

## **Advantage™ Engine Series Integrator's Guide**

2019 September 17

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# Symbols

The following symbols indicate safety precautions and supplemental information:

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 **WARNING:** This symbol indicates a hazard that could cause death, serious personal injury or electrical shock.

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 **CAUTION:** This symbol indicates a hazard that could result in property damage.

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 **Note:** This symbol indicates additional information about a subject.

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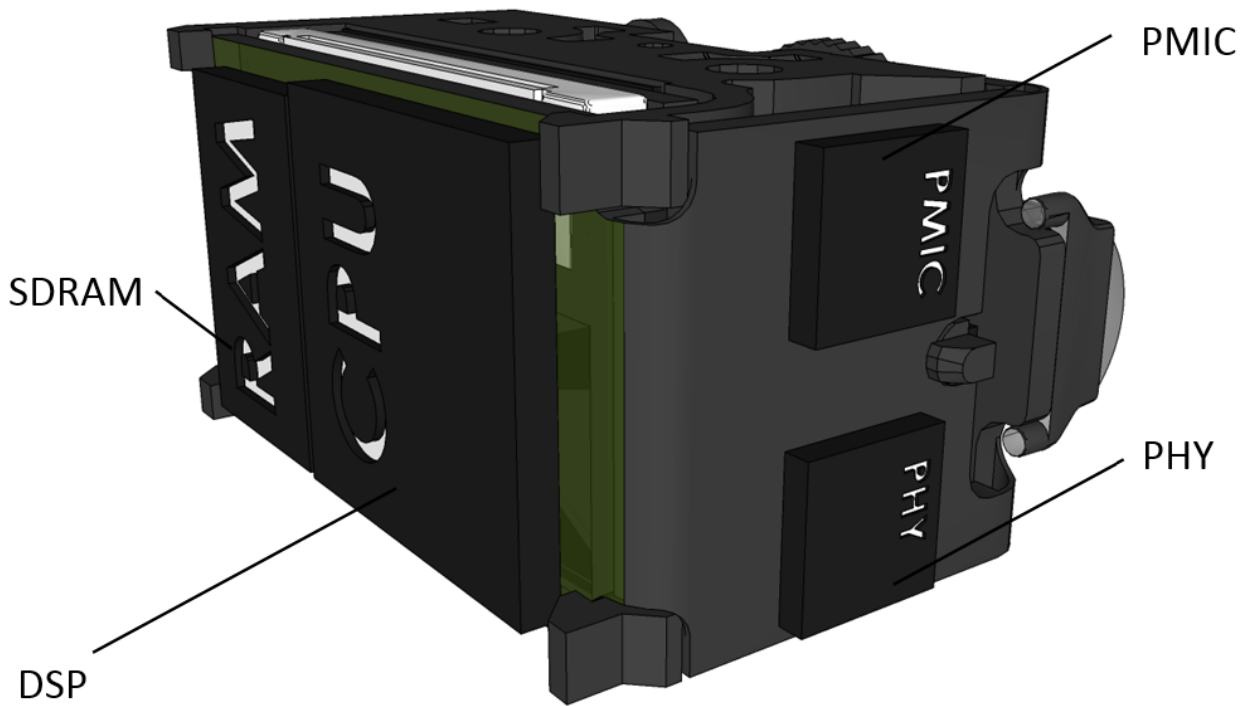
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 **Tip:** This symbol indicates suggestions and shortcuts that might not otherwise be apparent.

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# Integration Requirements

Under no circumstances can the device be operated when the device temperature exceeds 65°C, as measured at the points shown below. Use an external heat sink with the device, unless ambient air temperature is maintained at less than 35° C. Use thermally conductive paste or pads because the heat sink must have a good thermal connection to the device.



# System Overview

Both variants, Advantage 100 and Advantage 102, support simple mounting and integration.

## Capabilities

The AE allows maximum flexibility for an Original Equipment Manufacturer (OEM) to custom design Cognex smart camera technology into their product. The AE offers OEMs the ability to leverage the power of Cognex vision and ID tools in a product that is exceptionally compact and flexible.

The embedded engine can be deeply integrated into the OEM product by interfacing directly to the 31-pin ZIF connector. A flat ribbon cable connects to the AE ZIF connector which provides access to all communication, power and I/O signals. Alternatively, the AE can be integrated with the standard Cognex I/O board with an RJ-45 connection for Ethernet (or I/O board for RS-232 and USB – DataMan only), a cable with DB-15 connector for power, I/O and RS-232 communication or a lockable USB-C connector with a shortened cable coming from the enclosure.

AE variations include AE2 and AE3.

| Engine | Resolution                | Image Capture Speed |
|--------|---------------------------|---------------------|
| AE2    | 752 x 480, 1/3 inch CMOS  | 60 FPS              |
| AE3    | 1280 x 960, 1/3 inch CMOS | 40 FPS              |

## Electrical Specifications

### Features

This section details the electrical and I/O design of the AE hardware platform.

Please see the *Advantage Engine Sample Circuits* (available upon request from Cognex) for reference sample circuits of:

- the power supply
- status LED driver
- non-isolated current sink/source output
- non-isolated non-inverting current sink input
- isolated current sink/source output and input
- RS-232 interface
- Ethernet to cable interface
- USB to cable interface
- AE Flat Flexible Cable (FFC) connector interface

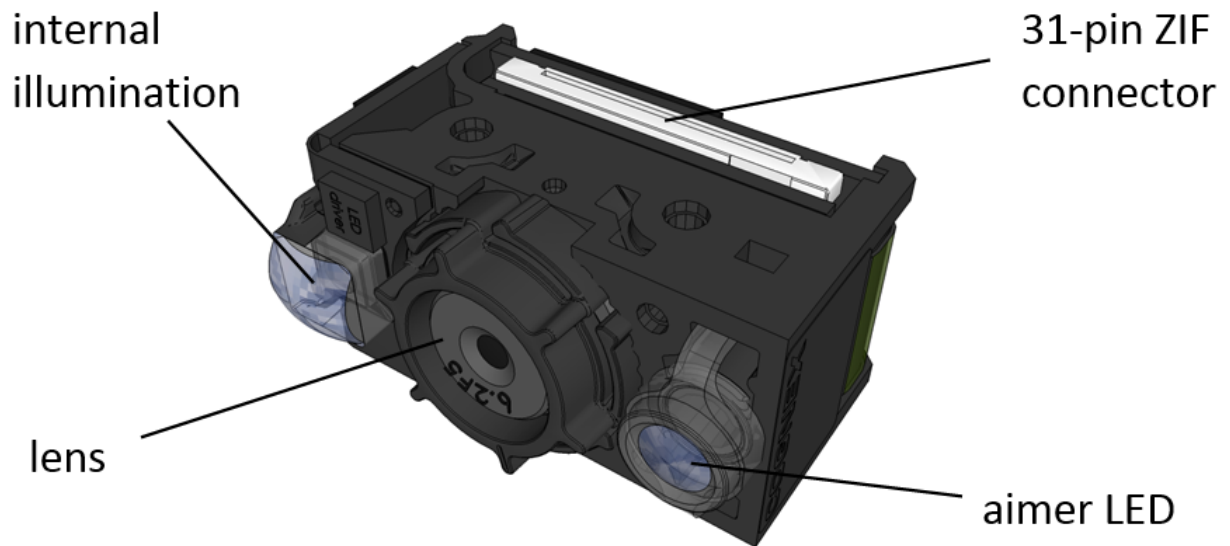
Supported Interfaces:

- UART with optional flow control
- USB 2.0 OTG
- Ethernet 10/100 Base-T

## Power Dissipation

Maximum 2.5 W at 5.0 VDC.

## Visual Description



# Software Development Environment

The AE works with In-Sight or DataMan software. Download or request the software as follows:

- In-Sight: contact your local Cognex Sales Engineer for a link to download the In-Sight software for the Advantage products.
- DataMan Support: <http://www.cognex.com>

## In-Sight PC Hardware Requirements

- Intel® Pentium® 4 processor running at 2GHz (or equivalent)
- 256MB of RAM
- 2GB of hard-disk space
- Video card capable of displaying 1024 x 768 resolution at 24-bit color depth. The DPI Display setting must be set to 96 DPI.
- Network Interface Card (at least 100Mbps) for connecting to In-Sight vision systems.

## In-Sight Operating System Requirements

In-Sight Explorer has been tested on the following operating systems:

- Microsoft® Windows Server® 2003, Service Pack 2
- Microsoft Windows XP Professional, Service Pack 3
- Microsoft Windows 7 Professional, Service Pack 1 (32- and 64-bit)
- Microsoft Windows Server 2008, Service Pack 1 (32- and 64-bit)
- Microsoft Windows Server 2008 R2, Service Pack 1 (64-bit)

## DataMan PC Hardware Requirements

- Intel® Pentium®/Celeron® family, or AMD K6/Athlon/Duron family processor
- 1.8GHz processor
- 512MB of available RAM

## DataMan Operating System Requirements

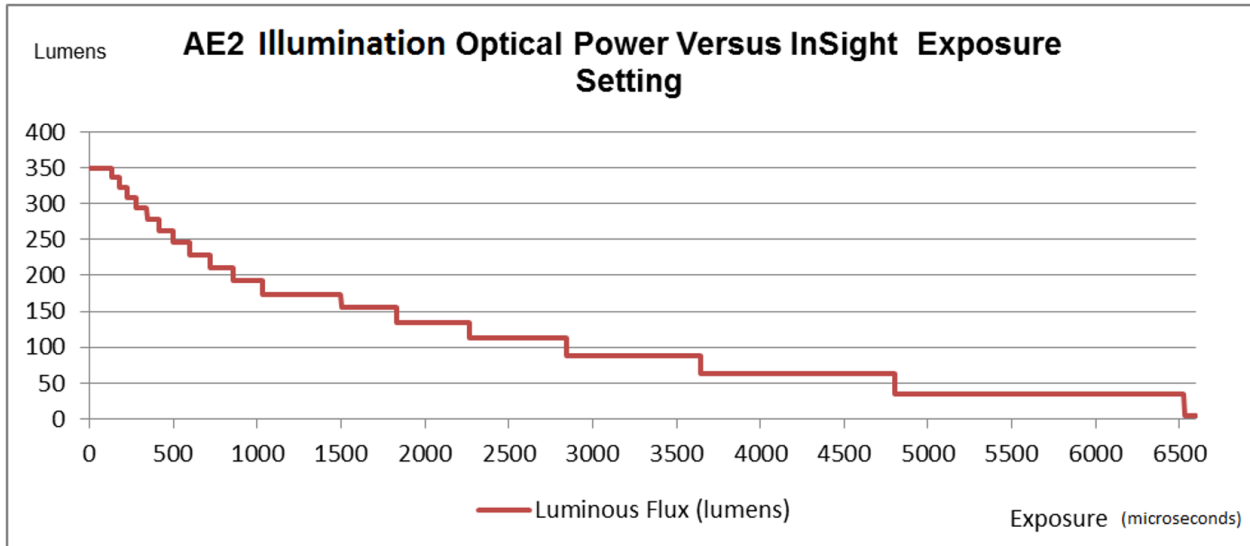
The DataMan software has been tested on the following operating systems:

- Microsoft® Windows XP Professional, Service Pack 3 (32- and 64-bit)
- Microsoft Windows 7 Professional, Service Pack 1 (32- and 64-bit)

Although In-Sight Explorer and DataMan may function on other operating systems, systems not meeting the requirements are not supported.

# Illumination Specifications

The AE includes a single internal illumination LED. The maximum illumination intensity available from the LED varies depending on the exposure setting (in microseconds) that you select, as shown in this figure:



Make sure light intensity value settings adhere to:

- The maximum intensity is lower for longer exposures so that the LED's maximum power dissipation is not exceeded.
- The LED supports a maximum duration of 25 mSec.

**Note:** For best performance, Cognex recommends a value of 7 mSec or less.

- The specified lumen values are produced when the maximum **Light Intensity** value is specified in the software. If you specify lower **Light Intensity** values, the intensity is reduced proportionally.
- The specified lumen values are representative of what a standard AE unit (that is, one without add-on illumination boards) will produce under the specified conditions.

In general, the correct method to setting exposure and light intensity value is:

1. Set **Light Intensity** to the maximum value.
2. Reduce the exposure time until you have an acceptable level of blur (short exposure freezes motion).
3. Check acquired image pixel values:
  - a. If the image is too dark, external illumination is needed.
  - b. If the image is too bright, continue to reduce the exposure time until the image contains the required range of pixel values (no 0 pels, no saturated pels).
4. If you have reduced the exposure time to its minimum limit and the image is still too bright, reduce the **Light Intensity** value until the image is correct.

# Optical and Mechanical Specifications

The following mechanical configurations are available:

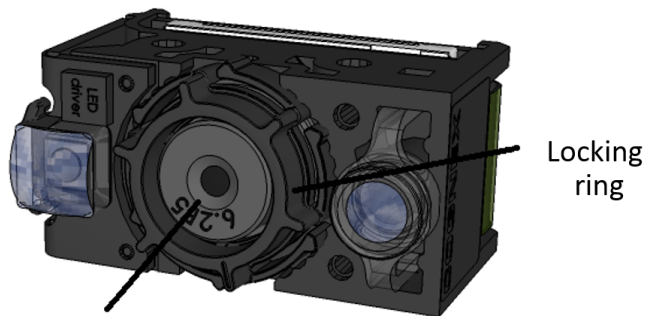
- AE standard 6.2 mm lens with locking ring
- AE with lens adapter and 3.5, 8, 10.3, 16, or 25 mm M12 lens

## Lens Configurations

This section gives a detailed description on the lenses you can use with the Advantage Engine.

### 6.2 mm Lens (Standard)

This is a lens with  $f/5$  aperture, focused at 70 mm, fixed in position by a locking ring.



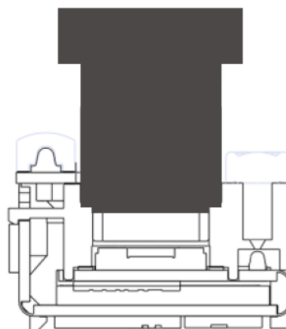
6.2 mm Lens focused  
at 70 mm

### M12 Lenses

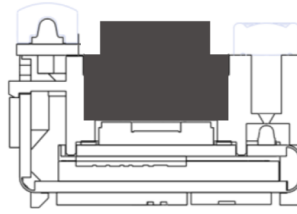
For larger volume OEM applications that require custom lenses, there is a range of M12 lenses available in the following configurations:

**Note:** The larger front cover (ADV-ADDILL-00) is required for some lens configurations. When using additional illumination, use ADV-ADDILL-00. When using external illumination, use ADV-EXTCVR-00 (10 pack of lens covers).

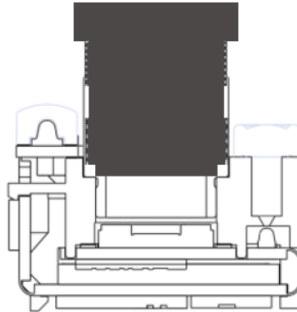
- 3.5 mm lens ( $f/6.0$ )



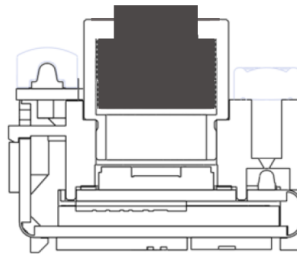
- 6.2 mm lens (f/5, f/10)



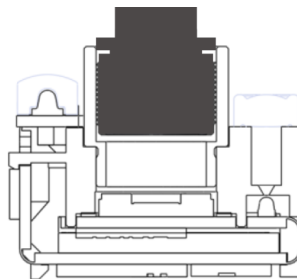
- 8 mm lens (f/2.0)



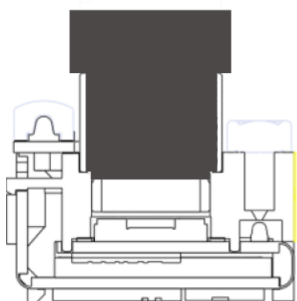
- 10.3 mm lens (f/5.0)



- 16 mm lens (f/7.0)

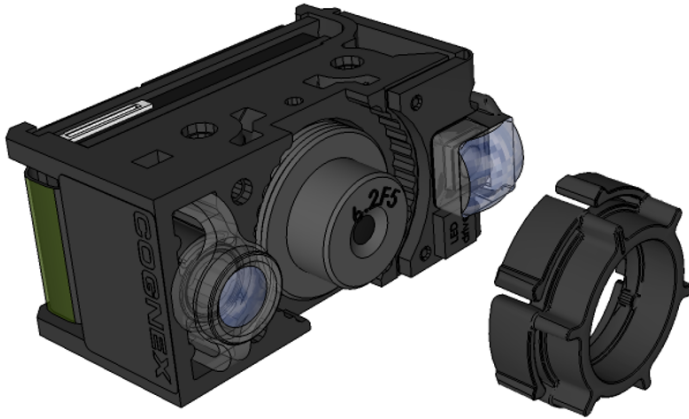


- 25 mm lens (f/2.0)

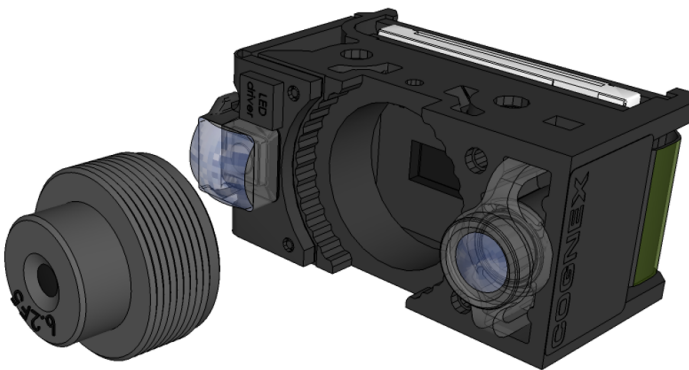


To install the M12 lens for different focal distance and aperture configurations, follow the steps below:

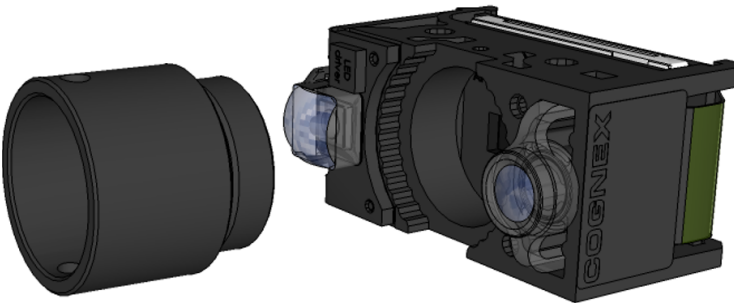
1. Remove the locking ring.



2. Rotate out the 6.2 mm lens.



3. Insert the thread extender (except for the 3.5 mm, which does not require an extender).

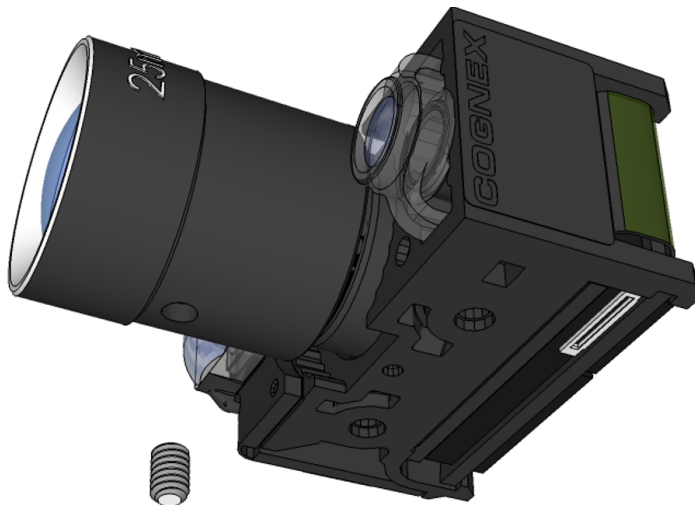


4. Insert the M12 lens.



5. After you have the focus you need, set the screw on the side of the lens and tighten it with a 0.9 mm hex driver or key. The screw is an M2X 2.4 set screw.

**⚠ WARNING:** The lens can be damaged if the screw is over-tightened.



## Field of View and Working Distances

The scan maps show the size of pixels and image width relative to the distance for the different lenses.

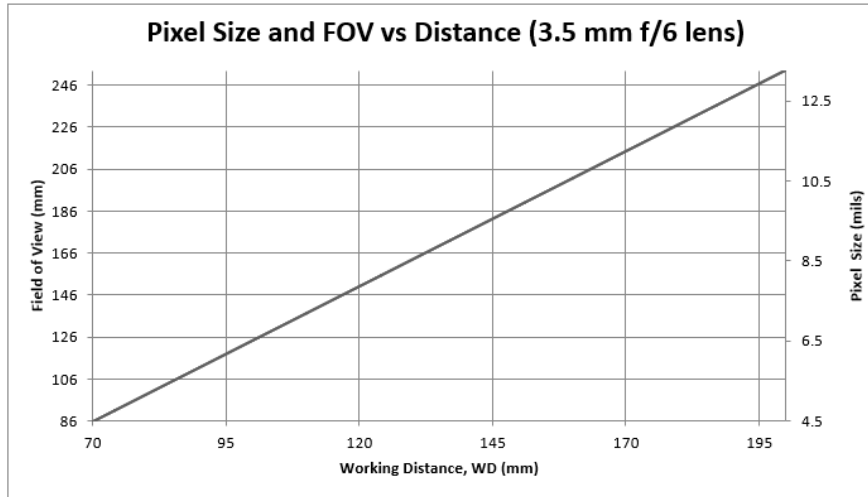
The field of view (FoV) determines the maximum length or width of a target that can be imaged by the Advantage Engine. Using the 6.2 mm lens as an example, the maximum width of a centered target at 200 mm working distance is 150 mm. Anything larger than this will not be imaged.

The pixel size shown here is the width of a target that will be imaged onto one pixel of the Advantage Engine. For the 6.2 mm lens a 7.9 mil wide target at 200 mm will be imaged onto 1 camera pixel, and thus the camera cannot distinguish features smaller than 7.9 mils at this distance.

## AE2 FOV and Working Distances

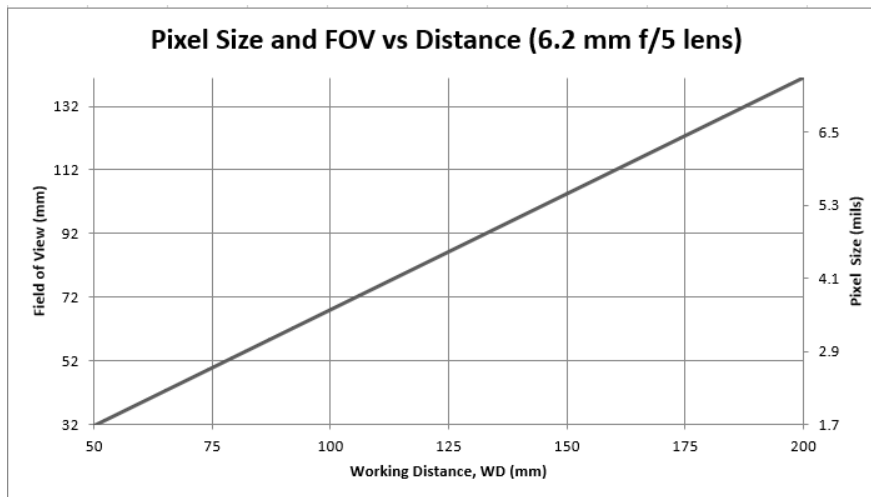
**i Note:** In all the cases below, working distance is measured from the front of the lens.

### 3.5 mm f/6 Lens



| Working Distance | FoV     | Pixel Size |
|------------------|---------|------------|
| 70.000           | 86.000  | 4.50       |
| 95.000           | 118.000 | 6.20       |
| 120.000          | 150.000 | 7.90       |
| 145.000          | 182.000 | 9.60       |
| 170.000          | 215.000 | 11.20      |
| 195.000          | 247.000 | 12.90      |

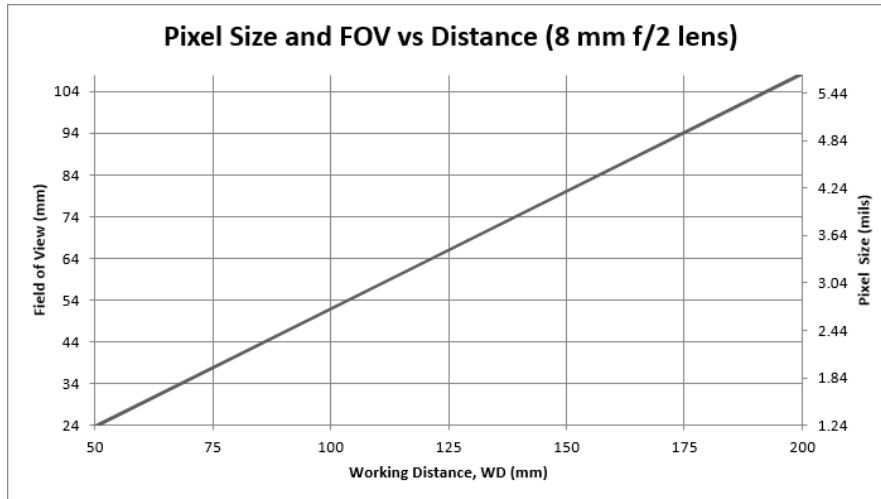
### 6.2 mm f/10 Lens



| Working Distance | FoV     | Pixel Size |
|------------------|---------|------------|
| 50.000           | 32.000  | 1.70       |
| 75.000           | 50.000  | 2.60       |
| 100.000          | 68.000  | 3.60       |
| 125.000          | 86.000  | 4.50       |
| 150.000          | 105.000 | 5.50       |
| 175.000          | 123.000 | 6.40       |
| 200.000          | 141.000 | 7.40       |

## 8 mm f/2 Lens

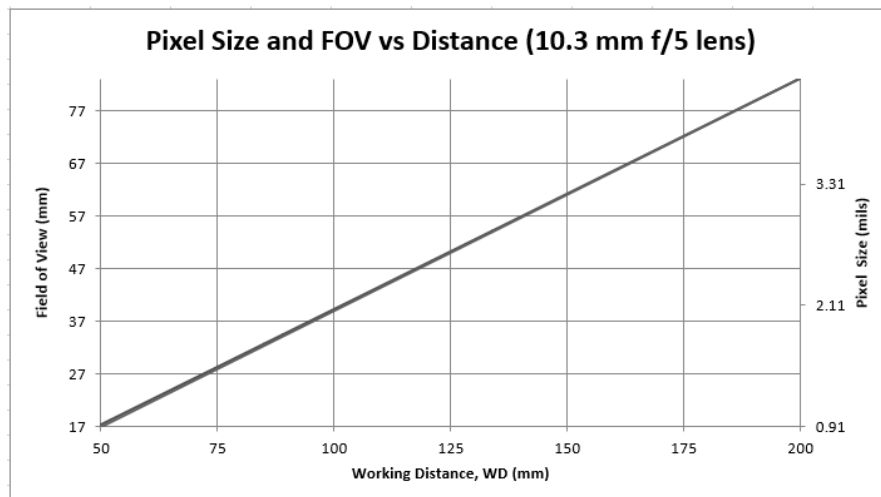
**Note:** A lens extender is required.



| Working Distance | FoV     | Pixel Size |
|------------------|---------|------------|
| 50.000           | 24.000  | 1.24       |
| 75.000           | 38.000  | 2.00       |
| 100.000          | 52.000  | 2.70       |
| 125.000          | 66.000  | 3.50       |
| 150.000          | 80.000  | 4.20       |
| 175.000          | 94.000  | 4.90       |
| 200.000          | 108.000 | 5.70       |

## 10.3 mm f/5 Lens

**Note:** A lens extender is required.

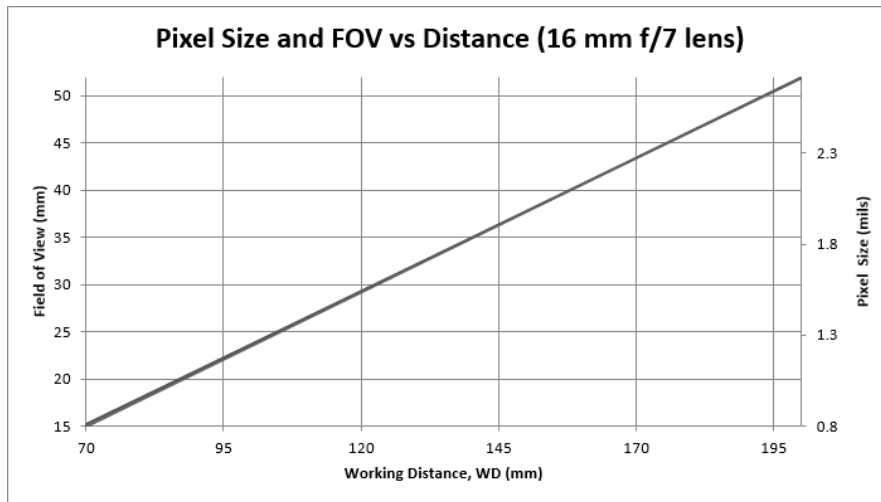


| Working Distance | FoV    | Pixel Size |
|------------------|--------|------------|
| 50.000           | 17.000 | 0.91       |

| Working Distance | FoV    | Pixel Size |
|------------------|--------|------------|
| 75.000           | 28.000 | 1.50       |
| 100.000          | 39.000 | 2.10       |
| 125.000          | 50.000 | 2.60       |
| 150.000          | 61.000 | 3.20       |
| 175.000          | 72.000 | 3.80       |
| 200.000          | 83.000 | 4.40       |

## 16 mm f/7 Lens

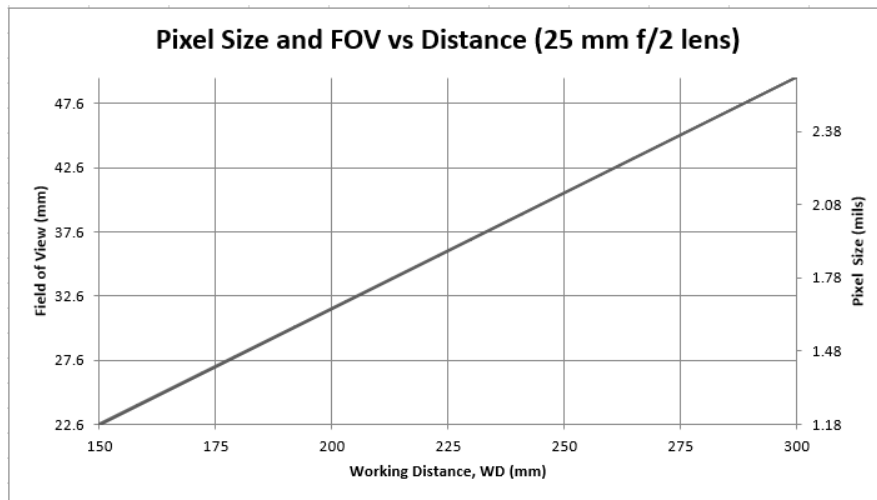
**Note:** A lens extender is required.



| Working Distance | FoV    | Pixel Size |
|------------------|--------|------------|
| 70.000           | 15.000 | 0.80       |
| 95.000           | 22.000 | 1.20       |
| 120.000          | 29.000 | 1.50       |
| 145.000          | 36.000 | 1.90       |
| 170.000          | 43.000 | 2.30       |
| 195.000          | 50.000 | 2.60       |

## 25mm f/2 Lens

**Note:** A lens extender is required.

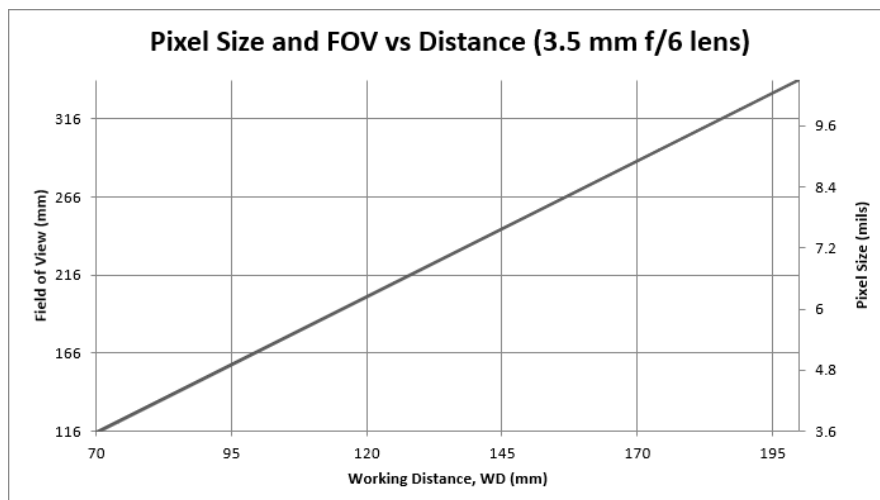


| Working Distance | FoV    | Pixel Size |
|------------------|--------|------------|
| 150.000          | 22.600 | 1.18       |
| 175.000          | 27.000 | 1.40       |
| 200.000          | 32.000 | 1.70       |
| 225.000          | 36.000 | 1.90       |
| 250.000          | 41.000 | 2.10       |
| 275.000          | 45.000 | 2.40       |
| 300.000          | 50.000 | 2.60       |

## AE3 FOV and Working Distances

**Note:** In all the cases below, working distance is measured from the front of the lens.

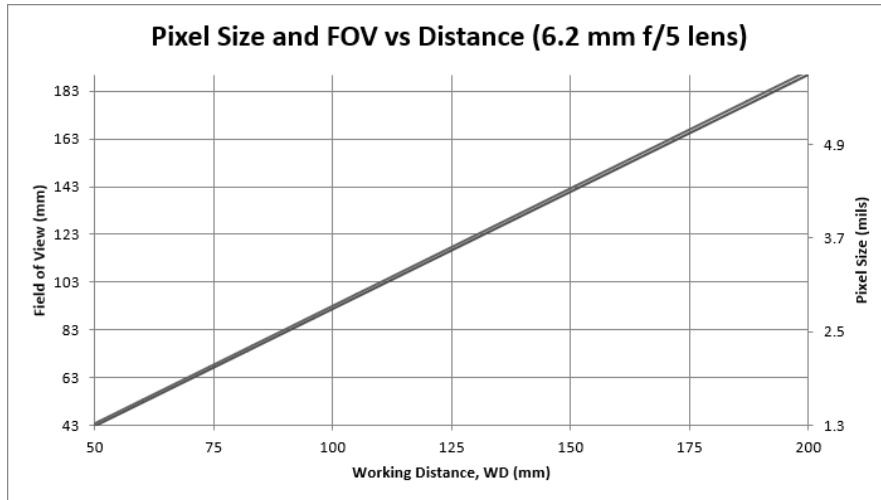
### 3.5 mm f/6 Lens



| Working Distance | FoV     | Pixel Size |
|------------------|---------|------------|
| 70.000           | 116.000 | 3.60       |
| 95.000           | 159.000 | 4.90       |

| Working Distance | FoV     | Pixel Size |
|------------------|---------|------------|
| 120.000          | 202.000 | 6.20       |
| 145.000          | 246.000 | 7.60       |
| 170.000          | 289.000 | 8.80       |
| 195.000          | 333.000 | 10.20      |

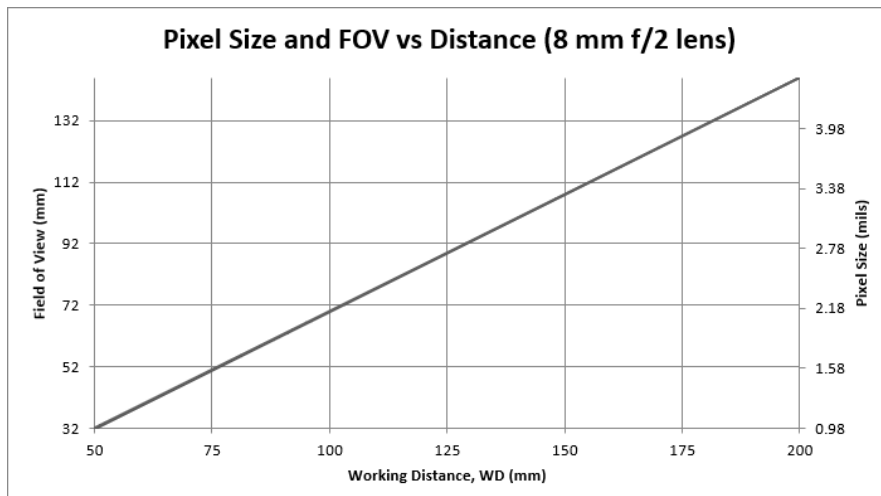
## 6.2 f/10 Lens



| Working Distance | FoV     | Pixel Size |
|------------------|---------|------------|
| 50.000           | 43.000  | 1.30       |
| 75.000           | 67.000  | 2.10       |
| 100.000          | 92.000  | 2.80       |
| 125.000          | 117.000 | 3.70       |
| 150.000          | 141.000 | 4.30       |
| 175.000          | 166.000 | 5.10       |
| 200.000          | 190.000 | 5.80       |

## 8 mm f/2 Lens

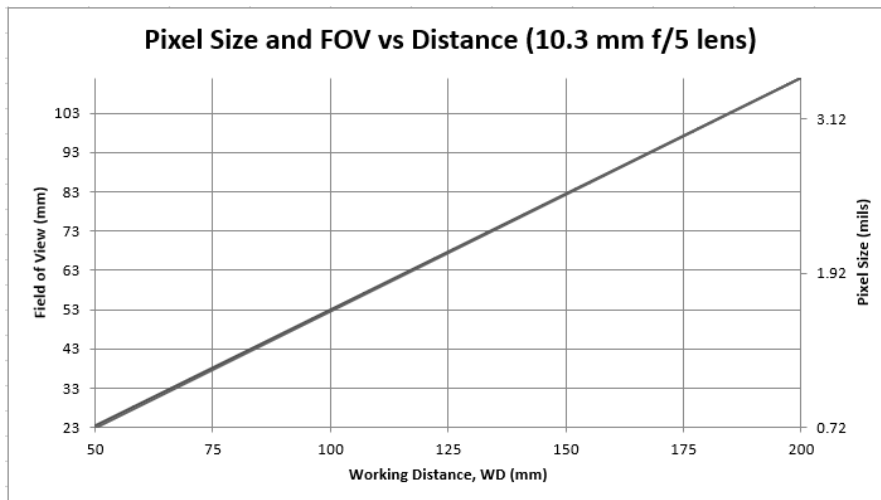
**Note:** A lens extender is required.



| Working Distance | FoV     | Pixel Size |
|------------------|---------|------------|
| 50.000           | 32.000  | 0.98       |
| 75.000           | 51.000  | 1.60       |
| 100.000          | 70.000  | 2.20       |
| 125.000          | 89.000  | 2.70       |
| 150.000          | 108.000 | 3.30       |
| 175.000          | 127.000 | 3.90       |
| 200.000          | 146.000 | 4.50       |

### 10.3 mm f/5 Lens

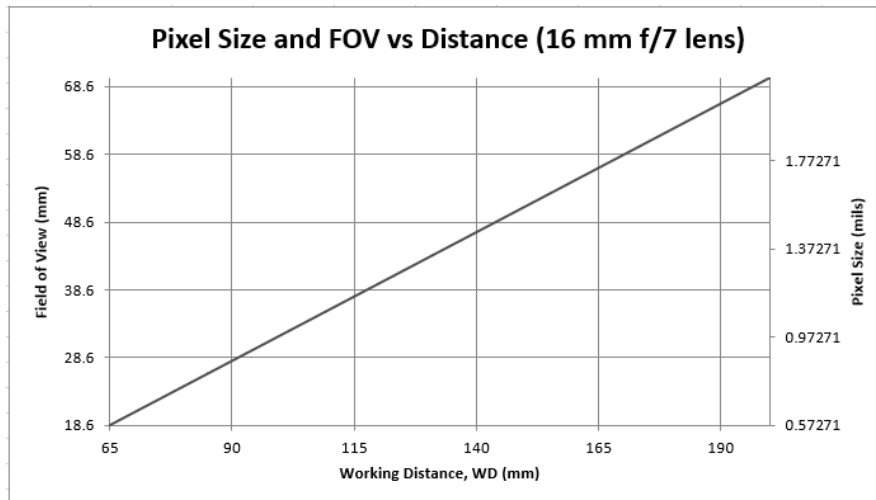
**Note:** A lens extender is required.



| Working Distance | FoV     | Pixel Size |
|------------------|---------|------------|
| 50.000           | 23.000  | 0.72       |
| 75.000           | 38.000  | 1.20       |
| 100.000          | 53.000  | 1.60       |
| 125.000          | 68.000  | 2.10       |
| 150.000          | 82.000  | 2.50       |
| 175.000          | 97.000  | 3.00       |
| 200.000          | 112.000 | 3.40       |

### 16 mm f/7 Lens

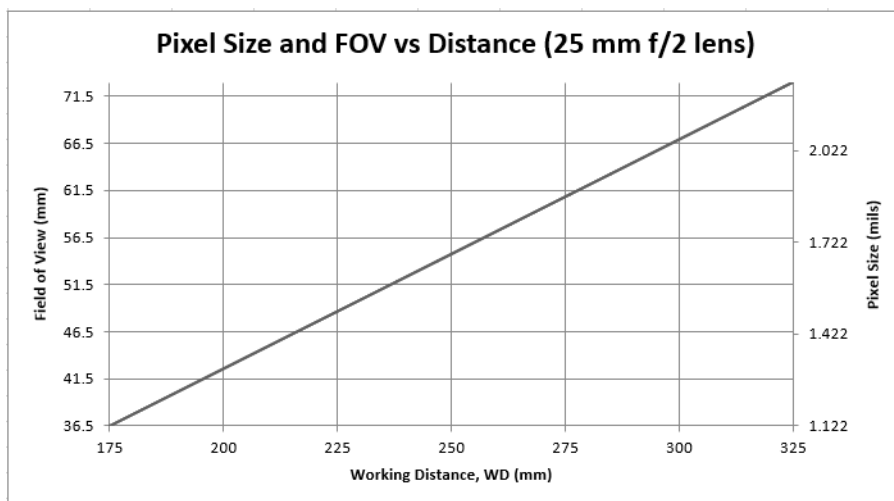
**Note:** A lens extender is required.



| Working Distance | FoV    | Pixel Size |
|------------------|--------|------------|
| 65.000           | 19.000 | 0.57       |
| 90.000           | 28.000 | 0.90       |
| 115.000          | 38.000 | 1.20       |
| 140.000          | 47.000 | 1.40       |
| 165.000          | 57.000 | 1.70       |
| 190.000          | 66.000 | 2.00       |

## 25 mm f/2 Lens

**Note:** A lens extender is required.



| Working Distance | FoV    | Pixel Size |
|------------------|--------|------------|
| 175.000          | 36.500 | 1.12       |
| 200.000          | 43.000 | 1.30       |
| 225.000          | 49.000 | 1.50       |
| 250.000          | 55.000 | 1.70       |
| 275.000          | 61.000 | 1.90       |

| Working Distance | FoV    | Pixel Size |
|------------------|--------|------------|
| 300.000          | 67.000 | 2.10       |
| 325.000          | 73.000 | 2.24       |

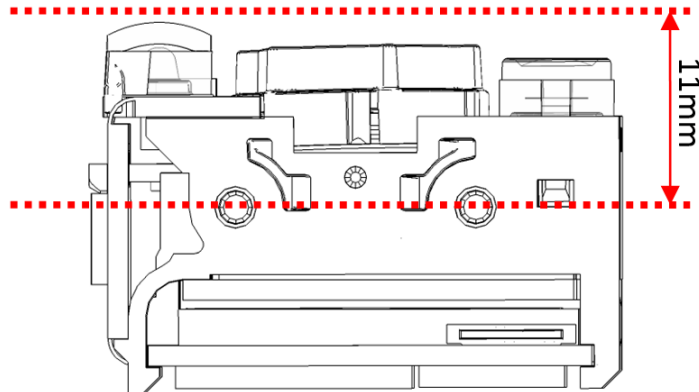
## Factory Focus Optimization

With custom factory focus, the lens used with the Advantage Engine is adjusted to optimize focus for the center 25% of the image. Depending on the lens selection and object distance, this can lead to objects on the image periphery to have less than optimal focus.

# Window Dimensions

The protective window that isolates the AE from the working environment must meet the following requirements:

- If you are using the standard 6.2 mm lens, mount the window 11 mm from the mounting holes, as specified.



- If you are using the 3.5 or 25 mm lens, position the window as close to the lens as possible, keeping in mind that the overall distance from the mounting holes will be determined by the focus position of the lens.
- Use glass or polycarbonate as material.
- A 34W x 16H mm clear area must be left centered on the lens axis.
- Use normal orientation to the axis of the lens.

As an example, the window of the Advantage 100 is 1 mm thick polycarbonate.

# Mounting Specifications

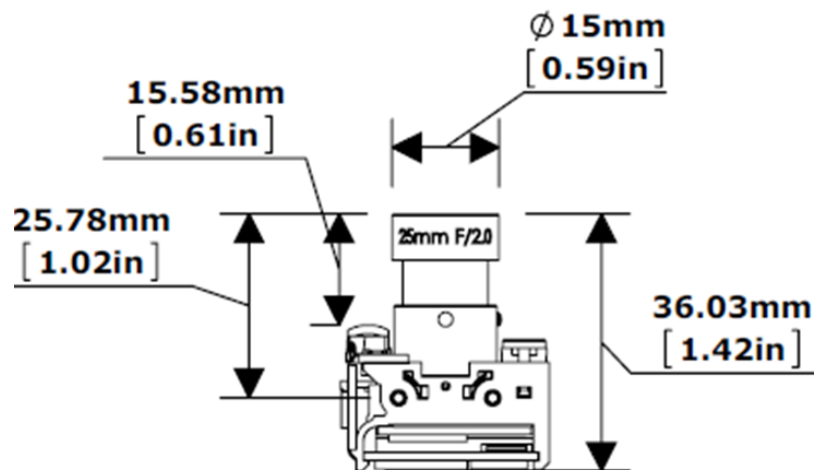
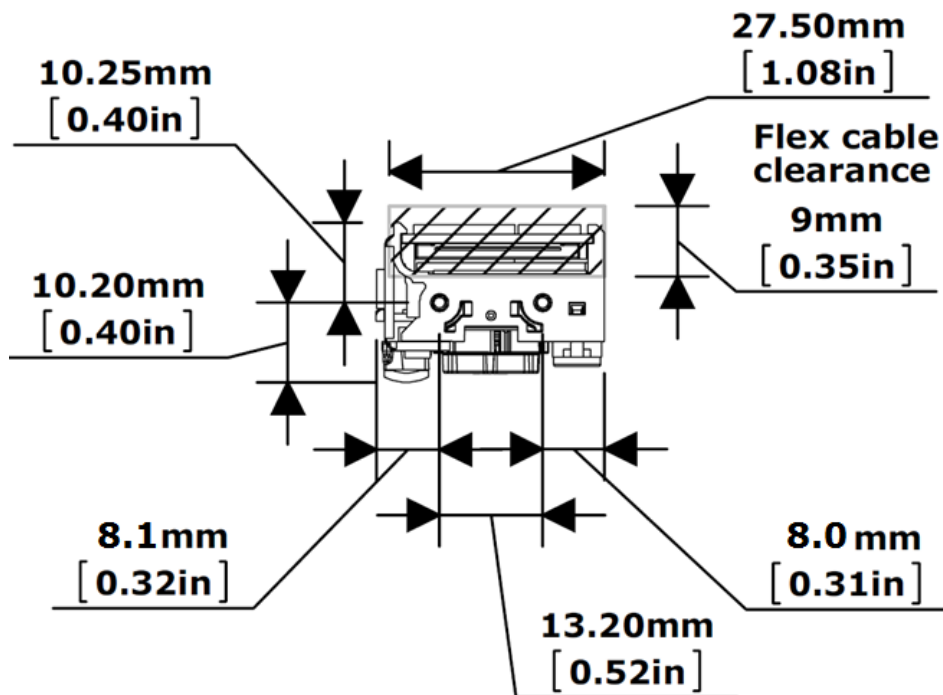
The illustrations in the following sections show the locations and spacing of built-in mounting points and the overall dimensions of the AE device.

## Dimensional Drawings

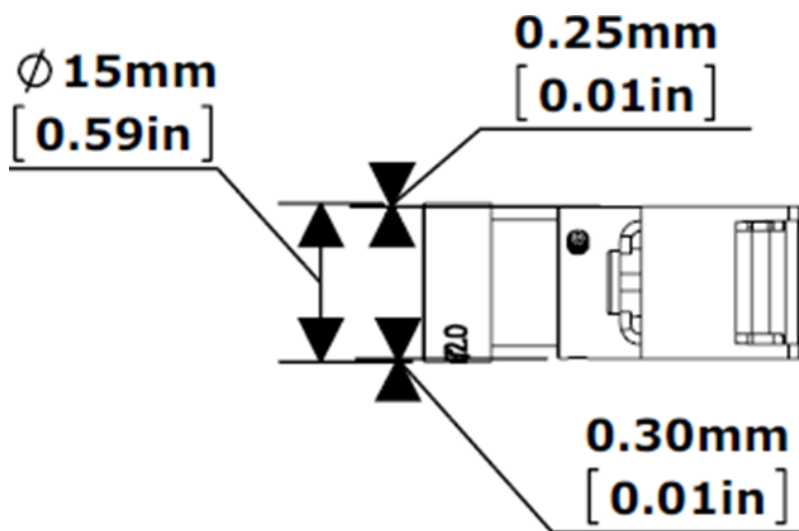
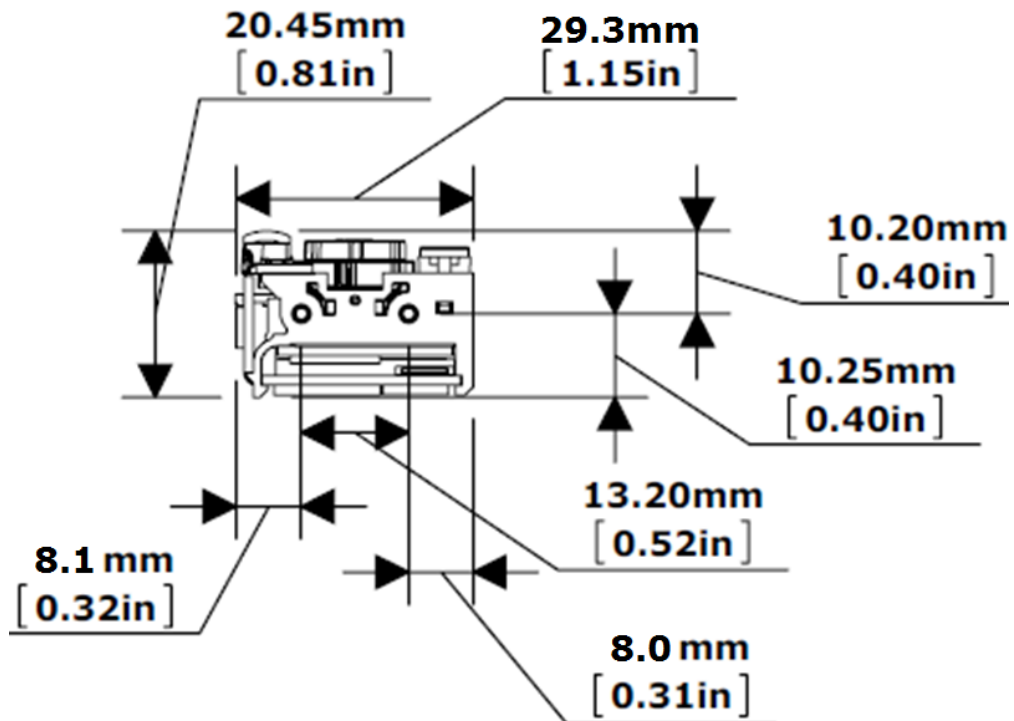
All dimensions are for the standard 6.2 mm lens, except where noted.

### AE with Top and Bottom Mounting, with 2 Possible Lenses

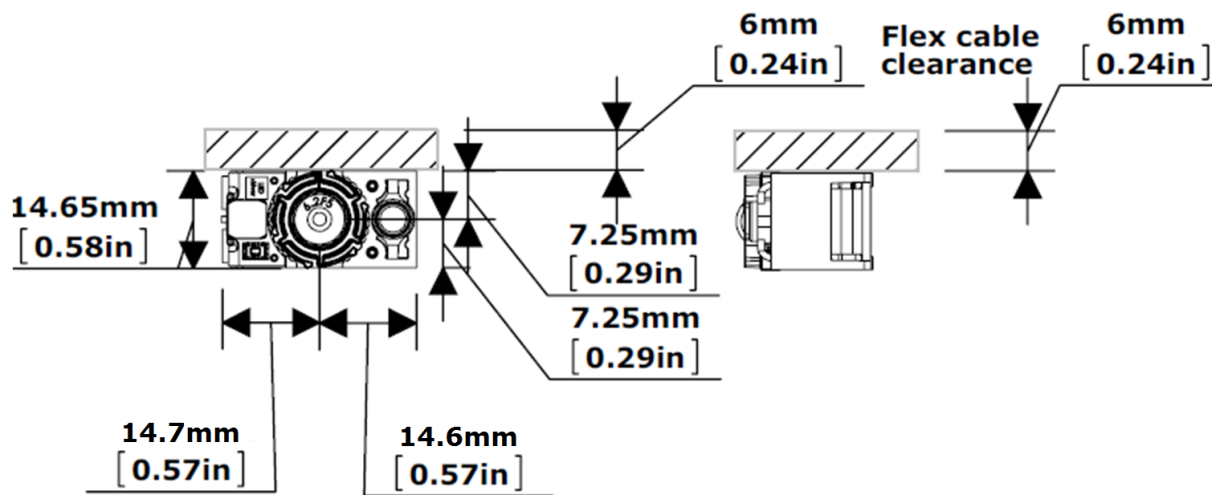
#### Top Mounting



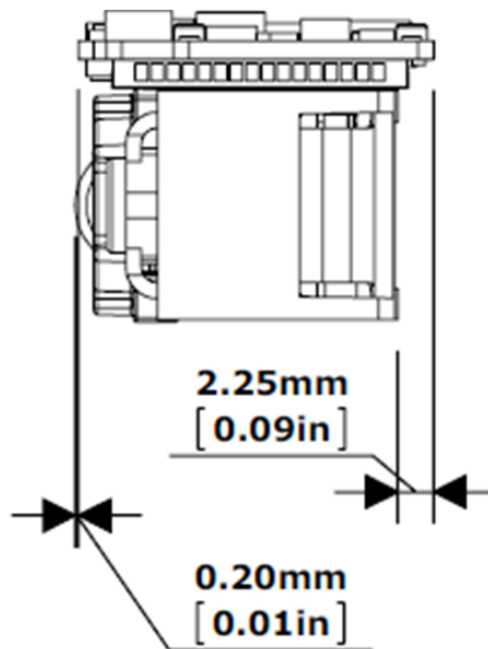
25mm lens

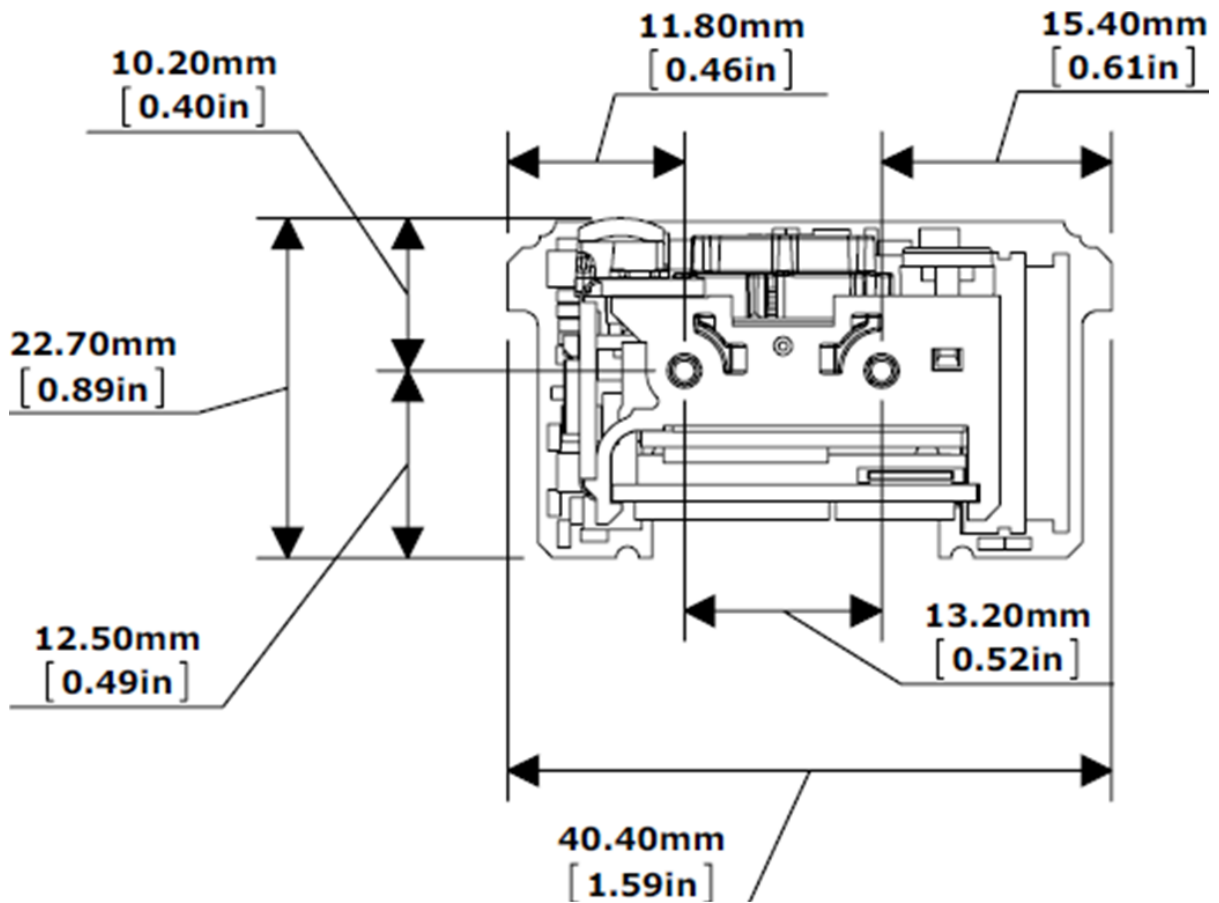
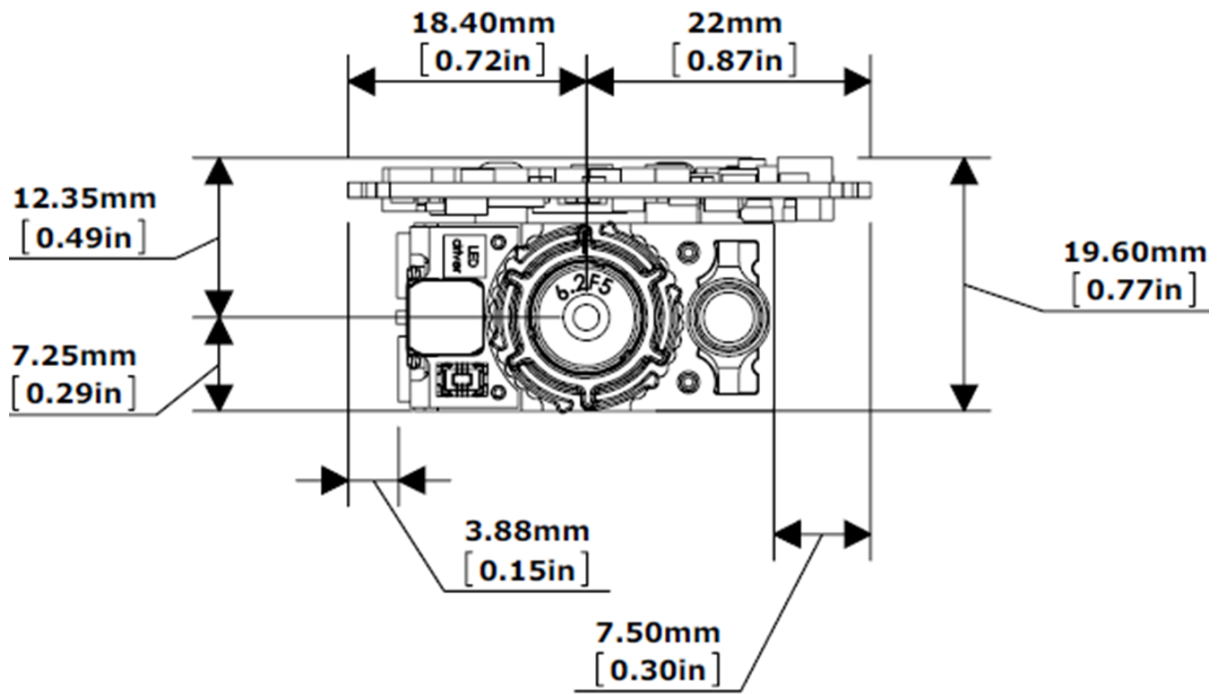


25mm lens

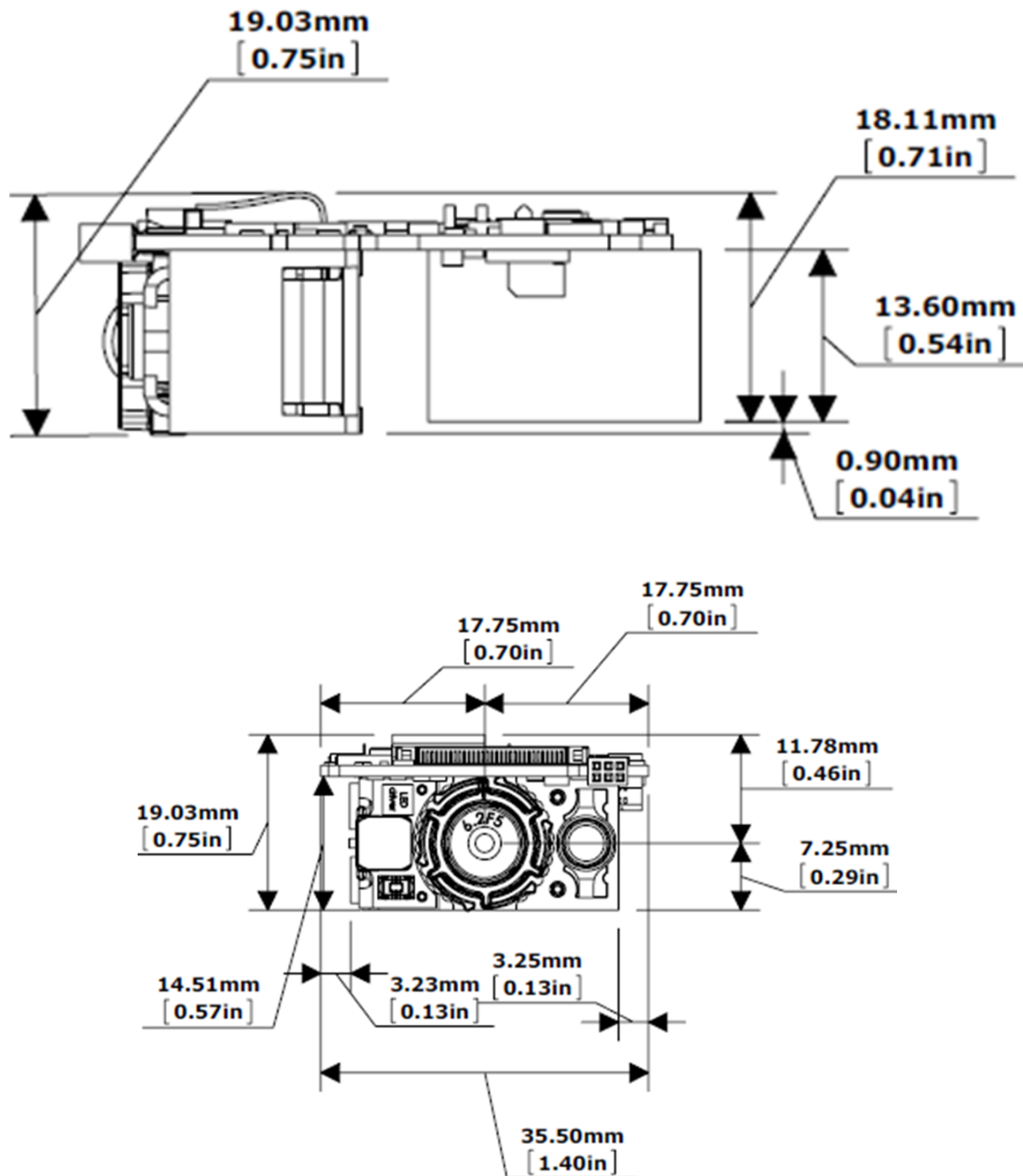


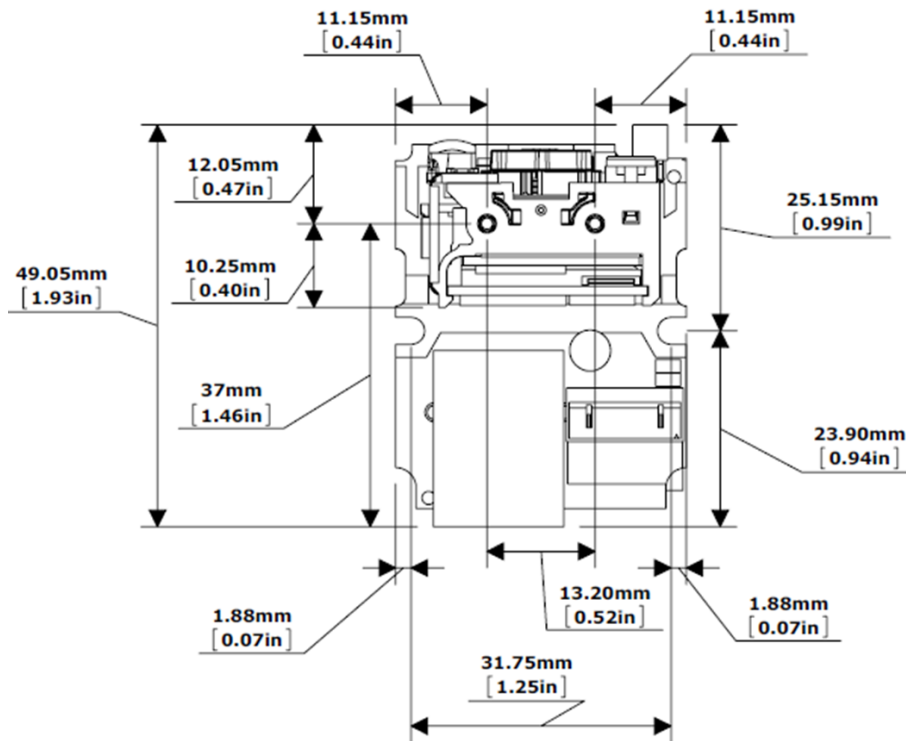
## DataMan RS-232 and USB I/O board



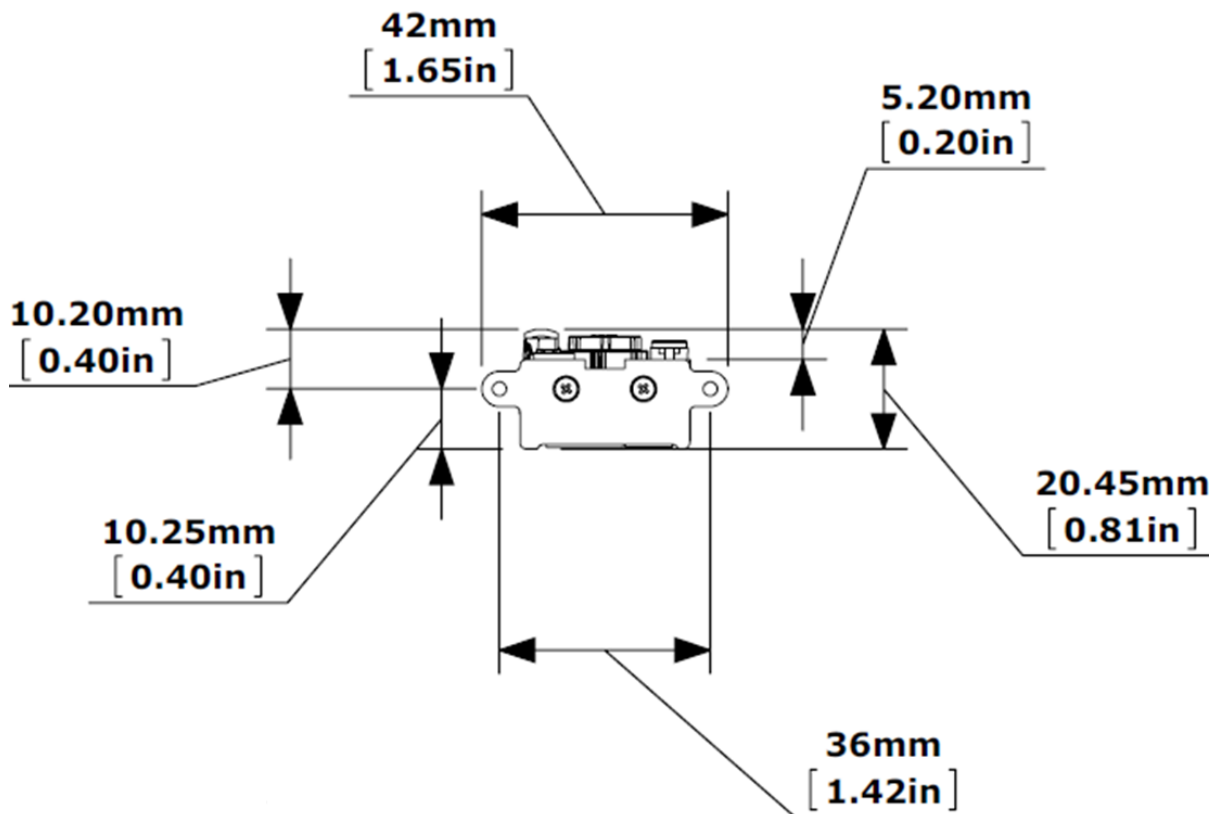


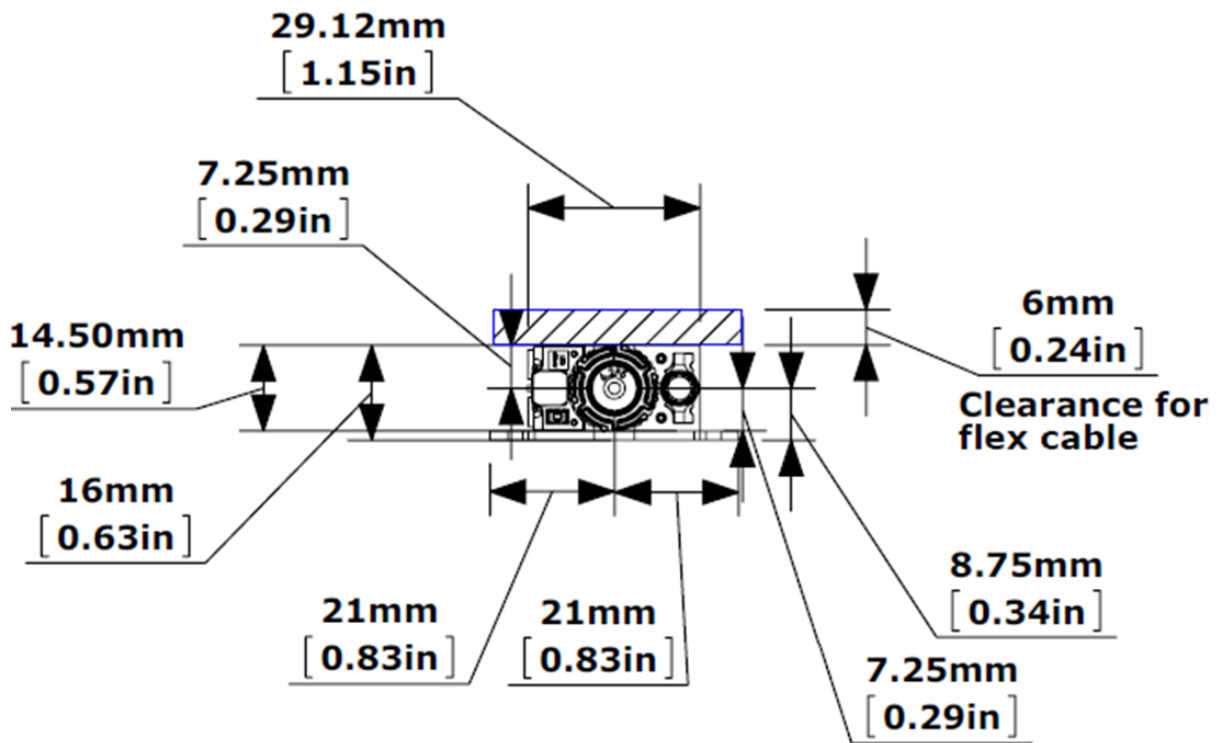
## In-Sight or DataMan I/O board with Ethernet and RS-232



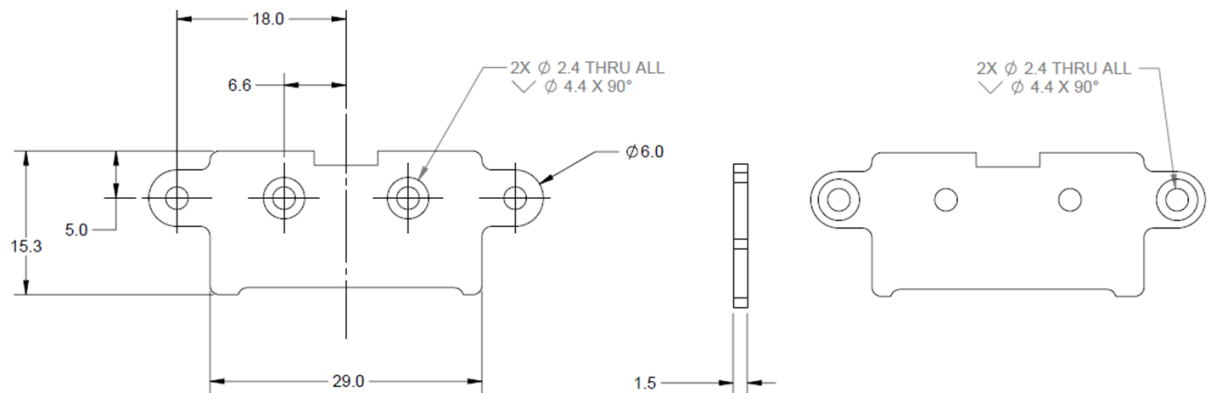


### AE with Example Mounting Plate



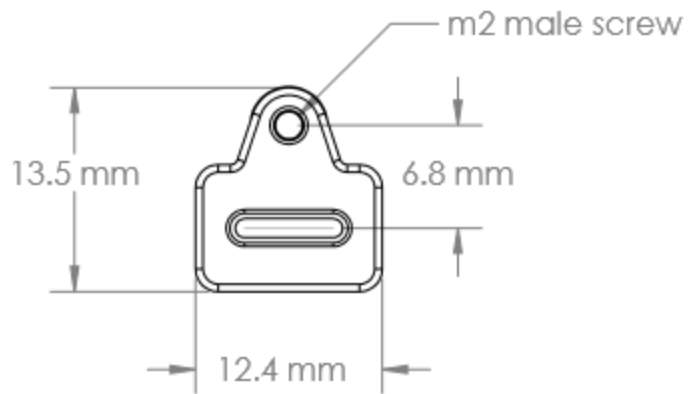


The following image illustrates an example mounting plate.



Use an M2x4 flat head screw, PT, zinc plated steel to mount the AE to the mounting plate (Cognex part number 196-1133R is an option). The torque limit is 0.18 N-m. Make sure that you attach the mounting plate to your working surface with an M2 flat screw.

## USB-C Connector Dimensions



# ZIF Clearance and Routing

The following requirements apply to the AE I/O cable routing:

- Make sure that the FFC exits the engine with a minimum bend radius of 4.0 mm.
- Make sure that the cable does not contact any sharp edges.
- Make sure that the addition bend radii is at least 4 mm.
- The cable is intended for stationary use. Make sure that it does not undergo any type of repetitive motion.

## Development Kits

For initial application development, OEMs can purchase the AE Development kit that provides the connection cables, lenses and other accessories enabling the immediate use of the AE to test application requirements. To order it, please contact your local Cognex Sales Engineer.

# Configurations

The AE can take any of the following three primary configurations:

1. Engine only
2. Engine with Advantage 100 I/O PCB with or without I/O Pigtail
3. Engine with DataMan 50 I/O PCB with or without I/O Pigtail

## Advantage Engine with Advantage 100 I/O PCB (with or without I/O Pigtail)

### Signal Assignment and Description

USB 2.0 D+ and D- must be a twisted pair with 90 Ohms differential. The cable should have an overall foil or braid shield. In-Sight applications do not support USB communications.

The PCB Plug is manufactured by Japan Aviation Electronics Industry Ltd. (JAE) and the part number is FI-C3-A1-15000. The DB15 part number is SUB-D15M-HD.

| PCB Plug Pin Number | DB15 Pin Number | Description           | Notes                                            |
|---------------------|-----------------|-----------------------|--------------------------------------------------|
| 13                  | 1               | USB VBUS              | 4.5-5.5V                                         |
| 5                   | 2               | RS-232 TxD            | RS-232 Transceiver Output                        |
| 7                   | 3               | RS-232 RxD            | RS-232 Transceiver Input                         |
| 10, 17              | 4               | GND                   |                                                  |
| 9                   | 5               | Power 4.9-24VDC       | Maximum 26.4VDC is supported                     |
| 8                   | 6               | RS-232 RTS            | RS-232 Transceiver Output                        |
| 15                  | 7               | Output 0              | Current Sink or Source 5V - 24V @ 25mA (max)     |
| 3                   | 8               | Trigger               | Sink @ 2mA (min)                                 |
| 4                   | 9               | Input 1               | Sink @ 2mA (min)                                 |
| 6                   | 10              | RS-232 CTS            | RS-232 Transceiver Input                         |
| 16                  | 11              | Output 1              | Current Sink or Source 5V - 24V @ 25mA (max)     |
| 14                  | 12              | Output Common         | 5-24 V (source mode), GND (sink mode)            |
| 2                   | 13              | Illumination Strobe   | Current Sink (5-24V), Current Source (5V) @ 25mA |
| 12                  | 14              | USB 2.0 D+/No Connect | In-Sight applications do not support USB.        |
| 11                  | 15              | USB 2.0 D-/No Connect | In-Sight applications do not support USB.        |
| 1                   | Drain Wire      | GND                   |                                                  |

## Advantage Engine with DataMan 50 I/O PCB (with or without I/O Pigtail)

### Signal Assignment and Description

USB 2.0 D+ and D- must be a twisted pair with 90 Ohms differential. The cable should have an overall foil or braid shield. In-Sight applications do not support USB communications.

The PCB Plug is manufactured by JST Mfg. Co. Ltd. and the part number is SHLP-16V-S-B. The DB15 part number is SUB-D15M-HD.

| PCB Plug Pin Number | DB15 Pin Number | Description         | Notes                                            |
|---------------------|-----------------|---------------------|--------------------------------------------------|
| 15                  | 1               | USB VBUS            | 4.5-5.5V                                         |
| 14                  | 2               | RS-232 TxD          | RS-232 Transceiver Output                        |
| 10                  | 3               | RS-232 RxD          | RS-232 Transceiver Input                         |
| 8                   | 4               | GND                 | Connected to Drain Wire                          |
| 3                   | 5               | Power 4.9-24VDC     | Maximum 26.4VDC is supported                     |
| 9                   | 6               | RS-232 RTS          | RS-232 Transceiver Output                        |
| 5                   | 7               | Output 0            | Current Sink or Source 5V - 24V @ 25mA (max)     |
| 12                  | 8               | Trigger             | Sink @ 2mA (min)                                 |
| 11                  | 9               | Input 1             | Sink @ 2mA (min)                                 |
| 13                  | 10              | RS-232 CTS          | RS-232 Transceiver Input                         |
| 4                   | 11              | Output 1            | Current Sink or Source 5V - 24V @ 25mA (max)     |
| 2                   | 12              | Output Common       | 5-24V (source mode), GND (sink mode)             |
| 16                  | 13              | Illumination Strobe | Current Sink (5-24V), Current Source (5V) @ 25mA |
| 7                   | 14              | USB 2.0 D+          |                                                  |
| 6                   | 15              | USB 2.0 D-          |                                                  |
| 1                   | Drain Wire      | GND                 |                                                  |

# ZIF Cables

## Cable Pinout and Signal Description

Pin numbers reflect the ordering on the connector installed on an I/O card that you design. The connector contact side must face toward the AE.

The pin locations on the ZIF connector and the AE are mirror image (Pin 1 on one is Pin 31 on the other and vice versa). Note that some pins and parameters are specific to **In-Sight** and **DataMan** firmware.

When you are implementing your own interface to the ZIF connector, refer to the important note at the end of the table.

| Cable Pin Number | Description                                                                                                      | Type/Level                                                             | Notes                                                                                                                            |
|------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| 31               | Communication Activity                                                                                           | LVTTL/Active High                                                      | Toggles when ENET/USB active                                                                                                     |
| 30               | Power OK                                                                                                         | LVTTL/Active High                                                      | AE power OK                                                                                                                      |
| 29               | <b>In-Sight:</b> Reserved<br><b>DataMan:</b> Gives information to the illumination driver about the power supply | N/A                                                                    |                                                                                                                                  |
| 28               | Input 1                                                                                                          | <b>In-Sight:</b> LVTTL/Active High<br><b>DataMan:</b> LVTTL/Active Low | General purpose input                                                                                                            |
| 27               | +5V                                                                                                              | Power                                                                  | 10% tolerance                                                                                                                    |
| 26               | Illumination Strobe                                                                                              | LVTTL/Active High                                                      | Active during sensor integration                                                                                                 |
| 25               | Illumination Intensity                                                                                           | LVTTL/Active High                                                      | 100KHz PWM, 10% = MAX, 90% = MIN                                                                                                 |
| 24               | GND                                                                                                              | Power                                                                  |                                                                                                                                  |
| 23               | UART_RX                                                                                                          | LVTTL                                                                  |                                                                                                                                  |
| 22               | UART_TX                                                                                                          | LVTTL                                                                  |                                                                                                                                  |
| 21               | UART_CTS                                                                                                         | LVTTL                                                                  |                                                                                                                                  |
| 20               | UART_RTS                                                                                                         | LVTTL                                                                  |                                                                                                                                  |
| 19               | <b>In-Sight:</b> EngineAvailable_L<br><b>DataMan:</b> Output 1                                                   | LVTTL/Active Low                                                       | <b>In-Sight:</b> AE is booted and available<br><b>DataMan:</b> General purpose output                                            |
| 18               | Output 2                                                                                                         | LVTTL/Active High                                                      | <b>DataMan:</b> GoodRead<br><b>In-Sight:</b> Configurable                                                                        |
| 17               | Output 0                                                                                                         | LVTTL/Active High                                                      | General purpose output                                                                                                           |
| 16               | Reserved                                                                                                         | N/A                                                                    |                                                                                                                                  |
| 15               | Trigger/Input 0                                                                                                  | <b>In-Sight:</b> LVTTL/Active High<br><b>DataMan:</b> LVTTL/Active Low | External trigger input                                                                                                           |
| 14               | USB enabled                                                                                                      | LVTTL/Active Low                                                       | Must be connected to ground through a 2.2KΩ resistor to enable USB communication. Must be connected to +3.3V if USB is not used. |
| 13               | Output 3                                                                                                         | LVTTL/Active High                                                      | DataMan BadRead, In-Sight configurable                                                                                           |

| Cable Pin Number | Description                                                    | Type/Level         | Notes                                                                                 |
|------------------|----------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------|
| 12               | <b>In-Sight:</b> Output 1<br><b>DataMan:</b> EngineAvailable_L | LVTTTL/Active High | <b>In-Sight:</b> General purpose output<br><b>DataMan:</b> AE is booted and available |
| 11               | SCL                                                            | LVTTTL             | I <sup>2</sup> C Bus clock                                                            |
| 10               | SDA                                                            | LVTTTL             | I <sup>2</sup> C Bus data                                                             |
| 9                | +5V                                                            | Power              | 10% tolerance                                                                         |
| 8                | USB2.0_D-                                                      | USB 2.0            | In-Sight applications do not support USB                                              |
| 7                | USB2.0_D+                                                      | USB 2.0            | In-Sight applications do not support USB                                              |
| 6                | GND                                                            | Ground             |                                                                                       |
| 5                | ENET_TX+                                                       | Ethernet           |                                                                                       |
| 4                | ENET_TX-                                                       | Ethernet           |                                                                                       |
| 3                | GND                                                            | Ground             |                                                                                       |
| 2                | ENET_RX+                                                       | Ethernet           |                                                                                       |
| 1                | ENET_RX-                                                       | Ethernet           |                                                                                       |

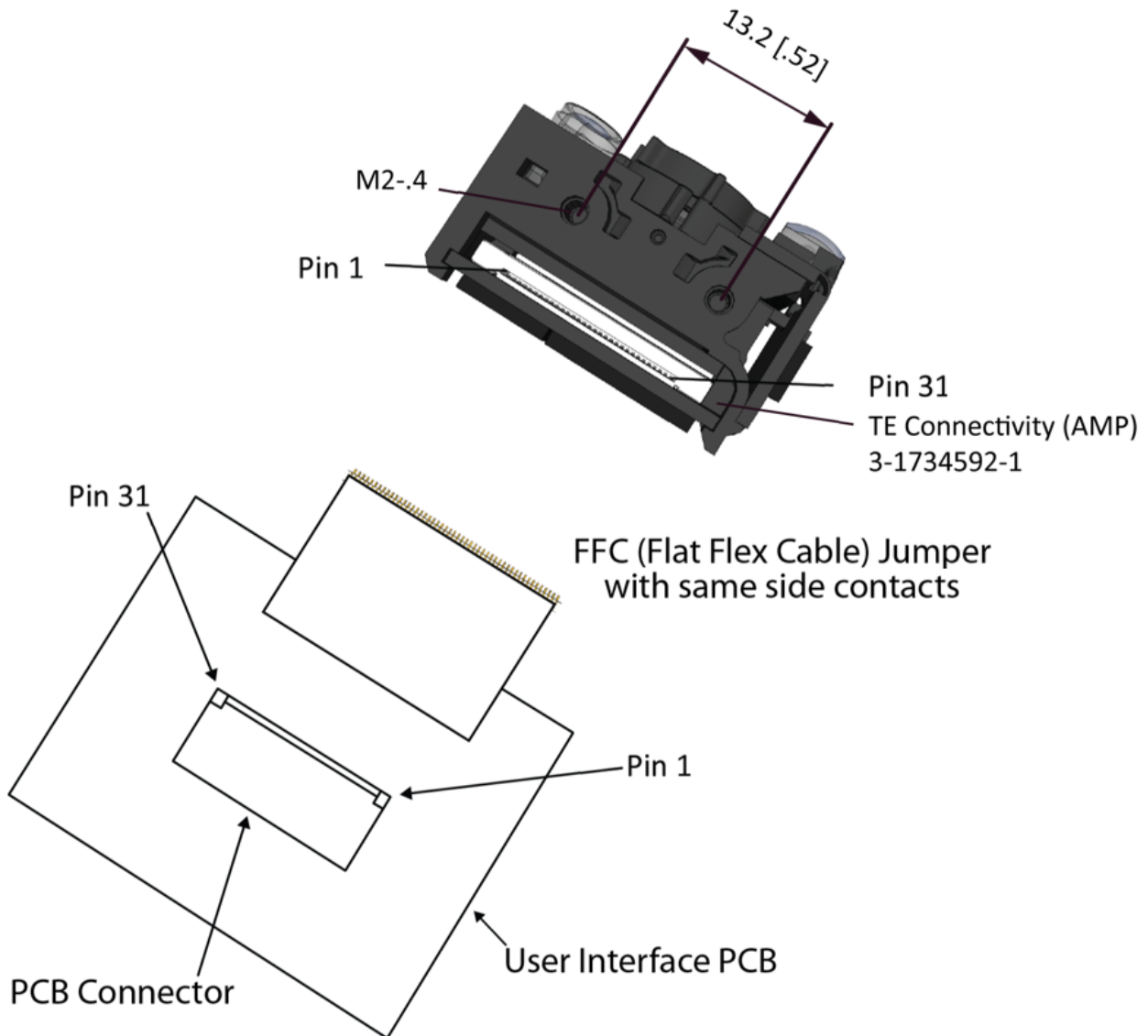
## Third-Party Connector

When implementing your own interface to the ZIF connector (as opposed to using one of the Cognex-supplied I/O modules), the AE firmware checks if all of the I/O interfaces defined in the table are physically present. It is your responsibility to configure your software application so that it uses only those physical interfaces that you actually implement. Regardless of which physical interfaces you implement, your circuit design must adhere to the following requirements:

- Pins 1, 2, 4, and 5 must be left unconnected if the Ethernet interface is not implemented.
- Pin 3 may be left unconnected.
- Pins 7 and 8 must be left unconnected if the USB interface is not implemented.
- Pin 14 must be connected to +3.3V if USB is not used.
- Pin 14 must be connected to ground through a 2.2KΩ resistor to enable USB communication.
- Pin 15:
  - In-Sight firmware: Pin must be connected to ground via a 2.2KΩ resistor if the trigger line is not used.
  - DataMan firmware: Pin must float or be pulled high if it is not used. The engine pulls the Trigger low during power up.
- Pin 16 (reserved) must be connected to +3.3V through a pull-up resistor.
- Pin 21 must be connected to ground via a 2.2KΩ resistor if the UART\_CTS line is not used.
- Pin 23 must be connected to ground via a 2.2KΩ resistor if the UART\_RX line is not used.
- Pin 28:
  - In-Sight firmware: Pin must be connected to ground via a 2.2KΩ resistor if the trigger line is not used.
  - DataMan firmware: Pin must float or be pulled high if it is not used.
- Pins 10, 11, 12, 13, 17, 18, 19, 25, 26, 30, and 31 may be left unconnected if not used.

## Connector Information

The connector manufacturer is TE Connectivity and the part number is CON-FPC-TE-1734592-31P-0.5. The cable manufacturer is Axon Cable Inc. and the part number is FFC0.50D31\_0146S3.0-0-05.0-05.0FABB.



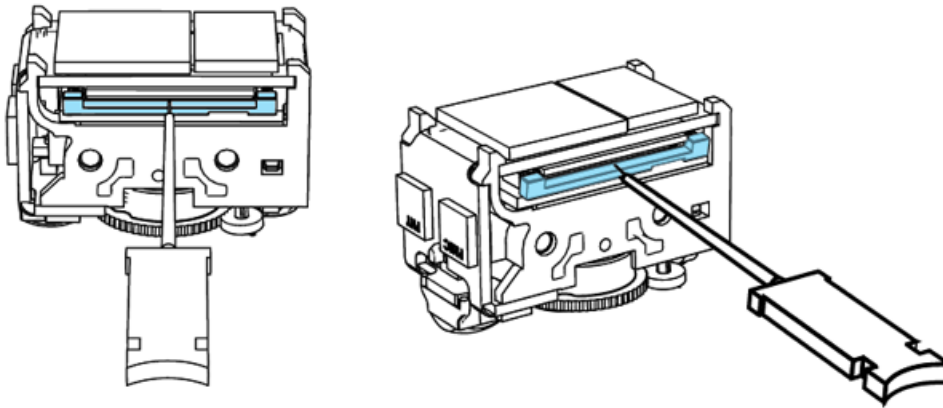
# ZIF/FFC Connector Information

The AE uses a 31-pin ZIF/FFC connector for all electrical connections. This section describes the procedures that must be used when working with this connector. Note the following:

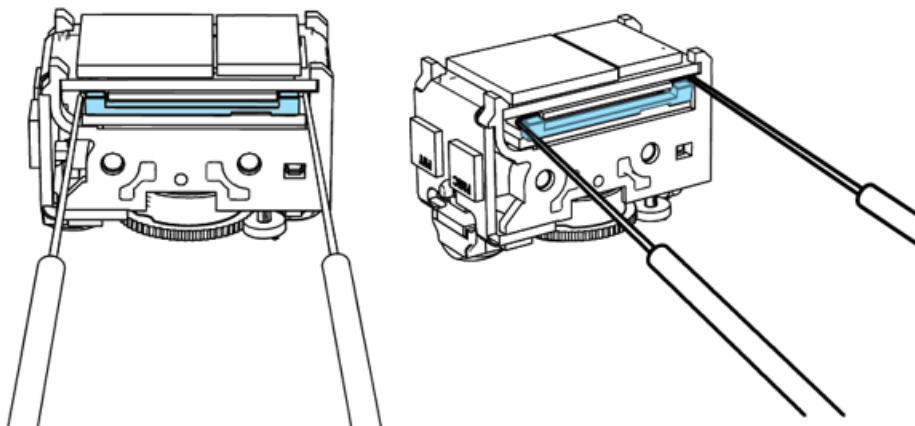
- Observe standard ESD precautions when working with the device.
- Secure the AE in an appropriate fixture.
- The ZIF/FFC connector is not designed for repeated connection/disconnection.

## Attaching the FCC Cable

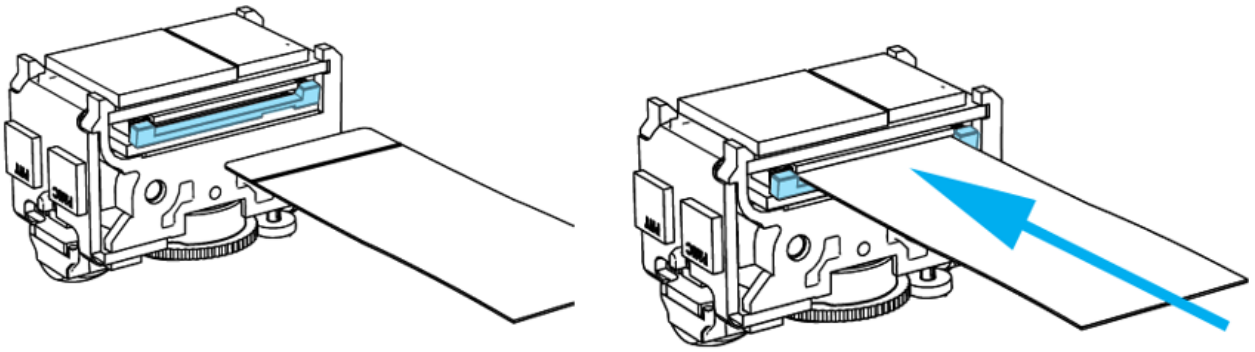
Before attaching the cable, partially withdraw the clamping device using either a pair of fine picks or tweezers, as shown below:



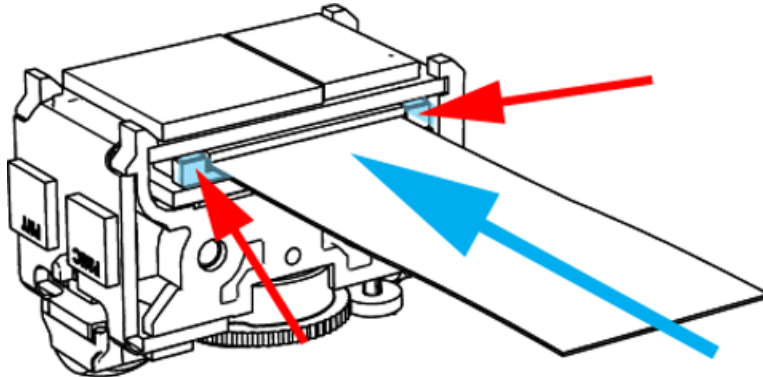
**OR**



While taking care that the clamping device remains in position, slide the FFC cable into the connector (contact side up) until it seats in the bottom of the connector.

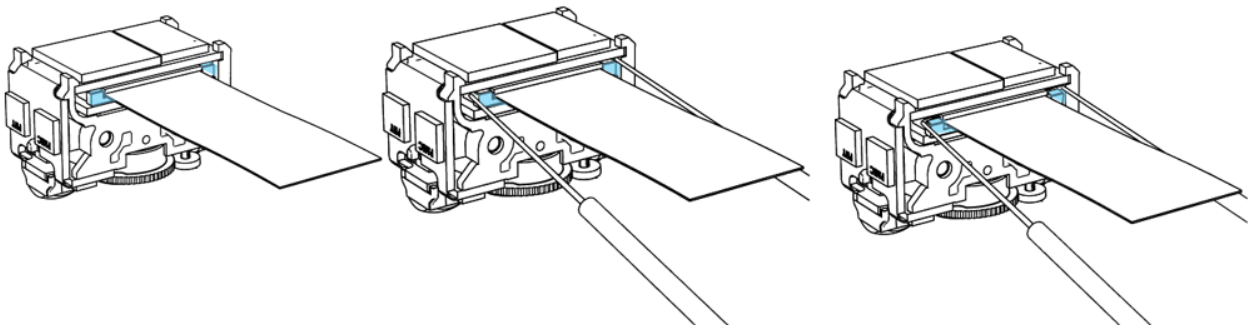


While keeping the cable in position, simultaneously press both ends of the clamping device firmly into the connector:



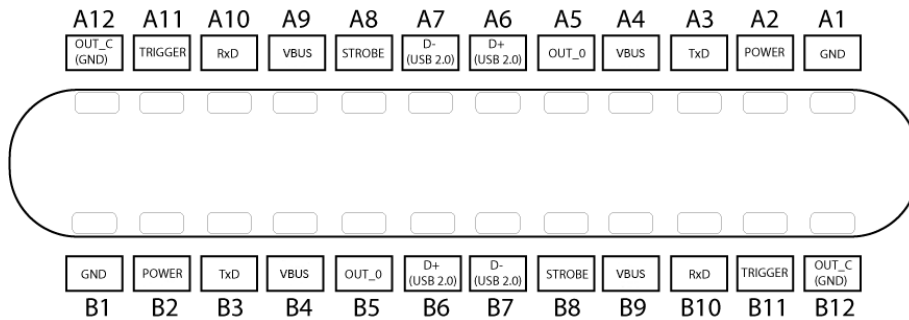
## Removing the FFC Cable

Using a pair of fine picks, gently loosen the clamping device by pulling on both sides at the same time. When the clamping device is loose, withdraw the cable.



# USB-C Connector

USB-C matches the pins in a paired configuration, enabling you to flip the plug and still operate. To support this feature, the Cognex connector will maintain the pairing of pins.



| Pin Number Pair | Definition          | DB15 Pin |
|-----------------|---------------------|----------|
| A1 & B1         | GND                 | 4        |
| A2 & B2         | Power 4.9-24 V*     | 5        |
| A3 & B3         | TxD                 | 2        |
| A4 & B4         | USB VBUS (4.5-5.5V) | 1        |
| A5 & B5         | OUT_0               | 7        |
| A6 & B6         | D+ (USB 2.0)        | 14       |
| A7 & B7         | D- (USB 2.0)        | 15       |
| A8 & B8         | STROBE              | 13       |
| A9 & B9         | USB VBUS (4.5-5.5V) | 1        |
| A10 & B10       | RxD                 | 3        |
| A11 & B11       | TRIGGER             | 8        |
| A12 & B12       | OUT_COMMON (GND)    | 4        |
| GND             | OUT_COMMON          | 12       |
| Drain Wire      | GND                 | N/A      |
| Not Connected   | RTS/OUT_2           | 6        |
| Not Connected   | IN_1                | 9        |
| Not Connected   | CTS/IN_2            | 10       |
| Not Connected   | OUT_1               | 11       |

\* Maximum 26.4 V is supported

# Precautions

To reduce the risk of injury or equipment damage, observe the following precautions when you install the Cognex product:

- Route cables and wires away from high-current wiring or high-voltage power sources to reduce the risk of damage or malfunction from the following causes: over-voltage, line noise, electrostatic discharge (ESD), power surges, or other irregularities in the power supply.
- Changes or modifications not expressly approved by the party responsible for regulatory compliance could void the user's authority to operate the equipment.
- Ensure that the cable bend radius begins at least six inches from the connector. Cable shielding can be degraded or cables can be damaged or wear out faster if a service loop or bend radius is tighter than 10X the cable diameter.
- This device is certified for office use only and if used at home, there can be frequency interference problems.
- This device should be used in accordance with the instructions in this manual.
- All specifications are for reference purposes only and can change without notice.

# Regulations/Conformity

The Advantage Engine is compliant with the following industry standards:

- ROHS compliance
- China ROHS compliance

When the Advantage Engine is employed within a proper housing, the combined unit can be made compliant with the following standards:

- EN55022
- EN61326-1

Because the Advantage Engine is a digital device, take into consideration electro-magnetic interference when designing your own system. Make sure that the following requirements are met:

- use a clean power supply
- ensure good signal ground integrity

In addition, carefully take into account the length and shape as well as the routing path of the flex strips and flex circuits that you use. They should be short, low resistance, and designed with no loops.

| Safety and Regulatory                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Manufacturer                                                                                 | Cognex Corporation<br>One Vision Drive Natick,<br>MA 01760 USA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| EU RoHS                                                                                      | Compliant to the most recent applicable directive.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Korea<br> | 이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.<br>Regulatory Model R00055: MSIP-REM-CGX-R00055.<br>Regulatory Model R00056: MSIP-REM-CGX-R00056.<br>This device is certified for office use only and if used at home, there can be frequency interference problems.                                                                                                                                                                                                                                                                                                                                                                                                  |
| International Product Safety                                                                 | The following guidelines relate to shock and vibration: <ul style="list-style-type: none"> <li>• I IEC 60068-2-27: 1K shocks, semi-sinusoidal, 11 g, 10 ms</li> <li>• I IEC 60068-2-6: vibration in each of 3 main axes for 2 hrs at 10 Gs (10 to 500 Hz at 100 m/s<sup>2</sup> / 15 mm)</li> </ul> <p>To ensure that your Advantage Engine is not subject to ESD (electrostatic discharge) damage, keep the device away from highly charged materials. Before handling the device, make sure that you are grounded by using heel and wrist straps and that you work on a grounded surface. In addition, the Advantage Engine must be kept in an environment controlled for low humidity.</p> |

## For European Community Users

Cognex complies with Directive 2012/19/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 on waste electrical and electronic equipment (WEEE).

This product has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment, if not properly disposed.

In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems for product disposal. Those systems will reuse or recycle most of the materials of the product you are disposing in a sound way.



The crossed out wheeled bin symbol informs you that the product should not be disposed of along with municipal waste and invites you to use the appropriate separate take-back systems for product disposal.

If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You may also contact your supplier for more information on the environmental performance of this product.

## Safety Warnings and Cautions

The following guidelines relate to shock and vibration:

- IEC 60068-2-27: 1 K shocks, semi-sinusoidal, 11 g, 10 ms
- IEC 60068-2-6: vibration in each of 3 main axes for 2 hrs at 10 Gs (10 to 500 Hz at 100 m/s<sup>2</sup> / 15 mm)

## China RoHS



| Part Name<br>部件名称                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Hazardous Substances 有害物质 |                   |                      |                                            |                                           |                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------|----------------------|--------------------------------------------|-------------------------------------------|---------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Lead (Pb)<br>铅            | Mercury (Hg)<br>汞 | Cadmium<br>(Cd)<br>镉 | Hexavalent<br>Chromium<br>(Cr (VI))<br>六价铬 | Polybrominated<br>biphenyls (PBB)<br>多溴联苯 | Polybrominated<br>diphenyl ethers (PBDE)<br>多溴二苯醚 |
| Regulatory<br>Model R00055<br>Regulatory<br>Model R00056                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | X                         | O                 | O                    | O                                          | O                                         | O                                                 |
| <p>This table is prepared in accordance with the provisions of SJ/T 11364.<br/>这个标签是根据SJ/T 11364 的规定准备的。</p> <p>O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB / T26572 - 2011.<br/>表示本部件所有均质材料中含有的有害物质低于GB / T26572 - 2011 的限量要求。</p> <p>X: Indicates that said hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB / T26572 - 2011.<br/>表示用于本部件的至少一种均质材料中所含的危害物质超过GB / T26572 - 2011 的限制要求。</p> |                           |                   |                      |                                            |                                           |                                                   |

