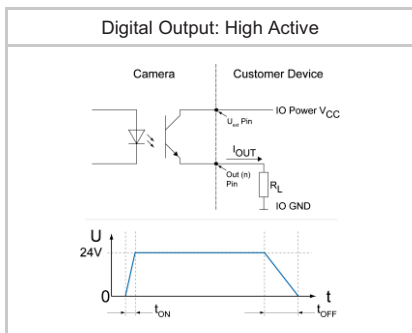
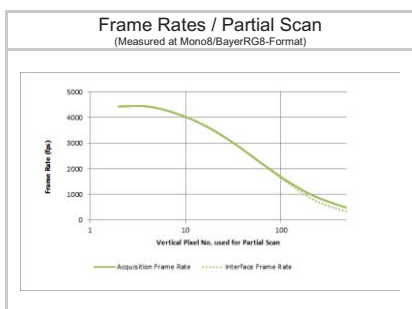
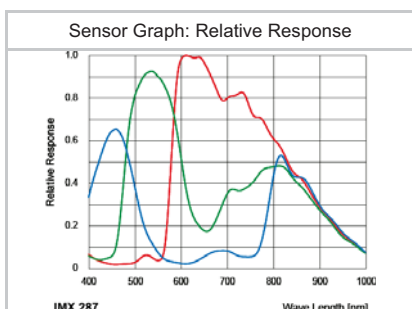




<sup>1)</sup> Sensor readout, different from pixel format

<sup>2)</sup> depends on the used interface



### Sensor Information

|            |                              |
|------------|------------------------------|
| Model Name | Sony IMX287                  |
| Type       | 1/2.9" progressive scan CMOS |
| Shutter    | Global Shutter               |
| Resolution | 720 × 540 pixels             |
| Scan Area  | 7.07 mm × 5.30 mm            |
| Pixel Size | 6.9 μm × 6.9 μm              |

### Data Quality

@ 20 °C, gain = 1, exposure time = 4 msec

|                      |                                                     |
|----------------------|-----------------------------------------------------|
| Dark Noise (σ)       | 3 e- typical                                        |
| Saturation           | 9500 e- typical                                     |
| Dynamic Range        | 70 dB typical                                       |
| SNR                  | 40 dB typical                                       |
| Quantum efficiency η | 47 % @ 465 nm, 58 % @ 536 nm, 53 % @ 631 nm typical |

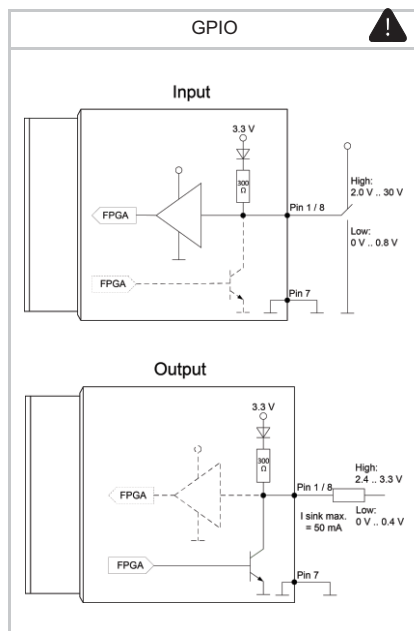
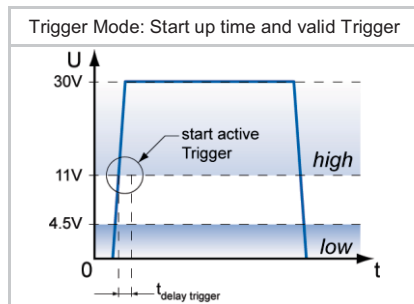
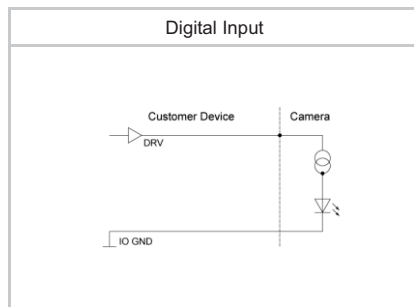
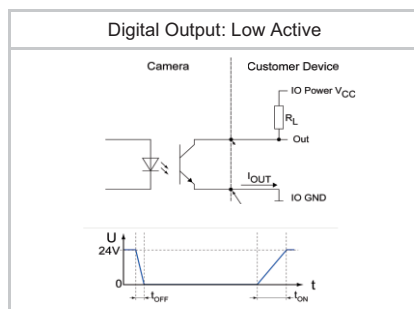
### Acquisition

|                                                                 |                                                                                                                                                                      |            |                                                   |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------------------------------------|
| Resolution                                                      | 720 px x 540 px                                                                                                                                                      |            |                                                   |
| Interface Frame Rate<br>(depends on used interface performance) | Format                                                                                                                                                               | Resolution | max. Frame Rate<br>(@ Trigger Mode) <sup>2)</sup> |
|                                                                 | Full Frame                                                                                                                                                           | 720 × 540  | 318 fps                                           |
|                                                                 | Binning 2x2                                                                                                                                                          | 360 × 270  | 436 fps                                           |
|                                                                 | Binning 2x1                                                                                                                                                          | 360 × 540  | 436 fps                                           |
|                                                                 | Binning 1x2                                                                                                                                                          | 720 × 270  | 436 fps                                           |
| Acquisition Frame Rate <sup>1)</sup><br>(Burst Mode)            | 441 fps   t <sub>readout</sub> = 2.27 msec (max. Res. Full Frame) @ 10 bit<br>323 fps   t <sub>readout</sub> = 3.1 msec (max. Res. Full Frame) @ 12 bit              |            |                                                   |
| Pixel Formats                                                   | BayerRG8, BayerRG10, BayerRG12, BayerRG12p<br>Mono8, Mono10, Mono12, Mono12p, RGB8, BGR8                                                                             |            |                                                   |
| Partial Scan                                                    | True Partial Scan with increasing Frame Rate on Y direction, Region of Interest (ROI) arbitrary<br>Width: minimum 16, increment 16<br>Height: minimum 4, increment 4 |            |                                                   |
| Adjustable Acquisition Frame Rate                               | Off or Off or 0,01 ... 5154 Hz                                                                                                                                       |            |                                                   |
| Acquisition Mode                                                | Continuous, Single Frame and Multi Frame                                                                                                                             |            |                                                   |
| Acquisition Status                                              | AcquisitionActive, AcquisitionTrigger Wait                                                                                                                           |            |                                                   |
| Exposure Mode                                                   | Timed                                                                                                                                                                |            |                                                   |
| Readout Mode                                                    | Overlapped, Sequential                                                                                                                                               |            |                                                   |

### Image Pre-Processing

|                         |                                                                                                                    |
|-------------------------|--------------------------------------------------------------------------------------------------------------------|
| Analogue Controls       | Exposure Time (1 μsec ... 60 sec   Step Size 1 μsec)<br>Gain (0 ... 48 dB), Offset (0 ... 255 LSB   12 bit)        |
| Gamma Correction        | Gamma (0.1 ... 2   available if LUT is enabled)                                                                    |
| LUT                     | Luminance (12 bit)                                                                                                 |
| Color Models            | Mono, Raw Bayer, RGB and BGR                                                                                       |
| Color Processing        | Integrated color processor for high quality color calculation                                                      |
| Color Adjustment        | Manual White Balance<br>Automatic White Balance (Once or Continuous)                                               |
| Color Enhancement       | Color Transformation to sRGB color space by optimized Matrix for 6500 K, 3000 K Lightsource or User defined Matrix |
| Color Tolerance         | -                                                                                                                  |
| Binning Horizontal      | 1 or 2                                                                                                             |
| Binning Vertical        | 1 or 2                                                                                                             |
| Image Flipping          | Horizontal, vertical                                                                                               |
| Defect Pixel Correction | via Defect Pixel List with up to 512 Pixel Coordinates                                                             |
| Fix Pattern Noise       | -                                                                                                                  |
| Correction              | -                                                                                                                  |

The Information in this document is subject to change without notice.



<sup>1)</sup> Sensor readout, different from pixel format

## Process Synchronization

|                      |                                                                                                                                                                                                                                                                     |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Trigger Mode         | Off (Free Running), On (Trigger)                                                                                                                                                                                                                                    |
| Trigger Overlap Type | Readout                                                                                                                                                                                                                                                             |
| Trigger Sources      | Hardware (Line0,1,2), Software, All, ActionCMD (Action 1) or Off<br>fixed Trigger Delay out of treadout: <sup>1)</sup><br>44,5 µsec @ 10 bit<br>48,6 µsec @ 12 bit<br>max. Trigger Delay during treadout: <sup>1)</sup><br>43,5 µsec @ 10 bit<br>49,1 µsec @ 12 bit |
| Trigger Delay        | 0 ... 2 sec, Tracking and buffering of up to 256 triggers                                                                                                                                                                                                           |
| External Flash Sync  | via Exposure Active<br>$t_{\text{delay flash}} \leq 3 \mu\text{sec}$ , $t_{\text{duration}} = t_{\text{exposure}}$                                                                                                                                                  |

## Digital I/Os

|                |                                                                                              |
|----------------|----------------------------------------------------------------------------------------------|
| Lines          | Input: Line 0, Output: Line3, GPIO: Line 1, Line 2                                           |
| Output Sources | Off, ExposureActive, Timer1, ReadoutActive, UserOutput 1-3 and TriggerReady                  |
| Line Debouncer | Low and high signal separately selectable<br>Debouncing Time 0 ... 5 msec, Step Size: 1 µsec |

## Memory

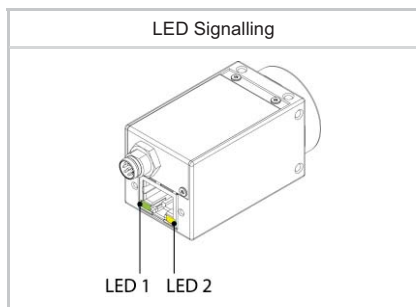
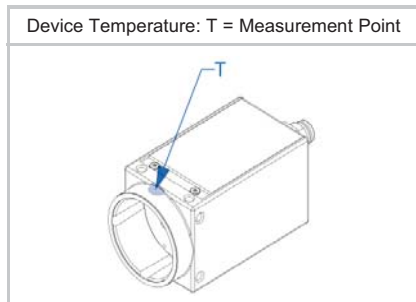
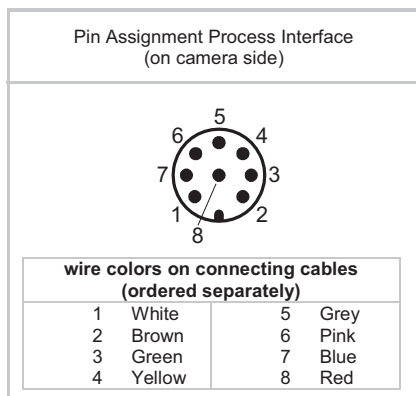
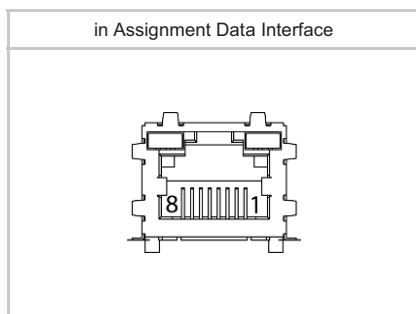
|                     |                                                               |
|---------------------|---------------------------------------------------------------|
| Image Buffer        | 9 MB<br>8 Images (Trigger Mode) / 1 Image (Free Running Mode) |
| Non-volatile Memory | 128 kb                                                        |

## Network Interface Data

|                           |                                                                                      |
|---------------------------|--------------------------------------------------------------------------------------|
| Interface                 | Gigabit Ethernet 1000BASE-T 1000 Mbits/sec<br>Fast Ethernet 100 BASE-T 100 Mbits/sec |
| Ethernet IP Configuration | Persistent IP, DHCP, LLA                                                             |
| Packet Size               | 576 ... 9000 Byte, Jumbo Frames supported                                            |

## GigE Vision<sup>®</sup> Features

|               |                                                                                                                                                                                                                                                                                                                     |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Events        | DeviceTemperatureStatusChanged, EventLost, ExposureEnd, ExposureStart, FrameEnd, FrameStart, FrameTransferSkipped, Error, GigEVisionHeartbeatTimeout, Line0..3 FallingEdge, Line0..3 RisingEdge, PrimaryApplicationSwitch, TransferBufferFull, TransferBufferReady, TriggerOverlapped, TriggerReady, TriggerSkipped |
| Action CMD    | yes, Action 1 for Trigger                                                                                                                                                                                                                                                                                           |
| Frame Counter | up to 2 <sup>32</sup>                                                                                                                                                                                                                                                                                               |
| Payload Size  | 0 ... 1166600 Byte                                                                                                                                                                                                                                                                                                  |
| Timestamp     | 64 bit, resolution in nsec, increment = 8                                                                                                                                                                                                                                                                           |
| Packet Delay  | 0 .. 2 <sup>32</sup> - 1 nsec                                                                                                                                                                                                                                                                                       |
| Packet Resend | Resend Buffer: 9 MB (8 Images)                                                                                                                                                                                                                                                                                      |
| GigE Vision   | v2.0 (v1.2 backward compatible)                                                                                                                                                                                                                                                                                     |



## Interfaces and Connectors

|                          |                  |                                           |                  |
|--------------------------|------------------|-------------------------------------------|------------------|
| Data and Power Interface | Gigabit Ethernet | Transfer Rate                             | 1000 Mbits/sec   |
|                          | Fast Ethernet    | Transfer Rate                             | 100 Mbits/sec    |
| Connector:               |                  | 8P8C Modular Jack (RJ45), screw lock type |                  |
| Assignment:              | 1 - MX1+         | 2 - MX1-                                  |                  |
|                          | 3 - MX2+         | 4 - MX3+                                  |                  |
|                          | 5 - MX3-         | 6 - MX2-                                  |                  |
|                          | 7 - MX4+         | 8 - MX4-                                  |                  |
| Process Interface        | Connector:       | M8/8-pin<br>(SACC-DSI-M8MS-8CON-M8-L180)  |                  |
|                          | Assignment:      | 1 - GPIO (Line2)                          | 2 - Power Vcc    |
|                          |                  | 3 - IN1 (Line0)                           | 4 - GND IN1      |
|                          |                  | 5 - Power VCC OUT                         | 6 - OUT1 (Line3) |
|                          |                  | 7 - GND (Power, GPIO)                     | 8 - GPIO (Line1) |

Caution



\* Note GPIOs: Ground loops are to be avoided and can lead to destruction of the device.

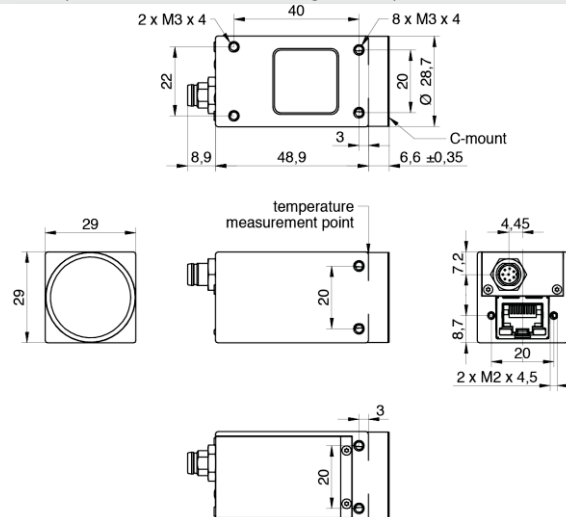
## Optical Data

|                |               |
|----------------|---------------|
| Lens Mount     | C-Mount       |
| Optical Filter | IR cut filter |

## Mechanical Data

|         |                                                                                    |
|---------|------------------------------------------------------------------------------------|
| Housing | Zinc die casting, nickel-chrome-plated,<br>IP40 (with mounted lens and GigE cable) |
|---------|------------------------------------------------------------------------------------|

### Dimensions



|        |       |
|--------|-------|
| Weight | 120 g |
|--------|-------|

## Environmental Data

|                       |                                                                                                  |
|-----------------------|--------------------------------------------------------------------------------------------------|
| Storage Temperature   | -10 °C ... + 70 °C                                                                               |
| Operating Temperature | +5 °C ... +65 °C @ T = Measurement Point or<br>*) +5 °C ... +75 °C @ internal Temperature Sensor |
|                       | Ambient temperature above 34 °C requires heat dissipation measures.                              |
| Int. Temperature      | yes, accuracy:                                                                                   |
| Sensor                | ±1 °C (typ) 0 °C ... +85 °C                                                                      |
| Humidity              | 10 % ... 90 % non-condensing                                                                     |

\*) the maximum temperature for Sony sensor characteristics (sensor performance) are guaranteed up to 50°C @ Measurement Point or 60°C @ internal temperature sensor

## LED Signalling

|     |              |           |
|-----|--------------|-----------|
| LED | Green flash  | RX active |
|     | Green        | Link ON   |
|     | Yellow       | Error     |
|     | Yellow flash | TX active |

## Electrical Data

|                      |                                                                                                                                                                                                                                                                                           |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power Supply (ext.)  | VCC: 12 ... 24 V DC $\pm$ 20%<br>I: 96 ... 194 mA                                                                                                                                                                                                                                         |
| Power over Ethernet  | Class 1 device<br>VCC: 36 ... 57 V DC<br>I: 65 mA @ 48 VDC                                                                                                                                                                                                                                |
| Power Consumption    | approx. 2.3 W @ 12VDC and 318 fps<br>approx. 3.1 W @ 48 VDC (PoE) and 318 fps<br>(Factory Setting "Default")                                                                                                                                                                              |
| Digital Input        | Optocoupler<br>$U_{IN(low)}$ : 0.0 ... 4.5 VDC<br>$U_{IN(high)}$ : 11.0 ... 30.0 VDC<br>$I_{IN}$ : 3.0 ... 10.0 mA<br>min. Impulse Length: 2.0 $\mu$ sec                                                                                                                                  |
| Digital Output       | Optocoupler<br>$U_{EXT}$ : 5 ... 30 V DC<br>$I_{OUT}$ : max. 50 mA<br>$t_{ON}$ = typ. 3 $\mu$ sec $t_{OFF}$ = typ. 40 $\mu$ sec                                                                                                                                                           |
| GPIO                 | direct, without optocoupler                                                                                                                                                                                                                                                               |
| GPIO used as Input:  | $U_{IN(low)}$ : 0.0 ... 0.8 VDC<br>$U_{IN(high)}$ : 2.0 ... 30.0 VDC<br>min. Impulse Length: 2.0 $\mu$ sec                                                                                                                                                                                |
| GPIO used as Output: | $U_{Out(low)}$ : 0.0 ... 0.4 VDC ( $I_{sink\ max}$ : 50 mA)<br>$U_{Out(high)}$ : 2.4 ... 3.3VDC ( $I_{max}$ : 1 mA)                                                                                                                                                                       |
| Caution              | * The General Purpose I/Os (GPIOs) are not potential-free and do not have an overrun cut-off. Incorrect wiring (overvoltage, undervoltage or voltage reversal) can lead to defects in the electronic system.<br>Ground loops are to be avoided and can lead to destruction of the device. |

## Conformity

|                            |                                                                      |
|----------------------------|----------------------------------------------------------------------|
| Conformity                 | CE, RoHS, REACH                                                      |
| KC Registration No. / Date | - / -                                                                |
| MTBF                       | 58 years @ T = 45 °C / 37 years @ T = 60 °C<br>T = Measurement Point |

## GenICam™ Features

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Short Exposure Range | yes, ShortExposureTimeEnable<br>Short Exposure Range 1 $\mu$ sec ... 60 sec<br>Default Exposure Range 15 $\mu$ sec ... 60 sec                                                                                                                                                                                                                                                                                                                                                                      |
| Timer                | Timer Selector: Timer 1<br>TimerTriggerSource:<br>Line0, SoftwareTrigger, ExposureStart, ExposureEnd, FrameTransferSkipped, TriggerSkipped, Off<br>TimerDelay: 0 $\mu$ sec ... 2 sec, Step Size: 1 $\mu$ sec<br>TimerDuration: 4 $\mu$ sec ... 2 sec, Step Size: 1 $\mu$ sec                                                                                                                                                                                                                       |
| Counter              | Counter Selector: Counter 1, Counter 2<br>CounterValue: 0 ... 65535<br>Counter Event Source: Counter1End or Counter2End, ExposureActive, FrameTransferSkipped, FrameTrigger, TriggerSkipped and Off<br>Counter Reset Source: Counter1End, Counter2End, Line0 and Off                                                                                                                                                                                                                               |
| Sequencer            | Sequencer Characteristics:<br>up to 128 sets,<br>up to 4 possible pathes for triggered set transitions,<br>6 trigger sources: Counter1End, Counter2End, ExposureActive, Line0, ReadoutActive, Timer1End<br>Sequencer Parameters for Exposure, Gain, Trigger, ROI and Output:<br>ExposureTime, CounterDuration, CounterEventActivation, CounterEventSource, CounterResetSource, ExposureMode, ExposureTime, Gain, Height, OffsetX, OffsetY, TriggerMode, UserOutputValue, UserOutputValueAll, Width |

## GenICam™ Features

|                              |                                                                                                                                                                   |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| User Sets                    | Factory Settings: UserSet0 (read only)<br>Freely Programmable: UserSet1, UserSet2, UserSet3<br>Parameters: any user definable Parameter                           |
| Acquisition Abort            | Delay up to 3.1 msec                                                                                                                                              |
| Chunk Data                   | yes,<br>Chunk Selector: Binning, Black Level, DeviceTemperature, ExposureTime, FrameID, Gain, Height, Image, ImageControl, LineStatusAll                          |
| Device Temperature           | InHouse<br>Event generation for Normal to High, High to Exceeded and Exceeded to Normal<br>Exceeded (no image transfer) = max. internal temperature sensor + 1 °C |
| Device Link Throughput Limit | yes, up to max. Device Link Speed                                                                                                                                 |
| SFNC Version                 | v2.3                                                                                                                                                              |

## Factory Settings after Start-Up

|                                |                                                |
|--------------------------------|------------------------------------------------|
| Trigger Mode                   | Off (Free Running)                             |
| Analog Controls                | Exposure Time: 4 msec, Gain: 0 dB, Offset: 0   |
| Pixel Format                   | BayerRG8                                       |
| Partial Scan                   | Off                                            |
| Acquisition Frame Rate         | Off                                            |
| Timer/Counter/Sequencer        | Off                                            |
| Defect Pixel Correction        | ON                                             |
| Fixed Pattern Noise Correction | -                                              |
| Digital Input                  | Line0, invert = false                          |
| Digital Output                 | Line3, invert = false, line source = Off       |
| GPIO 1/2                       | Line1, Line2, invert = false, LineMode = Input |
| TriggerSource                  | All                                            |

## Partial Scan @ FullFrame, min Exposure, Mono8 or BayerRG8

|          | Resolution | max. fps acquisition | max. fps interface <sup>2)</sup> |
|----------|------------|----------------------|----------------------------------|
| VGA      | 640 x 480  | 484                  | 402                              |
| CIF      | 352 x 288  | 755                  | 755                              |
| QCIF     | 176 x 144  | 1304                 | 1304                             |
| LineScan | 720 x 512  | 456                  | 335                              |
|          | 720 x 256  | 833                  | 670                              |
|          | 720 x 128  | 1419                 | 1339                             |
|          | 720 x 64   | 2185                 | 2185                             |
|          | 720 x 32   | 2997                 | 2994                             |
|          | 720 x 16   | 3681                 | 3648                             |
|          | 720 x 8    | 4156                 | 4156                             |
|          | 720 x 4    | 4432                 | 4431                             |
|          | 720 x 2    | 4432                 | 4425                             |
|          | 720 x 1    | -                    | -                                |

<sup>2)</sup> depends on the used interface

Distribution in the UK & Ireland



### Lambda Photometrics Limited

Lambda House Batford Mill  
Harpenden Herts AL5 5BZ  
United Kingdom

E: [info@lambdaphoto.co.uk](mailto:info@lambdaphoto.co.uk)

W: [www.lambdaphoto.co.uk](http://www.lambdaphoto.co.uk)

T: +44 (0)1582 764334

F: +44 (0)1582 712084