

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 ELiXA+ 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	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/cm ²)
Green	11.2		LSB 8bits/(nJ/cm ²)
Blue	7.8		LSB 8bits/(nJ/cm ²)

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

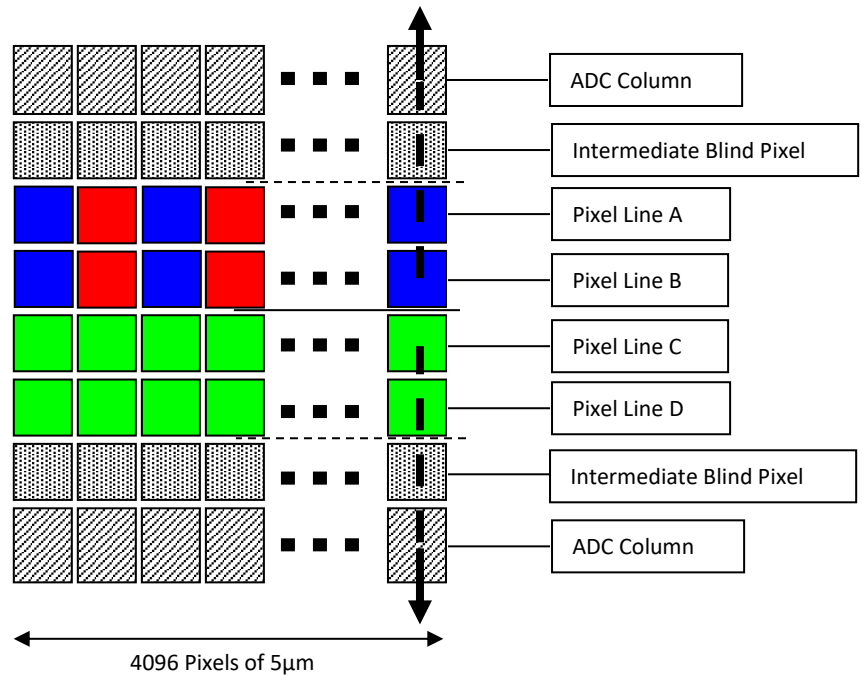
Functionality (Programmable via GenICam Control Interface)		
Analog Gain	Up to 12 (x4)	dB
Offset	-4096 to +4096	LSB
Trigger Mode	Timed (Free run) and triggered (Ext Trig, Ext ITC) modes	
Sensor Modes	<ul style="list-style-type: none"> • True Colour Enhanced : 2048 RGB Pixels of 10x10µm • True Colour Single : 2048 RGB Pixels of 10x10µm • Full Definition Enhanced : 4096 RGB Pixels 5x5µm • 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 ELiiXA+ Colour 4k/2k sensor is composed of two pairs of sensitive lines. The Colour version has been completed with RGB colour Filter and disposed as detailed beside.

Each pair of lines uses the same Analog to Digital Column converter (ADC Column). An appropriate (embedded) Time delay in the exposure between each line this allows to combine two successive exposures in order to double the sensitivity of a single line.

This Time Delay Exposure is used only in the Full Definition Enhanced mode (See Below).



True Colour mode in 2k 10µm

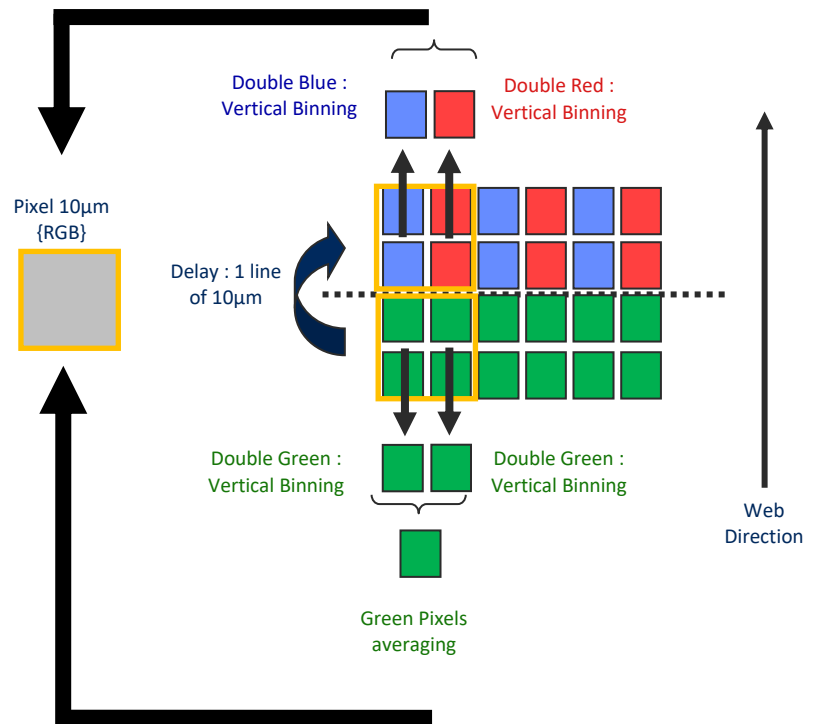
True Colour Enhanced Mode (TCE)

10µm Pixels (R,G,B)

Twice less pixels than B/W

Requires x3/2 the data flow of B&W

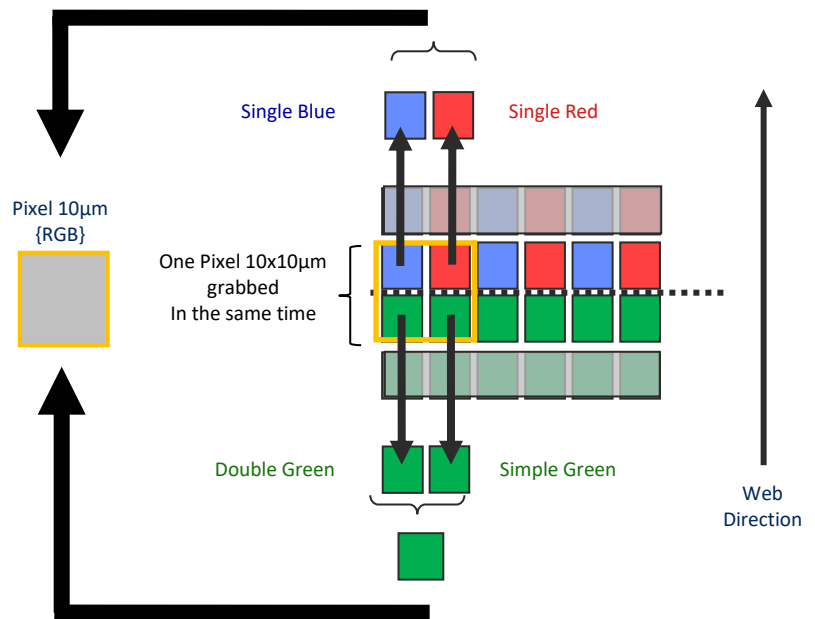
- High Sensitivity True Colour mode: Equivalent to 6 x Pixels of 5µm (with their respective colour filters).
- “Full Exposure control” not needed in TC as the TDI is not active (only binning). The Exposure time can be control as for a single line mode.



True Colour Single Mode (TCS)

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

- Sensitivity Half of the TCE mode: Equivalent to 3 x Pixels of 5µm (with their respective colour filters).
- “Full Exposure control” not needed in TC as the TDI is not active (only binning). The Exposure time can be control as for a single line mode.
- Not sensitive to the Scanning direction and the variation of the aspect ratio of the image.



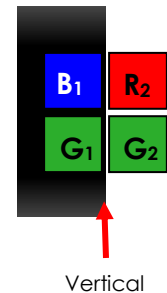
Column Interpolation Correction

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 or 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.



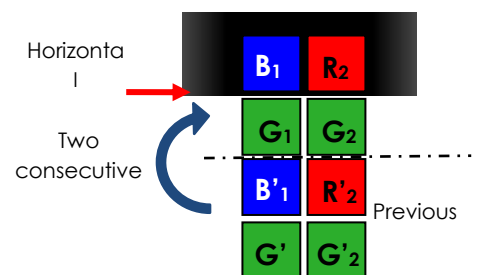
Line Interpolation Correction

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 or 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 $(G_1 - G'_1)$

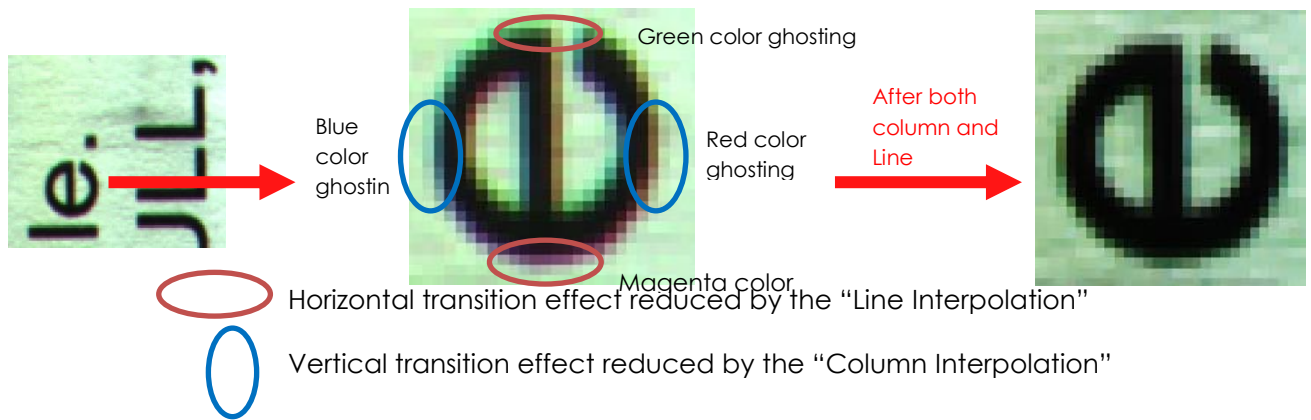
$R_2' = \alpha_R \times R_2$ and α_R is the red correction, calculated with the variation $(G_2 - G'_2)$

- This interpolation is available only for pixel size 10x10µm (True Colour Single 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



Full Definition Modes in 4k 5µm

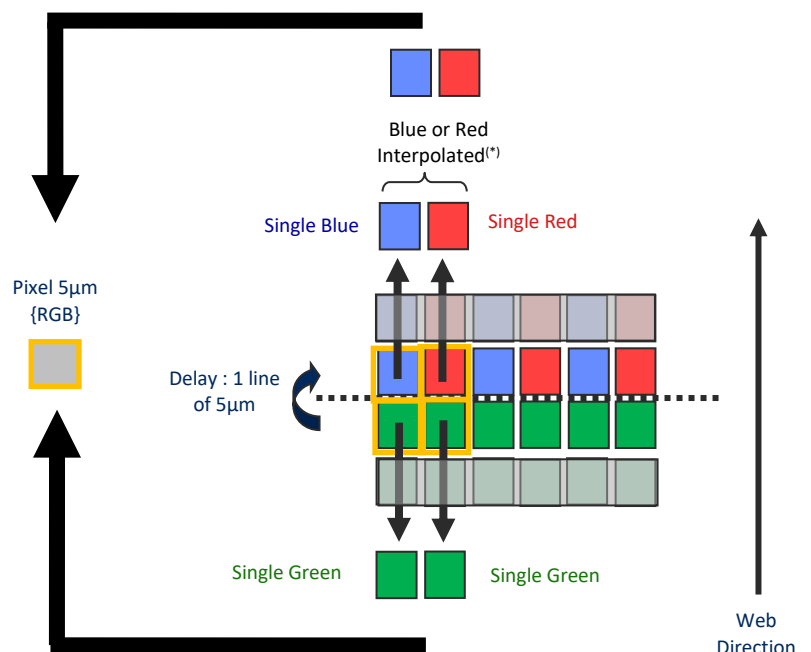
Full Definition Single Mode (FDS)

5µm Pixels (R,G,B)

Same definition than B&W

Requires x3 the data flow of the B&W

- Sensitivity is half of the TC mode available : Equivalent to 3 x Pixels of 5µm (with their respective colour filters).
- "Full Exposure control" not needed in this mode as the Time Delay Exposure is not active. The Exposure time can be control as for a single line mode.



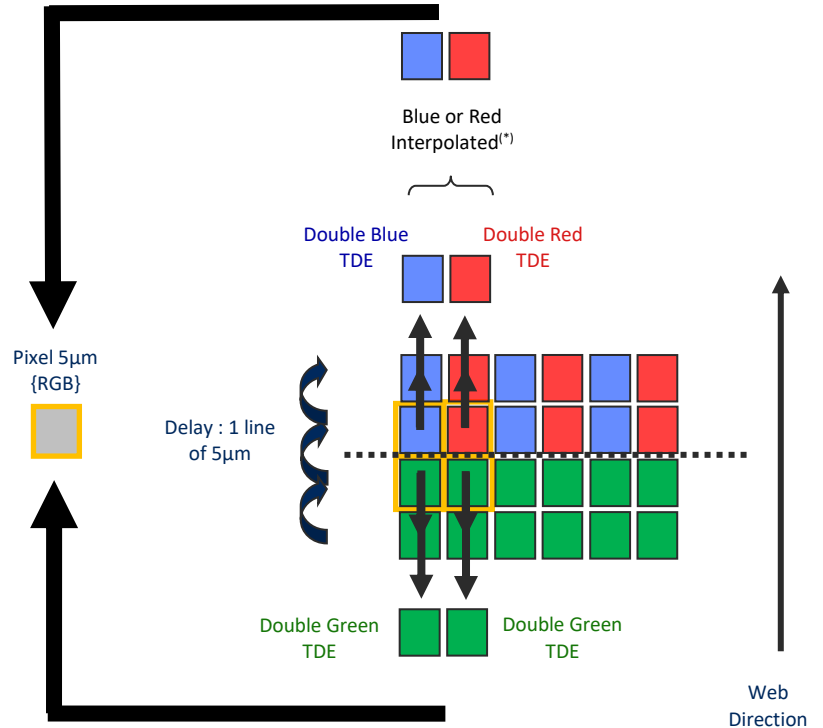
Full Definition Enhanced Mode (FDE)

5µm Pixels (R,G,B)

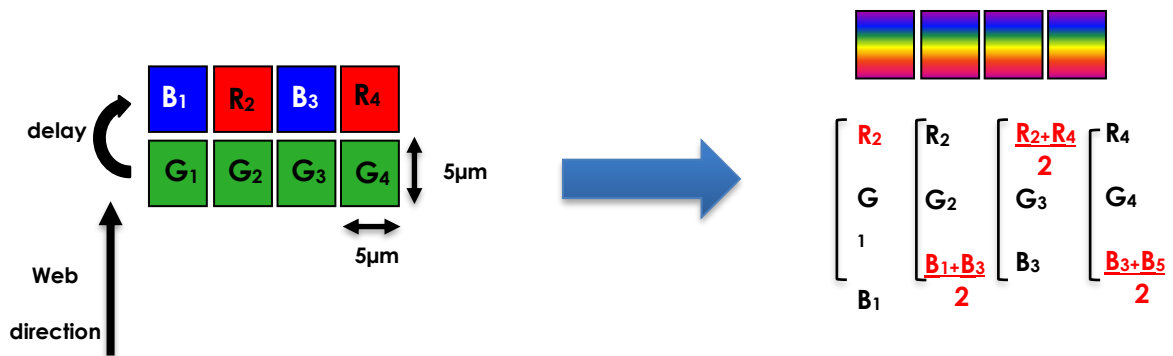
Same definition than B&W

Requires x3 the data flow of the B&W

- Sensitivity is the same as the TC mode available : Equivalent to 6 x Pixels of 5µm (with their respective colour filters).
- “Full Exposure control” is activated in this mode as the Time Delay Exposure is active.



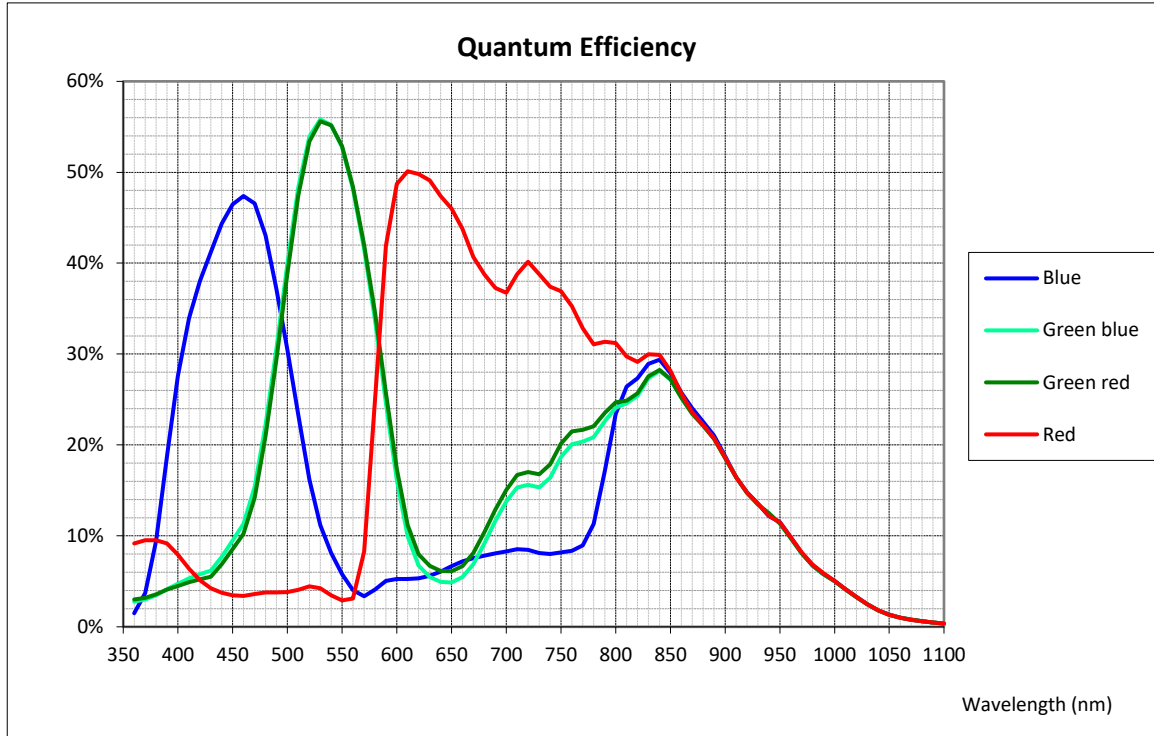
Color Interpolation in Full Definition modes.



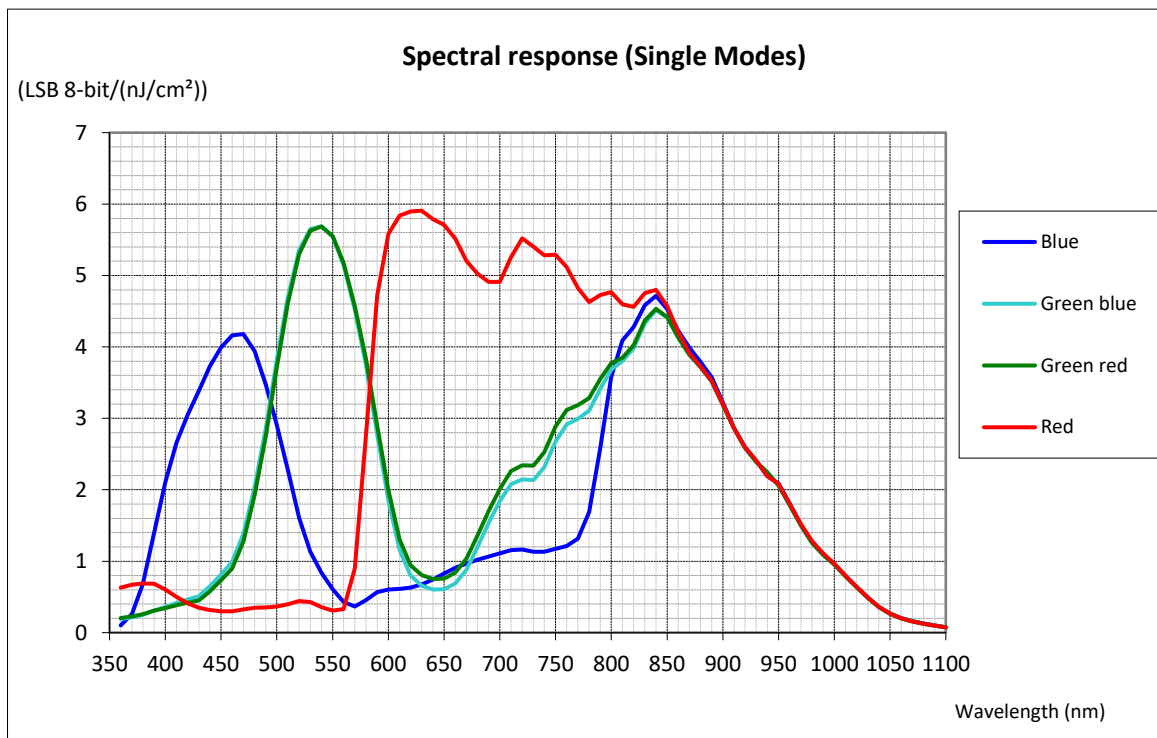
This colour mode (5µm) requires the indication of “Forward/Reverse” to the camera in order to manage the delay between the two coloured lines.

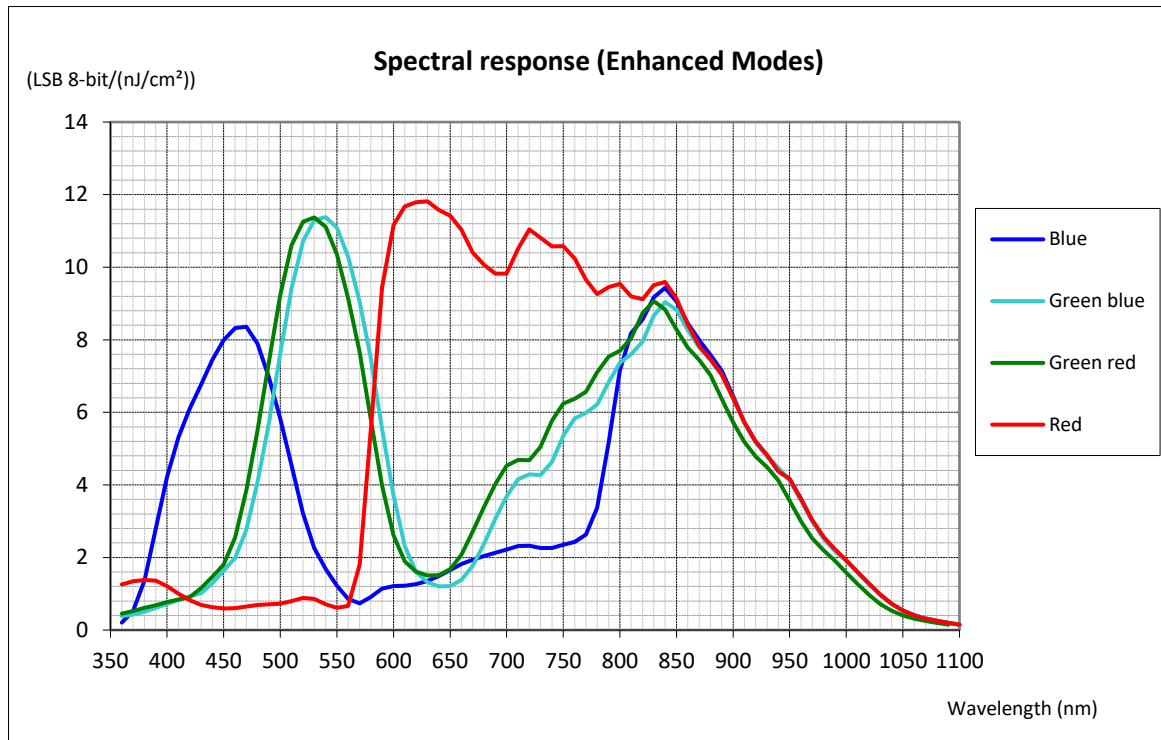
Response & QE curves

Quantum Efficiency

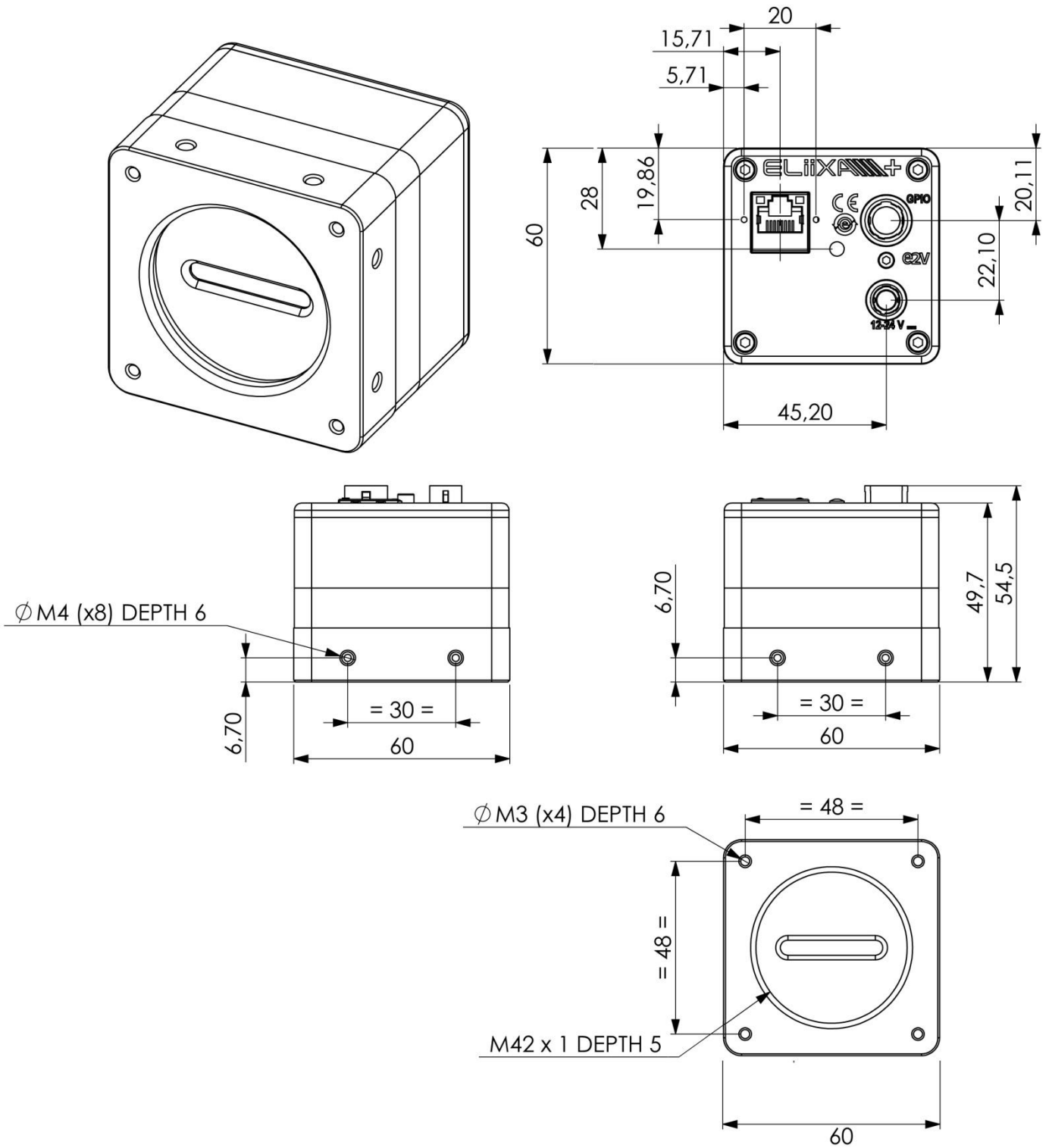


Spectral Response





Camera Hardware Interface



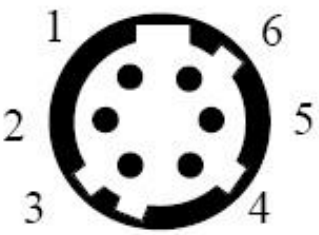
Input/output Connectors and LED



Power Connector

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

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

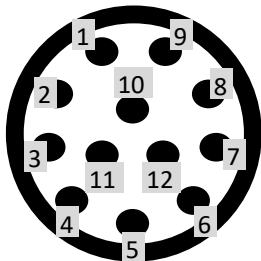
 Camera side description		Signal	Pin	Signal	Pin
		PWR	1	GND	4
		PWR	2	GND	5
		PWR	3	GND	6
Power supply from 12 to 24v Power 11W max with a typical inrush current peak of 1A during power up					

GPIO Connector

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

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

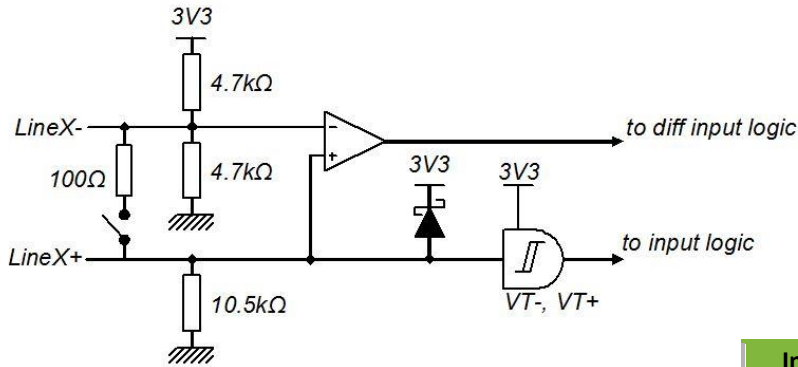
Cable type: cable immune from interference and with twisted pairs

 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.

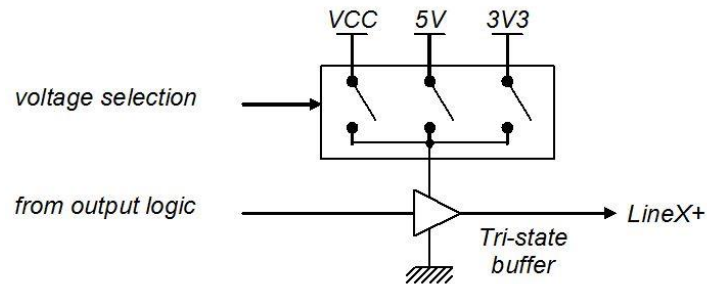


Input Thresholds	VT- Min	VT+ Max	Unit
24V	5.5	10.7	V
12V	2.9	5.5	V
3.3 / 5V	0.8	1.5	V

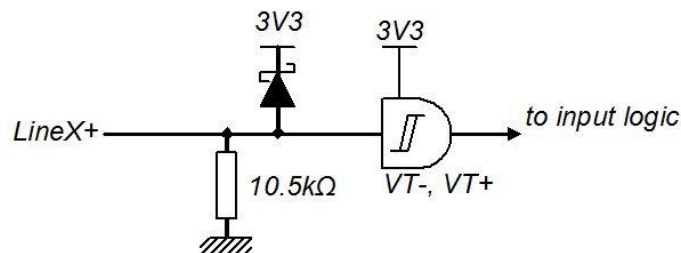
Lines 3, 4, 5 and 6

- 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™ ELiiXA+ 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

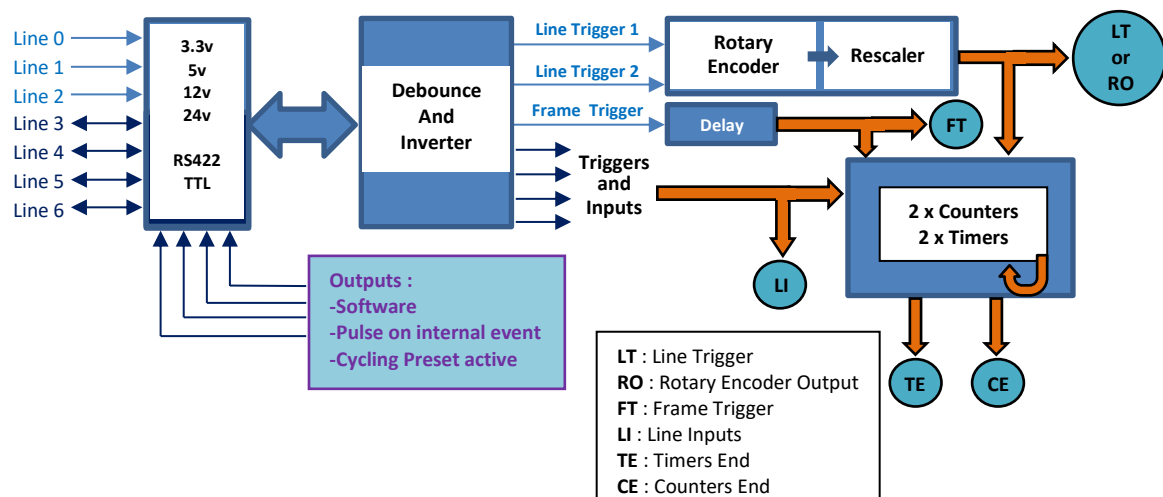
General Inputs/Outputs Management

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)

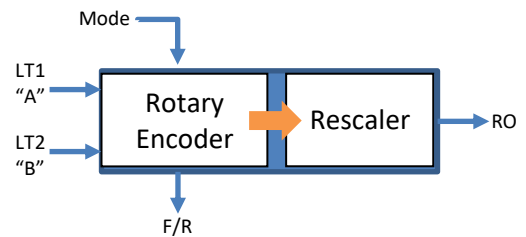
The Exposure starts at the end of a User's configurable delay after the Line Trigger rise

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.

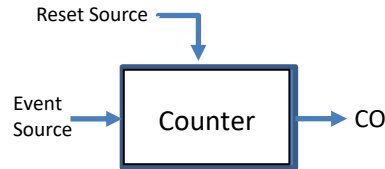
The Rotary Encoder can be bypassed. Then the "B" input is disabled and the Line Trigger 1 (LT1) connected on input "A" is passing through the Rotary encoder to enter the Rescaler

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

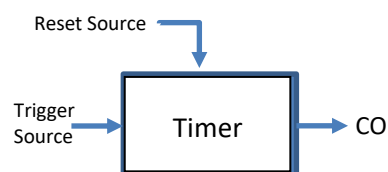
As soon as the Reset input is set but not active, the counter counts. If it reaches the duration before any reset, the output rises to 1 and the counter carries on counting. Then if the Reset arises, the “Value at Reset” is set with the current value (even higher than the duration), the output is set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

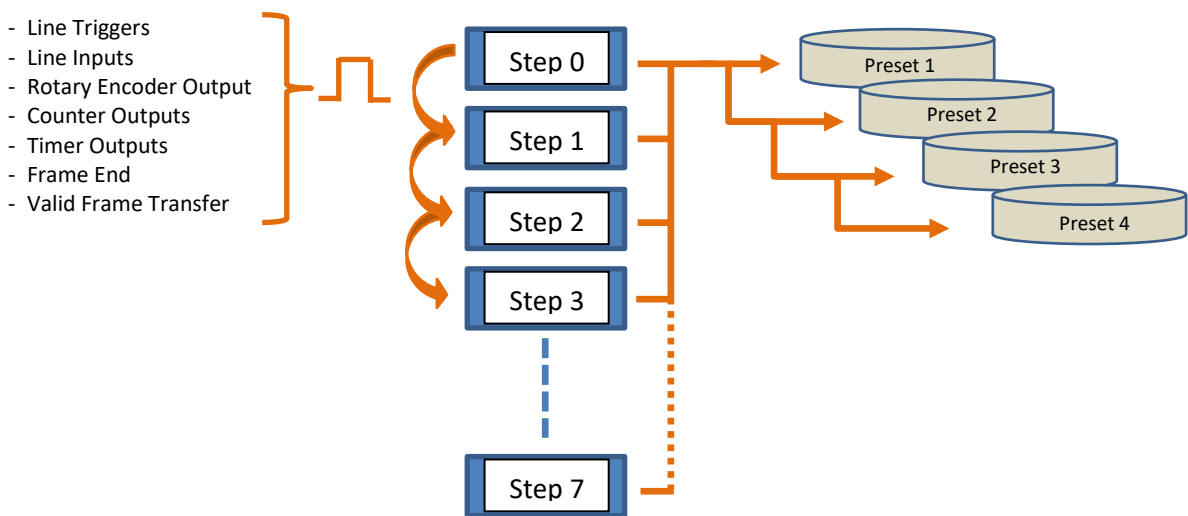
When the Reset arises, the output is set to 0 and the Timer can restart as soon as the reset input switches down to 0. If the reset arises before the end of the Timer duration, the Timer is reset without switching to 1 and can restart as soon as the reset input switches down to 0.

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
EV71YC4CNT4005-BA0	4k x 5µm	50kHz	Delivered with a pair of Heat Sinks
EV71YC4CNT2010-BA0	2k x 10µm	100kHz	

Datasheet

Features

- Cmos Monochrome Multi-Line Sensor :
 - 4096 RGB Pixels 5x5µm : 1, 2 or 4 Lines
 - 2048 RGB Pixels 10x10µm : 1 or 2 Lines
- 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 ELiXA+ 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	4 x 4096	2 x 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/cm ²)
Full Well Capacity	18000		electrons
Dynamic range (1S / 2S / 4S mode)	67,6 / 70,7 / 68,7		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 = 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	4k Pixels 5µm : Multi-Lines 1, 2 or 4 2k Pixels 10µm : Binning 1 or 2 Lines	(1S/2S/4S) (1SB/2SB)
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	

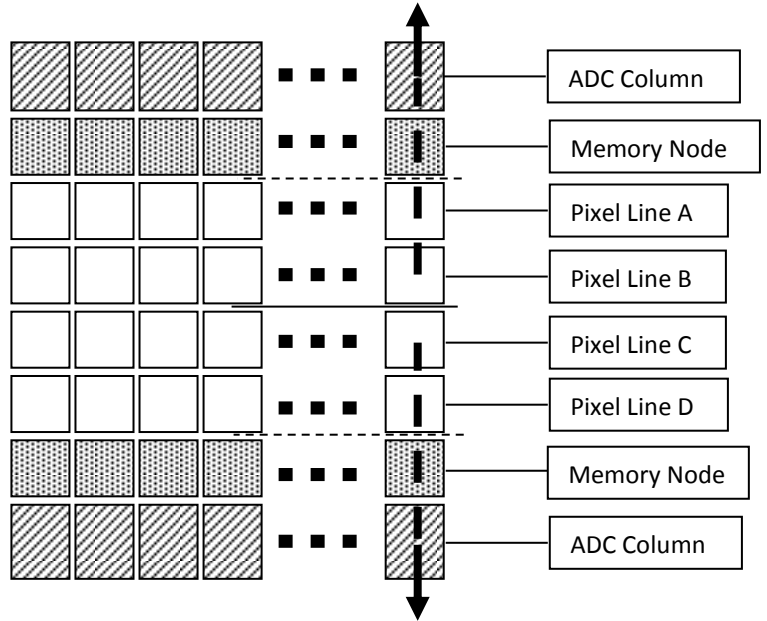
Image Sensor and Modes

Image Sensor

The Elixa+ 4k sensor is composed of two pairs of sensitive lines. Each pair of lines use the same Analog to Digital Column converter (ADC Column). An appropriate (embedded) Time delay in the exposure between each line allows combining two successive exposures in order to double the sensitivity of a single line.

This Time Delay Exposure is used only in the 4S multi-line modes (4 Lines) and also in the three binning modes, as described below.

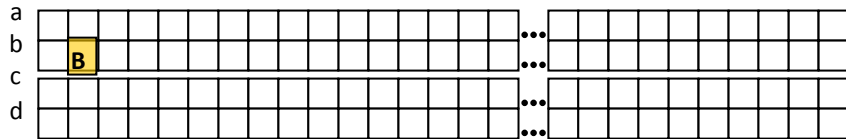
The 2048 Pixels of 10µm are achieved by the binning of 4 Pixels together.



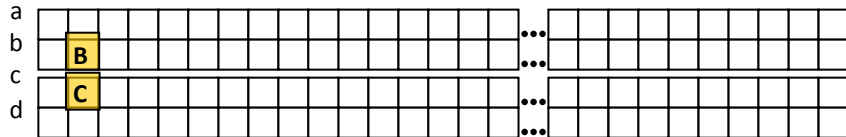
Sensor modes

4K Pixels 5µm

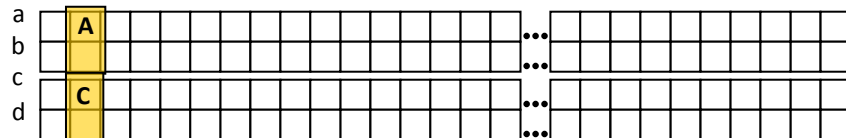
Mode 1S = B



Mode 2S = B+C (FPGA)

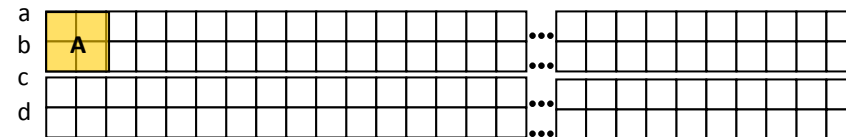


Mode 4S = (A.B)+(C.D)
Note : (A.B) = summation in the sensor

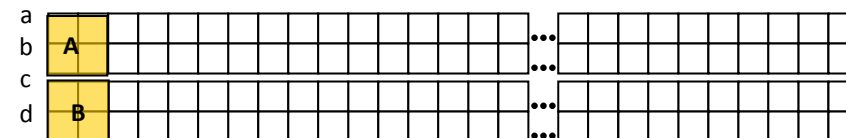


2k Pixels 10µm

Mode 1SB = A

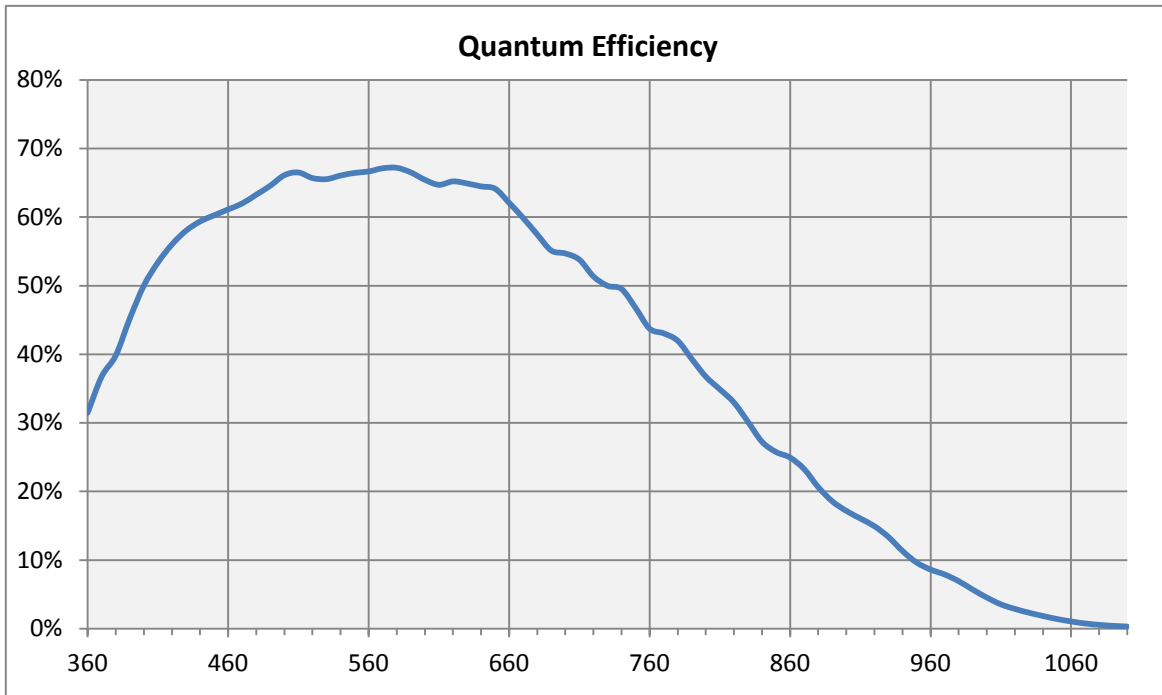


Mode 2SB = (A+B)



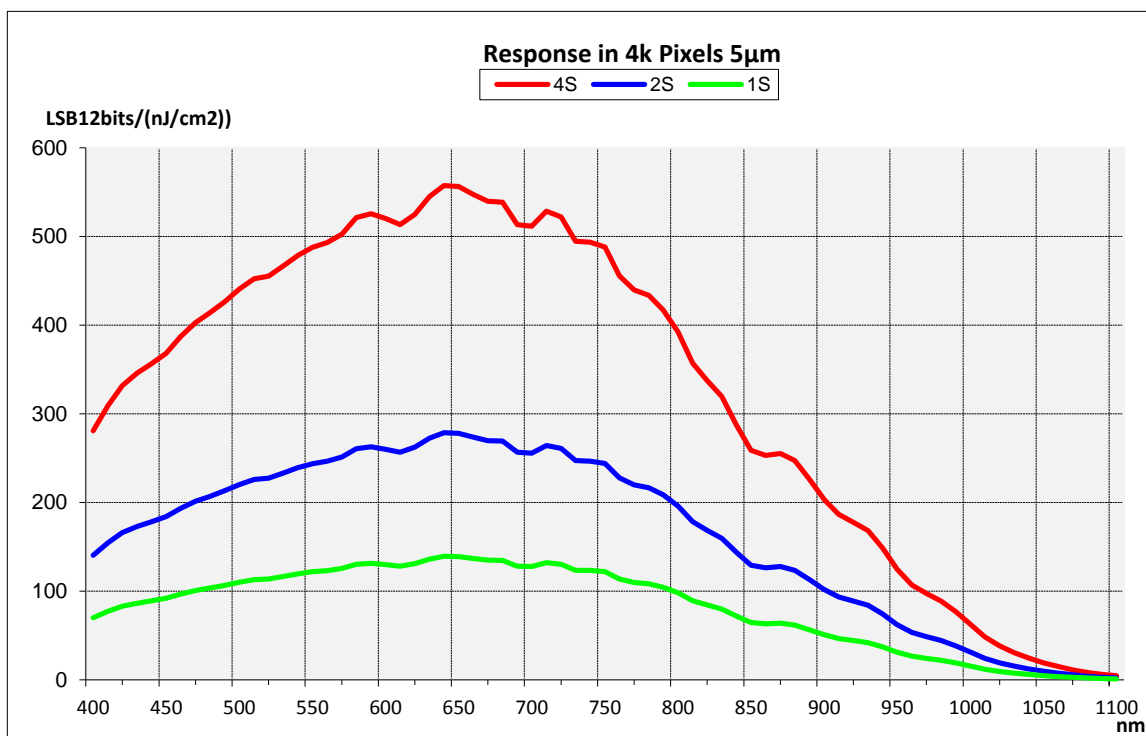
Response & QE curves

Quantum Efficiency

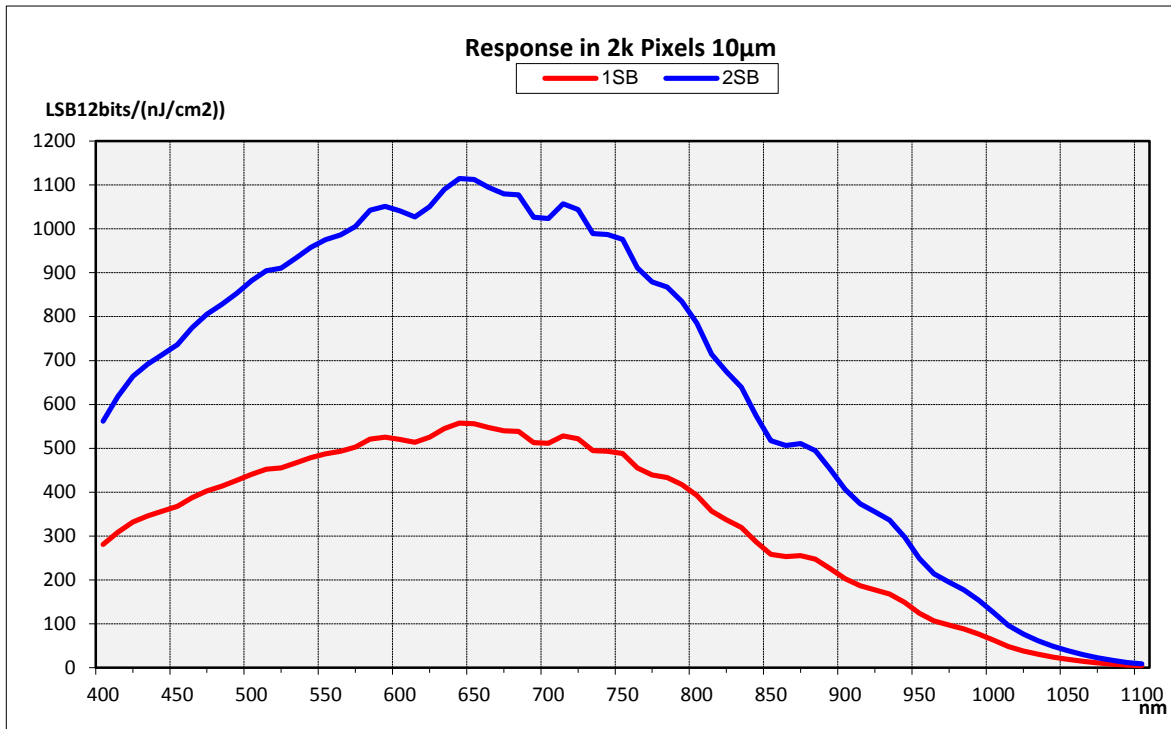


Spectral Responses

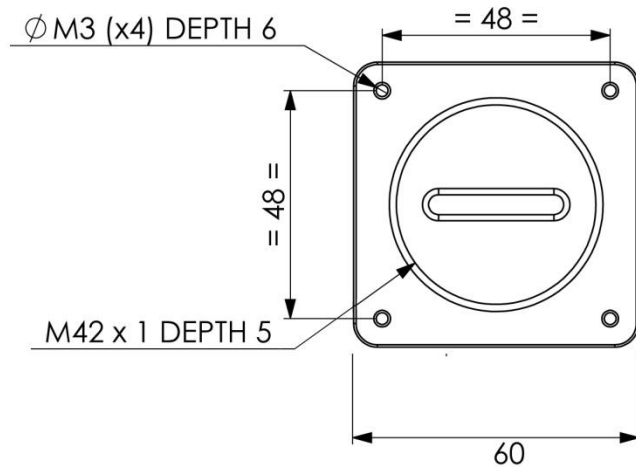
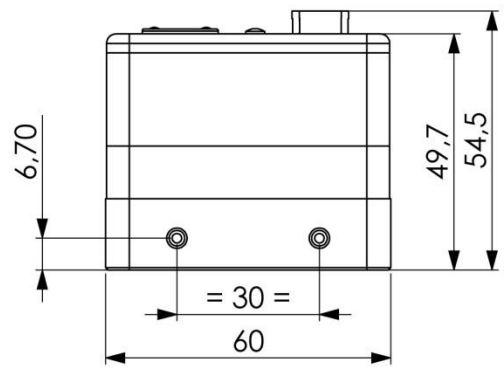
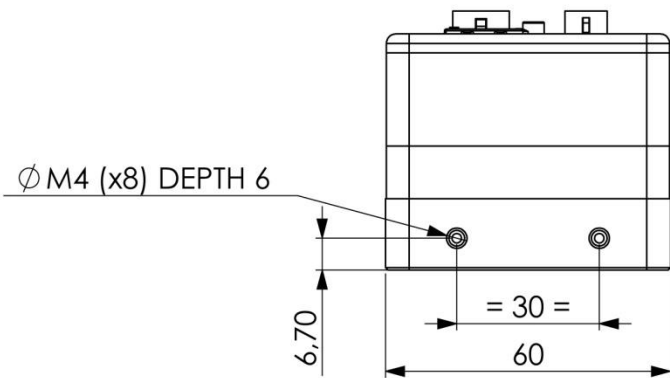
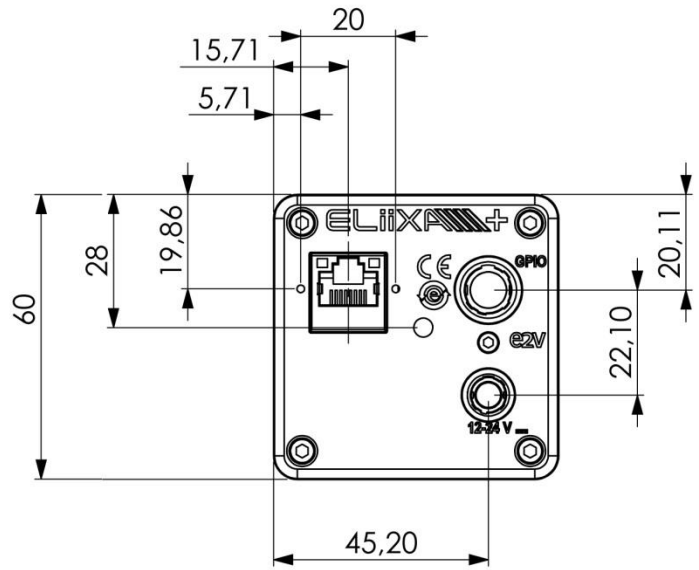
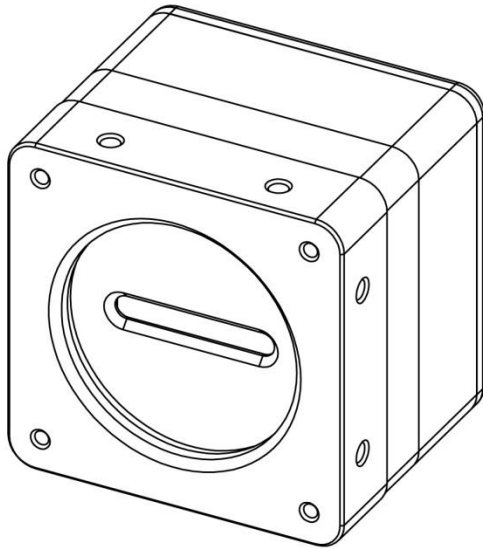
Single Modes : 1S, 2S, 4S



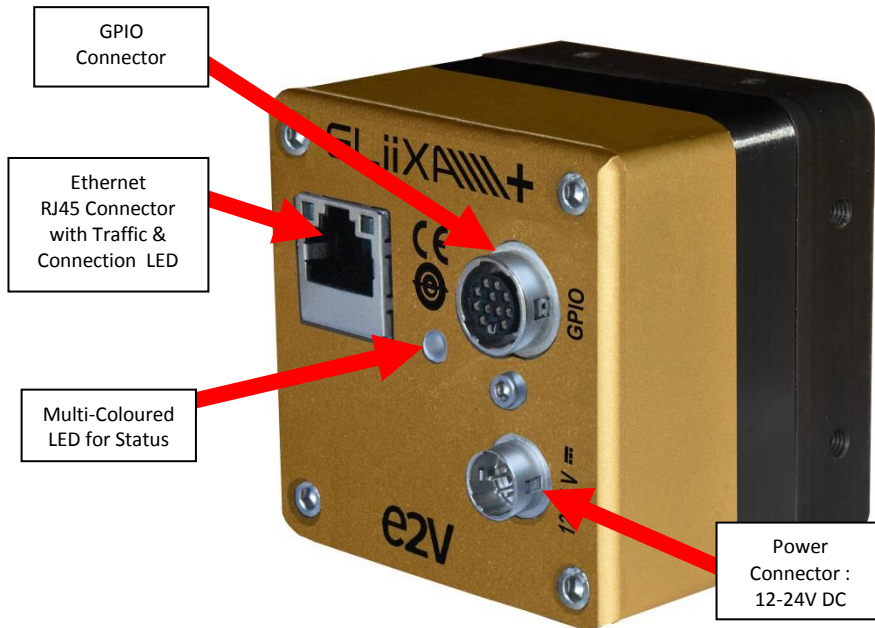
Binning Modes : 1SB, 2SB



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)

<p>Camera side description</p>	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

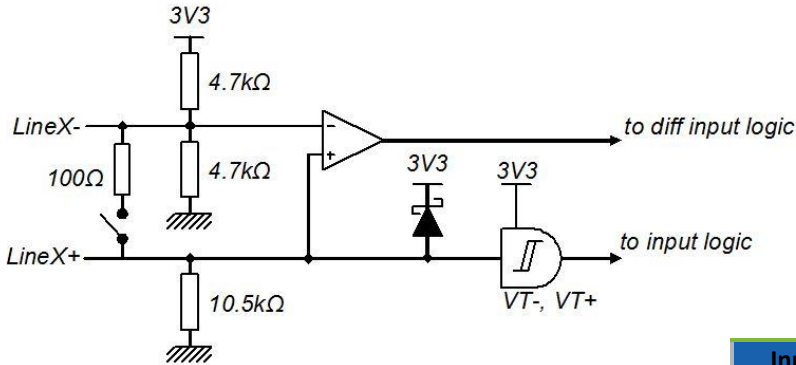
Cable type: cable immune from interference and with twisted pairs

<p>Camera side description</p>	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.

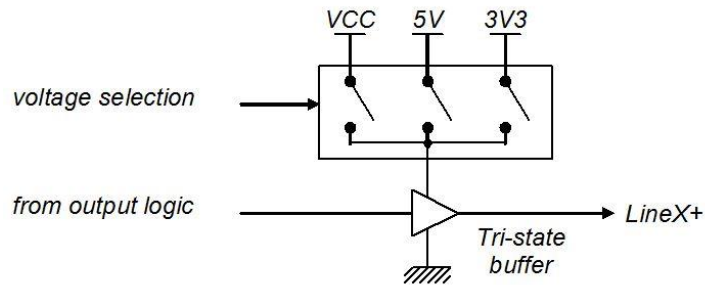


Input Thresholds	VT- Min	VT+ Max	Unit
24V	5.5	10.7	V
12V	2.9	5.5	V
3.3 / 5V	0.8	1.5	V

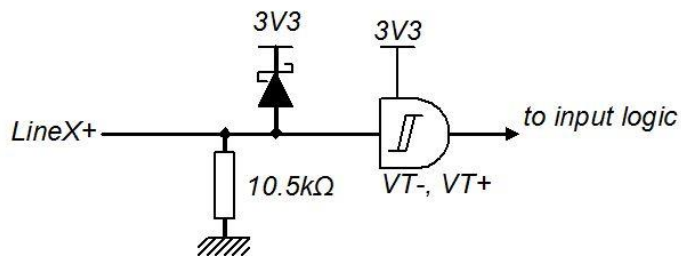
Lines 3, 4, 5 and 6

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

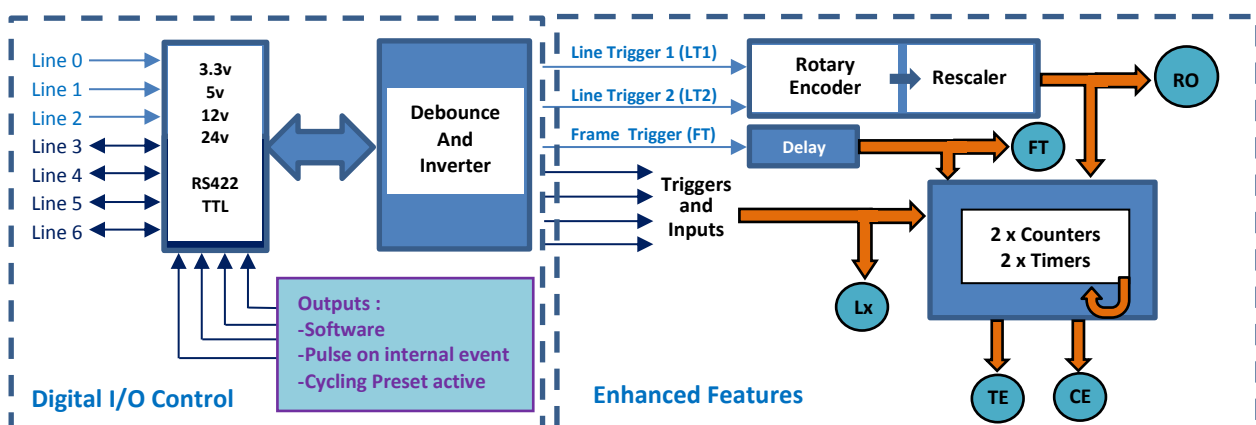
Camera Interface : GPIO

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 :

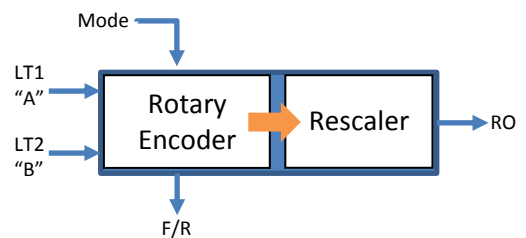
- Trigger Mode : Activates the Trigger. Only on Line and Frame Trigger activated in the same time.
- Trigger Source : Defines the Signal which is the Source of the Trigger (see table below)
- Trigger activation : Defines how the Source activate the Trigger (on edge for Line Start and Frame Start or level 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.

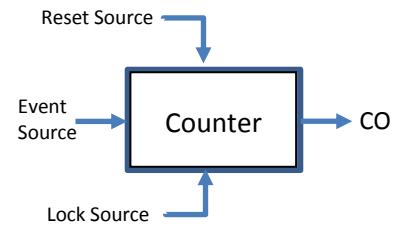
Counters

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

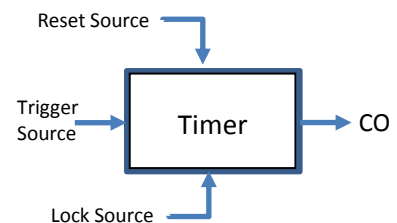
The Timer starts on its Trigger Source Edge

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 from its current timing position when the reset input is released.

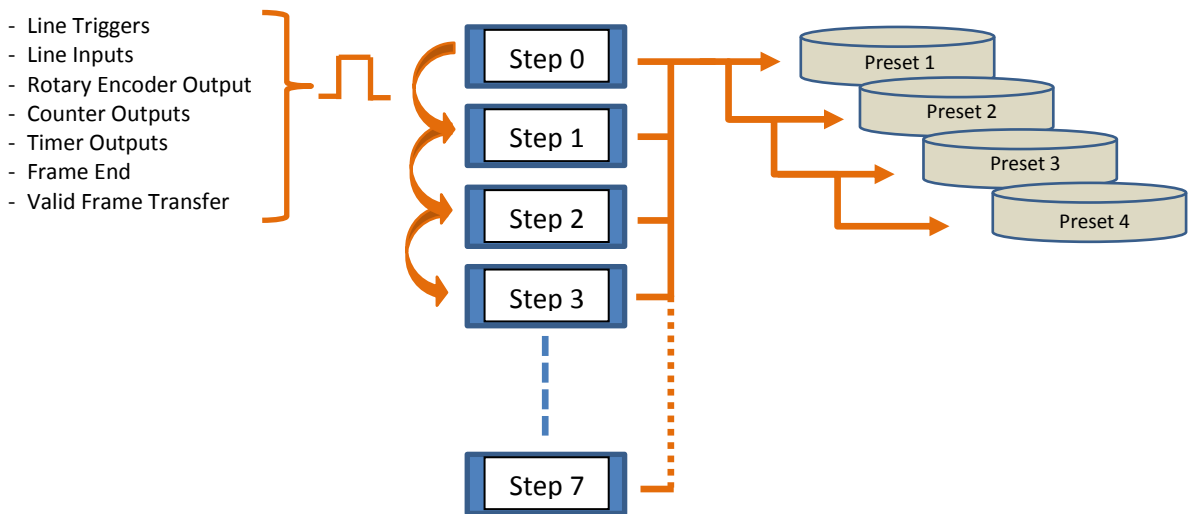


Cycling Preset modes and configuration

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
EV71YC4MNT4005-BA0	4k x 5µm	140kHz	Delivered with a pair of Heat Sinks
EV71YC4MNT2010-BA0	2k x 10µm	140kHz	

Datasheet

Features

- Cmos Colour Sensor :
 - 8192 RGB Pixels, 5 x 5µm (Full Definition)
 - 4096 RGB Pixels 10x10µm (True Colour)
- Interface : CameraLink® (up to 10 Taps at 85MHz)
- Line Rate :
 - Up to 50000 l/s In 8k Full Definition Mode
 - Up to 66000 l/s in 4k True Colour Mode
- Bit Depth : 24bits (RGB 8bits)
- Scan Direction
- Flat Field Correction
- Low Power Consumption : <9W
- F-Mount compliance



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 multi-line CMOS technology, the camera provides an unmatched 100,000 lines/s 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 four active lines and dual line filter configuration allowing the camera to be operated in several modes: True colour mode with 10µm RGB pixels to provide equivalent colour fidelity to 10µm pixel tri-linear solutions with advanced immunity to web variation or Full definition mode with a 8192 RGB pixel resolution.

Application

- Raw material surface inspection
- Flat panel display inspection
- PCB inspection
- Solar cell inspection
- Parcel and postal sorting
- High resolution document scanning
- Print and paper inspection



Key Specifications

Characteristics	Typical Value		Unit
Sensor Characteristics at Maximum Pixel Rate			
Resolution	8192	4096	RGB Pixels
pixel size (square)	5	10	µm
Max Line Rate	50	66	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/cm ²)
Green	11.2		LSB 8bits/(nJ/cm ²)
Blue	7.8		LSB 8bits/(nJ/cm ²)

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 Color Enhanced : 4096 RGB Pixels of 10x10µm • True Color Single : 4096 RGB Pixels of 10x10µm • Full Definition Enhanced : 8192 RGB Pixels 5x5µm • Full Definition Single : 8192 RGB Pixels 5x5µm 	
Mechanical and Electrical Interface		
Size (w x h x l)	126 x 60 x 35	mm
Weight	360	g
Lens Mounts	F, T2, M42	-
Sensor alignment	±100	µm
Sensor flatness	±35	µm
Power supply	12 - 24	V
Power dissipation	< 9	W
General Features		
Operating temperature	0 to 55 (front face) or 70 (Internal)	°C
Storage temperature	-40 to 70	°C
Regulatory	CE, FCC and RoHS compliant	

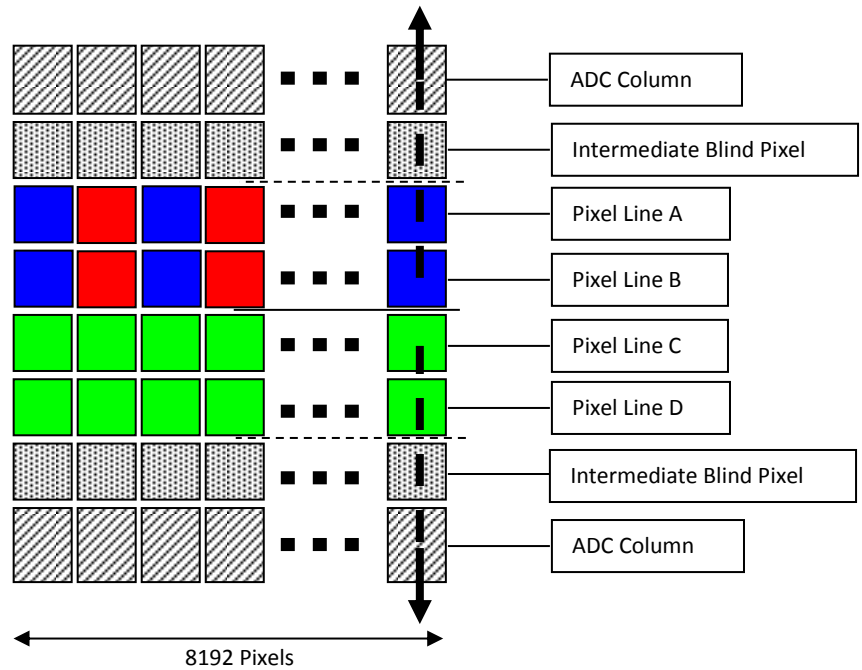
Image Sensor and color modes

The Eliixa+ Colour 8k sensor is composed of two pairs of sensitive lines.

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

Each pair of lines uses the same Analog to Digital Column converter (ADC Column). An appropriate (embedded) Time delay in the exposure between each line this allows to combine two successive exposures in order to double the sensitivity of a single line.

This Time Delay Exposure is used only in the Full Definition Enhanced mode (See Below).



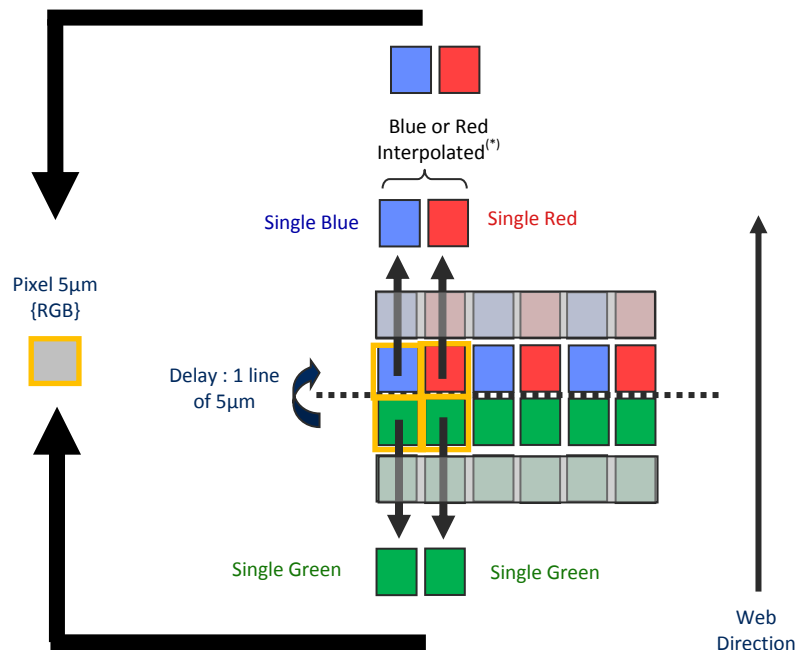
Full Definition Single Mode (FDS)

5µm Pixels (R,G,B)

Same definition than B&W

Requires x3 the data flow of the B&W

- Sensitivity is half of the TC mode available : Equivalent to 3 x Pixels of 5µm (with their respective colour filters).
- “Full Exposure control” not needed in this mode as the Time Delay Exposure is not active. The Exposure time can be control as for a single line mode.



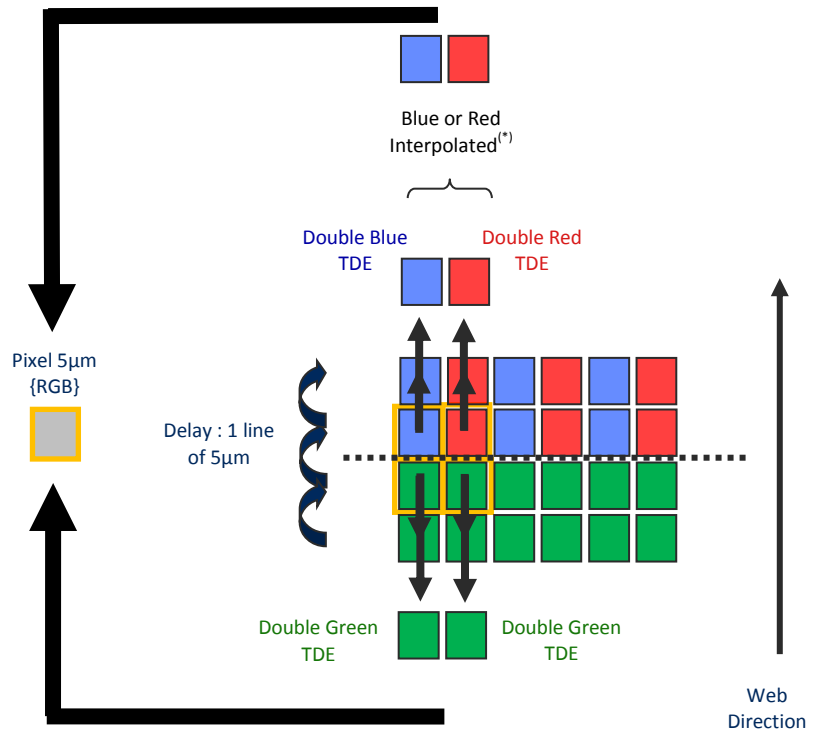
Full Definition Enhanced Mode (FDE)

5µm Pixels (R,G,B)

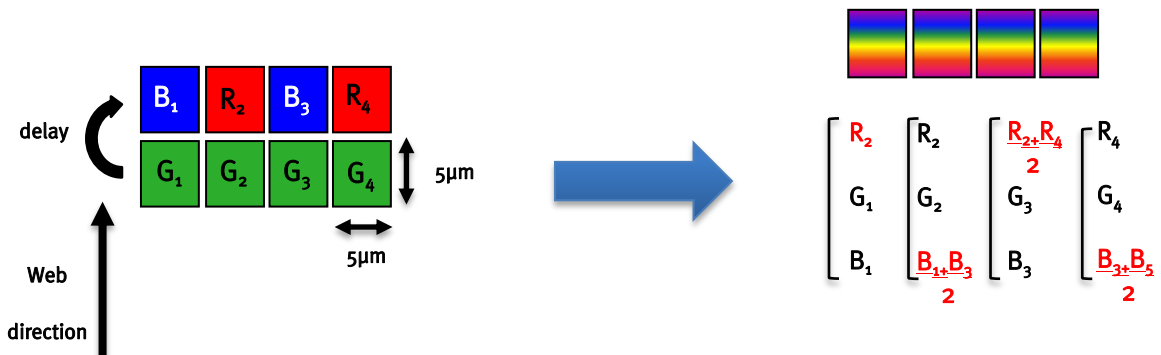
Same definition than B&W

Requires x3 the data flow of the B&W

- Sensitivity is the same as the TC mode available : Equivalent to 6 x Pixels of 5µm (with their respective colour filters).
- “Full Exposure control” is activated in this mode as the Time Delay Exposure is active.



Color Interpolation in Full Definition modes.

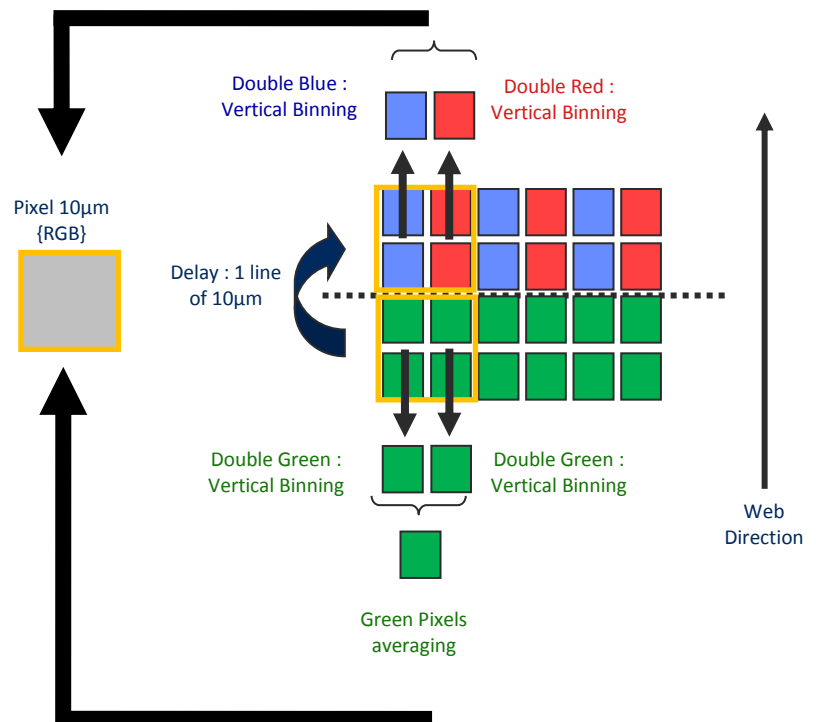


This color mode (5µm) requires the indication of “Forward/Reverse” to the camera in order to manage the delay between the two coloured lines.

True Colour Enhanced Mode (TCE)

10µm Pixels (R,G,B)
 Twice less pixels than B/W
 Requires $\times 3/2$ the data flow of B&W

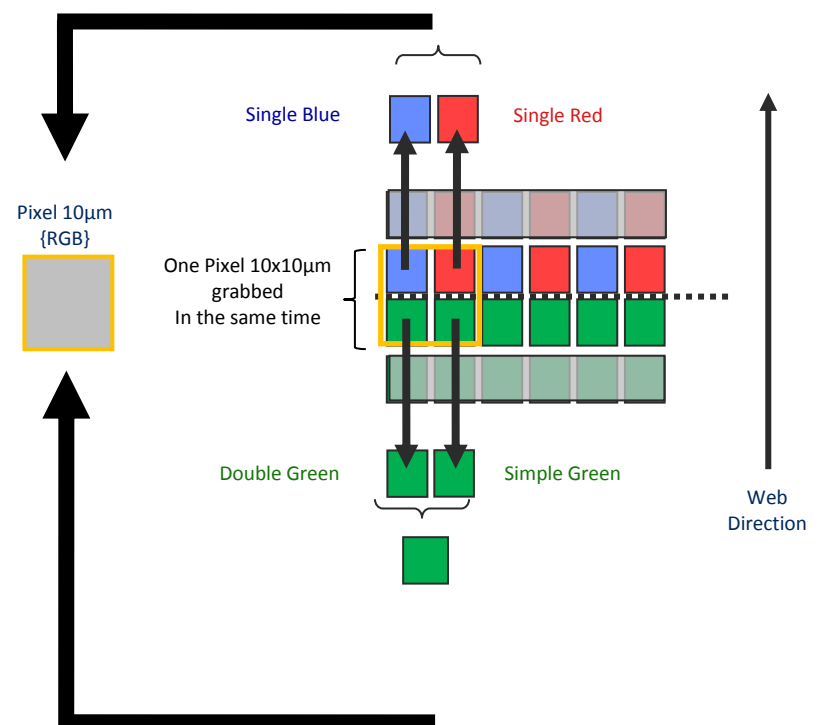
- High Sensitivity True Color mode: Equivalent to 6 x Pixels of 5µm (with their respective colour filters).
- “Full Exposure control” not needed in TC as the TDI is not active (only binning). The Exposure time can be control as for a single line mode.



True Colour Single Mode (TCS)

10µm Pixels (R,G,B)
 Twice less pixels than B/W
 Requires $\times 3/2$ the data flow of B&W

- Sensitivity Half of the TCE mode: Equivalent to 6 x Pixels of 5µm (with their respective colour filters).
- “Full Exposure control” not needed in TC as the TDI is not active (only binning). The Exposure time can be control as for a single line mode.
- Not sensitive to the Scanning direction and the variation of the aspect ratio of the image.



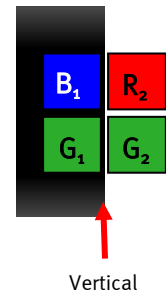
Column Interpolation Correction

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 or 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.



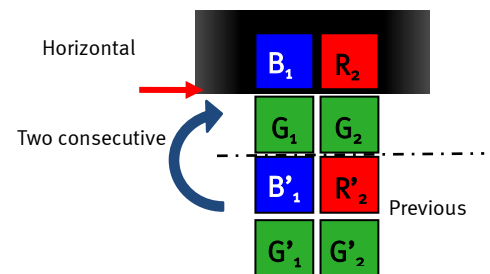
Line Interpolation Correction

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 or the Blue value of each colored pixel is corrected if the variation between two consecutive green values (previous to next line) is significant :

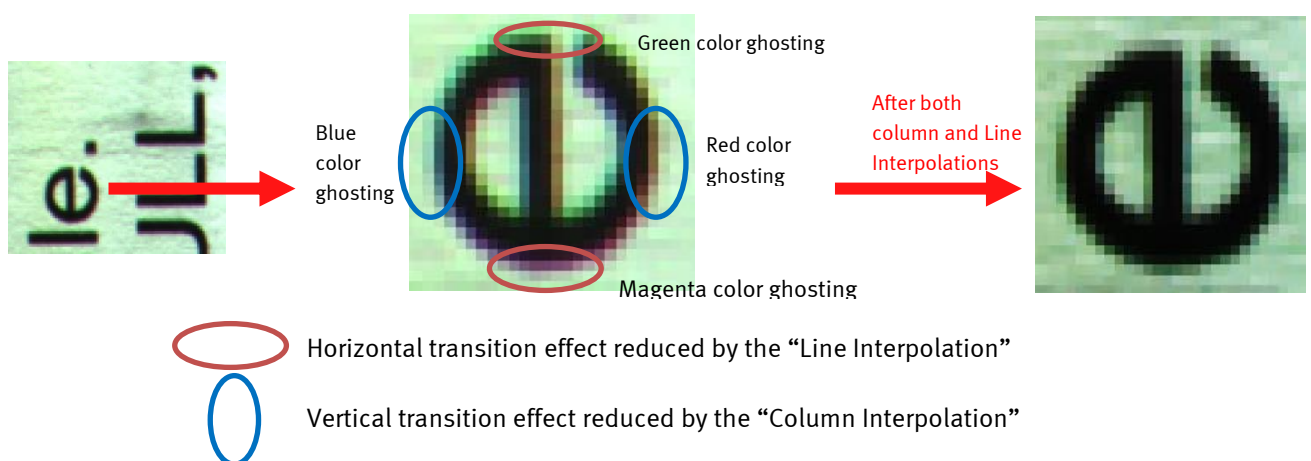
$B_1' = \alpha_B \times B_1$ and α_B is the blue correction, calculated with the variation $(G_1 - G'_1)$

$R_2' = \alpha_R \times R_2$ 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 Single 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.

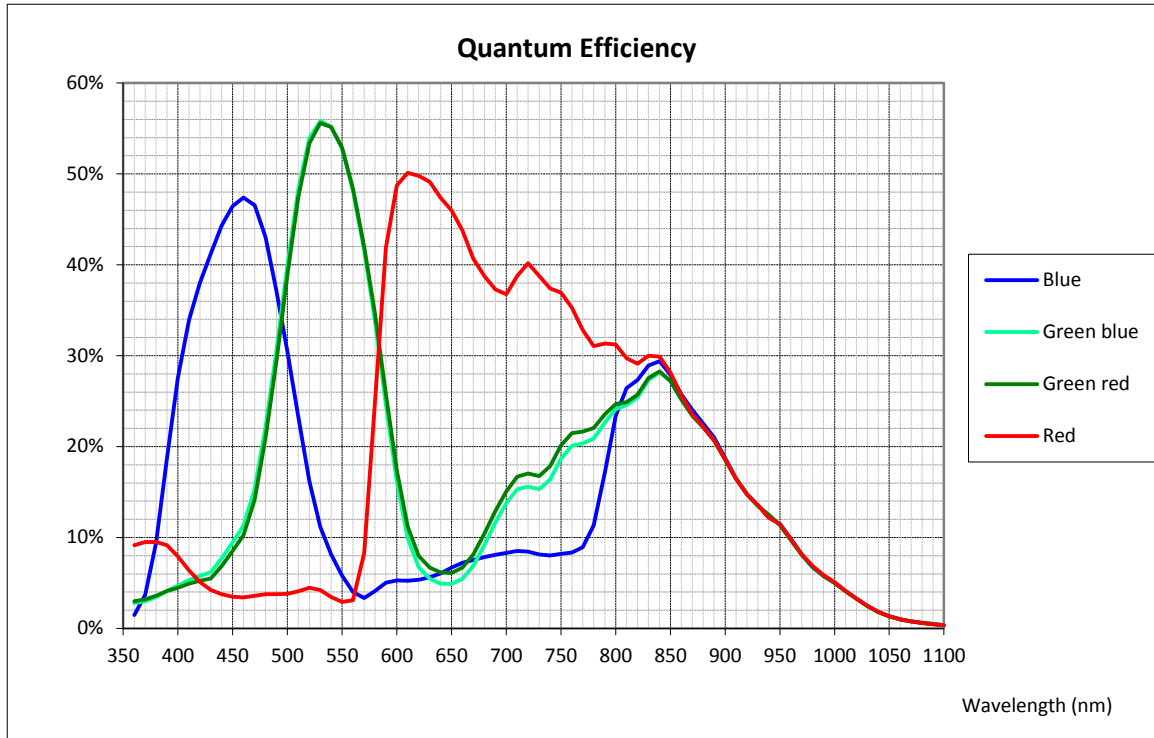


Effects of the interpolations

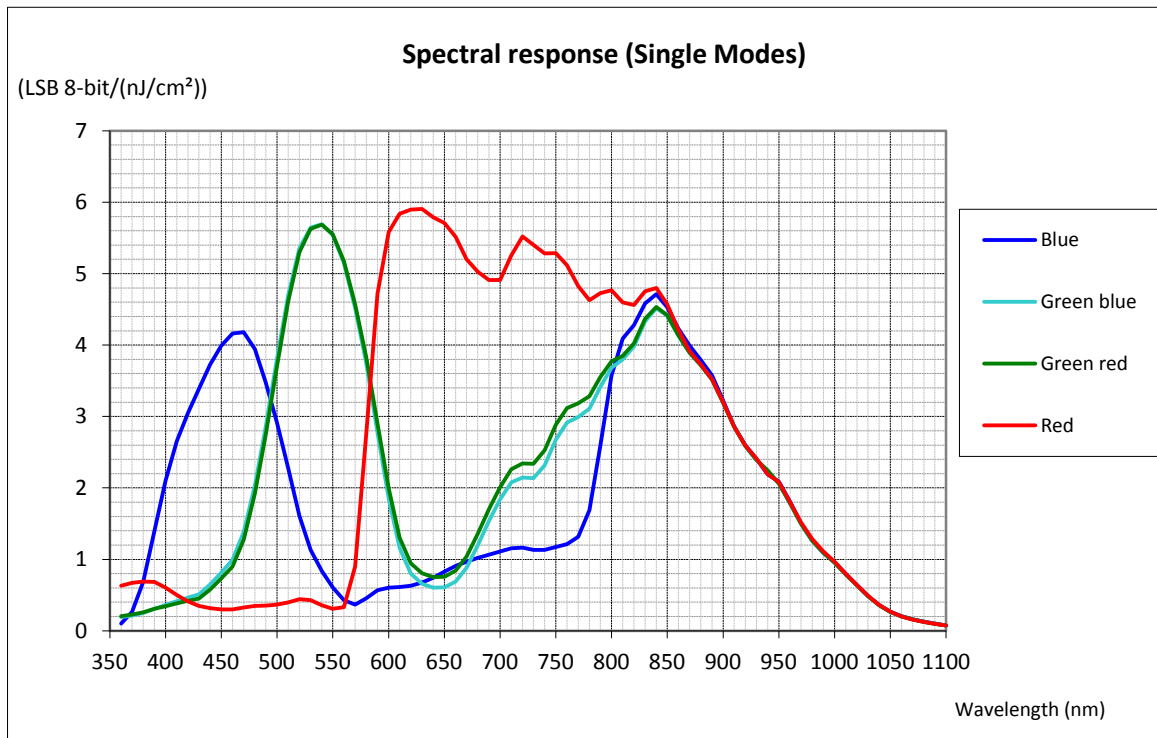


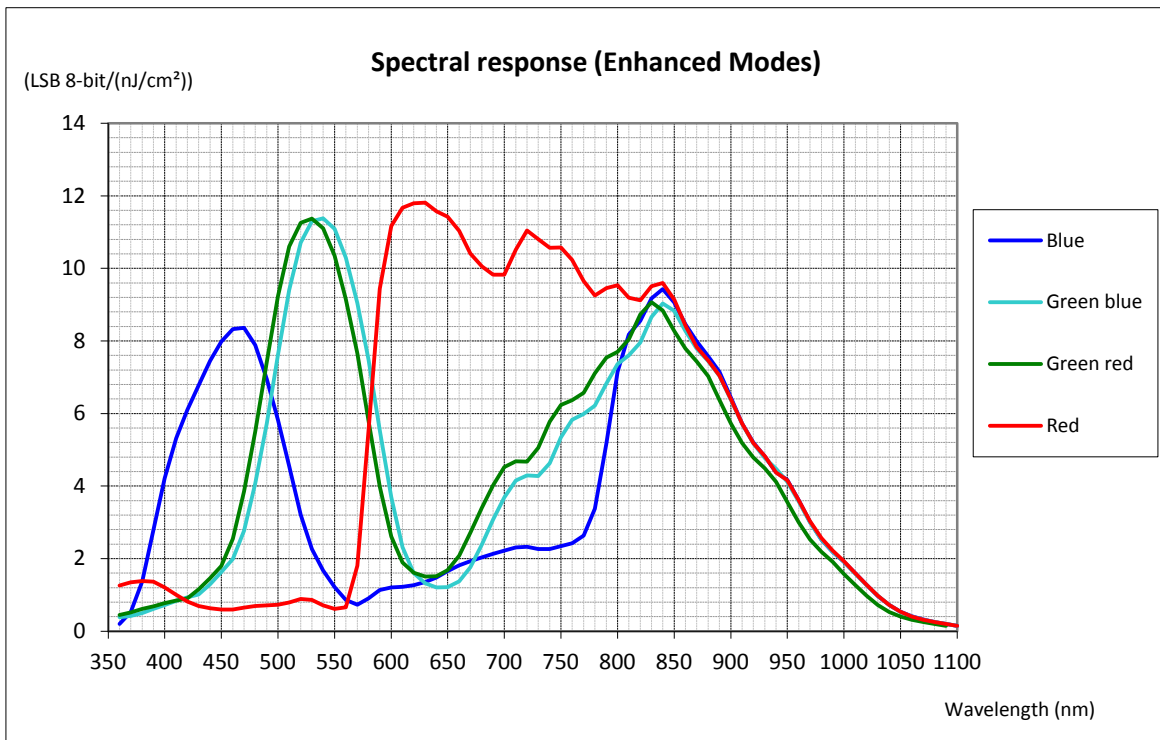
Response & QE curves

Quantum Efficiency

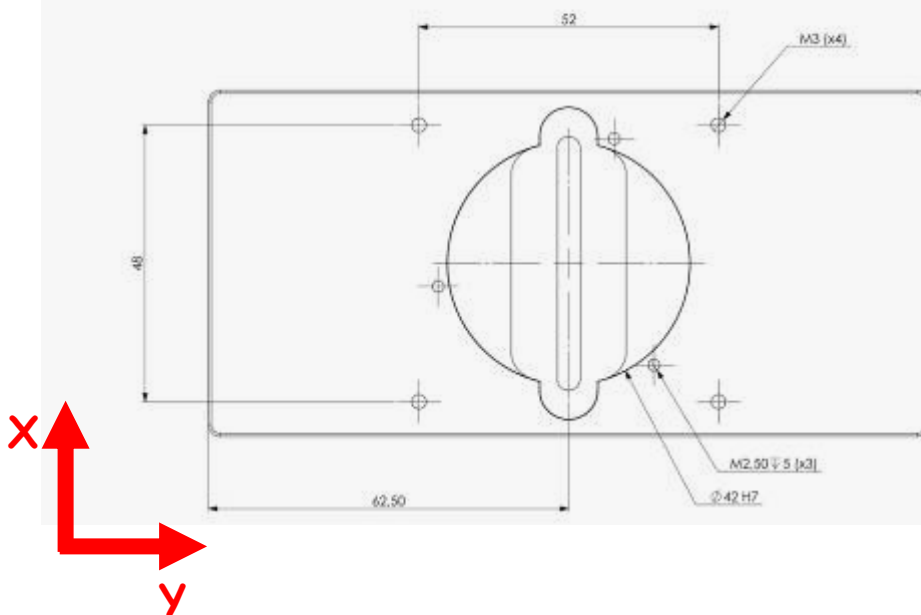
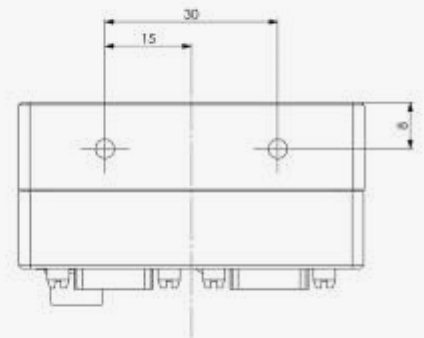
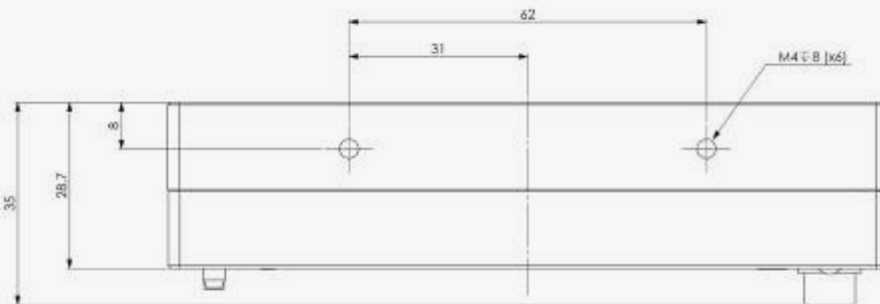
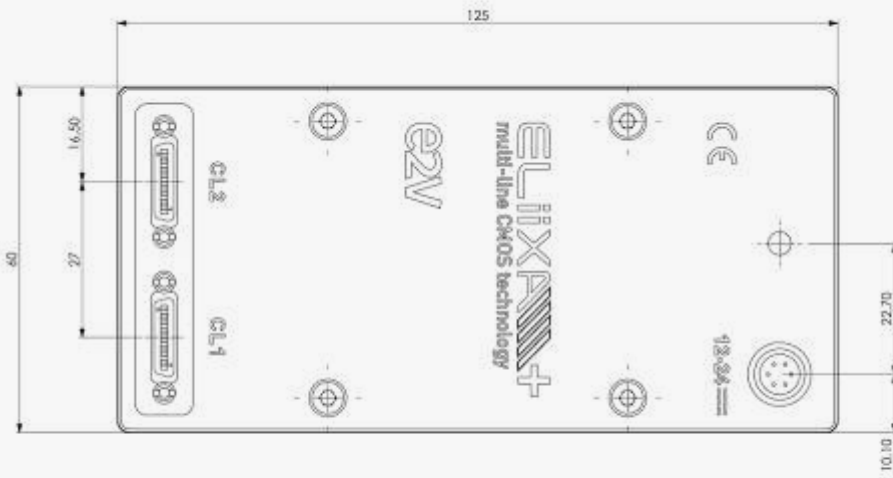


Spectral Response

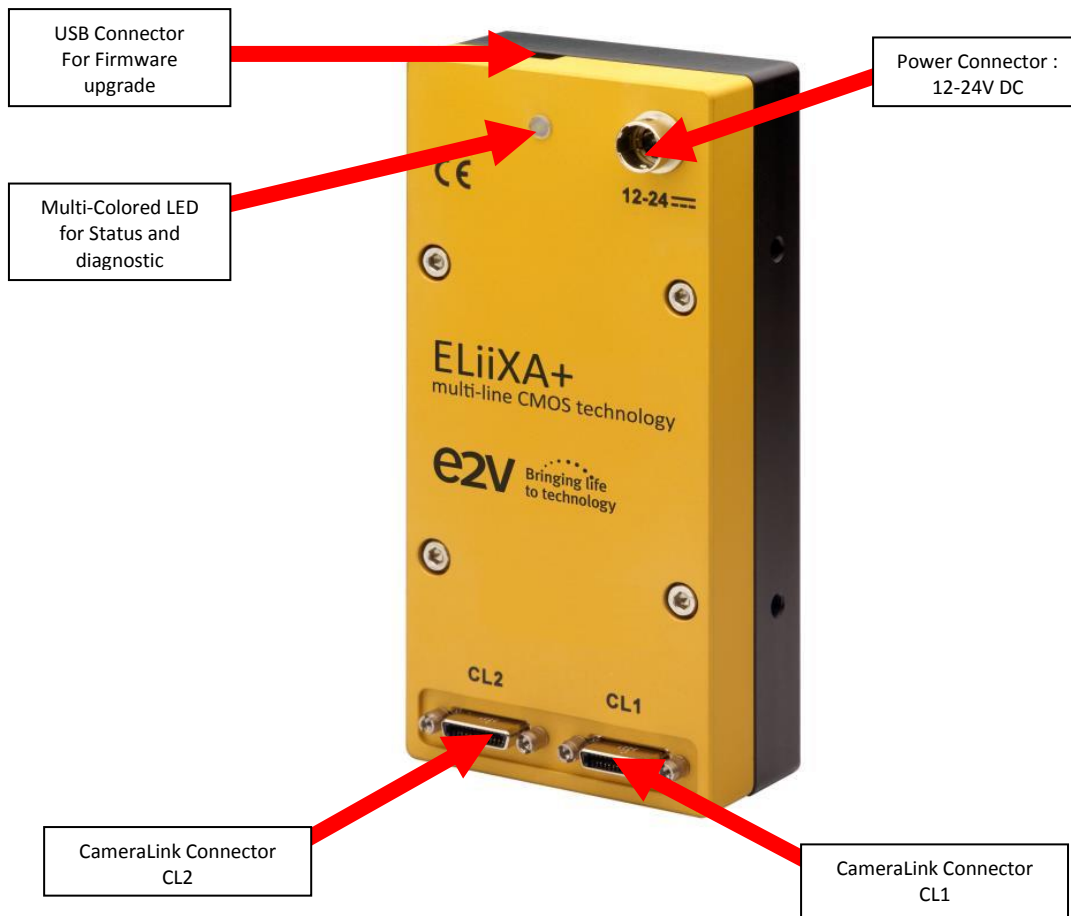




Camera Hardware Interface



Input/output Connectors and LED



Power Connector

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

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

<p>Camera side description</p>	Signal	Pin	Signal	Pin
	PWR	1	GND	4
	PWR	2	GND	5
	PWR	3	GND	6
Power supply from 12 to 24v Power 7,5W max with an typical inrush current peak of 1A during power up				

CameraLink Output Configuration

	Adjacent Channels
Base : 3 Channels RGB 8bits	3 x 85MHz
Medium : 2 x 3 Channels RGB 8bits	2x 3 x 85MHz
Full : 8 Channels 8bits	8 x 85MHz
Deca : 10 Channels 8bits	10 x 85MHz

Standard Conformity

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

- A shielded power supply cable
- A Camera Link data transfer cable ref. **MVC-1-1-5-2M** from CEI (Component Express, Inc.)

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

CE Conformity

The ELIIXA+ cameras comply with the requirements of the EMC (European) directive 2004/108/EC (EN50081-2, EN 61000-6-2).

FCC Conformity

The ELIIXA+ 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.

RoHs Conformity

ELIIXA+ cameras comply with the requirements of the RoHS directive 2011/65/EU.

Models

Part Number	Definition / Max Speed	True Color / TC Enhanced	Full Definition / FD Enhanced	New Sensor Generation	RGB Matrix
EV71YC4CCL8005-BA0	8k/50kHz – 4k/66kHz	Yes	Yes	With new Release	No
EV71YC4CCL8005-BH0	8k/50kHz	No	Yes	Yes	Yes
EV71YC4CCL4010-BH0	4k/66kHz	Yes	No	Yes	Yes

Datasheet

Features

- Cmos Sensor up to 4x 8192 Pixels, 5 x 5µm
- Multi-Line structure and Multi-Definition^(*):
 - 8192 pixels, 5x5µm in 1, 2 up to 4 lines summation
 - 4096 pixels, 10x10µm in 1 or 2 lines summation
 - 2048 pixels, 20x20µm
- Interface : CameraLink®
 - BA0/BH0 versions : Base or Medium
 - BA1/BH1 versions : Base, Medium, Full or Deca
- Line Rate : Up to 100000 l/s
- Data Rate : Up to 850 MB/s
- Bit Depth : 8, 10 and 12bits
- Flat Field Correction
- Look up Table
- Low Power Consumption : < 7,5W
- Mounts : F, T2, M42
- Full Exposure Control
- “BHx” Models with HDR Mode (High Dynamic Range)

(*) depending on Models

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 multi-line CMOS technology, the camera provides an unmatched 100,000 lines/s 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 four active lines, ensuring optimal spatial resolution in both scanning and sensor directions with standard F-mount lenses. Vertical and horizontal binning functions allow the camera to be operated in a 8,192 pixels, 5µm x 5µm pixel pitch, 4 active CMOS lines mode or 4,096 pixels, 10µm x 10 µm pixel pitch, 2 active CMOS lines mode depending on the user settings. This versatile feature sets new standard for next generation machine vision systems

Application

- Raw material surface inspection
- General inspection
- PCB inspection
- Parcel and postal sorting
- High resolution document scanning



Standard Conformity

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

- A shielded power supply cable
- A Camera Link data transfer cable ref. **MVC-1-1-5-2M** from CEI (Component Express, Inc.)

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

CE Conformity

The ELIIXA+ cameras comply with the requirements of the EMC (European) directive 2004/108/EC (EN50081-2, EN 61000-6-2).

FCC Conformity

The ELIIXA+ 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.

RoHS Conformity

ELIIXA+ cameras comply with the requirements of the RoHS directive 2011/65/EU.

Key Specifications

Functionality (Programmable via Control Interface)		
Sensor modes : Multi-definition, Multi-sensitivity	8k Pixels 5µm : Multi-Lines 1, 2 or 4 4k Pixels 10µm : Binning 1 or 2 Lines 2k Pixels 20µm : Binning 4x4, 1 line	
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)	125 x 60 x 35	mm
Weight	360	g
Lens Mount	F-Mount, T2 and M42x1	-
Sensor alignment (see chapter 2.1)	±100	µm
Sensor flatness	50	µm
Power supply	Single 12 DC to 24 DC	V
Power dissipation - CameraLink	< 7,5	W
General Features		
Operating temperature	0 to 55 (front face) or 70 (Internal)	°C
Storage temperature	-40 to 70	°C
Regulatory	CE, FCC and RoHS compliant	

Note : All values in LSB are given in 12 bits format

Characteristics	Typical Value		Unit
Sensor Characteristics at Maximum Pixel Rate			
Resolution	2 or 4 x 8192	1 or 2 x 4096	Pixels
pixel size (square)	5 x 5	10 x 10	µm
Max Line Rate (Bx0/Bx1 versions, 8 or 12bits)			
CameraLink Base 2 x 85MHz	20	40	kHz
CameraLink Medium 4 x 85MHz	40	80	kHz
Max Line Rate (Bx1 version only, 8 bits)			
CameraLink Full 8 x 85MHz	80	100	kHz
CameraLink Deca 10 x 85MHz	100	100	kHz
Radiometric Performance at Maximum Pixel Rate and minimum camera gain			
Bit depth	8, 10 and 12		Bits
Response (broadband)	450		LSB/(nJ/cm ²)
Full Well Capacity	27300 (in 2S or 4S mode and MultiGain at 1/2)		electrons
Response non linearity	0,3		%
PRNU HF Max	3		%
Dynamic range (1S / 2S / 4S mode)	67,6 / 70,7 / 68,7		dB

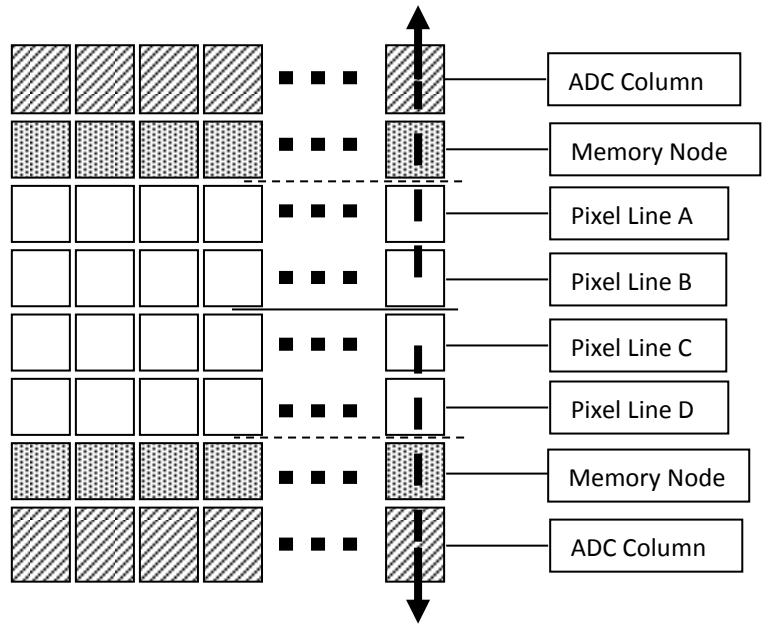
Camera Description

Image Sensor

The Eliixa+ 8k sensor is composed of two pairs of sensitive lines. Each pair of lines use the same Analog to Digital Column converter (ADC Column). An appropriate (embedded) Time delay in the exposure between each line allows combining two successive exposures in order to double the sensitivity of a single line.

This Time Delay Exposure is used only in the 4S multi-line modes (4 Lines) and also in the three binning modes, as described below.

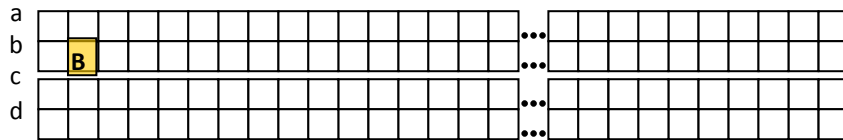
The 8192 Pixels of the whole sensor are divided in 2 blocks of 4096 pixels.



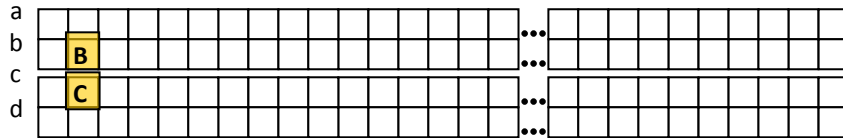
Sensor modes

8K Pixels Output

Mode 1S = B

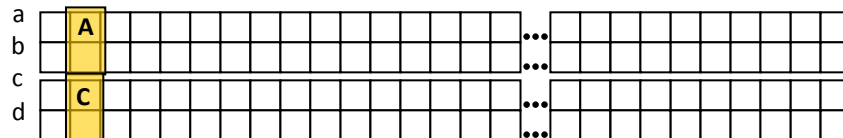


Mode 2S = B+C (FPGA)



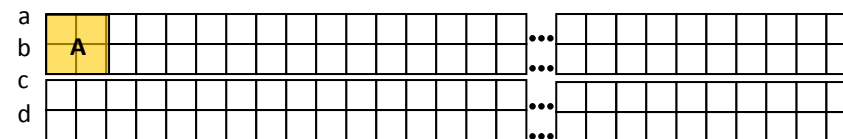
Mode 4S = (A.B)+(C.D)

Note : (A.B) = summation in the sensor (not available for EV71YC2MCL8005-BH0)

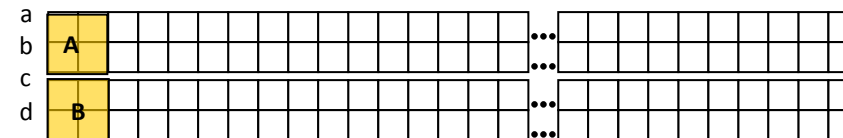


4k Pixels Output

Mode 1SB = A

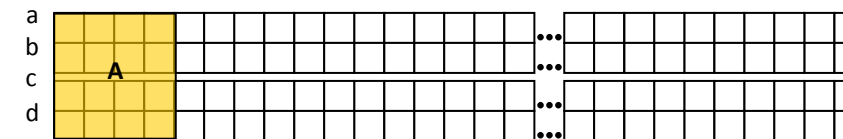


Mode 2SB = (A+B)



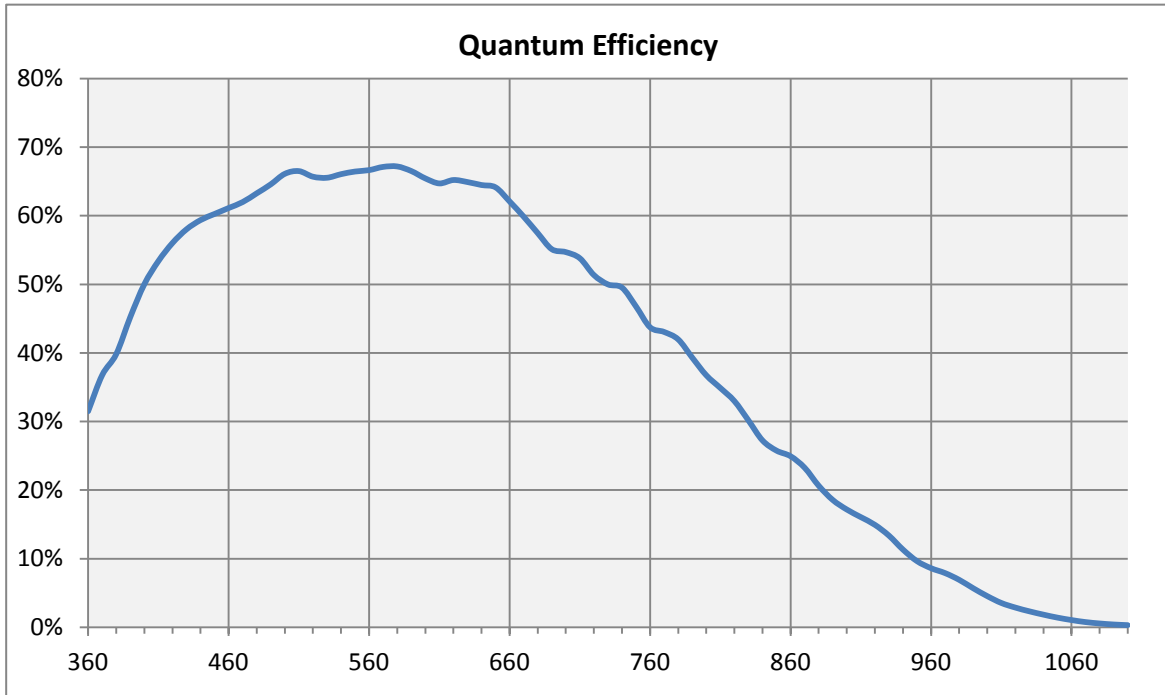
2k Pixels Output

Mode 4SB = A



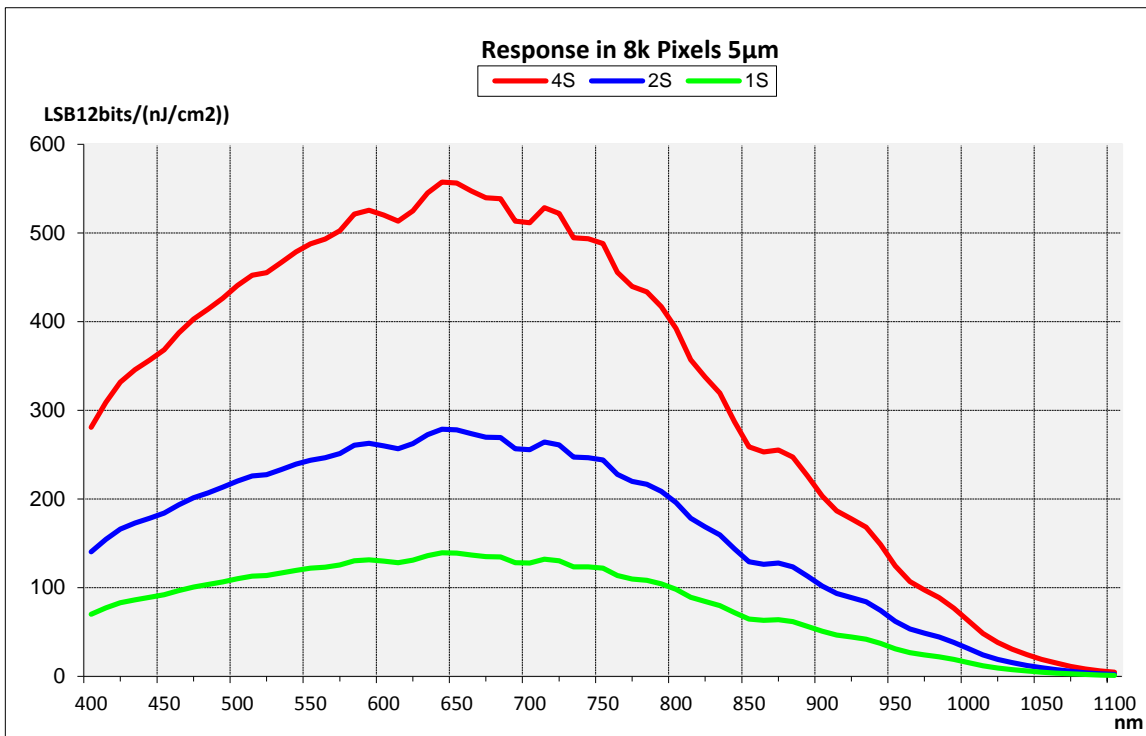
Response & QE curves

Quantum Efficiency

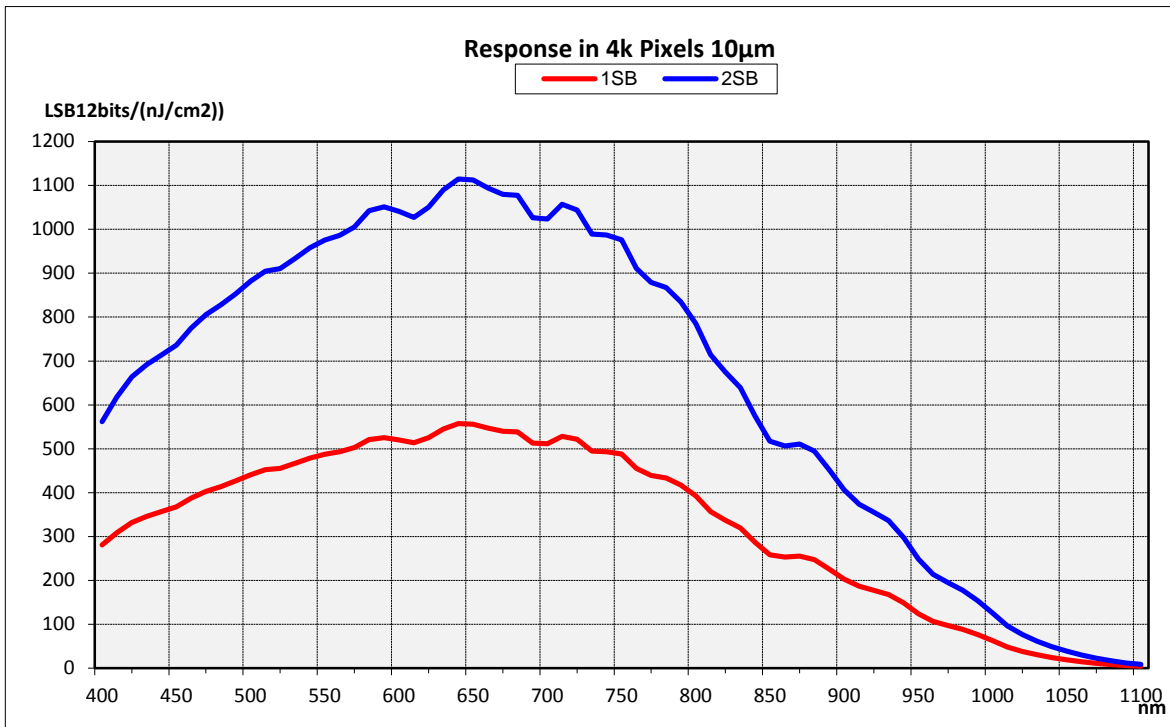


Spectral Responses

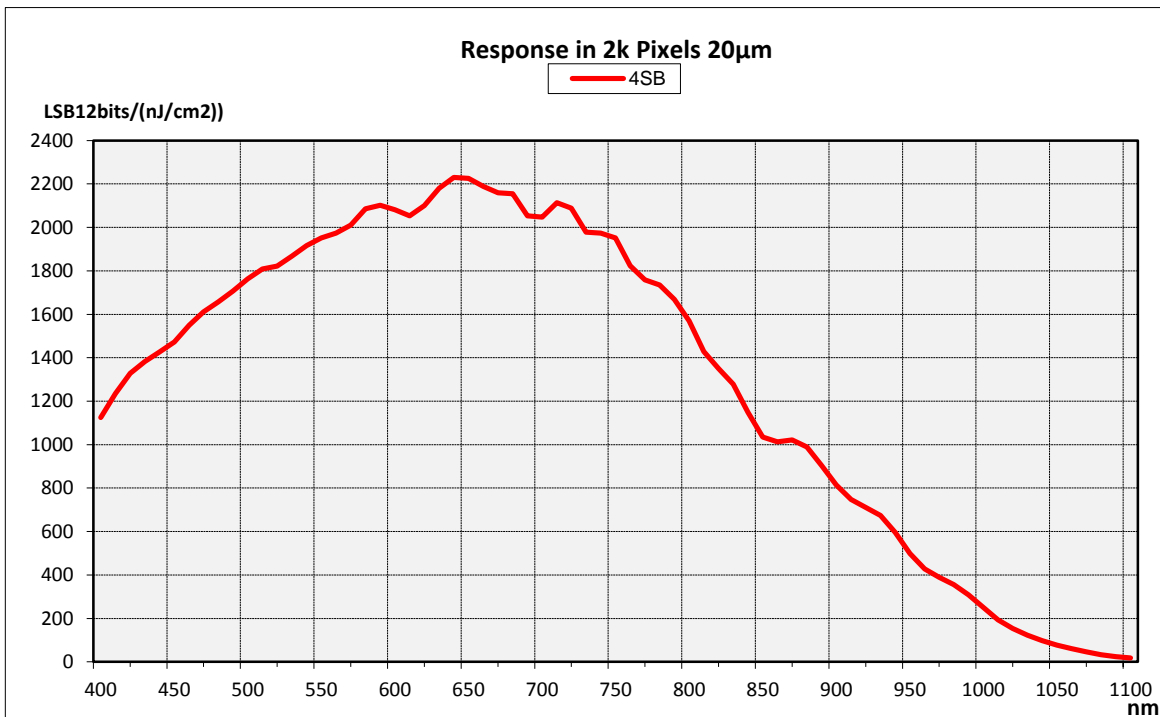
Single Modes : 1S, 2S, 4S



Binning Modes : 1SB, 2SB

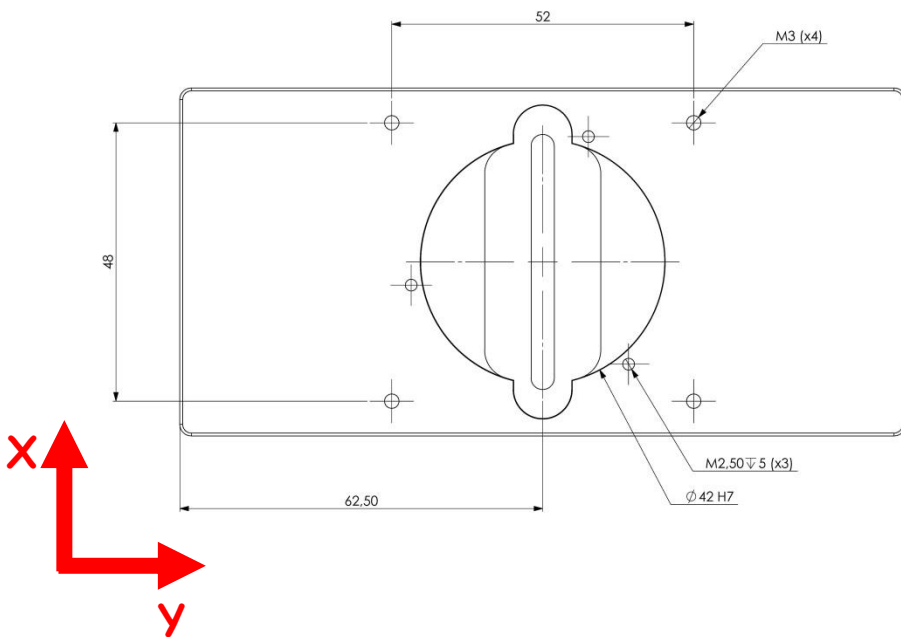
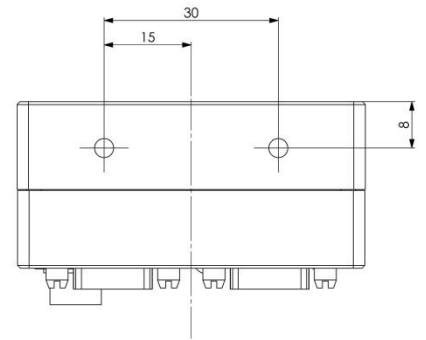
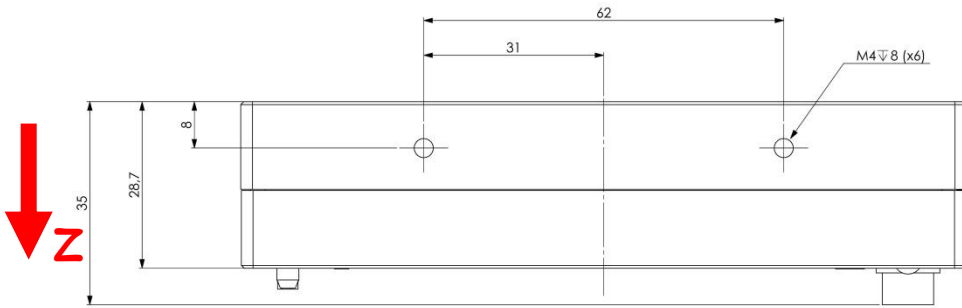
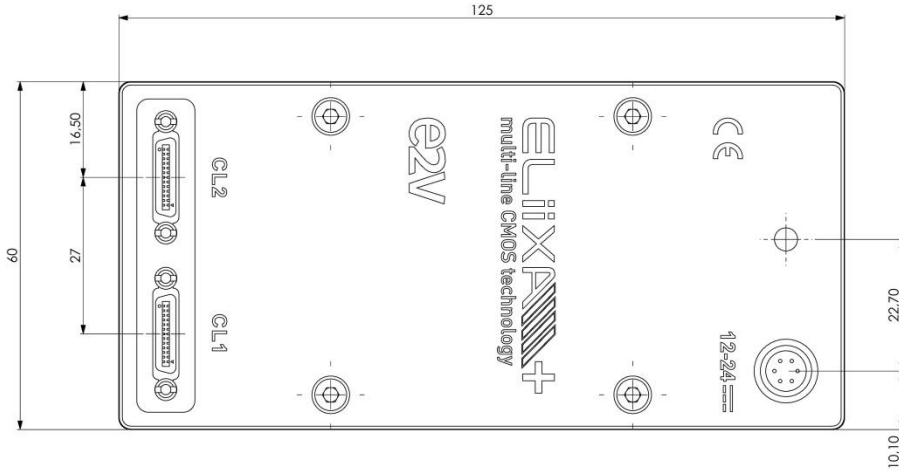


Binning 4x4 Mode



Camera Hardware Interface

Mechanical Drawings



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

Sensor alignment		
Z = -10.3 mm		±100µm
X = 9.5 mm		±100 µm
Y = 62.5mm		±100 µm
Flatness		50 µm
Rotation (X,Y plan)		±0,15°
Tilt (versus lens mounting plane)		50µm

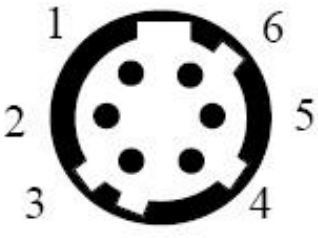
Input/output Connectors and LED



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
Power supply from 12 to 24v Power 7,5W max with an typical inrush current peak of 1A during power up				

Status LED Behaviour

After less than 2 seconds of power establishment, the LED first lights up in ORANGE. Then after a Maximum of 40 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

CameraLink Output Configuration

	Adjacent Channels	Pixels per Channel
Versions Bx0/Bx1		
Base : 2 Channels 8/10/12bits	2 x 85MHz (80/75/70/65/60MHz)	2 x 4096
Medium : 4 Channels 8/10/12bits	4 x 85MHz (80/75/70/65/60MHz)	4 x 2048
Version Bx1 (only)		
Full : 8 Channels 8bits	8 x 85MHz (80/75/70/65/60MHz)	8 x 1024
Deca : 10 Channels 8bits	10 x 85MHz (80/75/70/65/60MHz)	10 x 819

STANDARD CONFORMITY

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

- A shielded power supply cable
- A Camera Link data transfer cable ref. MVC-1-1-5-2M from CEI (Component Express, Inc.)

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

CE Conformity

The ELIIXA+ cameras comply with the requirements of the EMC (European) directive 2004/108/EC (EN50081-2, EN 61000-6-2).

FCC Conformity

The ELIIXA+ 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.

RoHs Conformity

ELIIXA+ cameras comply with the requirements of the RoHS directive 2011/65/EU.

Models

Part Number	Sensor	Outputs	Max Line Rate	Details
EV71YC4MCL8005-BA0	4x Lines, 8k 5x5µm 2x Lines, 4k 10x10µm	4x85MHz or 2x85MHz	40 KHz 80 KHz	-
EV71YC4MCL8005-BA1	4x Lines, 8k 5x5µm 2x Lines, 4k 10x10µm	Up to 10x85MHz	100 KHz	-
EV71YC4MCL8005-BH0	4x Lines, 8k 5x5µm 2x Lines, 4k 10x10µm	4x85MHz or 2x85MHz	40 KHz 80 KHz	New Sensor & HDR Function
EV71YC4MCL8005-BH1	4x Lines, 8k 5x5µm 2x Lines, 4k 10x10µm	Up to 10x85MHz	100 KHz	New Sensor & HDR Function
EV71YC2MCL8005-BA0	2x Lines, 8k 5x5µm 2x Lines, 4k 10x10µm	4x85MHz or 2x85MHz	40 KHz 80 KHz	New Sensor. 2 Lines only
EV71YC2MCL8005-BA1	2x Lines, 8k 5x5µm 2x Lines, 4k 10x10µm	Up to 10x85MHz	100 KHz	New Sensor. 2 Lines only

Datasheet

Features

- Cmos Colour Sensor :
 - 16384 RGB Pixels, 5 x 5µm (Full Definition)
 - 8192 RGB Pixels 10x10µm (True Colour)
- Interface : CoaXPress® (4x 6Gb/sLinks)
- Line Rate :
 - Up to 47500 l/s In 16k Full Definition Mode
 - Up to 95000 l/s in 8k True Colour Mode
- Bit Depth : 24bits (RGB 8bits)
- Efficient color interpolation
- Scan Direction
- Flat Field Correction
- Low Power Consumption : <19W
- 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 multi-line CMOS technology, the camera provides an unmatched 95,000 lines/s 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 four active lines and dual line filter configuration allowing the camera to be operated in several modes: True colour mode with 10µm RGB pixels to provide equivalent colour fidelity to 10µm pixel tri-linear solutions with advanced immunity to web variation or Full definition mode with a unique 16,384 RGB pixel resolution.

Application

- Printing Inspection
- High Resolution Document Scanning
- Printed Circuit Board Inspection
- Flat Panel Display Inspection
- High Quality Raw material Surface Inspection



GEN<i>i>CAM

Key Specifications

Characteristics	Typical Value		Unit
Sensor Characteristics at Maximum Pixel Rate			
Resolution	16384	8192	RGB Pixels
pixel size (square)	5	10	μm
Max line rate	47.5	95	
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
Response (Peak) : True Color or Full Def. Enhanced			
Red	11.8		LSB 8bits/(nJ/cm ²)
Green	11.2		LSB 8bits/(nJ/cm ²)
Blue	7.8		LSB 8bits/(nJ/cm ²)

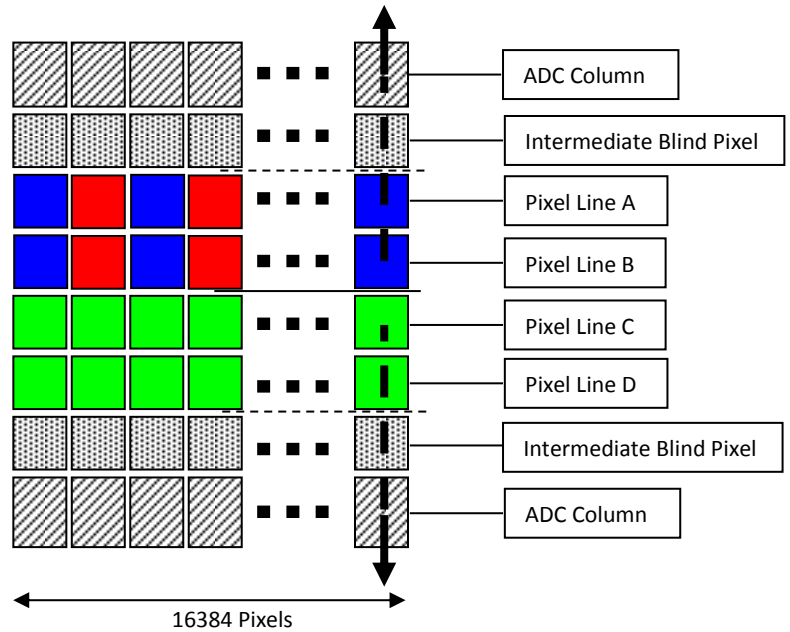
Functionality (Programmable via GenICam Control Interface)			
Analog Gain	Up to 12 (x4)		dB
Offset	-4096 to +4096		LSB
Trigger Mode	Timed (Free run) and triggered (Ext Trig, Ext ITC) modes		
Sensor Modes	<ul style="list-style-type: none"> • True Color Enhanced : 8192 RGB Pixels of 10x10μm • True Color Single : 8192 RGB Pixels of 10x10μm • Full Definition Enhanced : 16384 RGB Pixels 5x5μm • Full Definition Single : 16384 RGB Pixels 5x5μm 		
Mechanical and Electrical Interface			
Size (w x h x l)	100 x 156 x 36		mm
Weight	700		g
Lens Mount	M95 x 1		-
Sensor alignment (see chapter 4)	±100		μm
Sensor flatness	±35		μm
Power supply	Power Over CoaXPress : 24		V
Power dissipation – Typ. while grabbing	< 19		W
General Features			
Operating temperature	0 to 55 (front face) or 70 (Internal)		°C
Storage temperature	-40 to 70		°C
Regulatory	CE, FCC and RoHS compliant		

Image Sensor

The Eliixa+ Colour 16k sensor is composed of two pairs of sensitive lines. The Colour version has been completed with RGB colour Filter and disposed as detailed beside.

Each pair of lines use the same Analog to Digital Column converter (ADC Column). An appropriate (embedded) Time delay in the exposure between each line this allows to combine two successive exposures in order to double the sensitivity of a single line.

This Time Delay Exposure is used only in the Full Definition Enhanced.



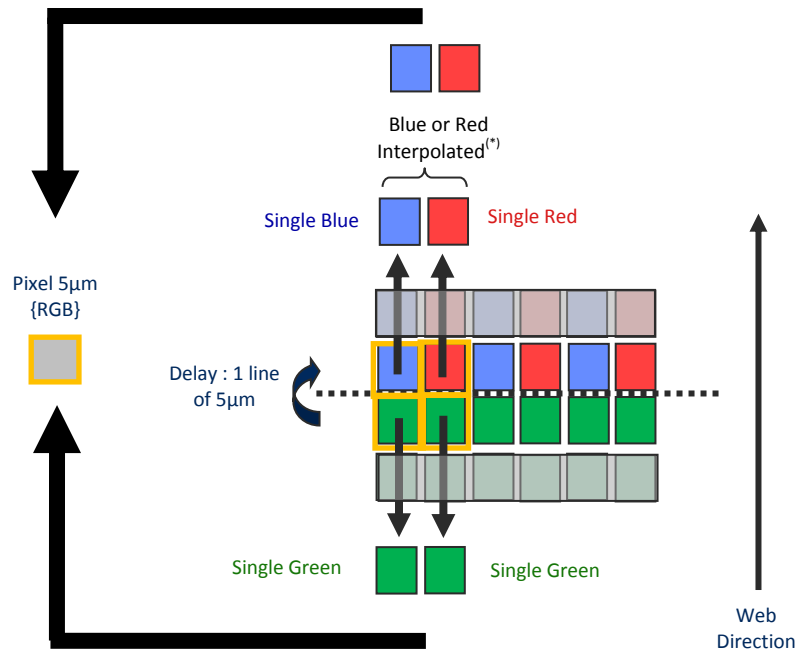
Full Definition Single Mode (FDS)

5 μ m Pixels (R,G,B)

Same definition than B&W

Requires x3 the data flow of the B&W

- Sensitivity is half of the TC mode available : Equivalent to 3 x Pixels of 5 μ m (with their respective colour filters).
- "Full Exposure control" not needed in this mode as the Time Delay Exposure is not active. The Exposure time can be control as for a single line mode.



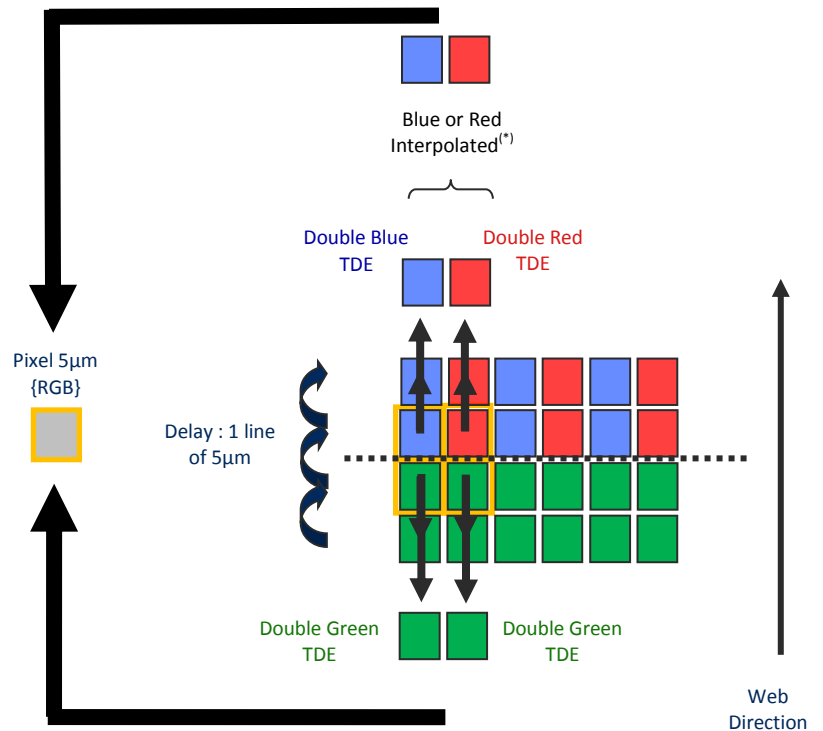
Full Definition Enhanced Mode (FDE)

5µm Pixels (R,G,B)

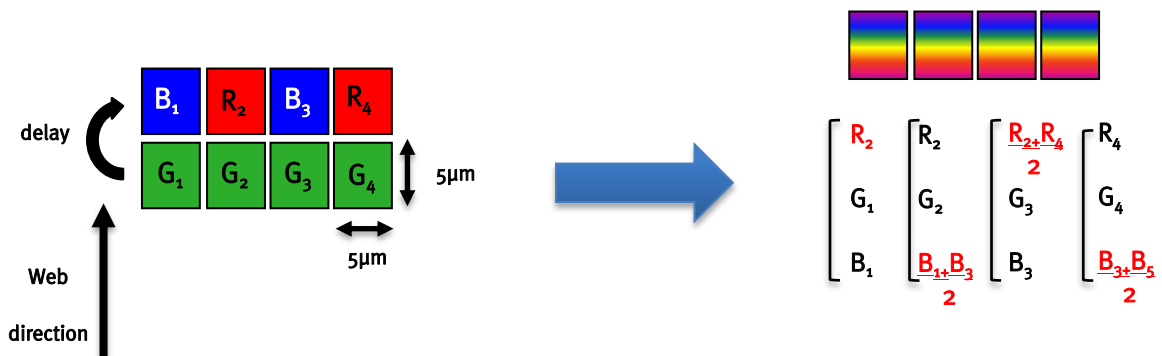
Same definition than B&W

Requires x3 the data flow of the B&W

- Sensitivity is the same as the TC mode available : Equivalent to 6 x Pixels of 5µm (with their respective colour filters).
- “Full Exposure control” is activated in this mode as the Time Delay Exposure is active.



Color Interpolation in Full Definition modes.

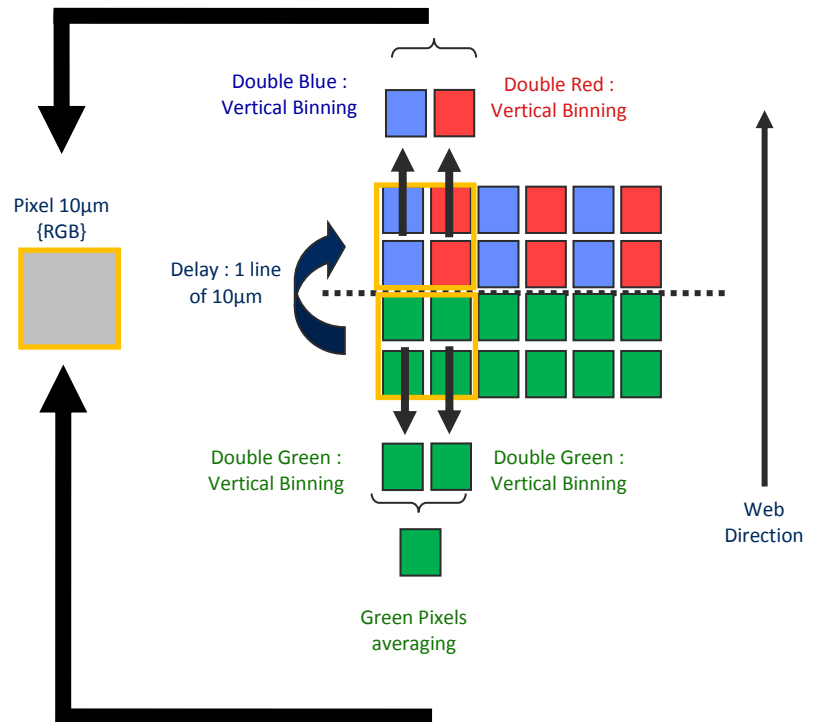


This color mode (5µm) requires the indication of “Forward/Reverse” to the camera in order to manage the delay between the two coloured lines.

True Colour Enhanced Mode (TCE)

10µm Pixels (R,G,B)
 Twice less pixels than B/W
 Requires $\times 3/2$ the data flow of B&W

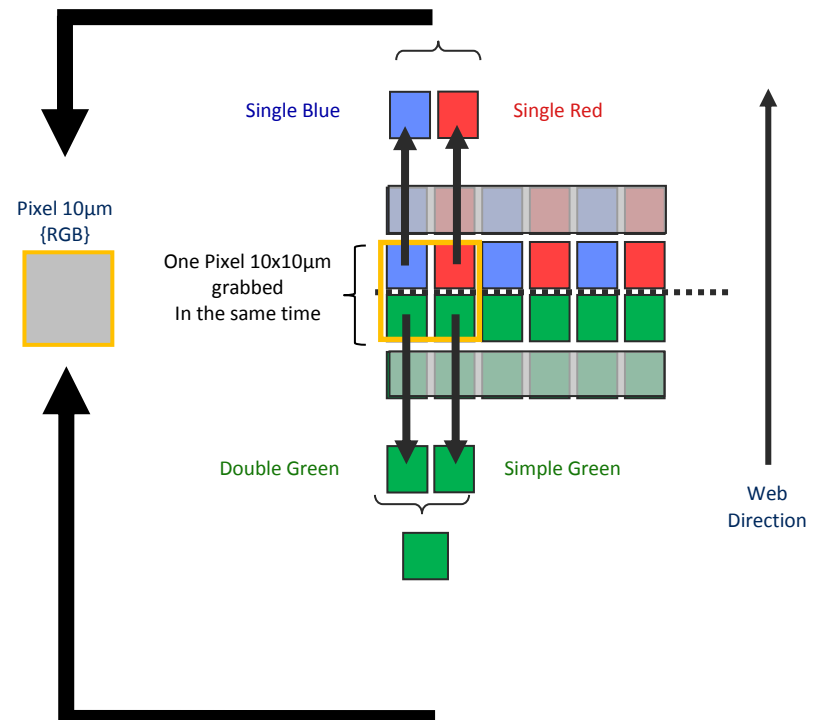
- High Sensitivity True Color mode: Equivalent to 6 x Pixels of 5µm (with their respective colour filters).
- “Full Exposure control” not needed in TC as the TDI is not active (only binning). The Exposure time can be control as for a single line mode.



True Colour Single Mode (TCS)

10µm Pixels (R,G,B)
 Twice less pixels than B/W
 Requires $\times 3/2$ the data flow of B&W

- Sensitivity Half of the TCE mode: Equivalent to 6 x Pixels of 5µm (with their respective colour filters).
- “Full Exposure control” not needed in TC as the TDI is not active (only binning). The Exposure time can be control as for a single line mode.
- Not sensitive to the Scanning direction and the variation of the aspect ratio of the image.



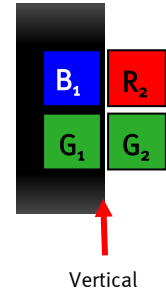
Column Interpolation Correction

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.



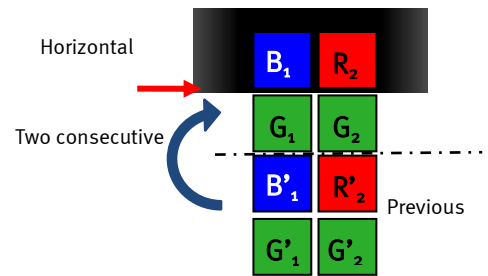
Line Interpolation Correction

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 :

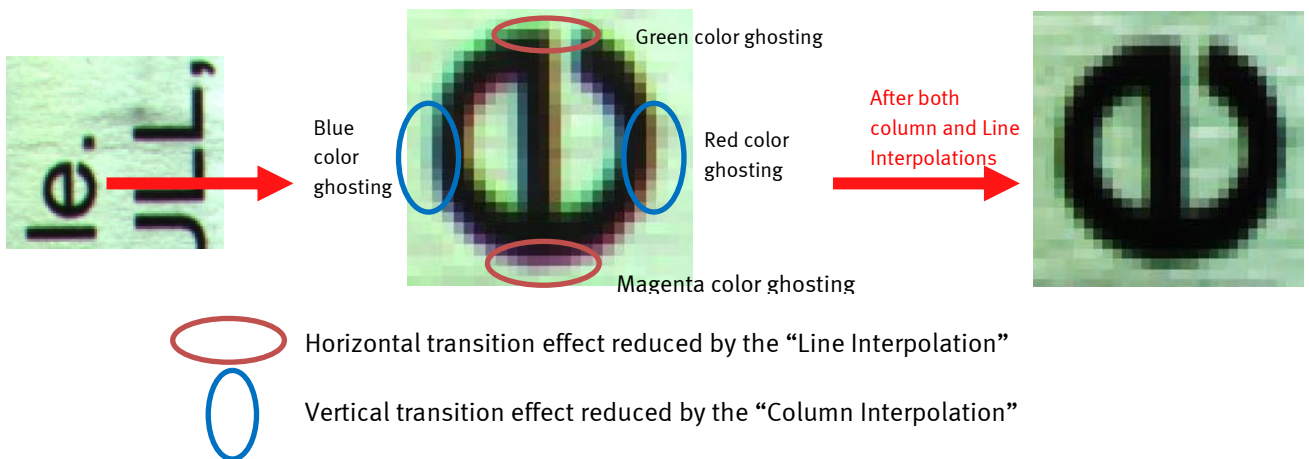
$B_1' = \alpha_B \times B_1$ and α_B is the blue correction, calculated with the variation $(G_1 - G'_1)$

$R_2' = \alpha_R \times R_2$ 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 Single 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.

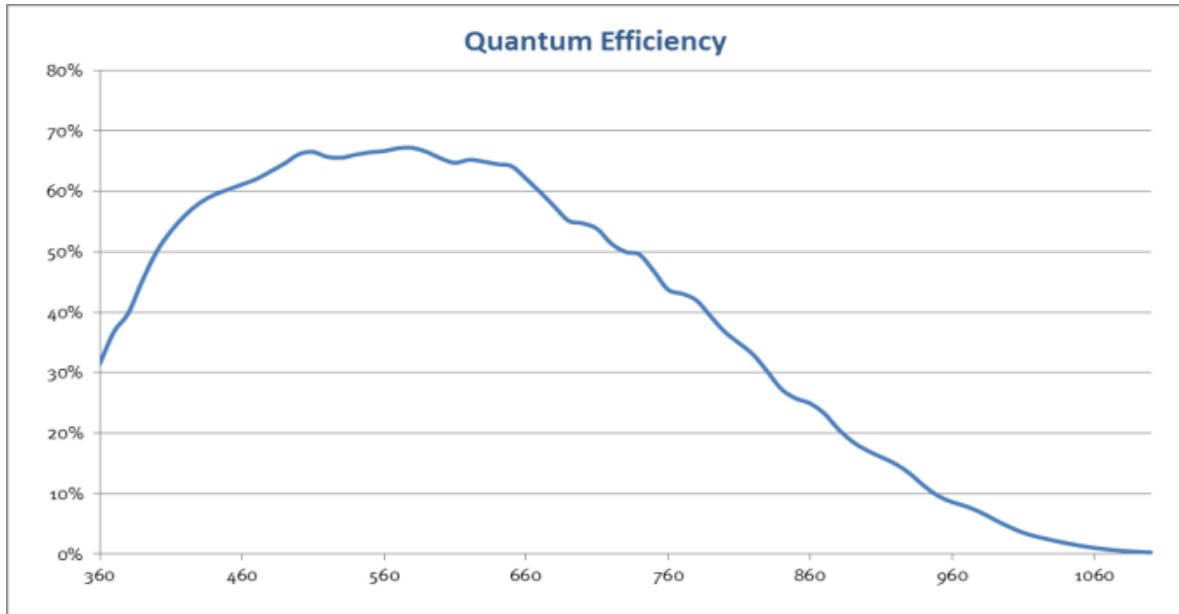


Effects of the interpolations

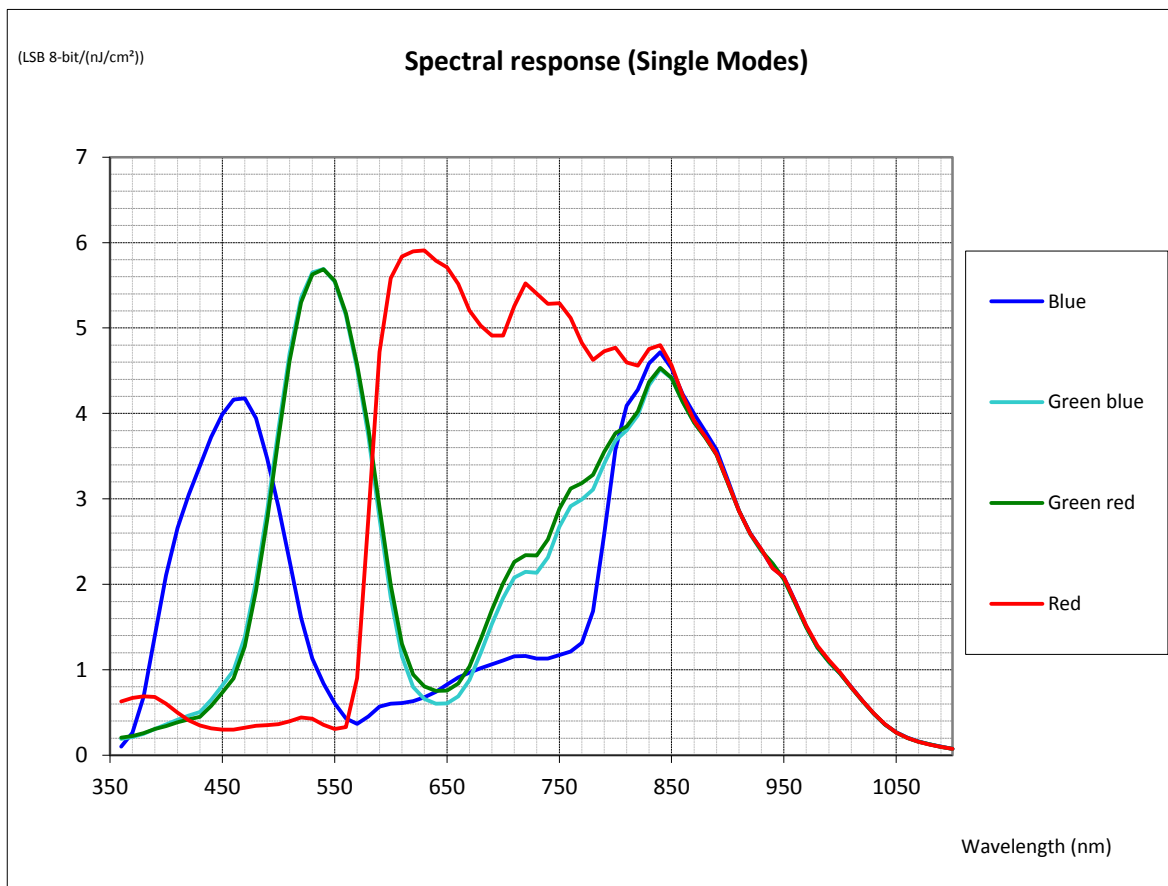


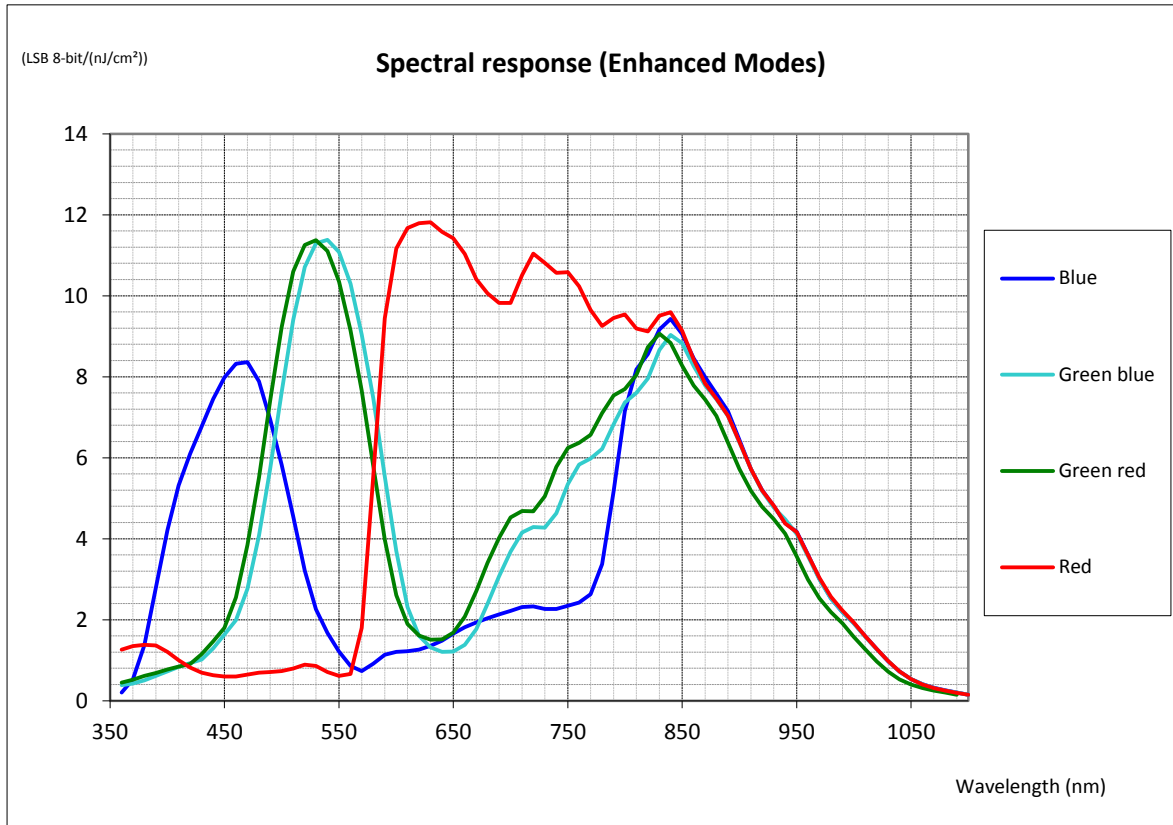
Response & QE curves

Quantum Efficiency



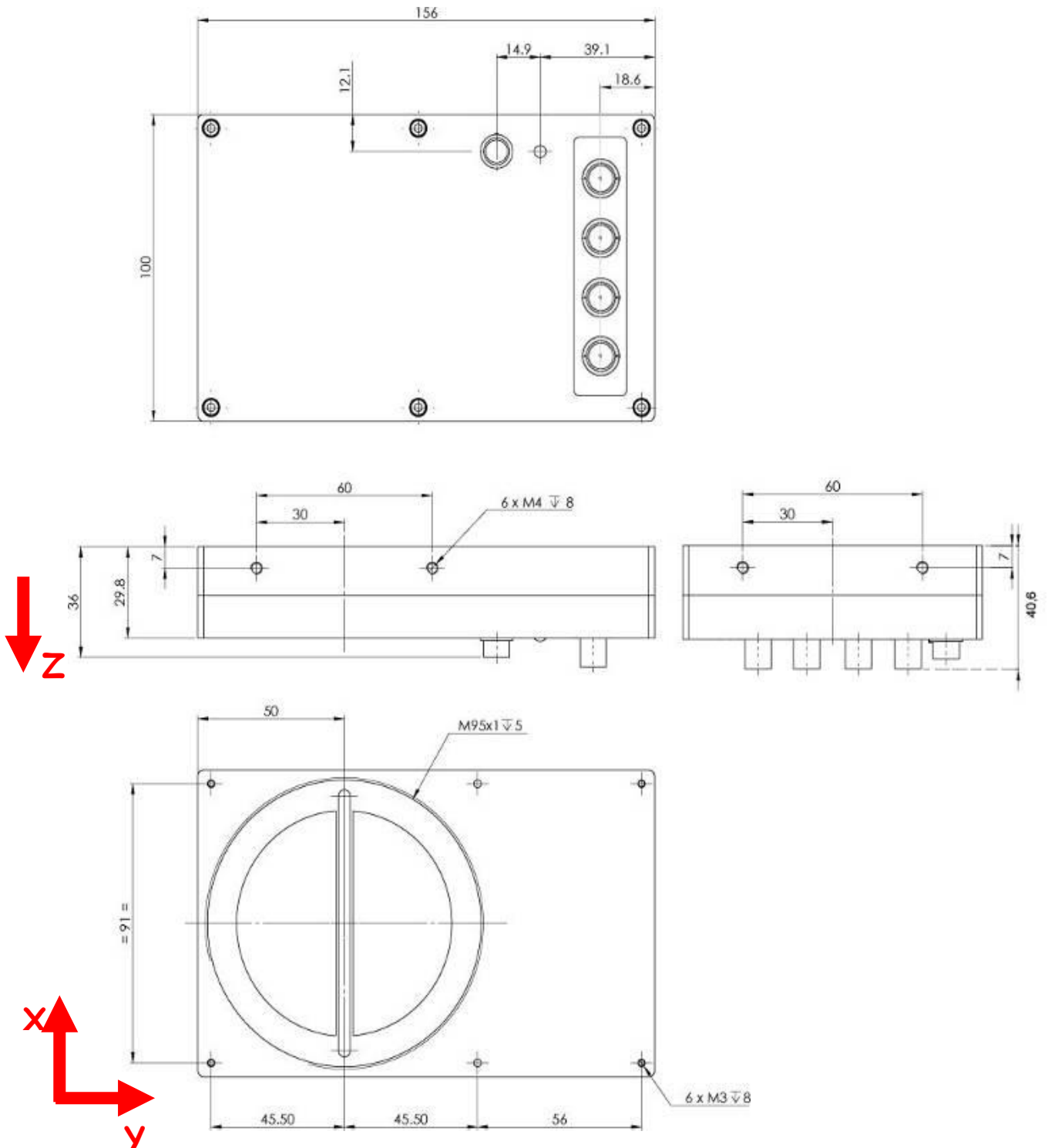
Spectral Response Curve





Hardware

Mechanical Drawing





Power Over CoaXPress

The ELIIXA+ CXP is compliant with the Power Over CoaXPress : There is no Power connector as the power is delivered through the Coaxial Connectors 1 and 2.

In the Standard, the Power Over CoaXPress allows to deliver 13W (under 24V) per Channel.

The ELIIXA+ CXP requires 19W then two connectors are required for the power : The two first are used for this purpose.

If you want to Power ON the Camera you have to connect the Coaxial connector output 1 of the camera to the coaxial connector 1 of the Frame Grabber.

Note 1 : Only the connector 1 position is mandatory. They other 3 connectors can be inverted but the camera still needs the 2 first connectors to get it power and be able to start up.

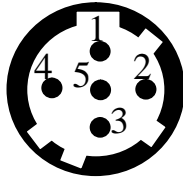
Note 2 : Removing the 2 first connectors will shut down the Camera : You can reset the Camera by quickly (**less than 1s**) connect/disconnect the Connector CXP1 but after a longer shut down, you'll have to reboot the PC with the Camera full connected to the frame grabber in order to synchronize the discovery of each power line.

Note 3 : With some frame grabber you have access to a specific command (from the Frame Grabber interface) for shutting down/up the power of the CoaxPress : This solution, with the complete reboot, is the better solution to ensure a complete power On of the Camera.

Trigger Connector

Camera connector type: Hirose HR10A-7R-5SB or compliant

Cable connector type: Hirose HR10A-7P-5P (male) or compliant, Provided with the Camera

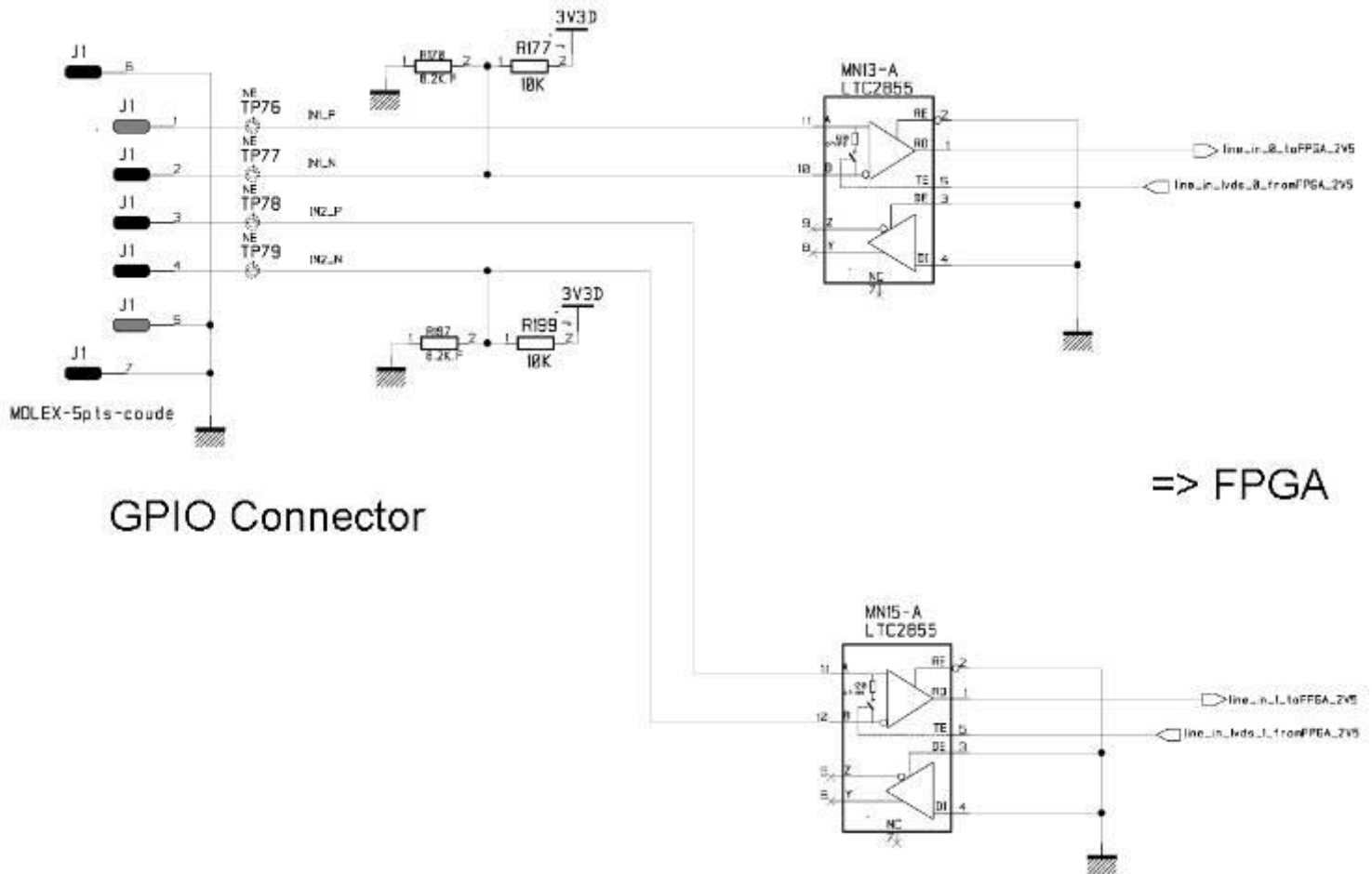


Receptacle viewed from camera back

Signal	Pin
LVDS IN1+ / TTL IN1	1
LVDS IN1-	2
LVDS IN2+ / TTL IN2	3
LVDS IN2-	4
GND	5

IN1/IN2 are connected respectively to Line0/Line1 and allow to get external line triggers or the forward/Reverse "Live" indication.

On the Connector side, the 120Ω termination is validated only if the input is switched in LVDS or RS422. The electrical schematic is detailed below :



Standard Conformity

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

- A shielded Trigger cable
- A 10m CoaXPress Cable for the data transfer, certified at 6Gb/s

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

CE Conformity

The ELIIXA+ cameras comply with the requirements of the EMC (European) directive 89/336/CEE (EN50081-2, EN 61000-6-2).

FCC Conformity

The ELIIXA+ 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.

Lenses Compatibility

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	
NIKON				
Rayfact F4	0,05 X – 0,5 X	1820,4mm – 230,3mm	Rayfact ML90mm F4	

Frame Grabbers Compliance

Brand	F.G. Name	Detailed Reference	tested
Active Silicon	Firebird FBD-4XCXP6 in PCIe x8 (Gen2)	Software V1.2.0	OK
Aval Data	APX-3664	-	By AvalData
Bitflow	Cyton-CXP4	-	OK
Matrox	Radiant eV-CXP	MIL9 + Update 50 Build60	OK
Silicon Software	MicroEnable 5 AQ8-CXP6B	Software V5.3.8	OK

Models

Part Number	Definition / Max Speed	Details
EV71YC4CCP1605-BA0	16k/47.5kHz – 8k/95kHz	New Sensor Generation with Model Name ELIIXA2C4CCP1605

DATASHEET

Features

- Cmos Sensor 4x 16384 Pixels, 5 x 5µm
- Multi-Line structure (1, 2 or 4)
- Interface :
 - Full CameraLink® (4, 8 or 10 Channels), 85MHz each
 - CoaXPress® (4x Links)
- Line Rate :
 - Up to 50000 l/s In CameraLink®
 - Up to 100000 l/s in CoaXPress®
- Data Rate :
 - Up to 850 MB/s In CameraLink®
 - Up to 1,6GB/s in CoaXPress®
- Bit Depth : 8, 10 or 12bits
- Flat Field Correction
- Look Up Table
- New „Bhx“ Models with New Sensor and HDR feature
- Low Power Consumption : <16W
- 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 multi line CMOS technology, the camera provides an unmatched 100 000 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 four active lines, ensuring optimal spatial resolution in both scanning and sensor directions with off-the-shelf lenses. An outstanding data rate in excess of 1.6 Gpixels per second, delivered via a new CoaXPress interface, allows for extremely high throughput and opens up an array of new possibilities for the next generation of inspection systems for demanding applications such as flat panel display, PCB and solar cell inspection.

Application

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



Standard Conformity

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

- For the CXP Version :
 - A shielded Trigger cable
 - A 10m CoaXPress Cable for the data transfer, certified at 6Gb/s
- For the CameraLink version :
 - 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 ELIIXA+ cameras comply with the requirements of the EMC (European) directive 89/336/CEE (EN50081-2, EN 61000-6-2).

FCC Conformity

The ELIIXA+ 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	4 x 16384	Pixels
Pixel Size (square)	5	µm
Max Line Rate		
CoaXPress® 4x Links (8 or 10bits)	100	kHz
CoaXPress® 4x Links (12 bits)	100	kHz
CameraLink® 10xTaps Deca 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 10 (CoaXPress® only) 12	Bits Bits Bits
Responsivity	450	LSB 12bits/(nJ/cm ²)
Response non linearity (between 5 – 95% saturation)	<1	%
Maximum PRNU	3	%
Dynamic Range	73	dB
Functionalities (Programmable via Control Interface)		
Sensor Modes	Multi-lines 1 , 2 and 4 (16k pixels) Binning 1 or 2 lines (8k pixels)	-
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		
CameraLink®	<13	W
CoaXPress®	<16	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	-

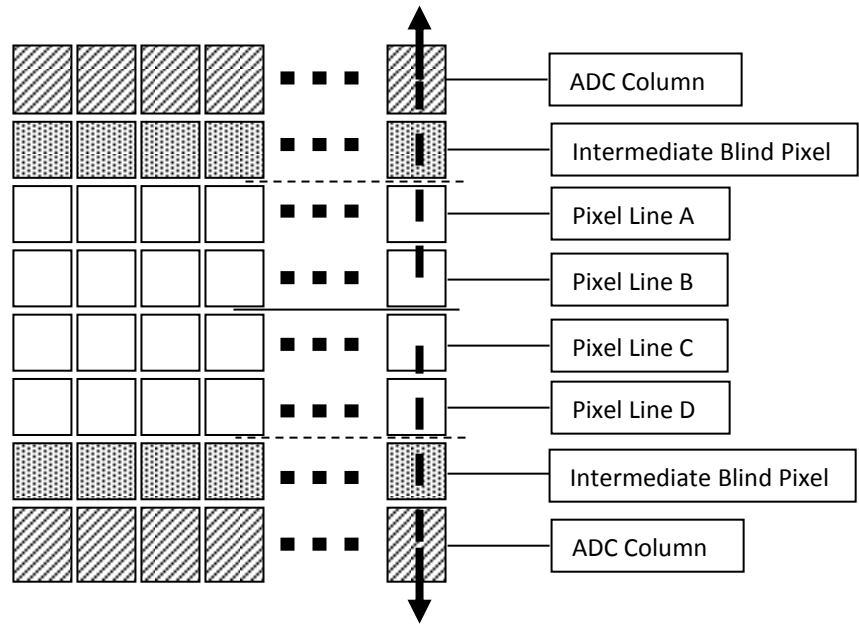
Camera Description

Image Sensor

The Eliixa+ 16k sensor is composed of two pairs of sensitive lines. Each pair of lines use the same Analog to Digital Column converter (ADC Column). An appropriate (embedded) Time delay in the exposure between each line this allows to combine two successive exposures in order to double the sensitivity of a single line.

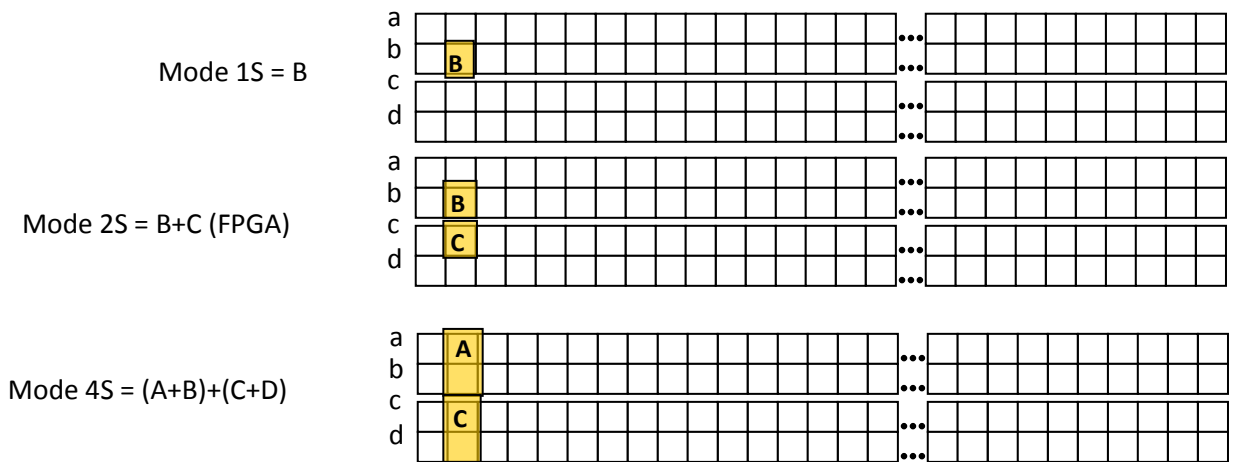
This Time Delay Exposure is used only in the 4S multi-line modes (4 Lines) and also in the two binning modes, as described below.

The 16384 Pixels of the whole sensor are divided in 4 blocks of 4096 pixels.

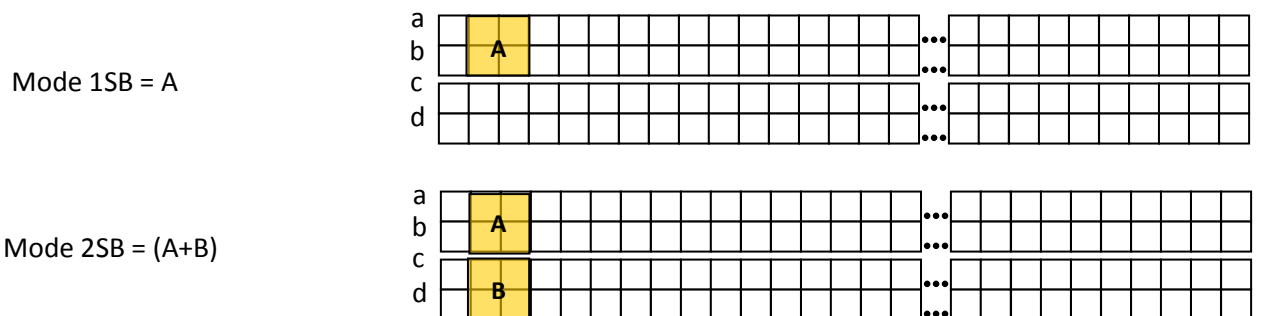


Multi-Lines modes

Multi-Lines Modes (16k Pixels Output)

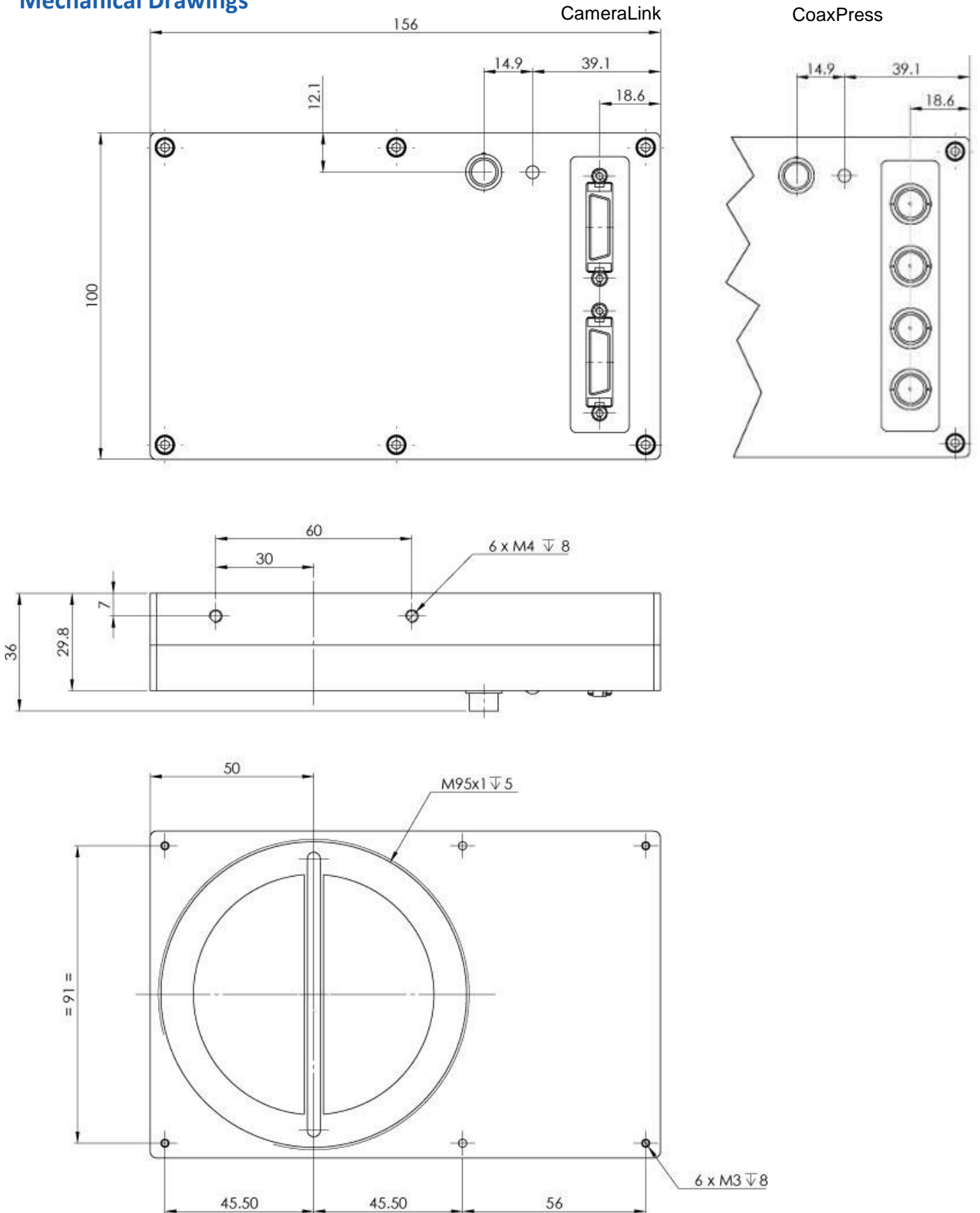


Binning Modes (8k Pixels Output) :



Camera Interface

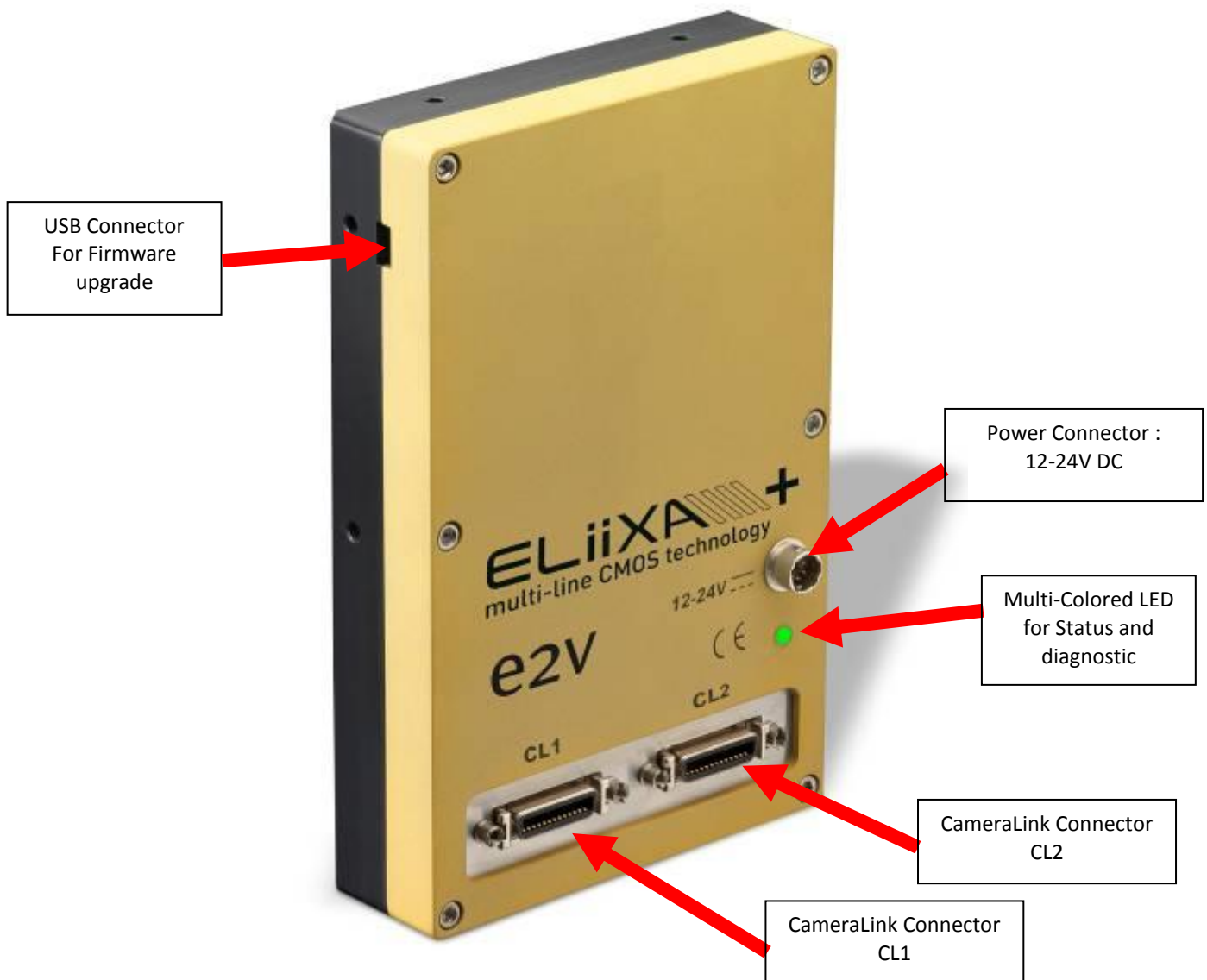
Mechanical Drawings



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

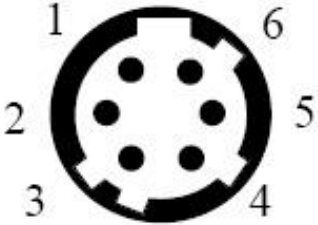
After less than 2 seconds of power establishment, the LED first lights up in ORANGE. Then after a Maximum of 30 seconds, the LED must turn in a following colour :

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

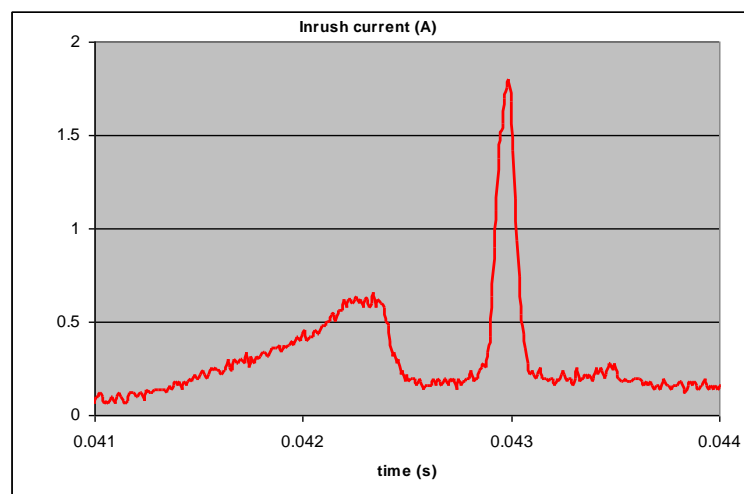
Camera connector type: Hirose HR10A-7R-6PB (male)

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				

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

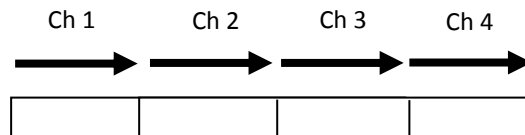
Power up Time : Around 43s (Green Light)



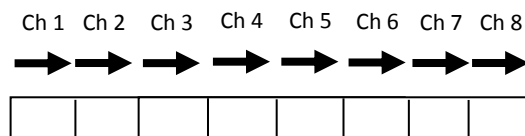
Output Configuration (CameraLink)

	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
Deca Mode		
10 Channels 8bits	10 x 85MHz	10 x 1638

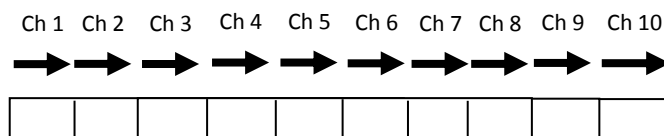
- Medium Mode 4x4096 Pixels at 85MHz each Channel (4x2048 pixels in Binning Mode 1SB or 2SB)
4 Taps Separate, from Left to Right :



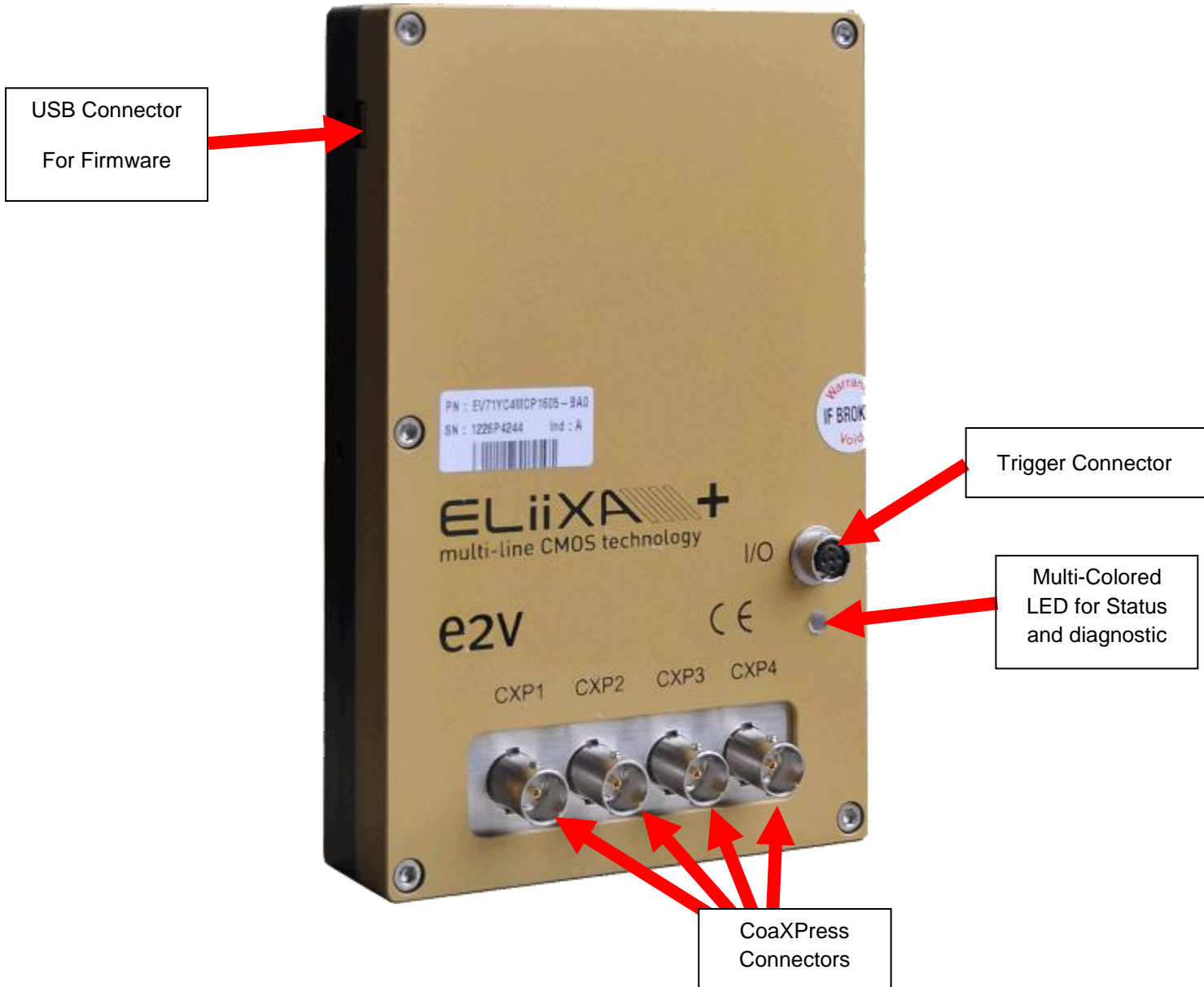
- FULL Mode 8x2048 Pixels at 85MHz each Channel (8x1024 pixels in Binning Mode 1SB or 2SB)
8 Taps Separate, from Left to Right :



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












Input/Output Connectors and LED (CoaXPress)



Status LED Behaviour

The Power LED behavior detail is the following :

Colour and State		Meaning
Off		No power
Solid orange		System booting
Fast flash green Shown for a minimum of 1s even if the link detection is faster		Link detection in progress
Slow flash alternate red / green		Device / Host incompatible
Slow pulse green		Device / Host connected, but no data being transferred
Slow pulse orange		Device / Host connected, waiting for event (e.g. trigger, exposure pulse)
Solid green whenever data transferred (i.e. blinks synchronously with data)		Device / Host connected, data being transferred
500ms red pulse In case of multiple errors, there shall be at least 200ms green before the next error is indicated		Error during data transfer (e.g. CRC error, single bit error detected)
Fast flash red		System error (e.g. internal error)

Power Over CoaXPress

The ELIIXA+ CXP is compliant with the Power Over CoaXPress : There is no Power connector as the power is delivered through the Coaxial Connectors 1 and 2.

In the Standard, the Power Over CoaXPress allows to deliver 13W (under 24V) per Channel.

The ELIIXA+ CXP requires 18W then two connectors are required for the power : The two first are used for this purpose.

If you want to Power ON the Camera you have to connect the Coaxial connector output 1 of the camera to the coaxial connector 1 of the Frame Grabber.

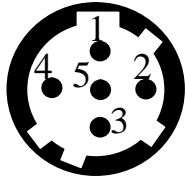
Note 1 : Only the connector 1 position is mandatory. They other 3 connectors can be inverted but the camera still needs the 2 first connectors to get it power and be able to start up.

Note 2 : Removing the 2 first connectors will shut down the Camera : You can reset the Camera by quickly (**less than 1s**) connect/disconnect the Connector CXP1 but after a longer shut down, you'll have to reboot the PC with the Camera full connected to the frame grabber in order to synchronize the discovery of each power line.

Note 3 : With some frame grabber you have access to a specific command (from the Frame Grabber interface) for shutting down/up the power of the CoaxPress : This solution, with the complete reboot, is the better solution to ensure a complete power On of the Camera.

Trigger Connector

Camera connector type: Hirose HR10A-7R-5SB or compliant
 Cable connector type: Hirose HR10A-7P-5P (male) or compliant,
 Provided with the Camera

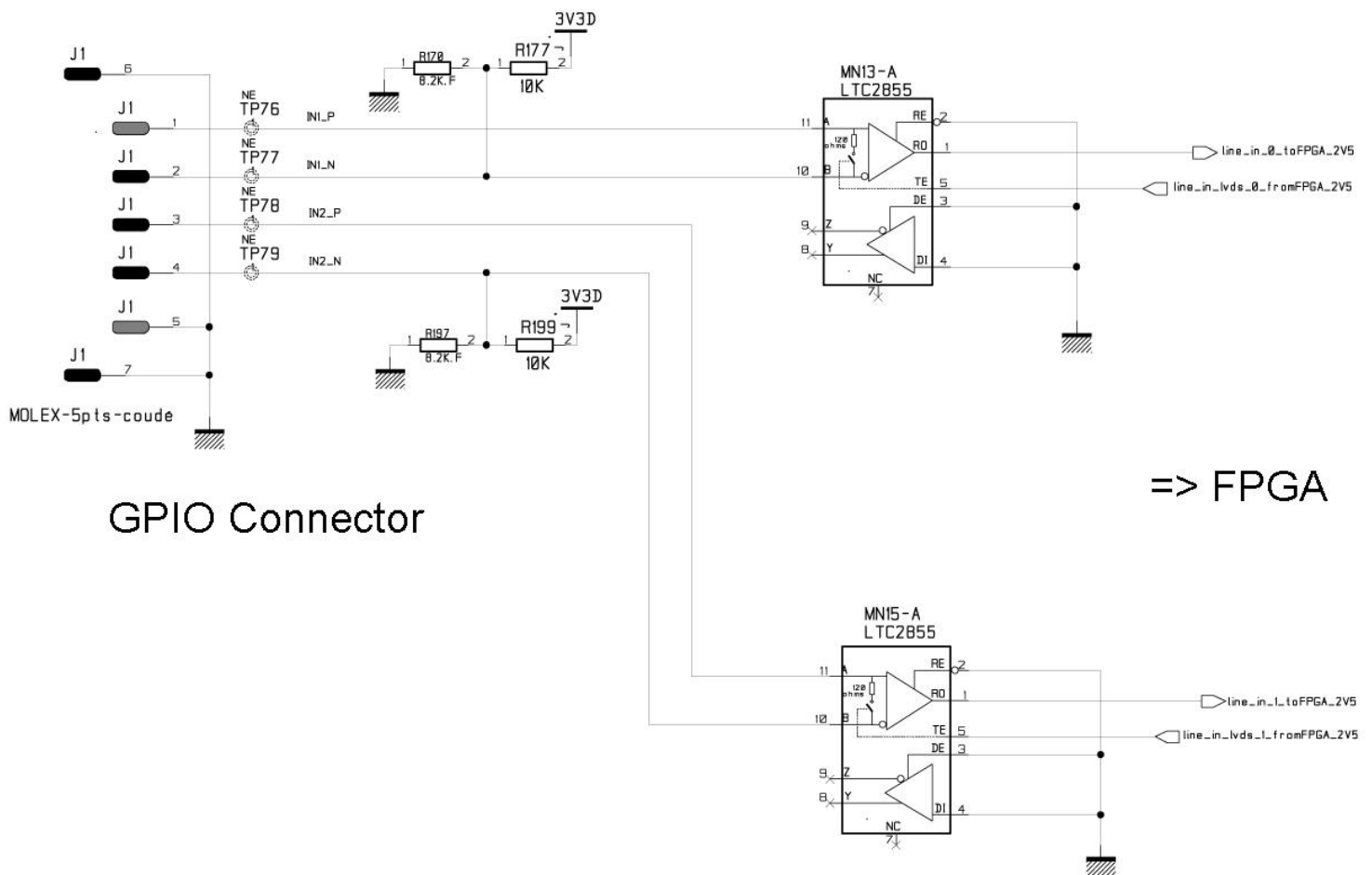


Receptacle viewed from camera back

Signal	Pin
LVDS IN1+ / TTL IN1	1
LVDS IN1-	2
LVDS IN2+ / TTL IN2	3
LVDS IN2-	4
GND	5

IN1/IN2 are connected respectively to Line0/Line1 and allow to get external line triggers or the forward/Reverse "Live" indication.

On the Connector side, the 120Ω termination is validated only if the input is switched in LVDS or RS422. The electrical schematic is detailed below :



GPIO Connector

Optical 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
EV71YC4MCL1605-BA1	16k : 50kHz 8k : 100kHz	CameraLink® 4, 8 or 10 Taps at 85MHz	-
EV71YC4MCP1605-BA0	16k /8k 100kHz	CoaXPress® 4 x 6Gb/s	-
EV71YC4MCL1605-BH1	16k : 50kHz 8k : 100kHz	CameraLink® 4, 8 or 10 Taps at 85MHz	New Sensor HDR Function
EV71YC4MCP1605-BH0	16k /8k 100kHz	CoaXPress® 4 x 6Gb/s	New Sensor HDR Function