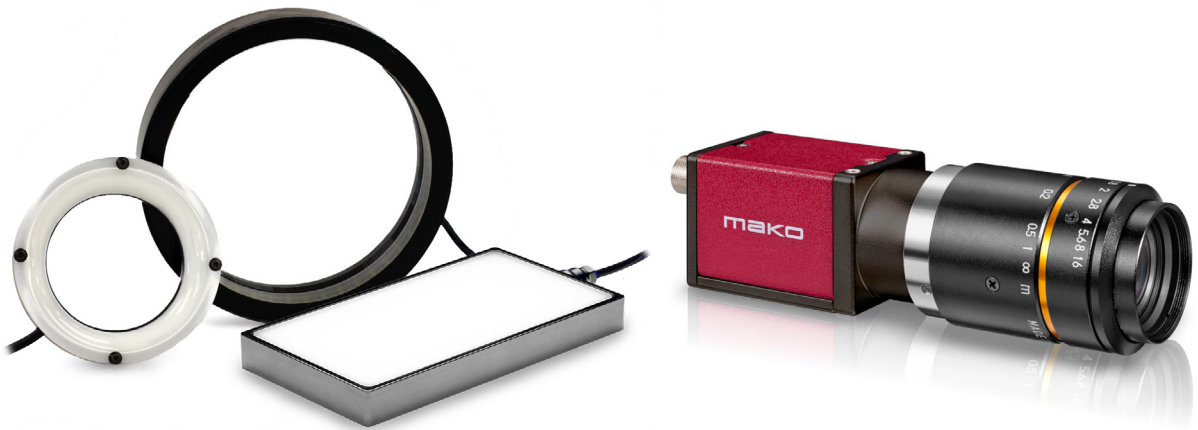


APPLICATION NOTE

Ai Lighting with Mako Cameras

Ai Lighting and Controllers, Equipment Specifications, Connections, SignaTech™, and Lighting Configurability.

V2.0.0
2021-JULY-08



Scope

This document details the compatibility between Advanced illumination controllers and lighting products with Mako cameras. The following information includes Ai lighting controller categories, their differing capabilities, detailed technical specifications, and unique advantages of deploying Ai lights and controllers in conjunction with Mako cameras.

Precautions



NOTICE

Damage to the connected devices

Read the manufacturer documentation before connecting the components.

Lighting with Ai

Ai lights are engineered with high power LEDs for maximum intensity. Each light features LEDs fully characterized with SignaTech™ (Signature Technology), Advanced illumination's proprietary control system that allows Ai lights to operate at maximum output under any operating conditions, all while protecting the light head from damage.



Triggering Ai lights with Mako cameras

To trigger Ai lights with a camera, you can use the DCS-100E controller on page 5 or any other Ai control unit that allows you to achieve the result desired.

Bar Lights

Bar Lights, also known as Linear Array Lights, offer both bright field and dark field illumination, depending on angle of incidence. Because of the variety of lengths available, Bar Lights are useful for large area illumination when used in opposing pairs or in a picture frame mounting orientation.

<https://www.advancedillumination.com/products/category/bar-light/>



Backlights

Backlighting provides an area of uniform illumination, oriented behind the object of interest, primarily for creating a part silhouette of instant contrast between dark and light. It is most useful for edge detection, part location/orientation or presence/absence, hole detection, and object gauging.

<https://www.advancedillumination.com/products/category/backlight/>



Dark Field Ring Lights

Dark Field Ring Lights provide illumination that is projected at a shallow angle to the imaging surface, 45 degrees or less. Typical applications include reflective flat surface defect or edge detection, where the majority of the light may reflect away from the camera on the flat, featureless surface, but defects may scatter the light to the camera, creating feature-appropriate contrast.

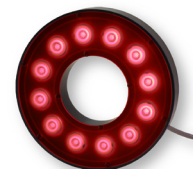
<https://www.advancedillumination.com/products/category/dark-field-ring-light/>



Bright Field Ring Lights

Bright Field Ring Lights provide illumination directly onto an object, at angles of incidence above 45 degrees horizontal, creating distinct shadows or general purpose illumination, depending on subject features. Highly effective when used on non-specular objects requiring high degrees of contrast.

<https://www.advancedillumination.com/products/category/ring-light-bright-field/>



Spot Lights

Spot Lights are typically characterized as general-purpose illuminators, used to create both bright field and dark field effects, depending on the light angle of incidence.

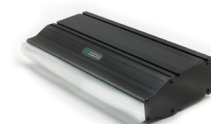
<https://www.advancedillumination.com/products/category/spot-light/>



Line Lights

Line lights, as opposed to Linear Array Bar Lights, employ a secondary lens to focus the light into a narrow beam, typically for short to intermediate working distances. Line Lights are mostly used in conjunction with line scan cameras and are typically mounted in a medium to high angle bright field orientation.

<https://www.advancedillumination.com/products/category/line-light/>



Coaxial Lights

Coaxial Lights provide a type of diffuse illumination, generated from an internal source. The light is then deflected downward onto the imaging plane via a 50% beamsplitter, which allows light from the object to be collected by the camera above. Ideal for imaging highly reflective objects or where the area of inspection is obscured by shadows from its surroundings.

<https://www.advancedillumination.com/products/category/coaxial-light/>



Diffuse Lights

Diffuse Lights, also known as “cloudy-day illumination” provide non-directional, soft illumination that is free of shadowing. This effect is well suited for inspecting highly specular and curved objects, but at close working distances.

<https://www.advancedillumination.com/products/category/diffuse-light/>



Discrete Control Systems

Discrete Control Systems (DCS) are dedicated external controllers that feature plug-and-play operation using Ai’s proprietary SignaTech™ (**Signature Technology**). Depending on the configuration, DCS controllers can support built-in pre-programmed sequencing for computational imaging, multi-channel control for RGB lighting, as well as high power pulsing for high-speed imaging analysis. Discrete controllers offer the most versatility for a control category while maintaining simple operation.

<https://www.advancedillumination.com/products/category/controllers/>



Inline Control Systems

Inline Control Systems (ICS) are cable-based controllers that provide steady and optimal power to light head assemblies using hard-coded current limiters that match each light’s peak output. ICS controllers have the advantage of being situated outside of the light head, drawing heat generated by the control electronics away from the LEDs, when compared to embedded control systems (ECS). This allows for lower LED junction temperatures, improving light longevity. Inline controllers are available in both overdrive strobe and continuous configurations.

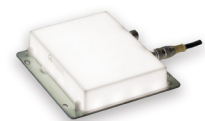
<https://www.advancedillumination.com/products/category/controllers/>



Embedded Control Systems

Embedded Control Systems (ECS) are closely integrated controllers built into each light head assembly. Embedded controllers are limited to a select number of lighting products but offer similar control advantages to Inline Control Systems. Being situated within the light head, ECS controlled lights do not require any additional controller in order to operate in both continuous and overdrive strobe modes.

<https://www.advancedillumination.com/eurobrite/>



Ai Controller Matrix

| | 24V Light | iCS 2 (1C) | iCS 3 (13) | iCS 3S (13S) | EuroBrite | DCS-100E | DCS-103E | DCS-400E | DCS-800E | Pulsar 320E |
|--------------------------------------|-----------|-----------------|-----------------|-----------------|-----------|----------|----------|----------|----------|-------------|
| Embedded Control System (In-light) | N/A | ✗ | ✗ | ✗ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ |
| In-line Control System (On-cable) | N/A | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ |
| Discrete Control System (Detachable) | N/A | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Continuous Mode | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ |
| Overdrive Strobe Mode | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| TCP/IP Ethernet Connectivity | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Analog Light Dimming Circuit | ✗ | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ |
| Gating On/Off Trigger Circuit | N/A | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Default-On Device Upon Power-Up | ✓ | ✓ | ✓ | ✗ | ✗ | N/A | N/A | N/A | N/A | N/A |
| IP Rating | N/A | 67 ² | 67 ² | 67 ² | 67 | N/A | N/A | N/A | N/A | N/A |

| | | | | | | | | | | |
|---|------------|------|------|------|------------------|-----|-----|------------------|------------------|-----|
| Max Number of Lights Connected/Controlled | 1 | 1 | 1 | 1 | 1-4 ³ | 1 | 1-3 | 1-4 | 1-8 | 2 |
| DC Input Voltage (Nominal) | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24,48 | 24,48 | 24 |
| Max Current per Output - Continuous (A) | PS Limited | 1.25 | 1.25 | 1.25 | 1.25 | 4.5 | 1.5 | 0.5 | 0.5 | N/A |
| Max Current per Output - Strobe(A) | N/A | N/A | 8 | 8 | 8 | 15 | 5 | 5/10@ 24v/48v | 5/10@ 24v/48v | 50 |

| | | | | | | | | | | |
|-------------------------------------|-----|-----------------|-----------------|-----|-----|----------------|----------------|--------------|--------------|--------|
| Trigger Delay (µs) | N/A | 20 ⁴ | 20 ⁴ | 20 | 20 | 20 | 20 | 20 | 20 | <2 |
| Input Trigger Pulse-Width Pass-Thru | N/A | ✓ ⁴ | ✓ ⁴ | ✓ | ✓ | ✓ ⁵ | ✓ ⁵ | ✗ | ✗ | ✗ |
| Output Pulse Width Range (µs) | N/A | 30 ⁴ | 30 ⁴ | 30+ | 30+ | 30-65k | 30-65k | 30- 3600k | 30- 3600k | 1-100K |

| | | | | | | | | | | |
|-----------------------|---|---|---|---|---|---|---|---|---|-----|
| RGB Light Control | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✗ | ✓ | ✓ | N/A |
| Computational Imaging | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ✗ |

¹ Separate 5-pin A-coded M12 power/trigger cable required.

² Must be ordered with an IP67+ rated light, otherwise comes IP50 rated as standard.

³ EuroBrite Bar Light, Large Spot Light, and Backlights can be daisy-chained up to 4 units.

⁴ Default-on device - gates light off when triggered to strobe.

⁵ In gated continuous mode only - no overdrive pass-thru.

Triggering Ai Lights

The following diagram shows a typical trigger setup between a Mako camera and an Ai light using a DCS-100E controller as an example. Advanced illumination offers a wide variety of controllers capable of connecting to Mako cameras.

Setup

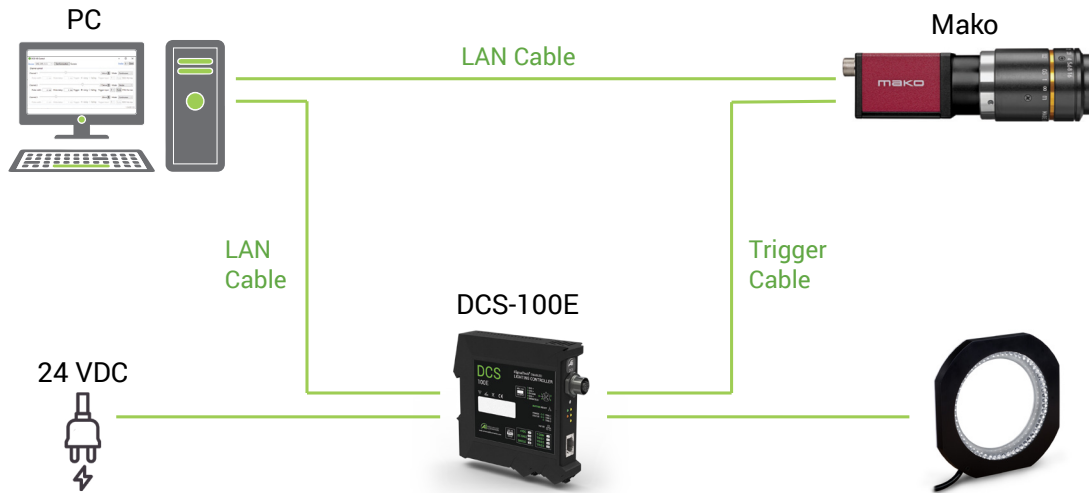


Figure 1: Application setup with Mako triggering Ai Lights

Note: DCS-100E is not PoE enabled.

Required Hardware

Table 1 lists the included components. Bullets show where you can select between various items.

| Component | Product | Product Details |
|--|---------------------------------|--|
| Camera | Mako | All models |
| Camera I/O cable | Hirose 8-pin female to open end | <ul style="list-style-type: none"> • K1200196 (2 m) • K1200197 (5 m) |
| Light control unit | Ai control unit | DCS-100E |
| Lighting system | Ai light | See Ai lighting categories on page 2 and 3. |
| Extension cable between Ai lights and DCS-100E | Female to male | <ul style="list-style-type: none"> • LC1S-C1 (1 m) • LC2S-C1 (2 m) • LC3S-C1 (3 m) • LC5S-C1 (5 m) |
| I/O cable | User supplied | See DCS wiring specifications on page 6 |

Table 1: Required hardware

DCS-100E and DCS-103E Specifications

| | DCS-100E | DCS-103E |
|---------------------------|--|--|
| Operating Modes | Pulse (Overdrive Strobe), Gated Continuous, Continuous | |
| Input Supply Requirements | 24 V DC Nominal, 4.5 A Recommended 21 V Min - 30 V Max; Power Inputs Reverse-Polarity Protected | |
| Output Channels | Number of Outputs: 1 Number of Channels per Output: 3 | Number of Outputs: 3 Number of Channels per Output: 1 |
| Output Power | Continuous: 90 W Max Total, 30 W per Channel* Pulsed: 540 W Peak Total, 180 W Peak per Channel* | |
| Pulse Width Range | 30 μ s - 65 ms | |
| Trigger Frequency Limit | 2 KHz | |
| Trigger Delay | 20 μ s | |

Table 2: DCS-100E and DCS-103E Specifications

DCS-100E and DCS-103E Pinout Functions

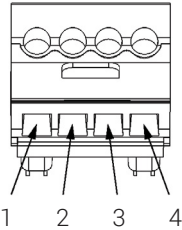
| Input Terminal Pinout | Pin | DCS-100E and DCS-103E Functions |
|---|-----|---------------------------------|
|  | 1 | Common Ground |
| | 2 | Trigger Input 1 |
| | 3 | Trigger Input 2 |
| | 4 | Trigger Input 3 |

Table 3: DCS-100E and DCS-103E Pinout Functions

DCS-100E and DCS-103E I/O CONNECTIONS

Mako Camera

DCS-100E/103E Controller

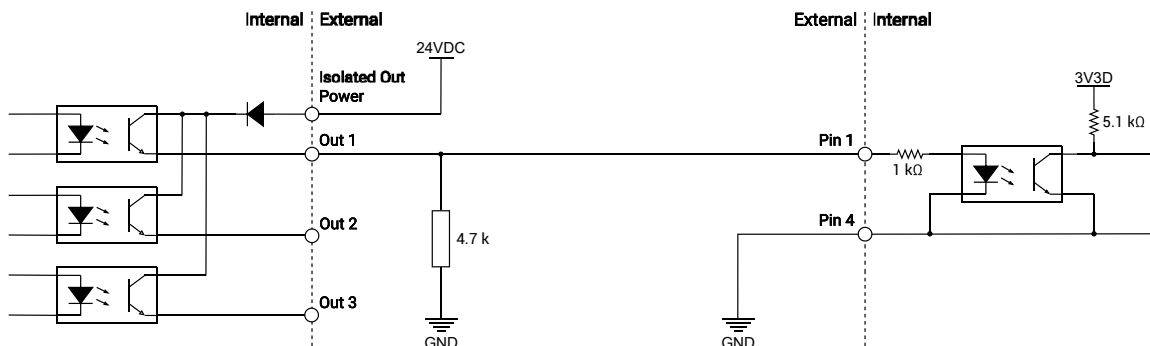


Figure 2: Mako output trigger to DCS-100E and DCS-103E input.

For more technical information on how to operate a DCS-100E and DCS-103E controller, please refer to the following manual: https://www.advancedillumination.com/wp-content/uploads/2019/05/DCS_Series_Manual_V2.pdf

DCS-400E and DCS-800E Specifications

| | DCS-400E | DCS-800E |
|---------------------------|--|---|
| Operating Modes | Sequence, Pulse (Overdrive Strobe), Continuous | |
| Input Supply Requirements | 24 V DC Nominal, 4.5 A Recommended 21 V Min - 48 V Max; Power Inputs Reverse-Polarity Protected | |
| Output Channels | Number of Outputs: 1 Number of Channels per Output: 4 | Number of Outputs: 2 Number of Channels per Output: 4 |
| Output Power | Continuous: 60 W Max Total, 15 W per Channel Pulsed: 480 W Peak Total, 120 W Peak per Channel | Continuous: 120 W Max Total, 30 W per Channel Pulsed: 960 W Peak Total, 120 W Peak per Channel |
| Pulse Width Range | 30 μ s - 3600 ms | |
| Trigger Frequency Limit | 2 KHz | |
| Trigger Delay | 20 μ s | |

Table 4: DCS-400E and DCS-800E Specifications

DCS-400E and DCS-800E Pinout Functions

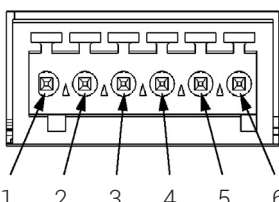
| Input Terminal Pinout | Pin | DCS-400E and DCS-800E Functions |
|---|-----|---------------------------------|
|  | 1 | Trigger Input 1 |
| | 2 | Trigger Input 2 |
| | 3 | Trigger Output 1 |
| | 4 | Trigger Output 2 |
| | 5 | Common Ground |
| | 6 | Common Ground |

Table 5: DCS-400E and DCS-800E Pinout Functions

DCS-400E and DCS-800E I/O Connections

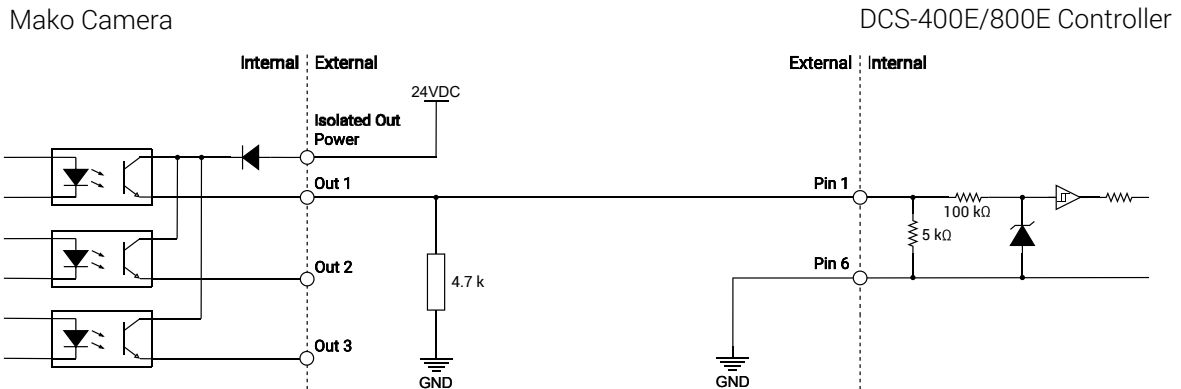


Figure 3: Mako output trigger to DCS-400E and DCS-800E input.

For more technical information on how to operate a DCS-400E and DCS-800E controller, please refer to the manual: https://www.advancedillumination.com/wp-content/uploads/2019/08/050167_DCS400_800_Manual_v1.1.pdf

Pulsar 320E Specifications

| | Pulsar 320E |
|---------------------------|---|
| Operating Modes | Pulse (Overdrive Strobe) |
| Input Supply Requirements | 24 V DC Nominal, 4.0 A Recommended 21 V Min - 30V Max; Power Inputs Reverse-Polarity Protected |
| Output Channels | Number of Outputs: 2 Number of Channels per Output: 1 |
| Output Power | Pulsed: 5000 W Peak Total, 2500 W Peak per Channel |
| Pulse Width Range | 30 μ s - 100 ms |
| Trigger Frequency Limit | 2 KHz |
| Trigger Delay | < 2 μ s |

Table 6: Pulsar 320E Specifications

Pulsar 320E Pinout Functions

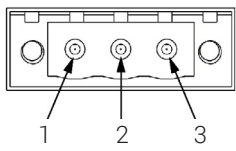
| Input Terminal Pinout | Pin | Pulsar 320E Functions |
|---|-----|-----------------------|
|  | 1 | Trigger Input 1 |
| | 2 | Trigger Input 2 |
| | 3 | Common Ground |

Table 7: Pulsar 320E Pinout Functions

Pulsar 320E I/O Connections

Mako Camera

Pulsar 320E Controller

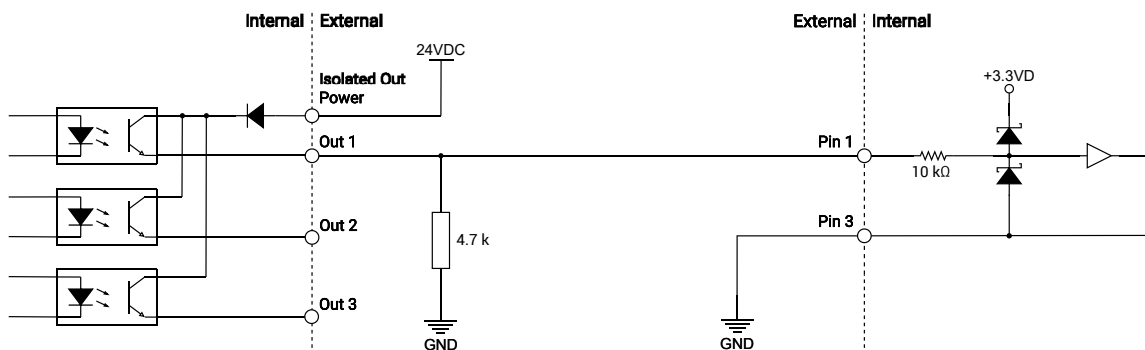


Figure 4: Mako output trigger to Pulsar 320E input.

For more technical information on how to operate a Pulsar 320E controller, please refer to the following manual:
https://www.advancedillumination.com/wp-content/uploads/2018/11/P320_Manual.pdf

IC, I3, and I3S Specifications

| | IC | I3 & I3S |
|---------------------------|---|--|
| Operating Modes | Gated Continuous, Continuous | Pulse (Overdrive Strobe), Gated Continuous, Continuous |
| Input Supply Requirements | 24 V DC Nominal, 1.25 A Recommended 21 V Min - 30 V Max; Power Inputs Reverse-Polarity Protected | |
| Output Power | Continuous: 25 W Max | Continuous: 25 W Max Pulsed: 125 W Peak Max |
| Pulse Width Range | 30 μ s - ∞ | |
| Trigger Frequency Limit | 2 KHz *Requires Duty Cycle \leq 1% beyond 1KHz | |
| Trigger Delay | 20 μ s | |
| Trigger Interaction | N/A | I3: Default ON Device I3S: Default OFF Device |

Table 8: IC, I3 and I3S Specifications

IC, I3 and I3S Pinout Functions

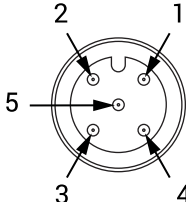
| Optional A-coded M12 Pinout | Pin (M12) | Wire Color (Flying Leads) | IC Functions | I3 & I3S Functions |
|---|-----------|---------------------------|-----------------------|-------------------------|
|  | 1 | Brown | 24 V DC | 24 V DC |
| | 2 | White | 0-10 V Analog Control | Shield |
| | 3 | Blue | DC GND | DC GND |
| | 4 | Black | GLO | PNP/Active High Trigger |
| | 5 | Gray | N/A | 0-10 V Analog Control |

Table 9: IC, I3 and I3S Pinout Functions

I3 and I3S I/O Connections

Mako Camera

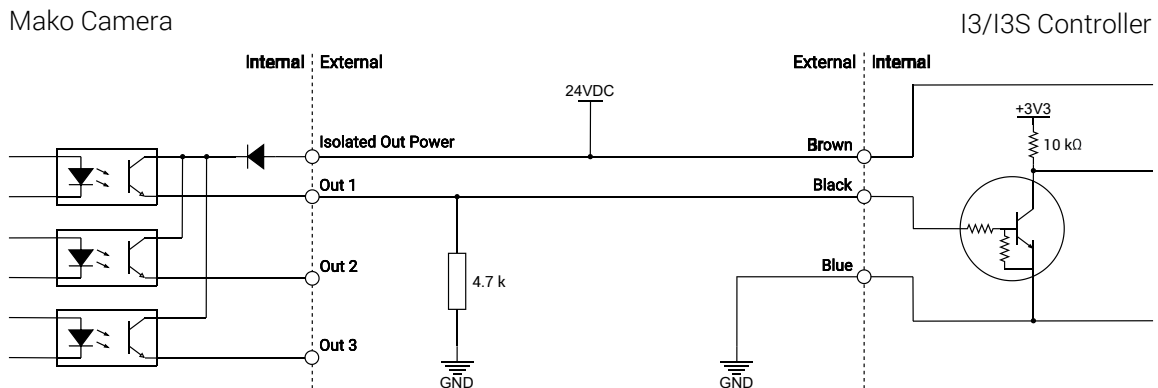


Figure 5: Mako output trigger to I3 and I3S input.

For more technical information on how to operate a IC, I3 or I3S controller, please refer to the following webpages:

IC: <https://www.advancedillumination.com/products/ics-2-0-inline-constant-current-source/>

I3 & I3S: <https://www.advancedillumination.com/products/i3-inline-constant-current-source/>

EuroBrite Control Specifications

| | EuroBrite |
|---------------------------|---|
| Operating Modes | Pulse (Overdrive Strobe), Gated Continuous, Continuous |
| Input Supply Requirements | 24 V DC Nominal, 1.25 A Recommended 21 V Min - 30 V Max; Power Inputs Reverse-Polarity Protected |
| Output Power | Continuous: 25 W Max Pulsed: 125 W Peak Max |
| Pulse Width Range | 30 μ s - ∞ |
| Trigger Frequency Limit | 2 KHz *Requires Duty Cycle \leq 1% beyond 1 KHz |
| Trigger Delay | 20 μ s |
| Trigger Interaction | Default ON device that strobes OFF when triggered |

Table 10: EuroBrite Control Specifications

EuroBrite Pinout Functions

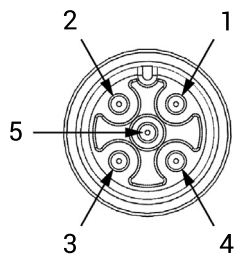
| M12 Pinout | Pin | EuroBrite Functions |
|---|-----|-------------------------|
|  | 1 | 24 V DC |
| | 2 | Shield |
| | 3 | DC GND |
| | 4 | PNP/Active High Trigger |
| | 5 | 0-10 V Analog Control |

Table 11: EuroBrite Pinout Functions

EuroBrite I/O Connections

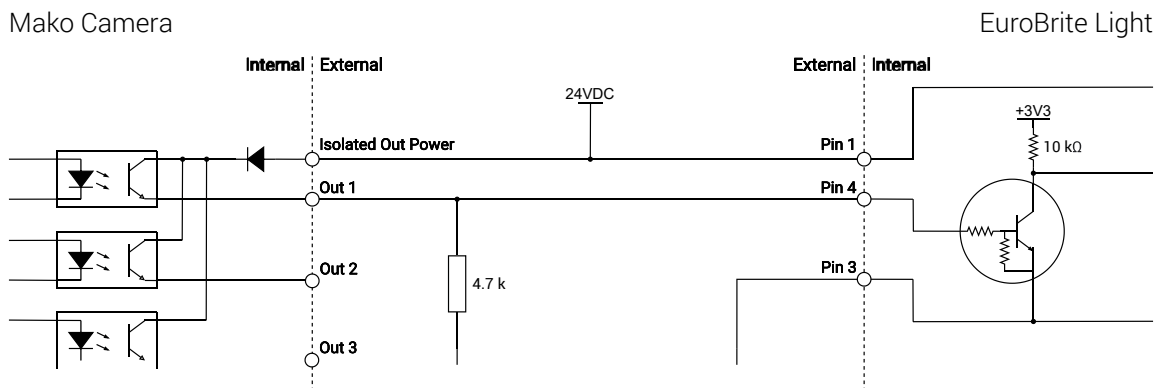


Figure 6: Mako output trigger to EuroBrite input.

For more information on EuroBrite lights, please refer to the following webpage:
<https://www.advancedillumination.com/eurobrite/>

Lighting with EuroBrite

EuroBrite™ lights are engineered to provide high-intensity illumination and advanced technology for unmatched performance at an exceptional value. The built-in controller, with Adaptive Overdrive™ and Adaptive Power™ technologies, drives the lights in both strobed and continuous modes.



Using Ai lights with Mako cameras

EuroBrite lights have embedded controllers, so they can work directly with Allied Vision cameras, no additional light controller is required.

Adaptive Power™

A feature of EuroBrite™ lighting control, Adaptive Power™ utilizes an on-board thermistor to maximize light output in continuous mode. By factoring in the ambient temperature and the heat-sinking potential of the customer's mounting structure, during the learning procedure, the maximum drive current is calculated and locked in.



Figure 7: EuroBrite Bar Light AL-S025300

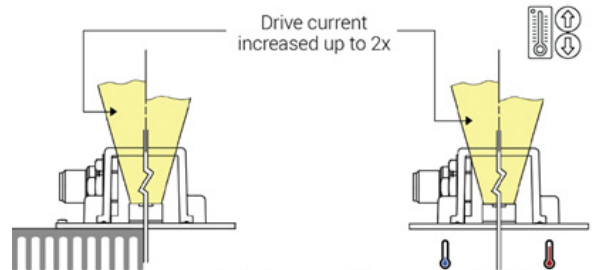


Figure 8: EuroBrite Adaptive Power drive current

Adaptive OverDrive™

Adaptive Overdrive™ provides a maximal output pulse in strobe mode, regardless of exposure period. Upon receiving an external trigger input, a EuroBrite™ light produces a high-power pulse for 5 ms. Should the external trigger pulse width exceed 5 ms, the light output pulse gradually trails off to a sustained, safe level for the remaining exposure period. Traditional fixed duration strobe drivers cannot provide similar performance.

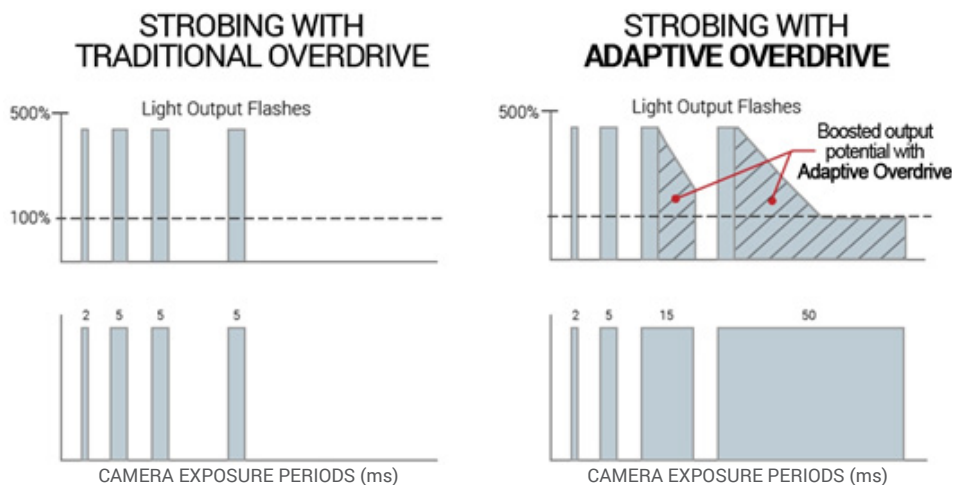


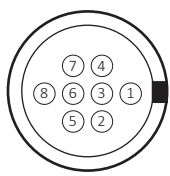
Figure 9: Traditional Overdrive vs. Adaptive Overdrive

Mako Output Description



Mako cameras are not intended to be connected to a DC distribution network. The maximum Length for I/O cables must not exceed 30 meters.

The general purpose I/O port uses a Hirose HR25-7TR-8PA(73) connector on the camera side. The mating cable connector is Hirose HR25-7TP-8S. Table X describes the I/O connector pin assignment, camera side Hirose HR25-7TR-8PA(73).



| Pin | Signal | Direction | Level | Description |
|-----|--------|-----------|-----------------------------|------------------------|
| 1 | Out 1 | Out | Open emitter, maximum 20 mA | Opto-isolated output 1 |
| 2 | Out 2 | Out | Open emitter, maximum 20 mA | Opto-isolated output 2 |
| 3 | Out 3 | Out | Open emitter, maximum 20 mA | Opto-isolated output 3 |

For input definitions, see the Mako manual.

Table 12: Mako output pin assignment

Mako Feature Configuration

We recommend you to use the following settings.

Light Pulse Width Equal to Exposure Time

| Feature group | Feature | Value |
|---------------|--------------------|----------|
| Strobe | StrobeDelay | 0 |
| | StrobeDuration | 0 |
| | StrobeDurationMode | Source |
| | StrobeSource | Trigger |
| SyncOut | SyncOutLevels | 0 |
| | SyncOutPolarity | Negative |
| | SyncOutSelector | SyncOut1 |
| | SyncOutSource | Exposing |

Table 13: Feature Configuration for Light Pulse Width Equal to Exposure Time

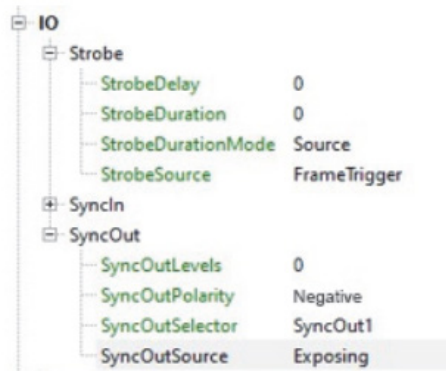


Figure 10: Feature Configuration for Light Pulse Width Equal to Exposure Time

Start of exposure with a timed strobe delay and duration

| Feature group | Feature | Value |
|---------------|--------------------|------------------|
| Strobe | StrobeDelay | 10 ¹ |
| | StrobeDuration | 100 ¹ |
| | StrobeDurationMode | Controlled |
| | StrobeSource | Exposing |
| SyncOut | SyncOutLevels | 0 |
| | SyncOutPolarity | Negative |
| | SyncOutSelector | SyncOut1 |
| | SyncOutSource | Strobe1 |

¹ Example values

Table 14: Feature Configuration for Start of Exposure with a Timed Strobe Delay and Duration

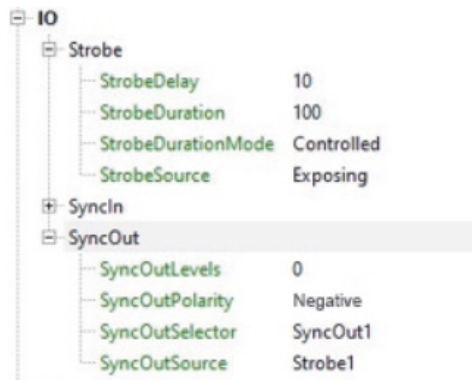


Figure 11: Feature Configuration for Start of Exposure with a Timed Strobe Delay and Duration

Controlling with SignaTech™

SignaTech™ (Signature Technology) is Advanced illumination's proprietary control system that allows Ai LED illuminators in machine vision systems to operate at maximum output under all operating conditions, while protecting the light head from damage.

During the light assembly process, key LED characterization information gets auto-populated into a light head's EEPROM. Microprocessor-based DCS and Pulsar controller software then reads the stored info, sets operating conditions, and manages any GUI and I/O functions.

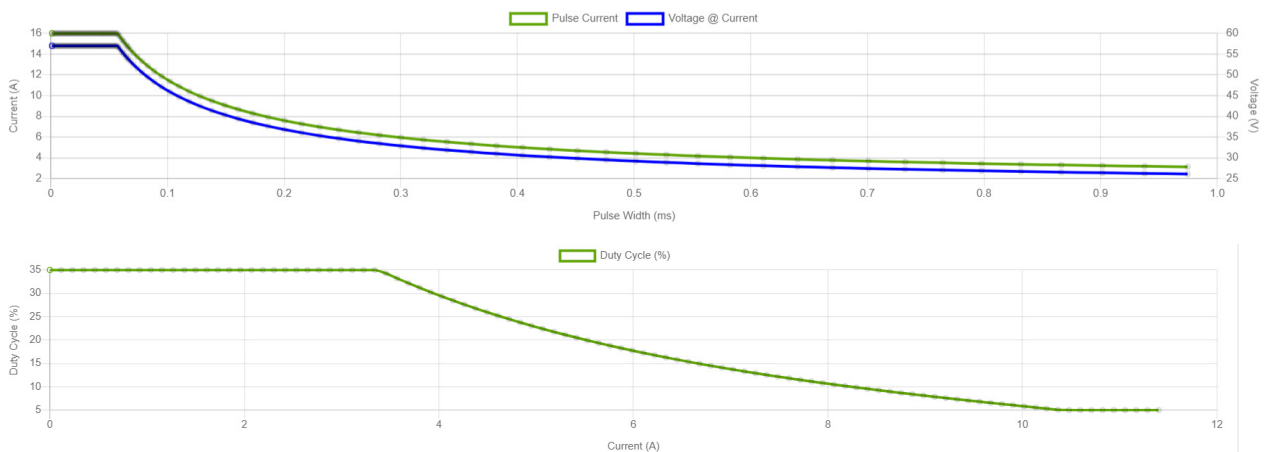


Figure 12: Sample charts from Advanced illumination's proprietary data management software, used in the production of SignaTech™ enabled lights.

The SignaTech™ Control System allows pulsing of certain LEDs up to 50 times overdrive currents while still maintaining the highest flux output and longest LED lifetime.

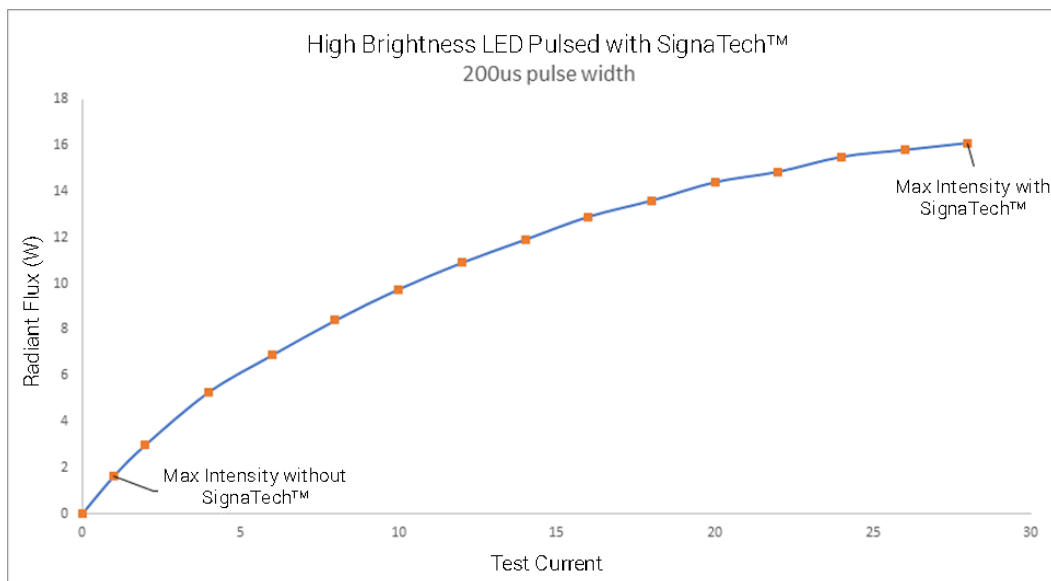


Figure 13: Sample data of an overdrive application, with and without SignaTech™ enabled.

Lighting with Ai

Product customization is a multi-tiered approach.

Stock Product

Standard product with an “off the shelf” configuration, available to ship within 1-2 days.

Build-to-Order (BTO)

Product requiring modifications within a large set of predefined variations, with hundreds of thousands of combinations available; depending on the product, they are usually shipped between 1-3 weeks.

Semi-Custom

Product requiring additional design and documentation efforts but can be a smart choice when more flexibility is required.

Custom

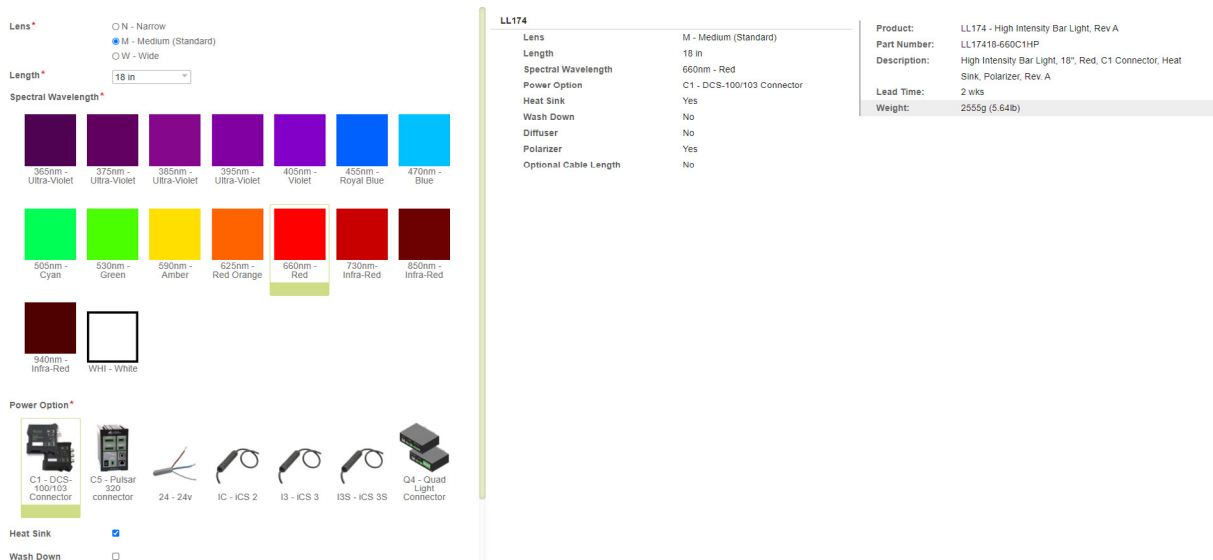
Fully custom-designed and built products that are engineered, often from the ground up, to fit your exact machine vision needs. Typically offered for OEM applications and volume orders.

Configuring Ai Lights



Through the Ai Configurator, users can build each light to their specifications by selecting their desired light size, wavelength, beam spread, power source, cable length, and more – all to best fit their inspection application. Access the Ai Configurator Tool on each product page or through this URL:

<https://www.advancedillumination.com/configurator-products-page/>



The screenshot shows the configuration interface for the LL174 High Intensity Bar Light. It includes sections for Lens selection (Narrow, Medium, Wide), Length (18 in), Spectral Wavelength (with color-coded swatches for various wavelengths from 365nm to 850nm), Power Option (C1, C5, 24-24v, IC, IS, ISS, Q4), Heat Sink, and Wash Down. A summary table on the right lists the selected configuration details.

| LL174 | | Product: LL174 - High Intensity Bar Light, Rev A | |
|-----------------------|----------------------------|--|---|
| Lens | M - Medium (Standard) | Part Number: | LL17418-660C1HP |
| Length | 18 in | Description: | High Intensity Bar Light, 18", Red, C1 Connector, Heat Sink, Polarizer, Rev A |
| Spectral Wavelength | 660nm - Red | Lead Time: | 2 wks |
| Power Option | C1 - DCS-100/103 Connector | Weight: | 2556g (5.64lb) |
| Heat Sink | Yes | | |
| Wash Down | No | | |
| Diffuser | No | | |
| Polarizer | Yes | | |
| Optional Cable Length | No | | |

Figure 14: Sample image from Advanced illumination’s online Configurator.

Technical Data and Ordering

Advanced illumination Products

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