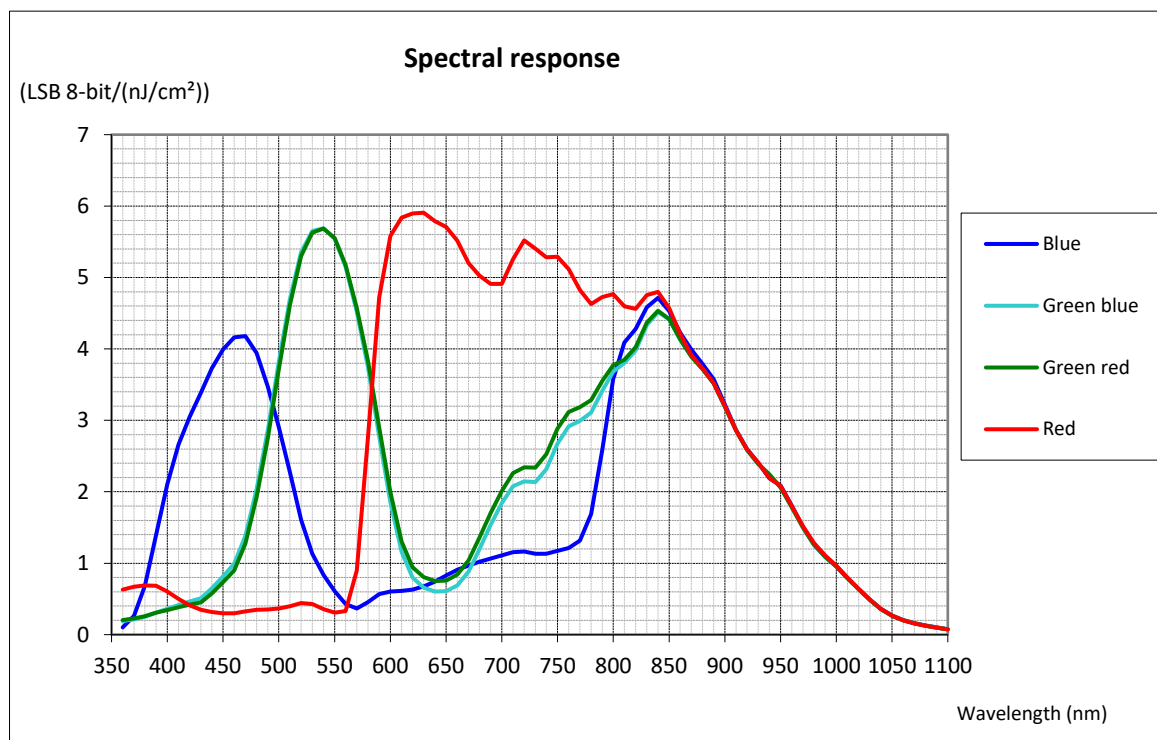


Response & QE curves

Quantum Efficiency

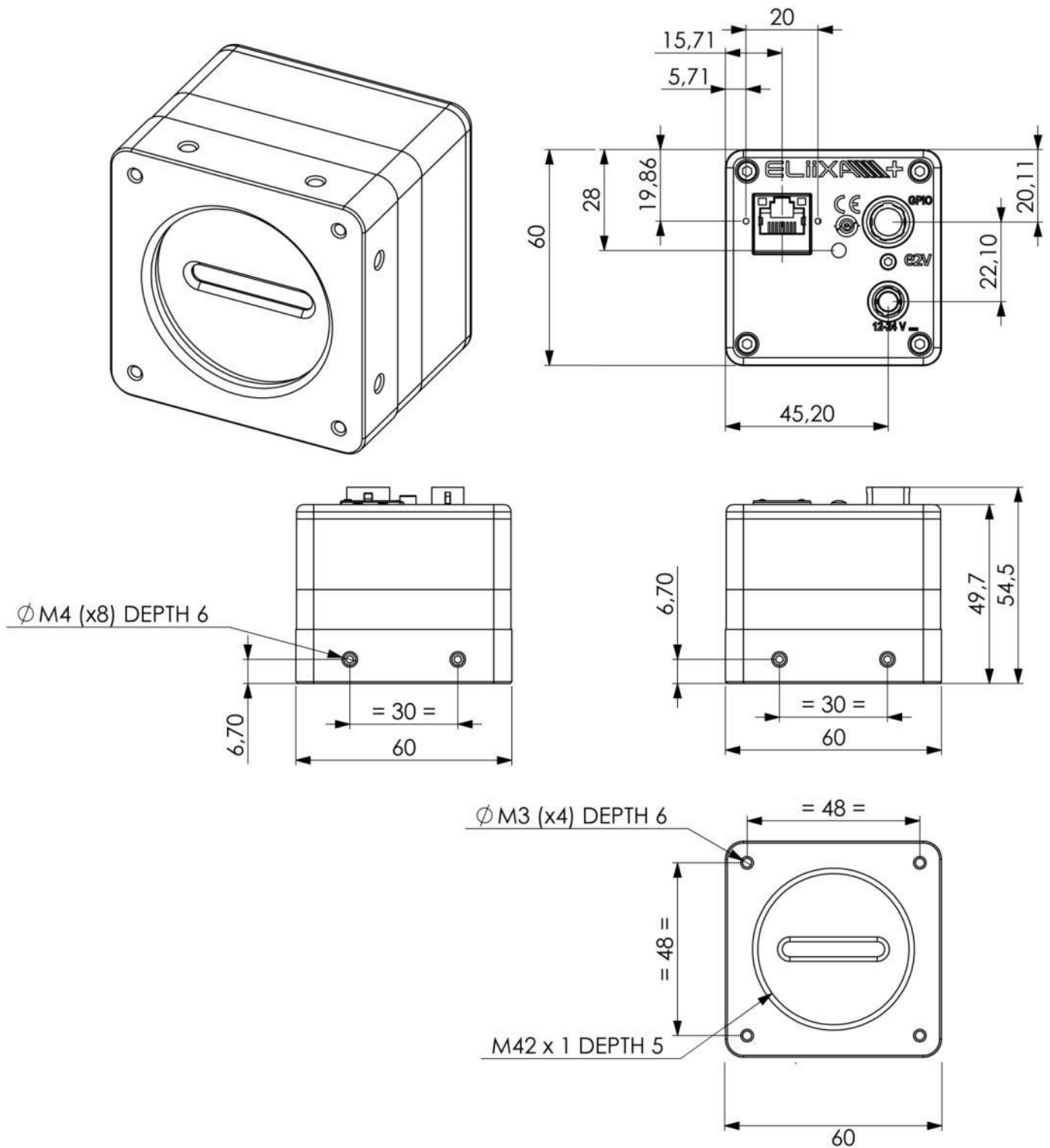


Spectral Response





Camera Hardware Interface



Input/output Connectors and LED



Power Connector

Camera connector type: Hirose HR10A-7R-6PB (male)

Cable connector type: Hirose HR10A-7P-6S (female)

Signal		Pin	Signal	Pin
PWR		1	GND	4
PWR		2	GND	5
PWR		3	GND	6

Camera side description

Power supply from 12 to 24v
Power 11W max with an typical inrush current peak of **1A** during power up

GPIO Connector

Camera Connector type: Hirose HR10A-10R-12SB

Cable Connector type: Hirose HR10A-10P-12P

Cable type: cable immune from interference and with twisted pairs

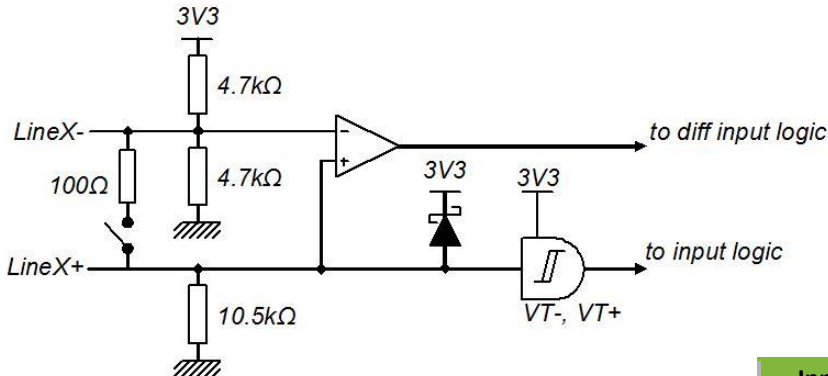
Signal		Pin	Signal	Pin
Line 0+		1	Line 3+	7
Line 0-		2	Line 4+	8
Line 1+		3	Line 5+	9
Line 1-		4	Line 6+	10
Line 2+		5	GND	11
Line 2-		6	GND	12

Camera side description

Lines 0, 1 and 2

The GPIO Connector allows the following connections :

- **Line 0, 1 or 2** : Dedicated inputs for Line Triggers and Frame Trigger. Differential (RS422 with or without termination) or TTL (Single End) in 3.3V, 5V, 12V or 24V.

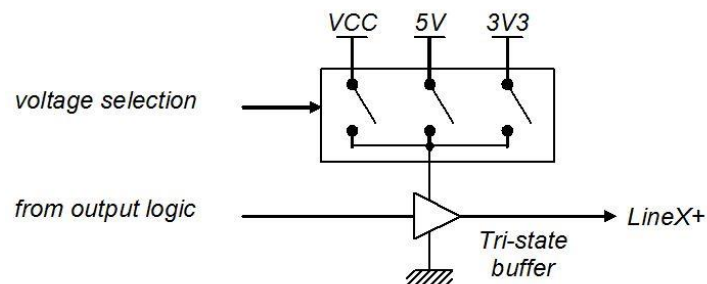


Input Thresholds	VT-Min	VT+ Max	Unit
24V	5.5	10.7	V
12V	2.9	5.5	V
3.3 / 5V	0.8	1.5	V

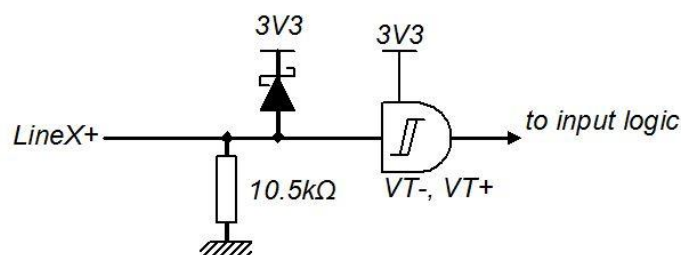
Lines 3, 4, 5 and 6

- **Line 3, 4, 5 and 6 :** Configurable Inputs or Outputs in TTL only :
 - Input Configuration : Single End in 3.3V, 5V, 12V or 24V
 - Output configuration : Single End or Open Collector in 3.3V, 5V, or Camera power Supply

INPUT Configuration



OUTPUT Configuration



Camera Interface : NBASE-T™

What is the NBASE-T™ Technology ?

NBASE-T™ technology defines a new type of Ethernet signaling that boosts the speed of installed based twisted-pair cabling well beyond the cable's designed limit of 1 Gigabit per second (Gbps) for distances up to 100 meters. Capable of reaching 2.5 and 5 Gbps using the large installed base of Cat5e and Cat6 cabling, NBASE-T™ solutions enable users to accelerate their networks in the most cost-effective, least disruptive manner.

Flexible silicon solutions can auto-negotiate the optimal network speed, be it the new NBASE-T™ rates, slower 2.5 Gbps and 5 Gbps rates, or—if the network infrastructure supports it—10 Gbps

To introduce these new cameras, e2v has partnered with Pleora Technologies, the world's leading supplier of high-performance video interfaces, the first company from the machine vision industry to join the NBASE-T™ Alliance, a consortium collaborating on new technologies that extend the bandwidth capabilities of twisted-pair copper cabling using standard Ethernet technology.



Then all NBASE-T™ UNiiQA+ are licensed for Pleora eBus SDK and PureGeV Software that you can download on Pleora website (<http://www.pleora.com/our-products/ebus-sdk>)

Camera Interface : GPIO

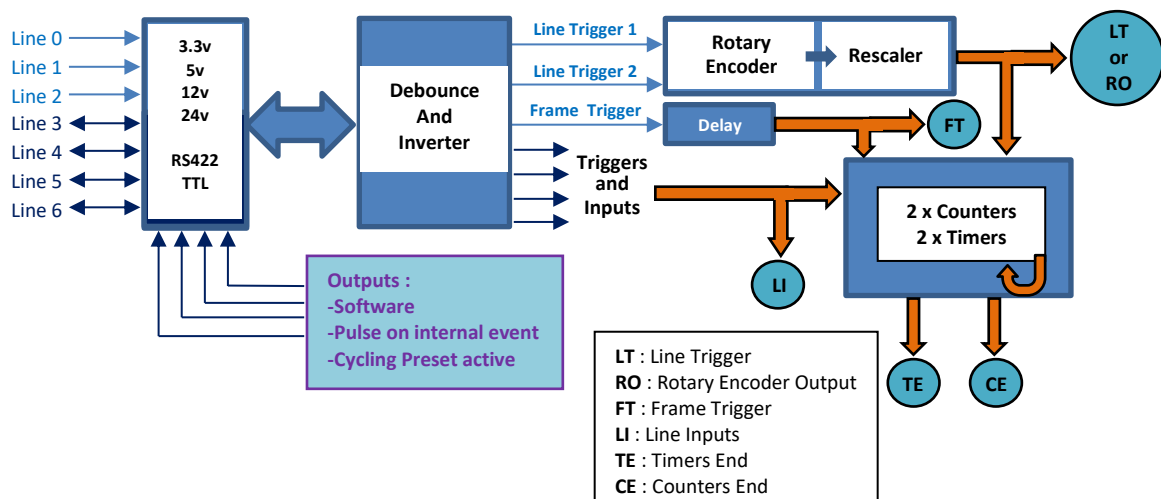
General Inputs/Outputs Management

The GPIO Modules allows the connection of 7 external Lines :

- 3 dedicated inputs : 2 Line Triggers (LT1 and LT2) and one Frame Trigger (FT)
- 4 convertible generic Inputs / Outputs

A flexible in/Out block in RS422 or TTL with different detection levels (3.3v, 5v, 12v, 24v/Camera Power Supply) with a lot of features :

- Debounce filter and Inverter on each Input
- A delay dedicated to the Frame Trigger only (FT)
- A Full Rotary Encoder management (Quadratic with or without reverse miscount)
- A Rescaler following the Rotary Encoder module (available also if Rotary Encoder is bypassed)
- 2x Counters and 2x Timers
- 4x Outputs which can be set on Software, Start Frame or each individual Cycling Preset mode used.



GenICam Triggers

Three GenICam Triggers can be configured :

■ Frame Start Trigger

On the Rising/Falling Edge of any of the following signals :

- Frame Trigger (FT)
- Timer End (TE1/TE2)
- Counter End (CE1/CE2)
- Software

■ Frame Active Trigger

On the High/Low Level of any of the following signals :

- Frame Trigger (FT)
- Timer End (TE1/TE2)
- Counter End (CE1/CE2)
- Software

■ Line Start Trigger

On the Rising/Falling Edge or High/Low Level of any of the following signals :

- Rotary Encoder Output (RO)
- Line Trigger (LT1/LT2)
- Timer End (TE1/TE2)
- Counter End (CE1/CE2)

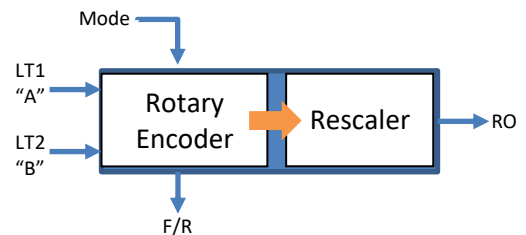
The Exposure starts at the end of a User's configurable delay after the Line Trigger rise

Rotary Encoder

The Embedded Rotary Encoder is managed by the two inputs Lines :

- LT1 taken as "A" quadrature input
- LT2 taken as "B" quadrature input

The Encoder takes in account the Forward/Reverse indication given to the camera (by software or external input) to determine the forward or Reverse position of the A and B quadrature inputs. Its "Forward/Reverse" outputs is just an indication of its working mode as soon as it is not disabled but has no action on the camera scanning direction.



The Output of the Rotary Encoder enters a Rescaler (Multiplier / Divider) that can be also bypassed (neutral). The Rotary encoder has two working modes :

- Quadratic without miscount : The Encoder is sending only forward lines. Any reverse line is not sent and not counted.
- Quadratic with miscount : The Encoder is sending only forward lines but reverse lines are miscount in an internal counter. The Encoder will restart sending Line triggers as soon as each reverse Line miscounted has been recounted forward.

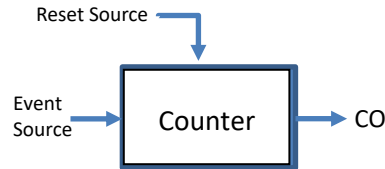
The Rotary Encoder can be bypassed. Then the "B" input is disabled and the Line Trigger 1 (LT1) connected on input "A" is passing through the Rotary encoder to enter the Rescaler

The Rotary encoder can't be used by changing the camera operation (Forward/Reverse) "on the fly" as some sensor modes require some reset and some time to change the scanning direction.

Counters

Two Counters are available to count any edge of the following information :

- Line Triggers (LT1/LT2)
- Frame Start
- Line Start
- End of the other counter (CE1 or CE2)
- End of any Timer (TE1 and TE2)
- Line inputs (L3 to L6)



The counter Duration is set and when the counted value reaches the duration, the Output of the counter rises to 1. If the reset input of the counter is not set (Off), the counter resets immediately : The end count value is set in the “Value at Reset”, the output is reset and Counter restarts counting on the same event.

The Reset input of the counter can be set on any of the following signal :

- Line Triggers (LT1/LT2)
- Frame Trigger
- Acquisition Start
- Acquisition End
- Line Inputs (L3 to L6)
- Software

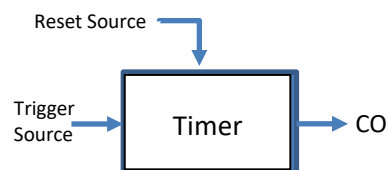
As soon as the Reset input is set but not active, the counter counts. If it reaches the duration before any reset, the output rises to 1 and the counter carries on counting. Then if the Reset arises, the “Value at Reset” is set with the current value (even higher than the duration), the output is set to 0 and the counter can restart counting on the same even as soon as the reset input switches down to 0.

If the Reset arises before the counter has reached the duration, the “Value at Reset” is set with the current value (even Lower than the duration), the output is set to 0 and the counter can restart counting on the same even as soon as the reset input switches down to 0.

Timers

Two Timers are available and start their timing any edge of the following information :

- Line Triggers (LT1/LT2)
- Frame Start
- Line Start
- End of the other counter (CE1 or CE2)
- End of any Timer (TE1 and TE2)
- Line inputs (L3 to L6)



The Timer Duration is set and when this value is reached, the Timer output rises to 1. If the Reset source is not set (Off) then the Timer resets immediately : The output is reset and Timer restarts after the same event edge.

As soon as the Reset input is set but not active, the timer Output remains to 1.

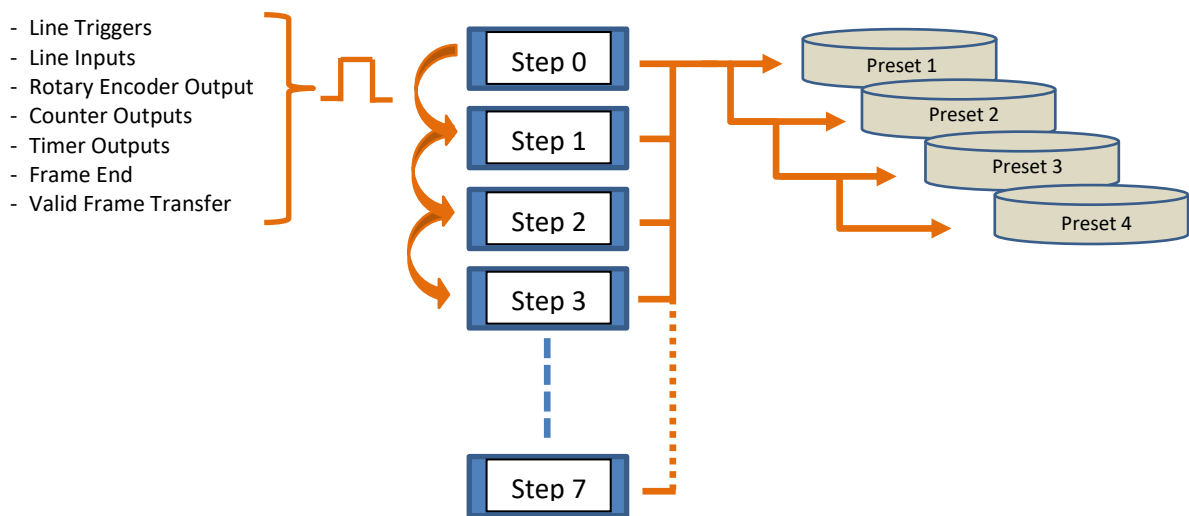
When the Reset arises, the output is set to 0 and the Timer can restart as soon as the reset input switches down to 0. If the reset arises before the end of the Timer duration, the Timer is reset without switching to 1 and can restart as soon as the reset input switches down to 0.

Cycling Preset modes and configuration

The Cycling Preset mode is the possibility for the camera to switch at least for each line between 4x sets of pre-defined parameters including :

- Exposure Time and Exposure Delay
- Flat Field Correction
- Gain (Amplification Gain)
- White Balance Gains
- RGB Colour Correction Matrix

The Cycling Preset mode configuration allows up to 8 different steps for switching between this choice of 4 sets of parameters and thus with the arising of different possible events (Line Input, Line Trigger, Frame Trigger, end of Counter and/or Timer ...) :



Models

Part Number	Definition	Max Speed	Details
EV71YC1CNT4005-BA0	4k x 5µm	50kHz	Delivered with a pair of Heat Sinks
EV71YC1CNT2010-BA0	2k x 10µm	100kHz	

Datasheet

Features

- CMOS Monochrome LineScan Sensors:
 - 4096 pixels, 5x5µm or 4096 pixels, 5x10µm (Versatile models Only)
 - 2048, 1024 or 512 pixels, 10x10µm
- Interface : CameraLink® (Base or Medium/Full)
- Line Rate :
 - Up to 40 kl/s for the Base Version
 - Up to 100 kl/s for the High-Speed Version
 - Line rate limited at 40kl/s in 12bits for all models
- Data Rate :
 - 42.5MHz, 60MHz and 85MHz in 1 or 2 Channels for Base version
 - 42.5MHz, 60MHz and 85MHz in Base, Medium, Full or Full+ (Deca) for the High Speed Version
- Bit Depth : 8, 10 or 12bits
- Flat Field Correction
- Contrast Expansion
- Power Supply : 10 – 15V. PoCI Compliant.
- Low Power Consumption : < 3.5W
- M42x1 Native and F-Mount, C-Mount adapters available
- GenCP Compliant (xml file embedded)



Description

e2v's UNiiQA+ line scan cameras family has been specifically designed to overcome the limitations of your current inspection system: make cost savings, improve your throughput, inspect larger areas or identify smaller defects.

Three UNiiQA+ product ranges are offered:

- UNiiQA+ Essential: low speed cameras for cost effective equipment or with modest speed requirement
- UNiiQA+ High-Speed: high speed cameras to help improve the performance of your system

The UNiiQA+ family has also been designed to be highly modular to enable engineers to reuse the same camera in multiple equipment, simplify logistics and reduce development cycle time. All UNiiQA+ cameras feature e2v's proprietary CMOS sensors : a single line of highly sensitive pixels of either 5µm or 10µm size.

Application

- Raw material inspection (plastic film, glass, wood...)
- Print and paper inspection
- Food sorting (Belt sorting, Lane sorting, Free fall sorting)
- Parcel and postal sorting
- Barcode reading



Key Specifications

Characteristics	Typical Value				Unit
Sensor Characteristics at Maximum Pixel Rate					
Resolution	4096	2048	1024	512	Pixels
pixel size	5 x 5 5 x 10 ^(*)	10 x 10	10 x 10	10 x 10	µm
Max Line Rate (Essential Version)					
CameraLink® Base	20	40	40	40	kHz
Max Line Rate (High Speed version)					
CameraLink® Base (8 or 10bits) (2)	40	80	100	100	kHz
CameraLink® Base or Medium (12bits) (3)	40	40	40	40	kHz
CameraLink® Medium (8/10bits) or Full (8bits)(2)	80	100	100	100	kHz
CameraLink® Deca (8bits)(4)	100	100	100	100	kHz

(*) Versatile Models Only

Characteristics	Typical Value					Unit
Radiometric Performance at Maximum Pixel Rate and minimum camera gain						
Bit depth	8, 10 and 12					Bits
Resolution	4096 5 x 5	4096 5 x 10	2048 10 x 10	1024 10 x 10	512 10 x 10	Pixels
Response (Peak at 565nm)	162	81	162/324 ^(*)	162/324 ^(*)	162/324 ^(*)	LSB/(nJ/cm²)
Camera Gain	5,9	5,9	11.1	11.1	11.1	e-/LSB _{12bits}
Full Well Capacity	23,7	23,7	47.3/23.7 ^(*)	47.3/23.7 ^(*)	47.3/23.7 ^(*)	Ke-
Response non linearity	1	1	2 ^(**)	2 ^(**)	2 ^(**)	%
Readout Noise	7,5	7,5	10.6	10.6	10.6	e-
Dynamic range	70	70	73/67 ^(*)	73/67 ^(*)	73/67 ^(*)	dB
SNR Max (3/4 Sat)	42	42	45/41.8 ^(*)	45/41.8 ^(*)	45/41.8 ^(*)	dB
PRNU HF Max	3					%

Notes :

(*) High Dynamic / High Response. : High dynamic with the Use of Multi-Column Gain 1/2

(**) e2v norm: more severe than EMVA 1288 Standard

Functionality (Programmable via Control Interface)		
Analog Gain	Up to 12 (x4)	dB
Offset	-4096 to +4096	LSB
Trigger Mode	Timed (Free run) and triggered (Ext Trig, Ext ITC) modes	
Mechanical and Electrical Interface		
Size (w x h x l)	60 x 60 x 33.65	mm
Weight	<150	g
Lens Mount	F, C and M42x1 (on the Front Face)	-
Sensor alignment (see chapter 2.1)	±100	µm
Sensor flatness	50	µm
Power supply	Single 10 DC to 15 DC	V
Power dissipation	< 3,6 PoCL compliant	W
General Features		
Operating temperature	0 to 50 (front face), 70 (internal)	°C
Relative Humidity for Operation	85%	%
Storage temperature	-40 to 70	°C
Regulatory	CE, FCC , Reach, RoHS and Chinese RoHs compliant	

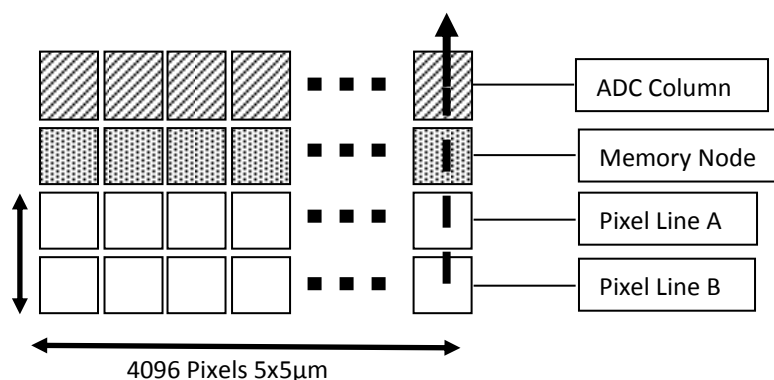
Image Sensor

The Uniiqa+ sensor is composed of one pair of sensitive lines of 4096 pixels of 5µm square.

Each pixel on the same column uses the same Analog to Digital Column converter (ADC Column).

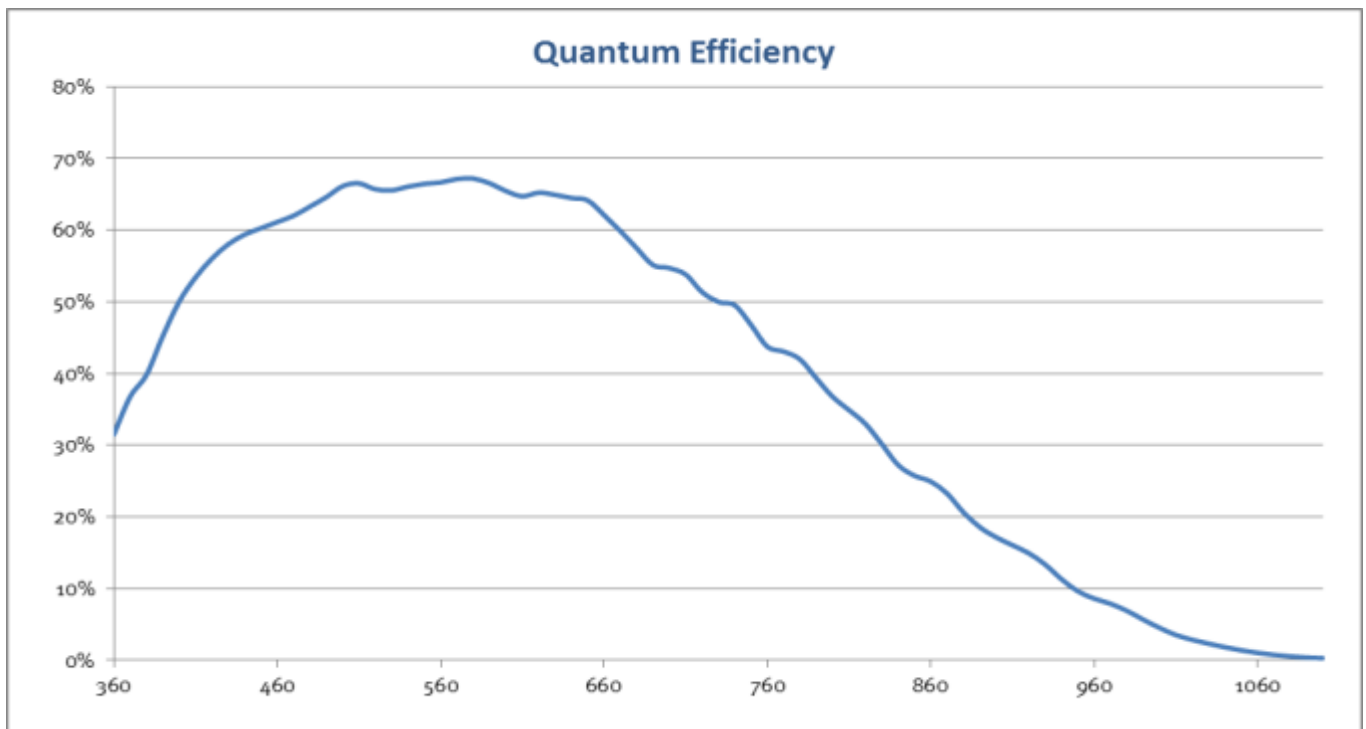
This structure allows several definitions :

- 4k pixels 5x5µm
- 2k Pixels 10x10µm by binning of 4 pixels
- Then, 1k or 0,5k 10x10µm are achieved by applying an ROI on the centre of the sensor.

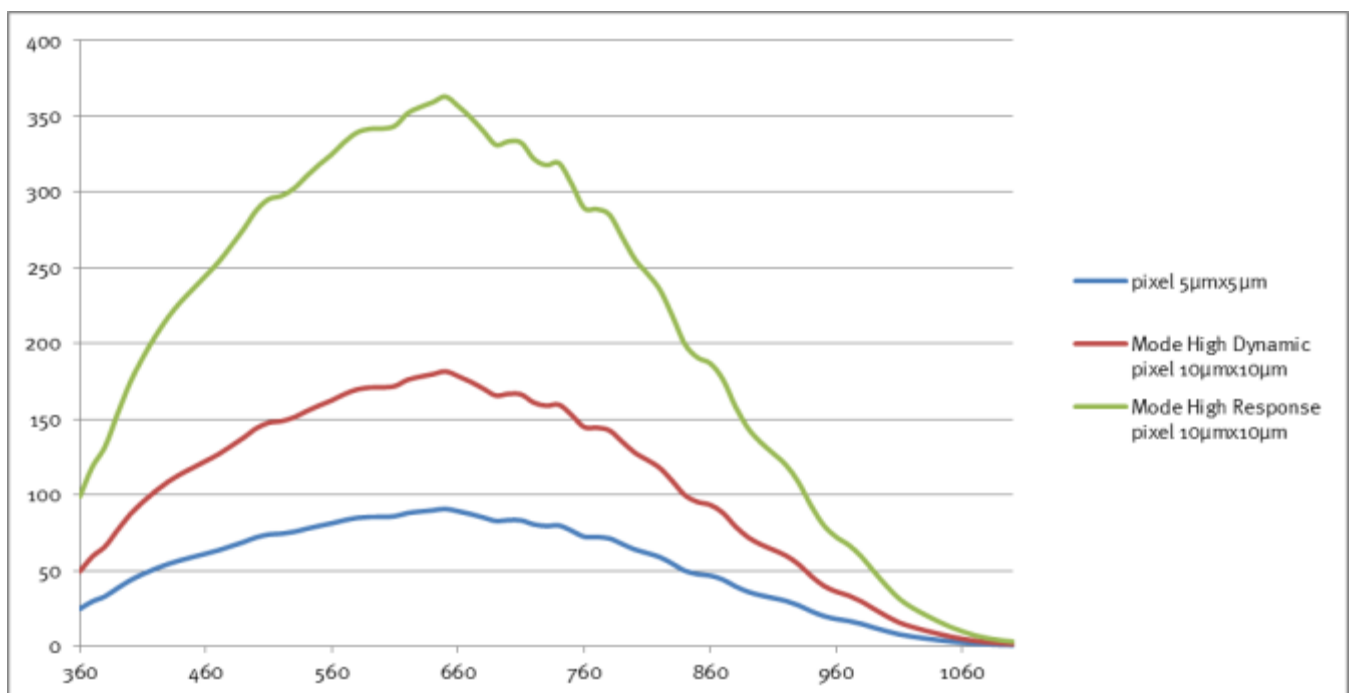


Response & QE curves

Quantum Efficiency

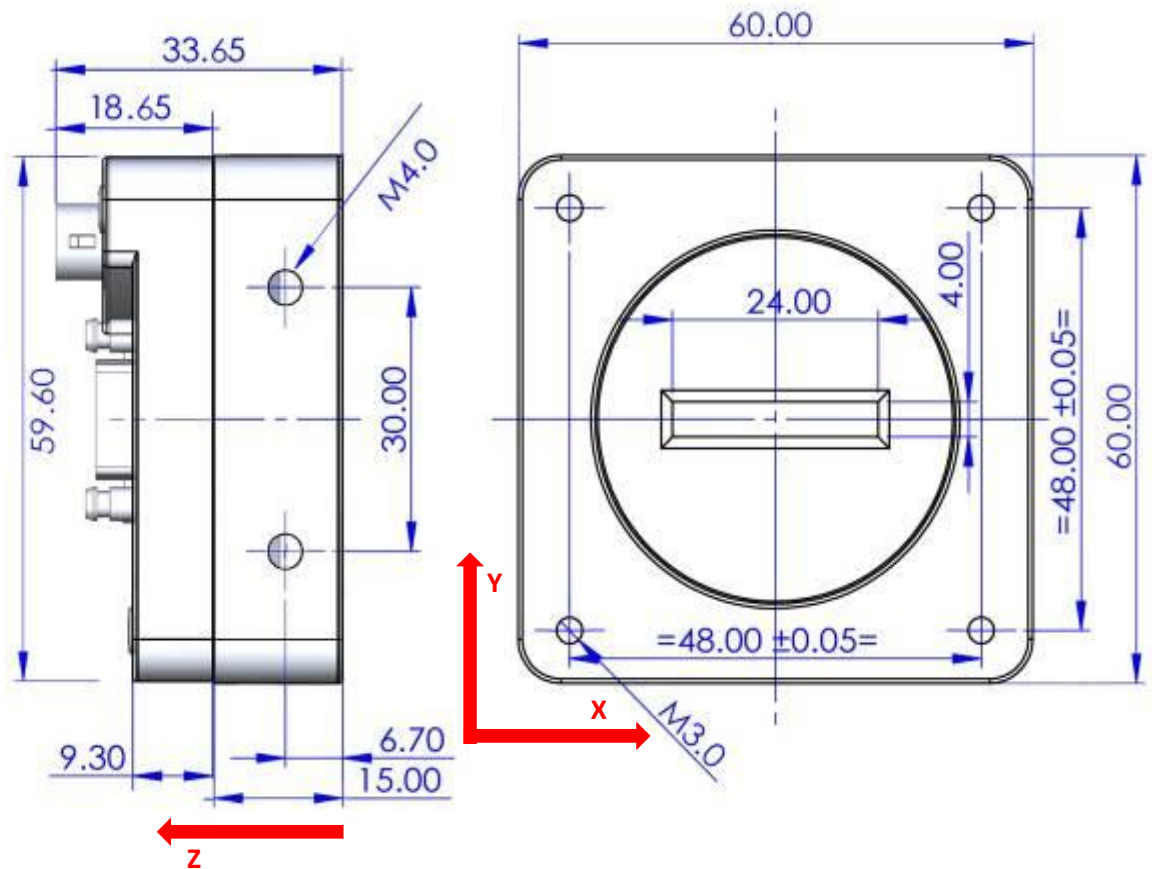


Spectral Response Curves



(*) High Dynamic / High Response. : High dynamic with the Use of Multi-Column Gain 1/2

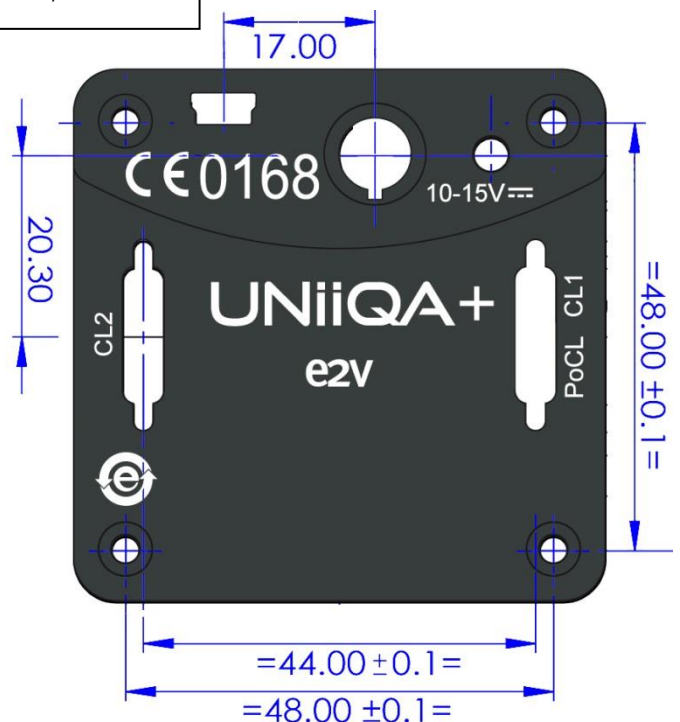
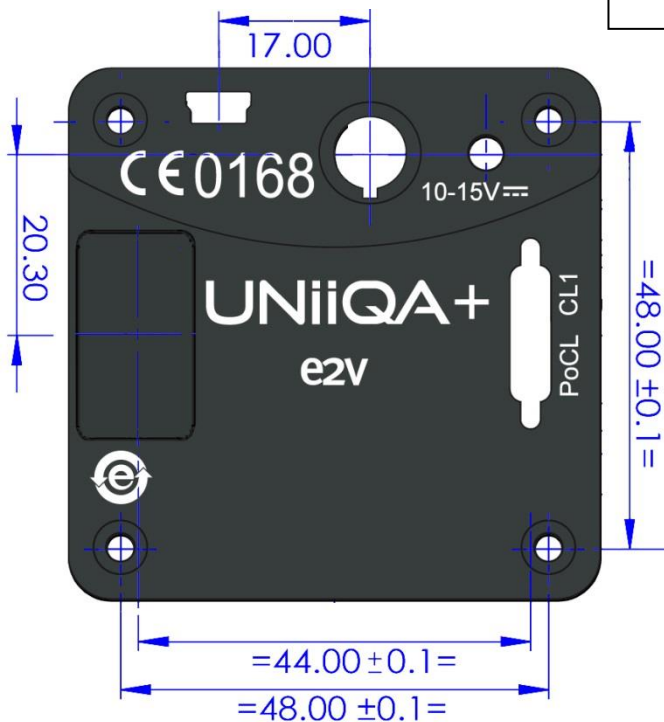
Camera Hardware and Interface



Essential Model

The Step file is available
on the web :
www.e2v.com/cameras

High Speed Model



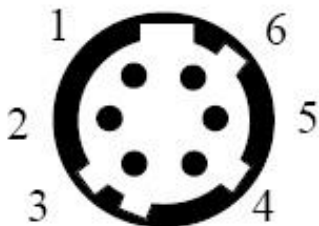
Input/output Connectors and LED



Power Connector

Camera connector type: Hirose HR10A-7R-6PB (male)

Cable connector type: Hirose HR10A-7P-6S (female)

 <p>Camera side description</p>	Signal	Pin	Signal	Pin
	PWR	1	GND	4
	PWR	2	GND	5
	PWR	3	GND	6
Power supply from 10 to 15v Power 3,5W max with an typical inrush current peak of 0,32A during power up				

The Camera is compliant PoCL (Power Over Camera Link) : The Power Connector is not used if the Frame Grabber can be also compliant PoCL

CameraLink Output Configuration

	Channels	Pixels per Channel			
Version "Essential"		4k	2k	1k	0,5k
Base : 1 Channel 8/10/12bits	1 x 85MHz (60/42.5MHz)	1 x 4096	1 x 2048	1 x 1024	1 x 512
Base : 2 Channels 8/10/12bits	2 x 85MHz (60/42.5MHz)	2 x 2048	2 x 1024	2 x 512	2 x 256
Version "High Speed"					
Base : 1 Channel 8/10/12bits	1 x 85MHz (60/42.5MHz)	1 x 4096	1 x 2048	1 x 1024	1 x 512
Base : 2 Channels 8/10/12bits	2 x 85MHz (60/42.5MHz)	2 x 2048	2 x 1024	2 x 512	2 x 256
Medium : 4 Channels 8/10/12bits	4 x 85MHz (60/42.5MHz)	4 x 1024	4 x 512	4 x 256	NR
Full : 8 Channels 8bits	8 x 85MHz (60/42.5MHz)	8 x 512	8 x 256	NR	NR
Deca : 10 Channels 8bits	10 x 42.5MHz (60/85MHz)	10 x 409	NR	NR	NR

NR : Not required as the fastest speed (100kHz) is already achieved by the precedent output mode with the lowest data rate (ex : 100kHz is achieved on 512 pixel in base mode with 2 x 42.5Mhz. Medium is not required, even for 10bits.

Standard Conformity

The UNIIQA+ cameras have been tested using the following equipment:

- A shielded power supply cable
- A Camera Link data transfer cable ref. 1MD26-3560-00C-500 (3M), 1SF26-L120-00C-500 (3M)
- A linear AC-DC power supply

e2v recommends using the same configuration to ensure the compliance with the following standards.

CE Conformity

The UNIIQA+ cameras comply with the requirements of the EMC (European) directive 2004/108/EC (EN 50081-2, EN 61000-6-2).

CE 0168

FCC Conformity

The UNIIQA+ cameras further comply with Part 15 of the FCC rules, which states that: Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation

This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.



RoHS / Chinese RoHS

RoHS per EU Directive 2011/65/EC and WEEE per EU Directive 2002/96/EC
China Electronic Industry Standard SJ/T11364-2006



GenICam / GenCP

GenICam/GenCP XML Description File, Superset of the GenICam™ Standard Features Naming Convention specification

V1.5, Camera Link Serial Communication : GenICam™ Generic Control Protocol (Gen CP V1.0)



Models

	Camera Part Number	Description	Details
UNIIQA+ Essential	EV71YC1MCL4005-BA2	Versatile Base CameraLink	4k pixels 5x5µm up to 20kHz 2k, 1k and 0,5k pixels 10x10µm up to 40kHz
	EV71YC1MCL4005-BA0	4k Pixels Base CameraLink	4k pixels 5x5µm up to 20kHz
	EV71YC1MCL2010-BA0	2k pixels Base CameraLink	2k pixels 10x10µm up to 40kHz
UNIIQA+ High Speed	EV71YC1MCL4005-BA3	Versatile Full CameraLink	4k pixels 5x5µm up to 100kHz 2k, 1k and 0,5k pixels 10x10µm up to 100kHz
	EV71YC1MCL4005-BA1	4k Pixels Full CameraLink	4k pixels 5x5µm up to 100kHz
	EV71YC1MCL2010-BA1	2k pixels Full CameraLink	2k pixels 10x10µm up to 100kHz

Datasheet

Features

- Cmos Monochrome Sensor :
 - 4096 RGB Pixels 5x5µm
 - 2048 RGB Pixels 10x10µm
- Interface : NBASE-T™ (up to 5Gb/s)
- Line Rate : Up to 140 kl/s in 8bits
- Bit Depth : 8, 10 and 12bits
- Scan Direction
- Flat Field Correction
- Cycling Preset Modes and Memories
- Multi ROI
- Look up Table
- HDR Mode
- Metadata
- Rotary Encoder
- Mounts : F, C, M42 (embedded)



Description

To maintain their competitive advantage, industrial leaders in the machine vision market have a continuous requirement to improve defect detection accuracy and reduce the cost of imaging. The availability of the UNIIQA+ cameras with an NBASE-T™ connection offers a straightforward solution, providing:

- High throughput - enabling high resolution and colour imaging without a frame grabber at speeds of up to 5 Gigabits per second (Gbps) over Category 5e standard Ethernet cable.
- Easy integration – compatible with GigE Vision protocol.
- Long-length (100 meters+), field terminable, inexpensive cabling - reduces costs and enables easier integration in imaging systems compared with optic fibre cabling

Applications

- Raw material surface inspection
- Parcel and postal sorting
- High resolution document scanning
- Print and paper inspection
- Industrial Inspection



Key Specifications

Characteristics	Typical Value		Unit
Sensor Characteristics at Maximum Pixel Rate			
Resolution	4096	2048	Pixels
pixel size (square)	5	10	μm
Max Line Rate (in 8 or 10Bits)	140	140	kHz
Radiometric Performance at Maximum Pixel Rate and minimum camera gain			
Bit depth	8 / 10 / 12		Bits
Response non linearity	< 1		%
PRNU HF Max	3		%
Dynamic range	65		dB
Response (broadband)	450		LSB/(nJ/cm²)
Full Well Capacity	18000		electrons
Dynamic range	67,6		dB

Test conditions :

- All values are given at Nominal Gain (0dB) : Preamp Gain x1, Amp Gain 0dB
- Figures in LSB are for a 12bits format
- Measured at exposure time = 400 μs and line period = 400 μs in Ext Trig Mode (Max Exposure Time)
- Maximum data rate

Functionality (Programmable via GenICam Control Interface)		
Analog Gain	Up to 12 (x4)	dB
Offset	-4096 to +4096	LSB
Trigger Mode	Timed (Free run) and triggered (Ext Trig, Ext ITC) modes	
Mechanical and Electrical Interface		
Size (w x h x l)	60 x 60 x 55	mm
Weight	247/335 without/with Heat Sinks	g
Lens Mounts	C, F, M42 (embedded in the Front Face)	-
Sensor alignment	±100	µm
Sensor flatness	±50	µm
Power supply	12 - 24	V
Power dissipation	< 11	W
General Features		
Operating temperature	0 to 60 (front face) or 85 (Internal)	°C
Storage temperature	-40 to 70	°C
Regulatory	CE, FCC and RoHS compliant	

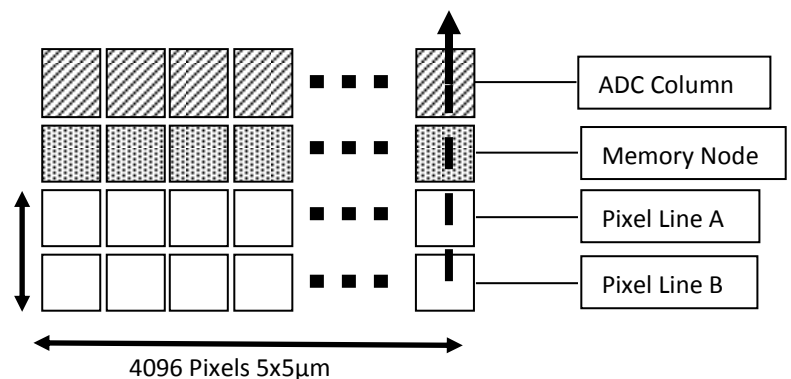
Image Sensor

The Uniiqa+ sensor is composed of one pair of sensitive lines of 4096 pixels of 5 μm square.

Each pixel on the same column uses the same Analog to Digital Column converter (ADC Column).

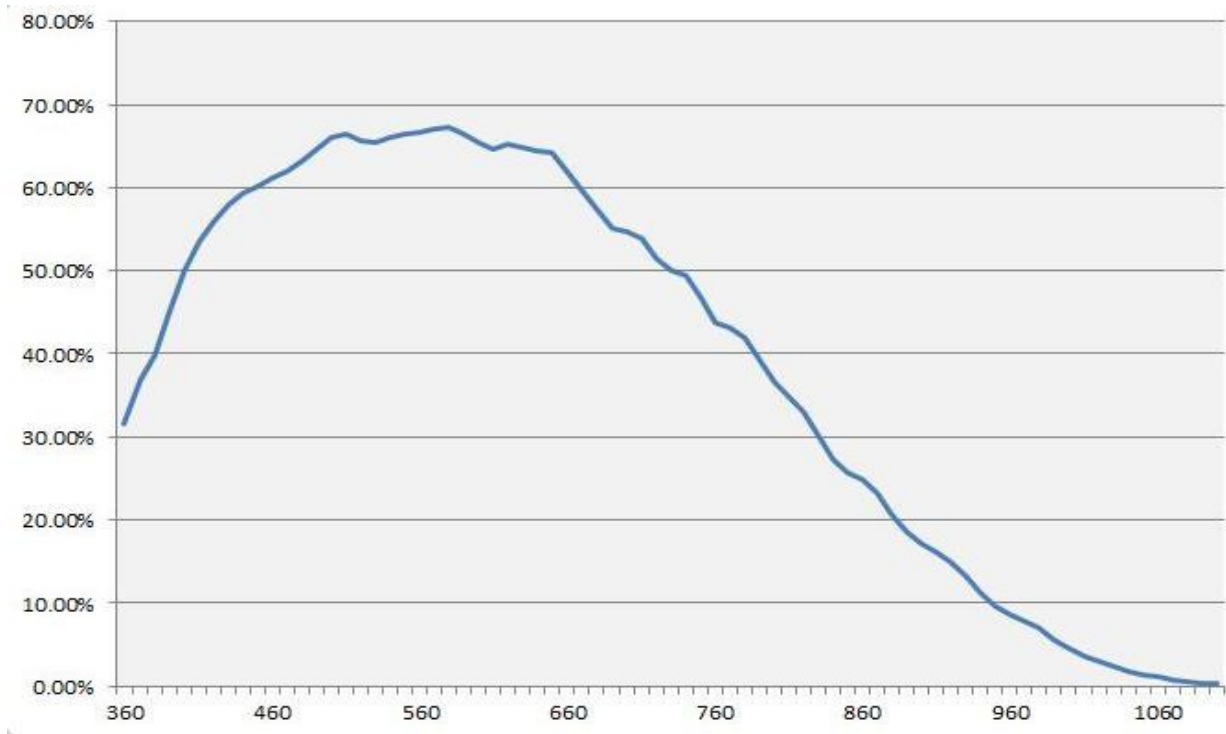
This structure allows several definitions :

- 4k pixels 5x5 μm
- 2k Pixels 10x10 μm by binning of 4 pixels
- Then, 1k or 0,5k 10x10 μm are achieved by applying an ROI on the centre of the sensor.

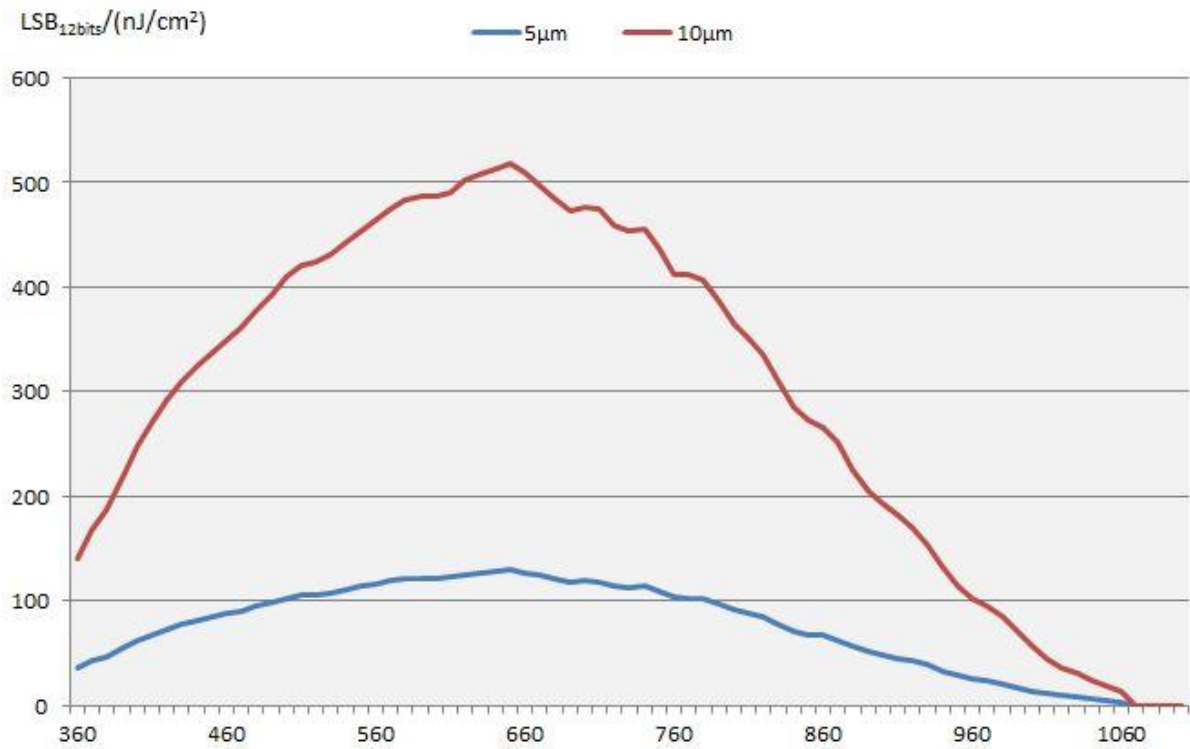


Response & QE curves

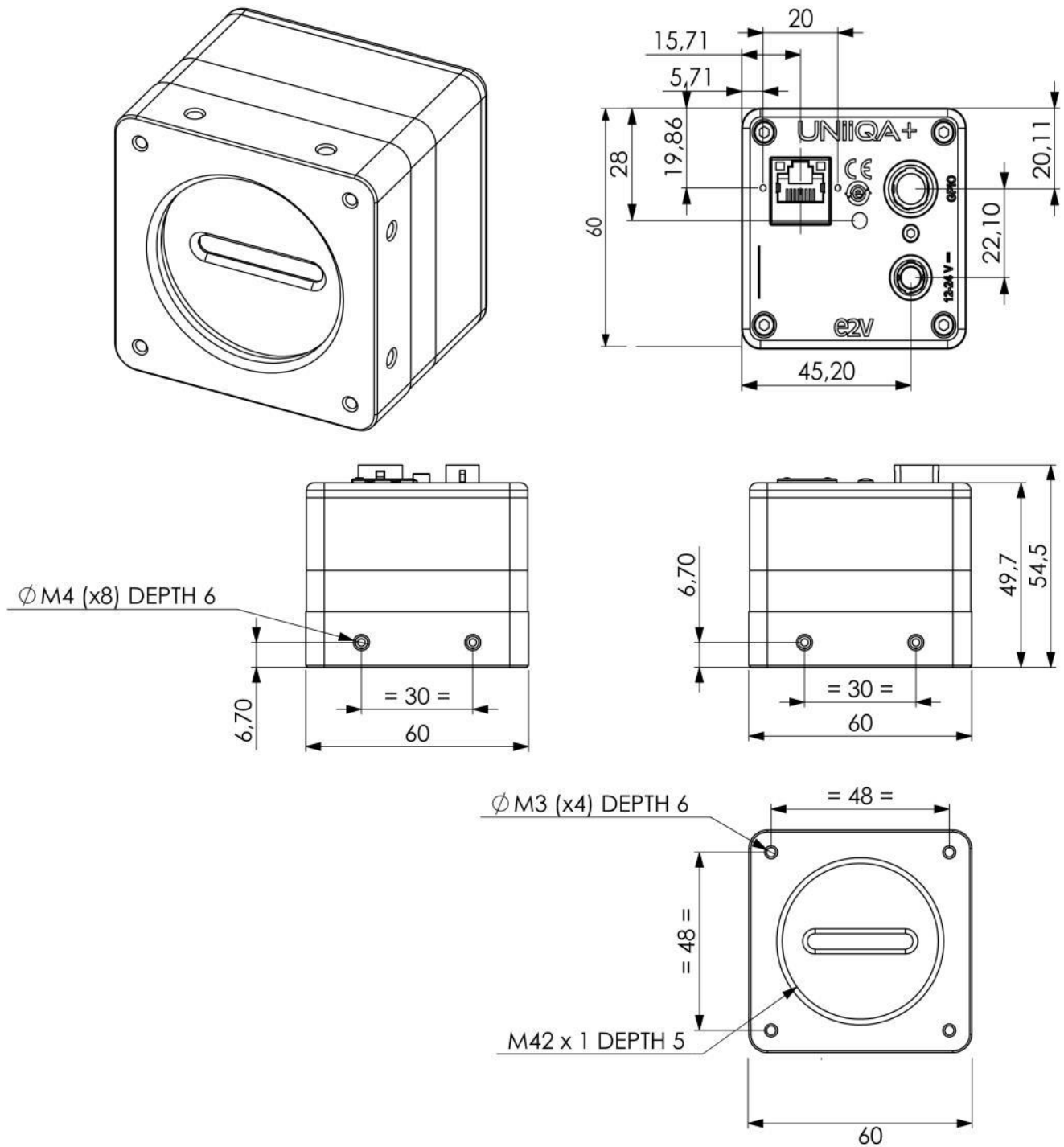
Quantum Efficiency



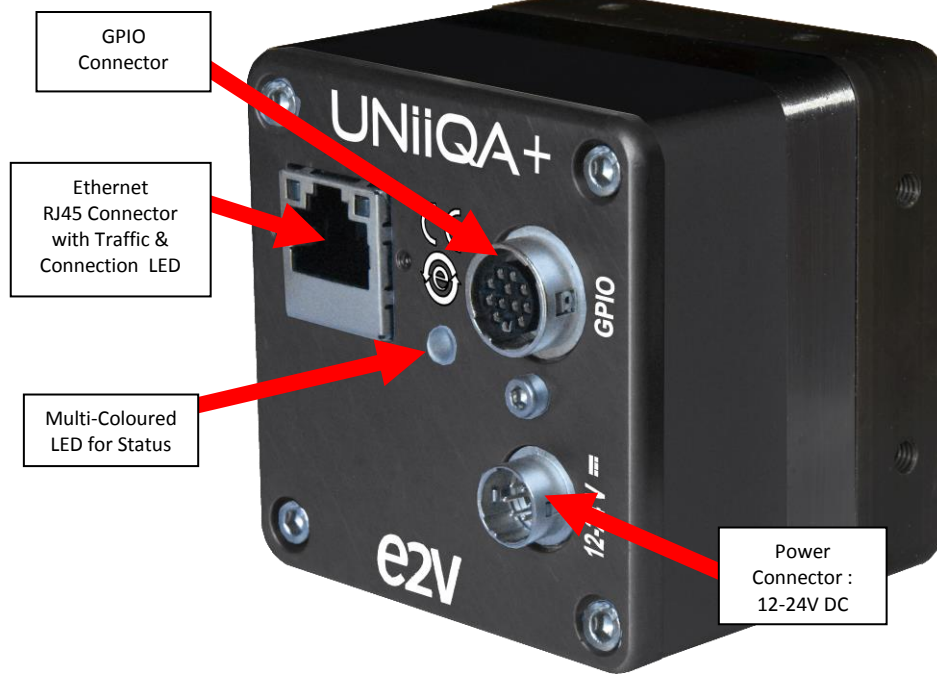
Spectral Response



Camera Hardware Interface



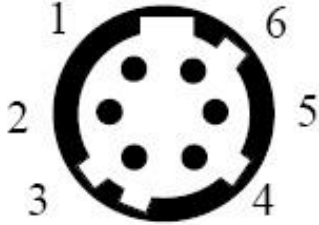
Input/output Connectors and LED



Power Connector

Camera connector type: Hirose HR10A-7R-6PB (male)

Cable connector type: Hirose HR10A-7P-6S (female)

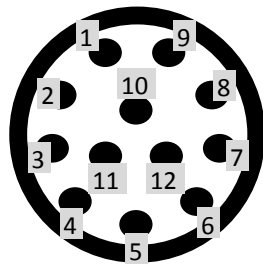
 Camera side description	Signal	Pin	Signal	Pin
	PWR	1	GND	4
	PWR	2	GND	5
	PWR	3	GND	6
Power supply from 12 to 24v Power 11W max with an typical inrush current peak of 1A during power up				

GPIO Connector

Camera Connector type: Hirose HR10A-10R-12SB

Cable Connector type: Hirose HR10A-10R-12P

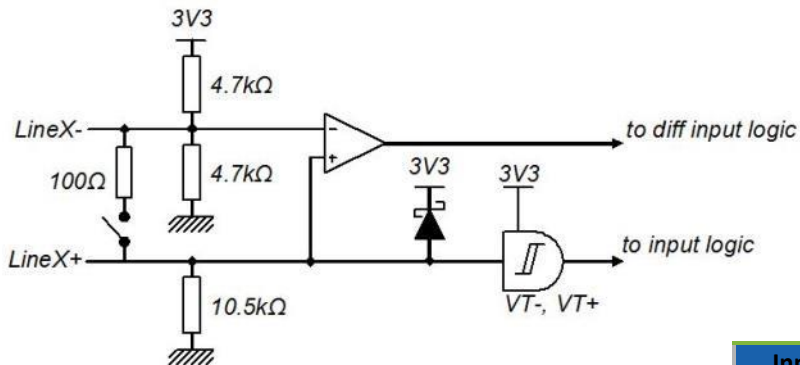
Cable type: cable immune from interference and with twisted pairs

 Camera side description	Signal	Pin	Signal	Pin
	Line 0+	1	Line 3+	7
	Line 0-	2	Line 4+	8
	Line 1+	3	Line 5+	9
	Line 1-	4	Line 6+	10
	Line 2+	5	GND	11
	Line 2-	6	GND	12

Lines 0, 1 and 2

The GPIO Connector allows the following connections :

- **Line 0, 1 or 2** : Dedicated inputs for Line Triggers and Frame Trigger. Differential (RS422 with or without termination) or TTL (Single End) in 3.3V, 5V, 12V or 24V.

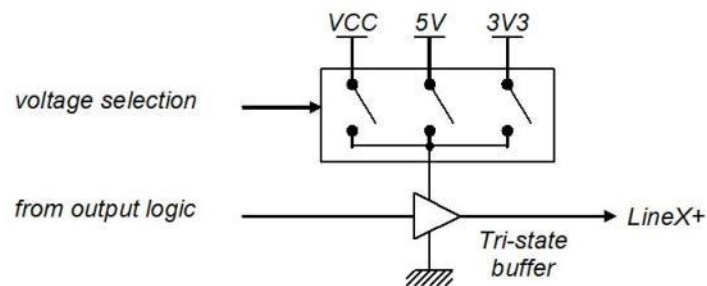


Input Thresholds	VT- Min	VT+ Max	Unit
24V	5.5	10.7	V
12V	2.9	5.5	V
3.3 / 5V	0.8	1.5	V

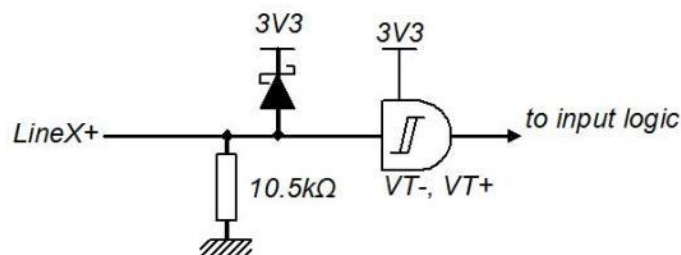
Lines 3, 4, 5 and 6

- **Line 3, 4, 5 and 6** : Configurable Inputs or Outputs in TTL only :
 - Input Configuration : Single End in 3.3V, 5V, 12V or 24V
 - Output configuration : Single End or Open Collector in 3.3V, 5V, or Camera power Supply

INPUT Configuration



OUTPUT Configuration



Camera Interface : NBASE-T™

What is the NBASE-T™ Technology ?

NBASE-T™ technology defines a new type of Ethernet signaling that boosts the speed of installed based twisted-pair cabling well beyond the cable's designed limit of 1 Gigabit per second (Gbps) for distances up to 100 meters. Capable of reaching 2.5 and 5 Gbps using the large installed base of Cat5e and Cat6 cabling, NBASE-T™ solutions enable users to accelerate their networks in the most cost-effective, least disruptive manner.

Flexible silicon solutions can auto-negotiate the optimal network speed, be it the new NBASE-T™ rates, slower 2.5 Gbps and 5 Gbps rates, or—if the network infrastructure supports it—10 Gbps

To introduce these new cameras, e2v has partnered with Pleora Technologies, the world's leading supplier of high-performance video interfaces, the first company from the machine vision industry to join the NBASE-T™ Alliance, a consortium collaborating on new technologies that extend the bandwidth capabilities of twisted-pair copper cabling using standard Ethernet technology.



Then all NBASE-T™ UNIIQA+ are licensed for Pleora eBus SDK and PureGeV Software that you can download on Pleora website (<http://www.pleora.com/our-products/ebus-sdk>)

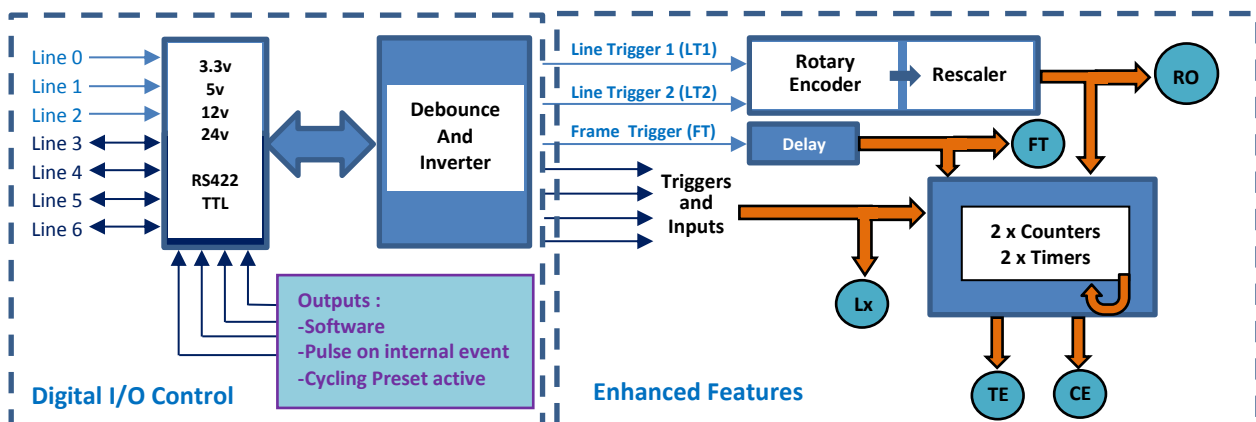
Camera Interface : GPIO

The GPIO Modules allows the connection of 7 external Lines :

- 3 dedicated inputs : 2 Line Triggers (LT1 and LT2) and one Frame Trigger (FT)
- 4 convertible generic Inputs / Outputs

A flexible in/Out block in RS422 or TTL with different detection levels (3.3v, 5v, 12v, 24v/Camera Power Supply) with a lot of features :

- Debounce filter and Inverter on each Input
- A delay dedicated to the Frame Trigger only (FT)
- A Full Rotary Encoder management (Quadratic with or without reverse miscount)
- A Rescaler following the Rotary Encoder module (available also if Rotary Encoder is bypassed)
- 2x Counters and 2x Timers
- 4x Outputs which can be set on Software, Start Frame or each individual Cycling Preset mode used.



GenICam Triggers

Four GenICam Triggers can be configured :

Four GenICam Triggers can be configured :

- Line Start Trigger : Start the Line on an Edge variation of the Source
- Exposure Active Trigger : Exposure active on a certain Level of the Source
- Frame Start Trigger : Start the Frame on an Edge variation of the Source
- Frame Active Trigger : Frame active on a certain Level of the Source

Each Trigger has these 5 following parameters :

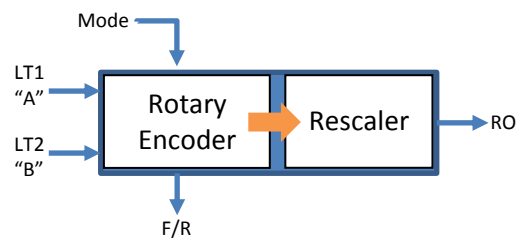
- Trigger Mode : Activates the Trigger. Only on Line and Frame Trigger activated in the same time.
- Trigger Source : Defines the Signal which is the Source of the Trigger (see table below)
- Trigger activation : Defines how the Source activate the Trigger (on edge for Line Start and Frame Start or level for Exposure Active and Frame Active)
- TriggerMaskSource : Defines the signal that can be set to enable/disable the Trigger
- TriggerMaskActivation : Defines on which level the TriggerMaskSource is activated.

Rotary Encoder

The Embedded Rotary Encoder is managed by the two inputs Lines :

- Line Trigger 1 taken as “A” quadrature input
- Line Trigger 2 taken as “B” quadrature input

The Encoder takes in account the Forward/Reverse indication given to the camera (by software or external input) to determine the forward or Reverse position of the A and B quadrature inputs. Its “Forward/Reverse” outputs is just an indication of its working mode as soon as it is not disabled but has no action on the camera scanning direction.



The Output of the Rotary Encoder enters a Rescaler (Multiplier / Divider) that can be also bypassed (neutral).

The Rotary encoder has two working modes :

- Quadratic without miscount : The Encoder is sending only forward lines. Any reverse line is not sent and not counted.
- Quadratic with miscount : The Encoder is sending only forward lines but reverse lines are miscount in an internal counter. The Encoder will restart sending Line triggers as soon as each reverse Line miscounted has been recounted forward.

The Rotary Encoder can be bypassed. Then the “B” input is disabled and the Line Trigger 1 (LT1) connected on input “A” is passing through the Rotary encoder to enter the Rescaler

The Rotary encoder can’t be used by changing the camera operation (Forward/Reverse) “on the fly” as some sensor modes require some reset and some time to change the scanning direction.

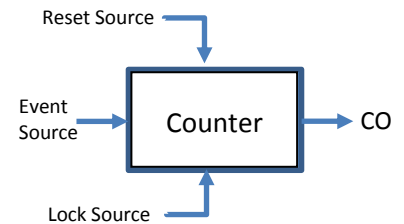
Counters

The Counter counts the Event Source Edges.

The counter Duration is set and when the counted value reaches the duration, the Output of the counter rises to 1. If the reset input of the counter is not set (Off), the counter resets immediately : The end count value is set in the "Value at Reset", the output is reset and Counter restarts counting on the same event.

The Reset input can be set on an external source and also can maintain the reset of the counter (on level)

As soon as the Reset input is set but not active, the counter counts. If it reaches the duration before any reset, the output rises to 1 and the counter carries on counting. Then if the Reset arises, the "Value at Reset" is set with the current value (even higher than the duration), the output is set to 0 and the counter can restart counting on the same even as soon as the reset input switches down to 0.



If the Reset arises before the counter has reached the duration, the "Value at Reset" is set with the current value (even lower than the duration), the output is set to 0 and the counter can restart counting on the same even as soon as the reset input switches down to 0.

The Counter can also be locked by an external source : As soon as the lock input is active, the counter value doesn't increment on an Event Source edge but can be reset if the reset signal arises.

Timers

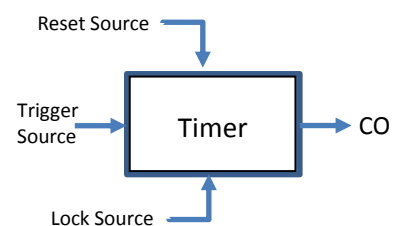
The Timer starts on its Trigger Source Edge

The Timer Duration is set and when this value is reached, the Timer output rises to 1. If the Reset source is not set (Off) then the Timer resets immediately : The output is reset and Timer restarts after the same event edge.

As soon as the Reset input is set but not active, the timer Output remains to 1.

When the Reset arises, the output is set to 0 and the Timer can restart as soon as the reset input switches down to 0. If the reset arises before the end of the Timer duration, the Timer is reset without switching to 1 and can restart as soon as the reset input switches down to 0.

The Timer can also be locked by an external source : As soon as the lock input is active, the Timer stops at its current timing value and can be reset if the reset signal arises. The Timer restarts form its current timing position when the reset input is released.

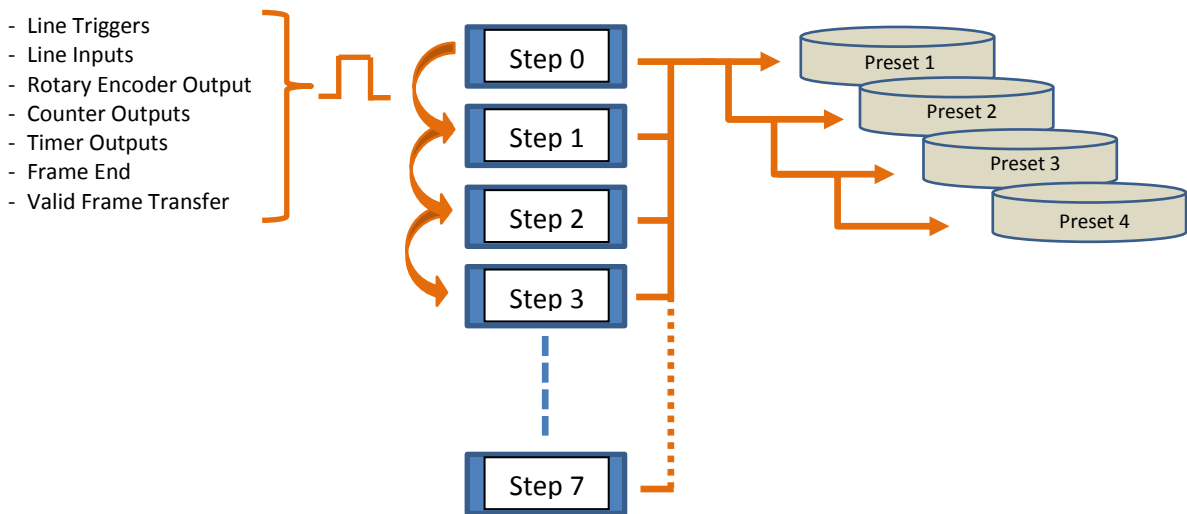


Cycling Preset modes and configuration

The Cycling Preset mode is the possibility for the camera to switch at least for each line between 4x sets of pre-defined parameters including :

- Exposure Time and Exposure Delay
- Flat Field Correction
- Gain (Amplification Gain)
- White Balance Gains
- RGB Colour Correction Matrix

The Cycling Preset mode configuration allows up to 8 different steps for switching between this choice of 4 sets of parameters and thus with the arising of different possible events (Line Input, Line Trigger, Frame Trigger, end of Counter and/or Timer ...) :



Models

Part Number	Definition	Max Speed	Details
EV71YC1MNT4005-BA0	4k x 5µm	140kHz	Delivered with a pair of Heat Sinks
EV71YC1MNT2010-BA0	2k x 10µm	140kHz	

DATASHEET

Features

- Cmos Sensor 16384 Pixels, 5 x 5µm
- Interface : Medium/Full/Full+ CameraLink® :
- (4, 8 or 10 Channels), 85MHz each
- Line Rate : Up to 50000 l/s
- Data Rate : Up to 680 MB/s
- Bit Depth : 8 or 12bits
- Flat Field Correction
- Look Up Table
- Low Power Consumption : <13W
- Compliant with Standard Lenses of the Market



Description

e2v's next generation of line scan cameras are setting new, high standards for line rate and image quality. Thanks to e2v's recently developed CMOS technology, the camera provides 50 000 lines/s in a 16k pixel format and combines high response with an extremely low noise level; this delivers high signal to noise ratio even when short integration times are required or when illumination is limited. The 5µm pixel size is arranged in one single active line, ensuring optimal spatial resolution in both scanning and sensor directions with off-the-shelf lenses.

Application

- Flat Panel Display Inspection
- PCB Inspection
- Solar Cell Inspection
- Glass Inspection
- Print Inspection



Standard Conformity

The UNIIQA+ cameras have been tested using the following equipment:

- A shielded power supply cable
- A Camera Link data transfer cable ref. 14B26-SZLB-500-OLC (3M)
- A linear AC-DC power supply

e2v recommends using the same configuration to ensure the compliance with the following standards.

CE Conformity

The UNIIQA + cameras comply with the requirements of the EMC (European) directive 89/336/CEE (EN 50081-2, EN 61000-6-2).

FCC Conformity

The UNIIQA + cameras further comply with Part 15 of the FCC rules, which states that: Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation
- This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
- This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
- Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

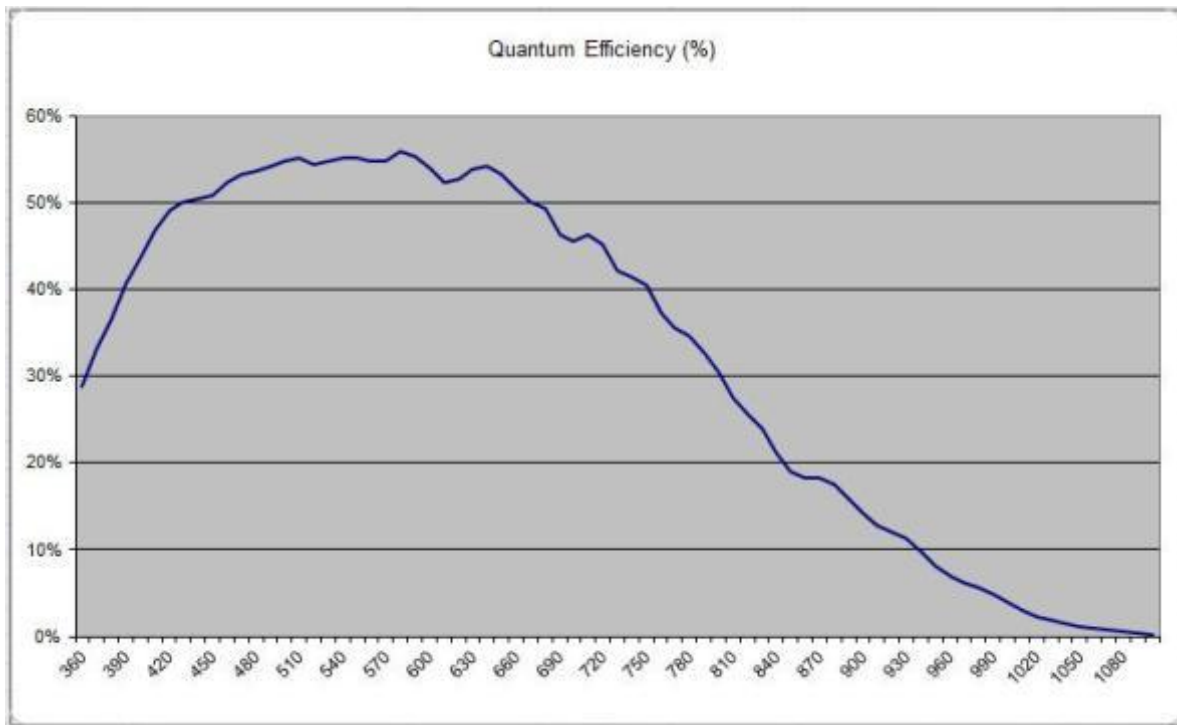
Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Key Specifications

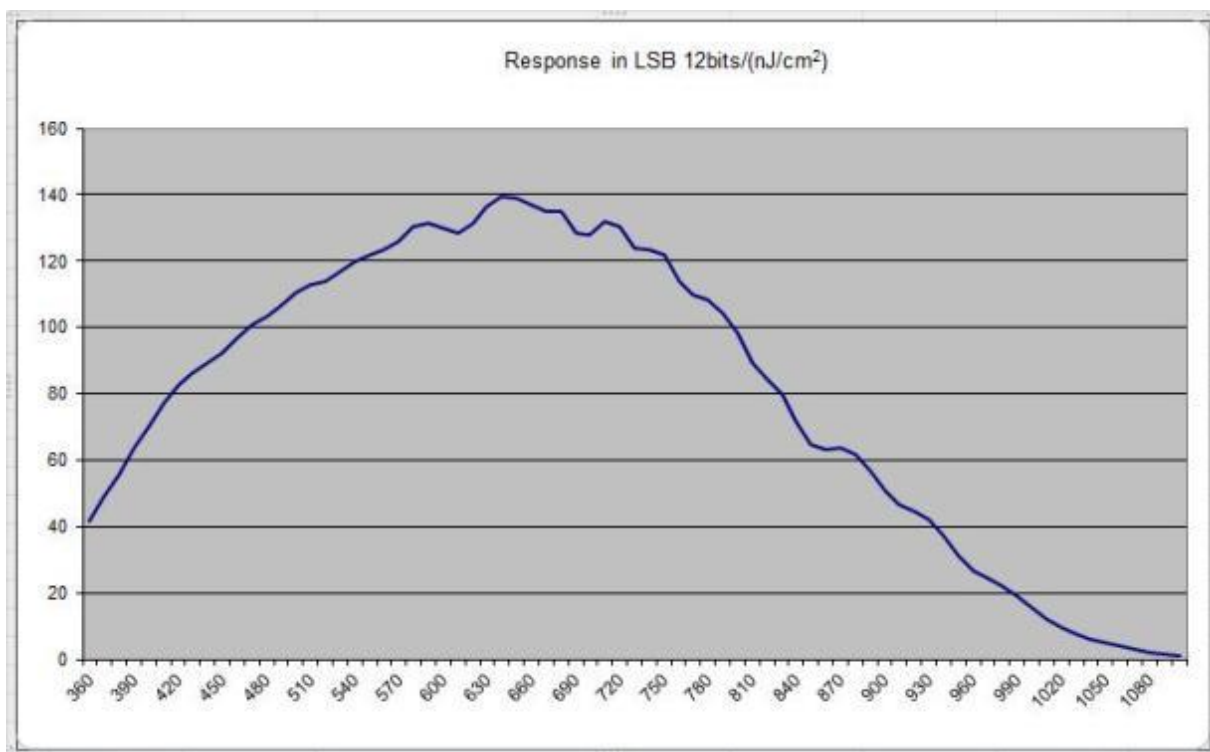
Characteristics	Value	Unit
Sensor Characteristics		
Resolution	16384	Pixels
Pixel Size (square)	5	μm
Max Line Rate		
CameraLink® 10xTaps Full+ mode (8 bits)	50	kHz
CameraLink® 8xTaps Full mode (8 bits)	40	kHz
CameraLink® 4xTaps Medium mode (8 or 12 bits)	20	kHz
Radiometric Performances (at Maximum Pixel rate and Minimum Camera Gain)		
Bit Depth	8 12	Bits Bits
Responsivity	137	LSB 12bits/(nJ/cm2)
Response non linearity (between 5 – 95% saturation)	<1	%
Maximum PRNU	3	%
Dynamic Range	67	dB
Functionalities (Programmable via Control Interface)		
Gain (Analog : In the ADC converter)	Up to 12	dB
Offset	-4096 to +4095	LSB
Trigger Mode	Timed (Free run) and triggered (Ext Trig, Ext ITC) modes	
Mechanical and Electrical Interface		
Power Supply	Single 12 to 24	V _{DC}
Power Consumption	<13	W
Lens Mount	M95	-
Sensor Alignment	±100	μm
Sensor Flatness	±35	μm
General Features		
Operating Temperature	0 to 55 Front Face	°C
Storage Temperature	-40 to 70	°C
Regulatory	CE, FCC and RoHs Compliant	-

Response & QE curves

Quantum Efficiency

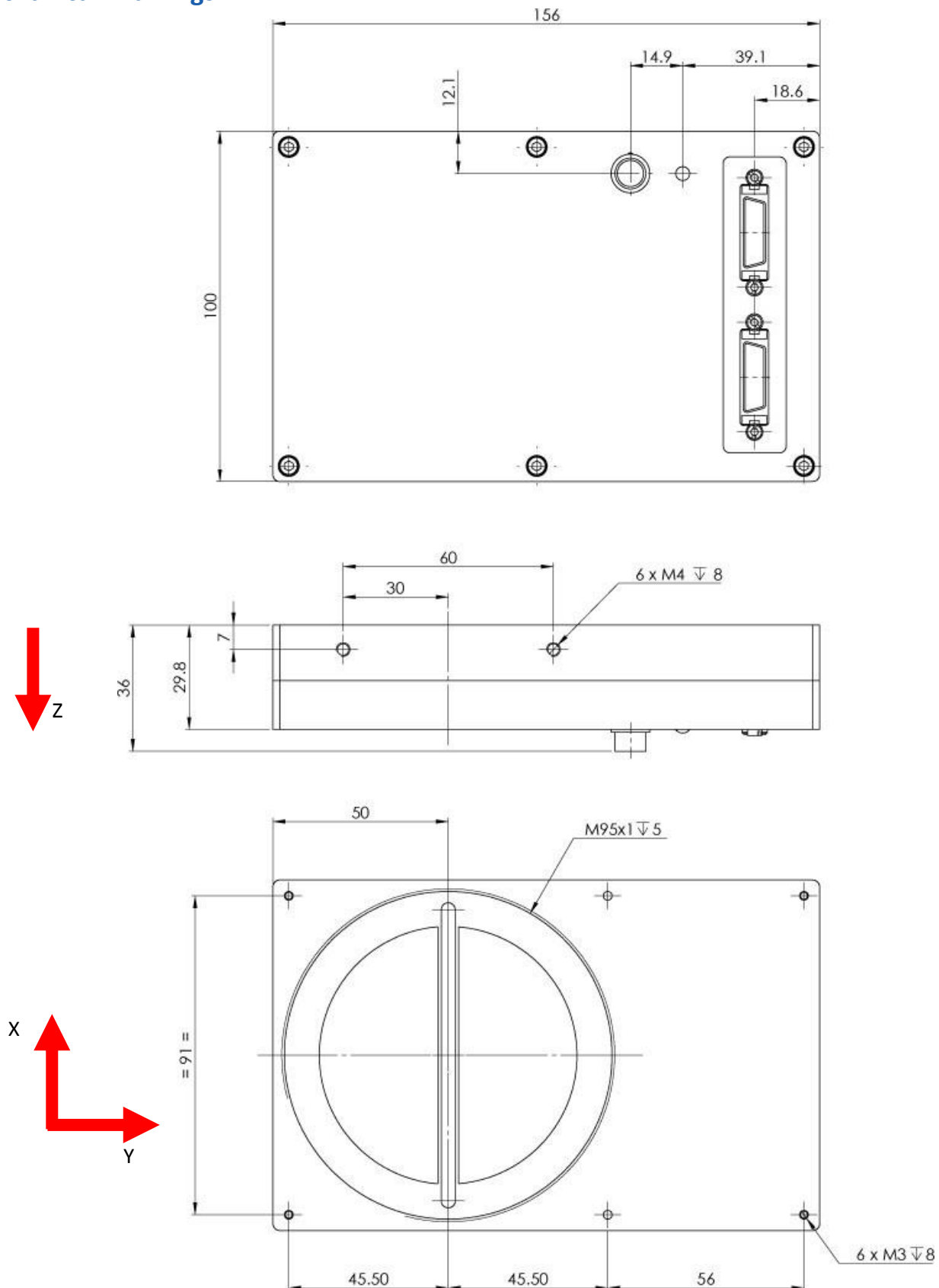


Spectral Response



Camera Interface

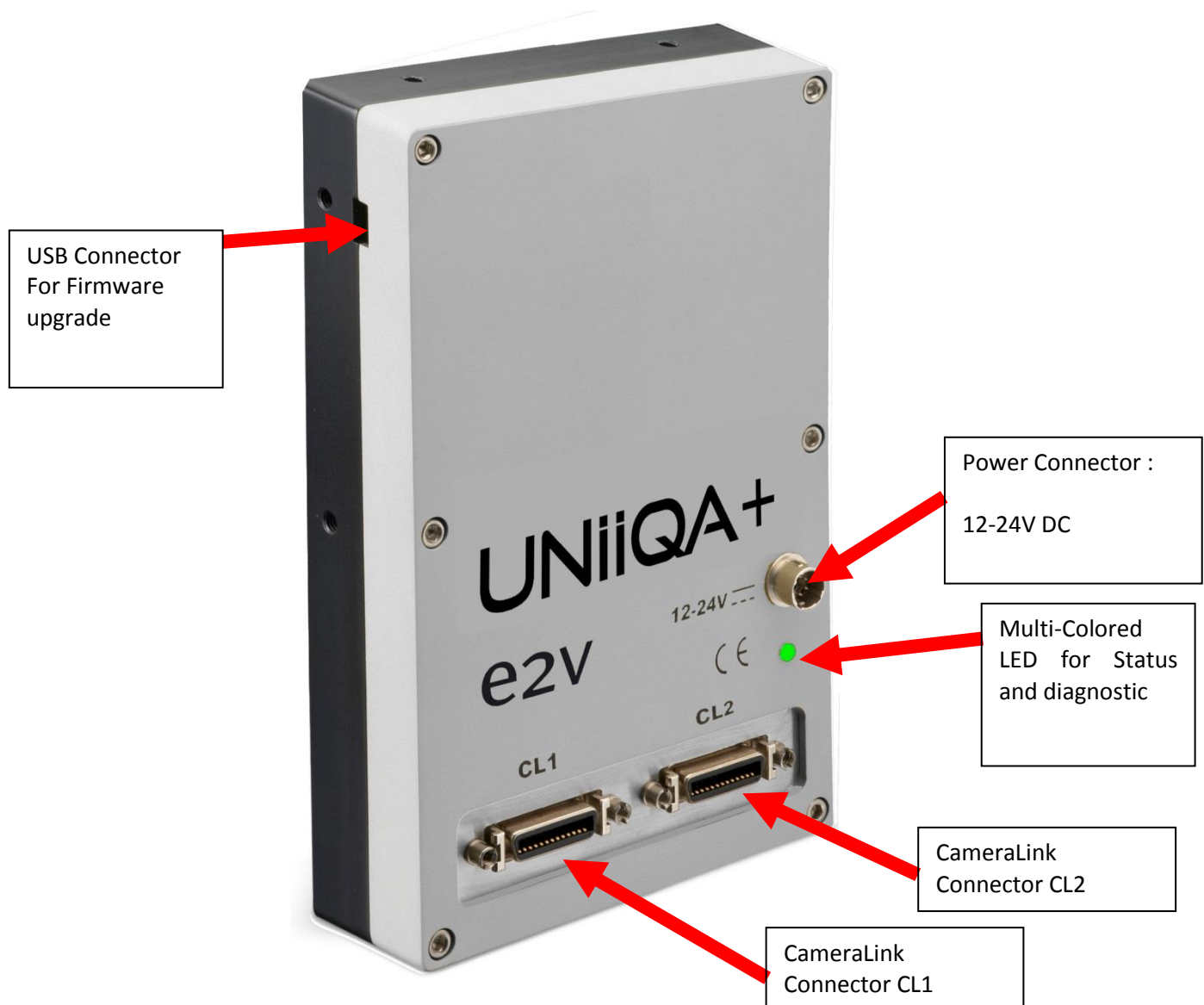
Mechanical Drawings



Sensor Positioning

Sensor alignment		
X	9 ±0,1	mm
Y	50 ±0,1	mm
Z	-9,4 ±0,15	mm
Planarity	±35	μm
Rotation (X,Y plan)	±0,2	°
Tilt (versus lens mounting plane)	±35	μm

Input/Output Connectors and LED (CameraLink)



Status LED Behaviour

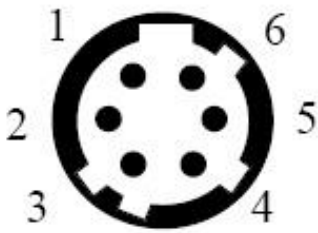
After less than 2 seconds of power establishment, the LED first lights up in ORANGE. Then after a Maximum of 30 seconds, the LED must turn in a following colour :

Colour and state	Meaning
Green and continuous	OK
Green and blinking slowly	Waiting for Ext Trig (Trig1 and/or Trig2)
Red and continuous	Camera out of order : Internal firmware error

Power Connector

Camera connector type: Hirose HR10A-7R-6PB (male)

Cable connector type: Hirose HR10A-7P-6S (female)



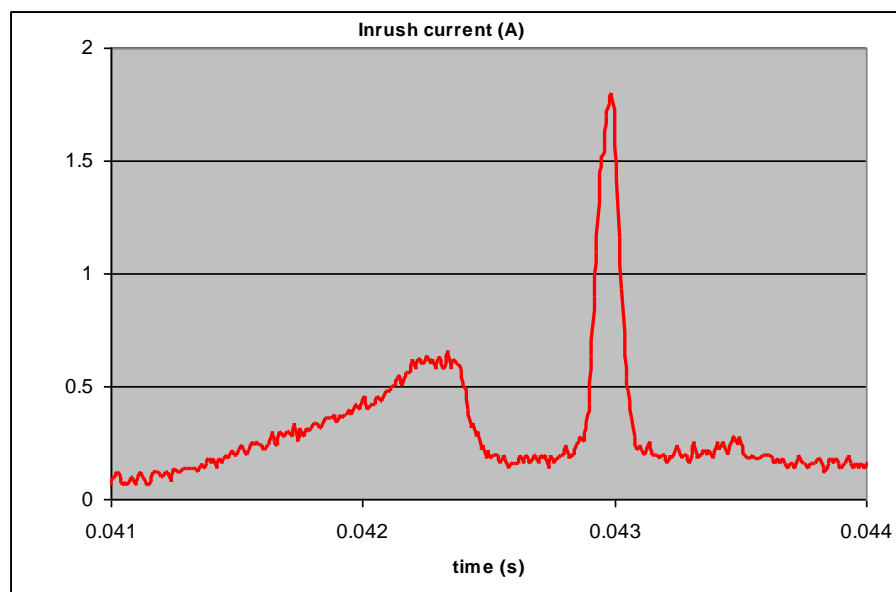
Camera side description

Signal	Pin	Signal	Pin
PWR	1	GND	4
PWR	2	GND	5
PWR	3	GND	6

Power supply from 12 to 24v
 Power 13W max with an typical inrush current peak of **1,8A** during power up

	Current consumption	
Typical values	12V	24V
ELIIXA+ CL (normal)	1,06A	0,54A
ELIIXA+ CL (Standby)	0,47A	0,25A

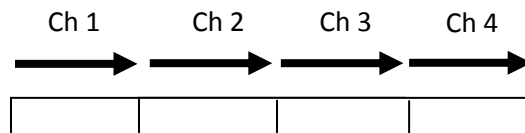
Power up Time : Around 43s (Green Light)



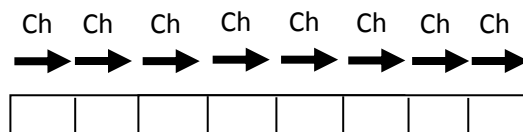
Output Configuration

	Connector CL1 + CL2	Pixels per Channel
Medium CameraLink Mode		
4 Channels 8bits	4 x 85MHz	4 x 4096
4 Channels 12bits	4 x 85MHz	4 x 4096
Full CameraLink Mode		
8 Channels 8bits	8 x 85MHz	8 x 2048
Full + CameraLink Mode		
10 Channels 8bits	10 x 85MHz	10 x 1638

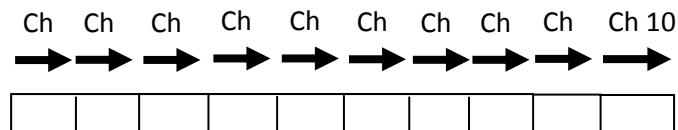
- Medium Mode 4x4096 Pixels at 85MHz each Channel (4x2048 pixels in Binning Mode 1SB or 2SB) : 4 Taps Separate, from Left to Right



- FULL Mode 8x2048 Pixels at 85MHz each Channel (8x1024 pixels in Binning Mode 1SB or 2SB) : 8 Taps Separate, from Left to Right

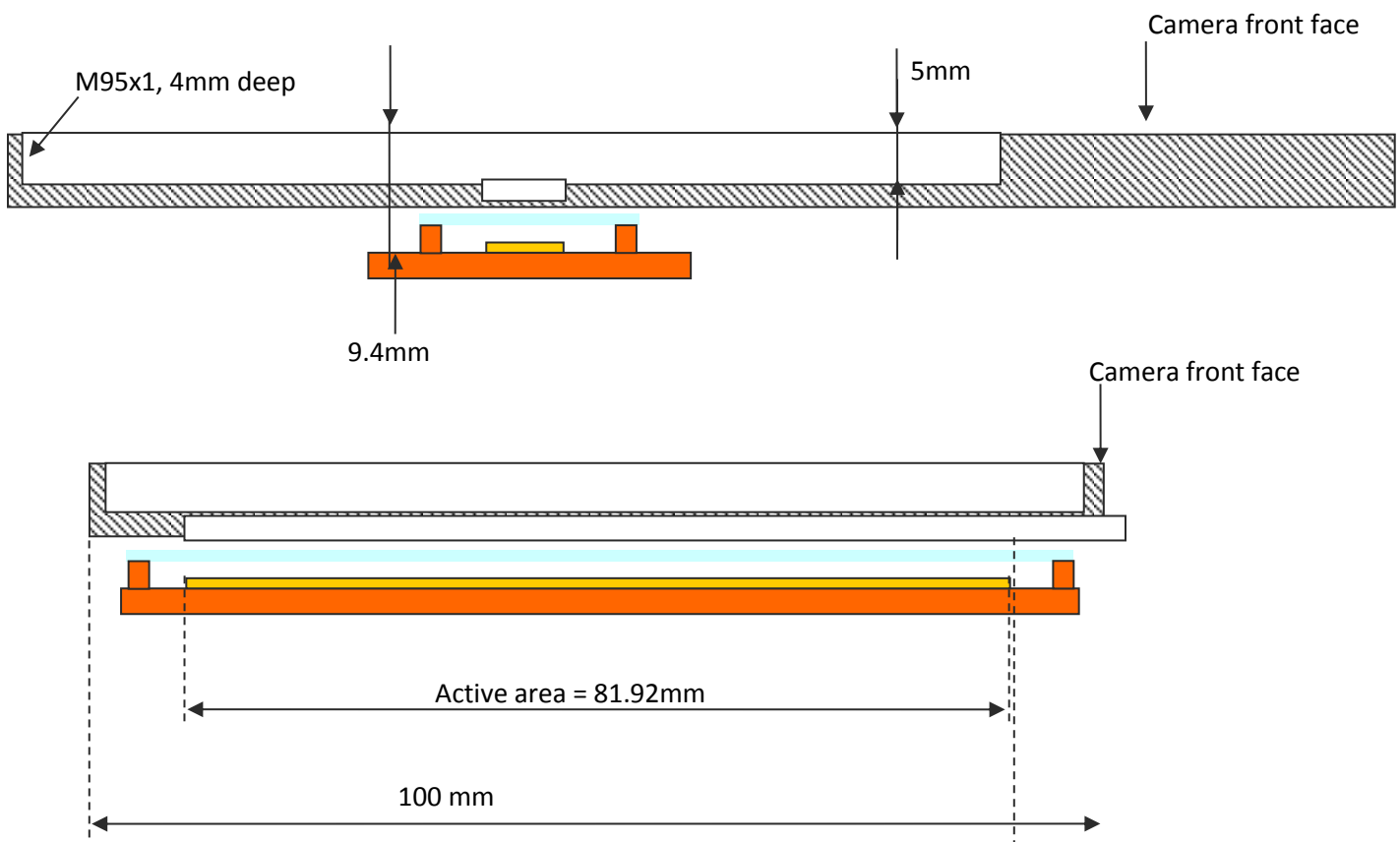


- FULL+ Mode 10x1638 Pixels at 85MHz each Channel (10x819 pixels in Binning Mode 1SB or 2SB) : 10 Taps Separate, from Left to Right :



Optical Interface

Mechanical Interface



Lens Compliance

QIOPTICS (LINOS)				
	Nominal Magnification	Magnification Range	M95 Focus tube Reference	Lens Reference Part number
Inspec.x. L 5.6/105	0,33 X	0,25 – 0,45 X	2408-012-000-41	0703-085-000-20
Inspec.x. L 5.6/105	0,5 X	0,4 – 0,65 X	2408-012-000-41	0703-084-000-20
Inspec.x. L 5.6/105	0,87 X	0,6 – 0,9 X	2408-012-000-43	0703-083-000-20
Inspec.x. L 5.6/105	1 X	0,85 – 1,2 X	2408-012-000-43	0703-082-000-20
Inspec.x. L 4/105	3 X	2,8 – 3,3 X	2408-012-000-46	0703-104-000-20
Inspec.x. L 4/105	3,5 X	3,3 – 3,7 X	2408-012-000-44	0703-095-000-21
Inspec.x. L 3.5/105	5 X	4,8 – 5,2 X	2408-012-000-45	0703-102-000-20
SCHNEIDER KREUZNACH				
	Nominal Magnification	Magnification Range	Working Distance (at nom. Mag.)	Reference Part number
SR 5.6/120-0058	1 X	0,88 – 1,13 X	212 mm	1002647
SR 5.6/120-0059	0,75 X	0,63 – 0,88 X	252 mm	1002648
SR 5.6/120-0060	0,5 X	0,38 – 0,63 X	333 mm	1002650
SR 5.6/120-0061	0,33 X	0,26 – 0,38 X	453 mm	1004611
Accessories	V mount 25mm macro-extension tube		Necessary to combine the whole lens system	20179
	V mount to Leica adapter			20054
	Unifoc 76			13048
	Adapter M58x0.75 – M95x1			1062891
	Extension tube M95x1, 25mm		To be combined to reach the appropriate magnification	1062892
	Extension tube M95x1, 50mm			1062893
	Extension tube M95x1, 100mm			1062894
MYUTRON				
	Nominal Magnification	Working Distance	M95 Custom Mount available Aperture (∞) : 4.7	
XLS03-E	x0,3	477mm		
XLS53-E	x0,5	324mm		
XLS75-E	x0,75	246mm		
XLS010-E	x1	197mm		
XLS014-E	x1,4	170mm		
XLS203-E	x2	146mm		

EDMUND OPTICS			
	Nominal Magnification	Working Distance (at nom. Mag.)	Reference Part number
TechSpec F4	1 X	151 mm	NT68-222
TechSpec F4	1,33 X	158,5 mm	NT68-223
TechSpec F4	2,0 X	129 mm	NT68-224
TechSpec F4	3,0 X	110 mm	NT68-225
Accessories	Large Format Tip/Tilt Bolt Pattern Adapter, 2X		NT69-235
	Large Format Focusing Module		NT69-240
	Large Format Adapter Set		NT69-241
NAVITAR			
Raptar Pro 4/86	1 X	Extension Tubes on request	1 - 17494
NIKON			
Rayfact F4	0,05 X – 0,5 X	1820,4mm – 230,3mm	Rayfact ML90mm F4
NAVITAR			
Raptar Pro 4/86	Magnification : 1 X	Extension Tubes on request	1 - 17494

Camera Models

Camera Part Number	Max Speed	Interface	Features
EV71YC1MCL1605-BA1	16k : 50kHz	CameraLink® 4, 8 or 10 Taps at 85MHz	-
EV71YC1MCL1605-BA2	16k : 50kHz	CameraLink® 4, 8 or 10 Taps at 85MHz	New Sensor and ROI