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Introduction

This Ultra-Compact Machine Vision Solution is a comprehensive hardware solution for machine vision applications and factory automation. The included components are easy to assemble for integration into laboratory and OEM systems, and provide a foundational compact machine vision system that can be suited to fit a wide range of applications.

Features

- **Simple**
  - All kit components interact seamlessly with one another
  - This kit is a tested machine vision system with high resolution
- **Versatile**
  - Fixed Focal Length Lens
    - Provides a variable working distance, field of view, and magnification
    - Provides a variable aperture for light throughput control and diffraction/aberration control
    - Features a 100mm – ∞ working distance
  - Ring Light
    - Ideal for a wide variety of inspection and measurement systems with matte objects
- **Compact**
  - Small form factor camera, lens, and light in an 80.5 x 75mm (3.17 x 2.95”) form factor
    - Extra compact right-angle USB camera connection
- **High Resolution**
  - Camera features 2.2um pixels and provides high Nyquist of 227lp/mm when paired with high-resolution fixed focal length lens
  - Lens optimized for camera sensor (ON Semi AR0521 BSI chip)

Contents

- 16mm UC Series Fixed Focal Length Lens
- Allied Vision Alvium 1800 U-500m, 1/2.5" 5.0MP C-Mount, Right Angle USB 3.1 Monochrome Camera*
- 2.95" White Advanced Illumination High Intensity Ring Light*
- M35.5 x 0.5 to M25.5 x 0.5 Ring Light Thread Adapter
- 24V Power Supply with Tinned Leads*
- 8m USB 3.0 Micro-B to Type-A Locking Cable
- M6 and $^{1}/_{4}$-20 Mounting Plate for Alvium Camera*

* Parts are CE certified

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Assembly

1) Use the included screw to attach the $^{1}/_{4}$-20/M6 mounting adapter to the base of the camera.

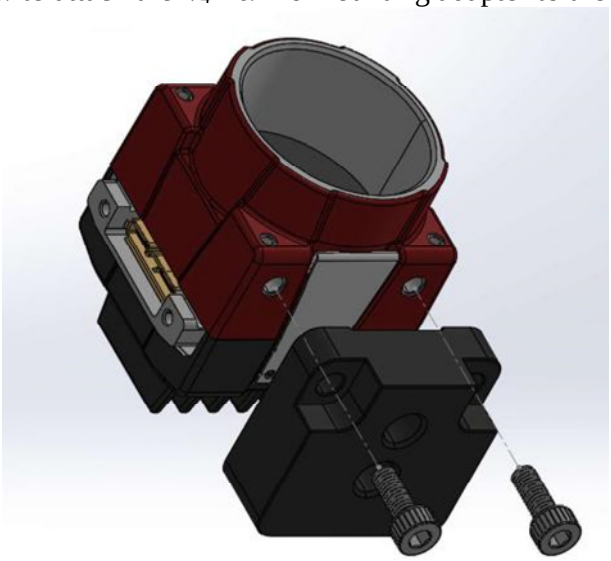

Figure 1. Adapter Connects to Bottom of Camera for $^{1}/_{4}$-20 or M6 Mounting.

2) Connect Micro-B to Type-A locking USB cable to the camera's USB port.

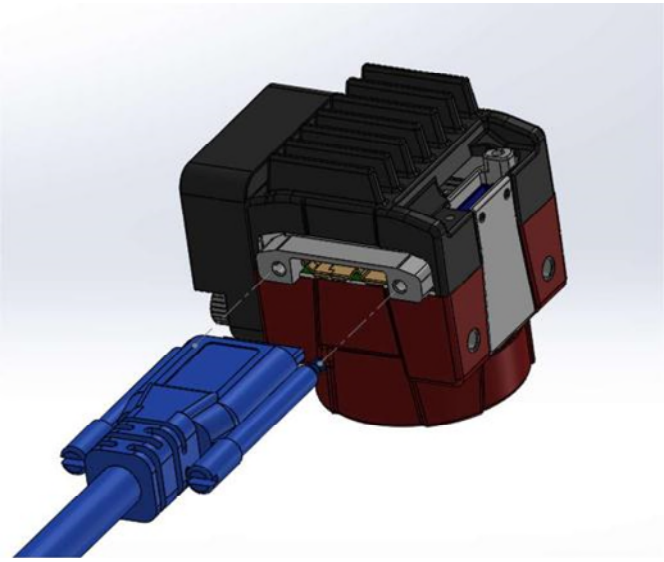

Figure 2. Micro-B USB Connection into Camera.

3) Thread machine vision lens onto the front of the camera.

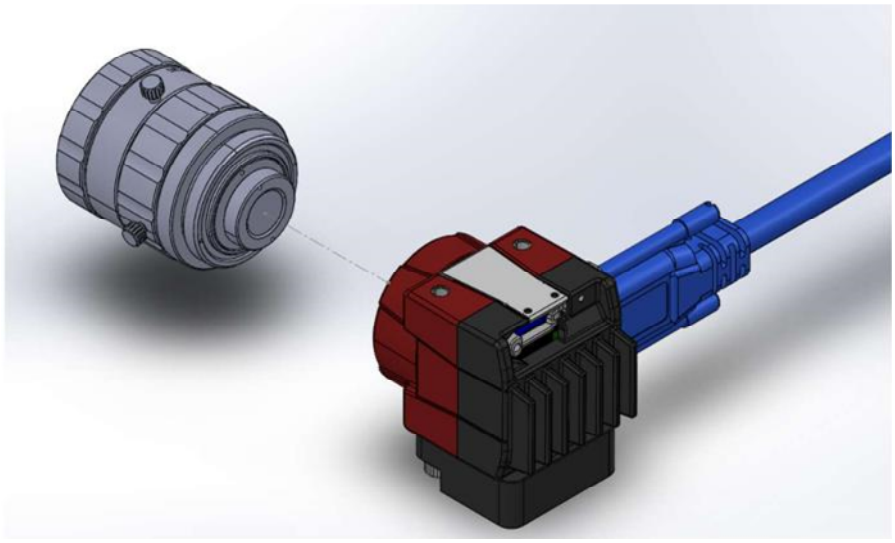

Figure 3.Thread Lens C-mount onto camera C-mount.

4) Thread M35.5 to M25.5 ring light adapter onto the front of the machine vision lens.

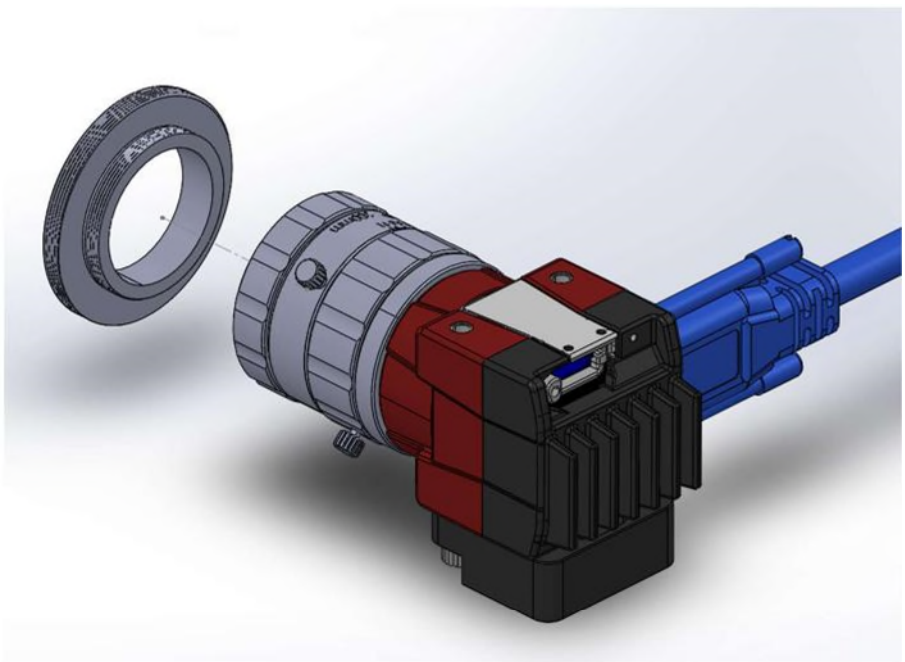

Figure 4. Thread Adapter onto Lens Filter Threads.

5) Thread the ring light onto the ring light lens adapter using the light's internal threads.

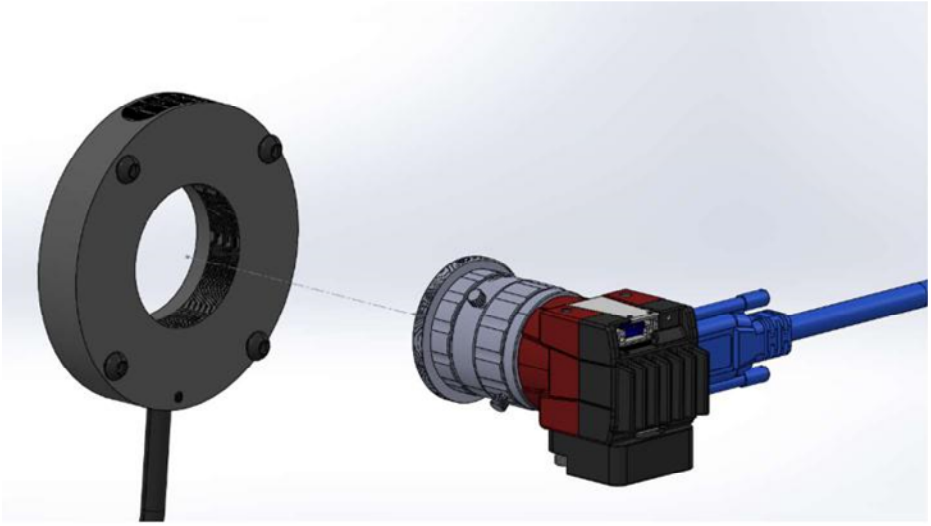

Figure 5. Thread Light Adapter onto Ring Light.

6) Connect USB to PC and download VMBA or 3rd party software to control the camera. a. VMBA Software: https://www.alliedvision.com/en/support/software-downloads/

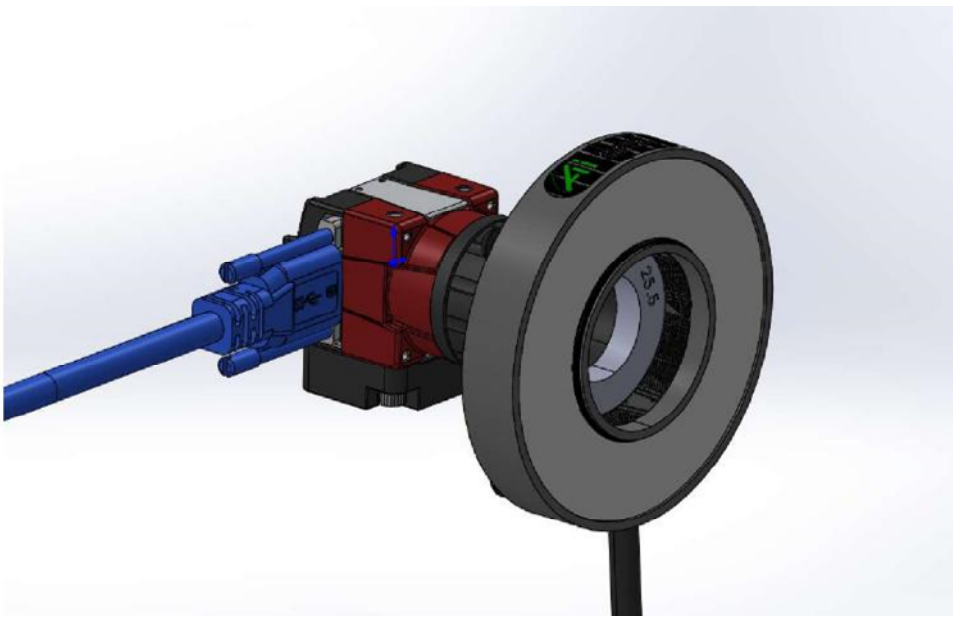

Figure 6. Completed Solution Assembly.

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Connecting the Power Supply

Figure 7. 24V Power Supply and Wire Nuts

The 24V power supply unit has tinned leads that are marked positive/negative and includes two wire nuts for easy connection to all in-line current controlled Advanced Illumination lights. To connect the 24V power supply to the ring light connect the +24VDC white power supply lead to the brown ring light lead using a wire nut. Connect the black GND power supply lead to the blue ring light power supply lead using the other wire nut as shown in the diagram below.

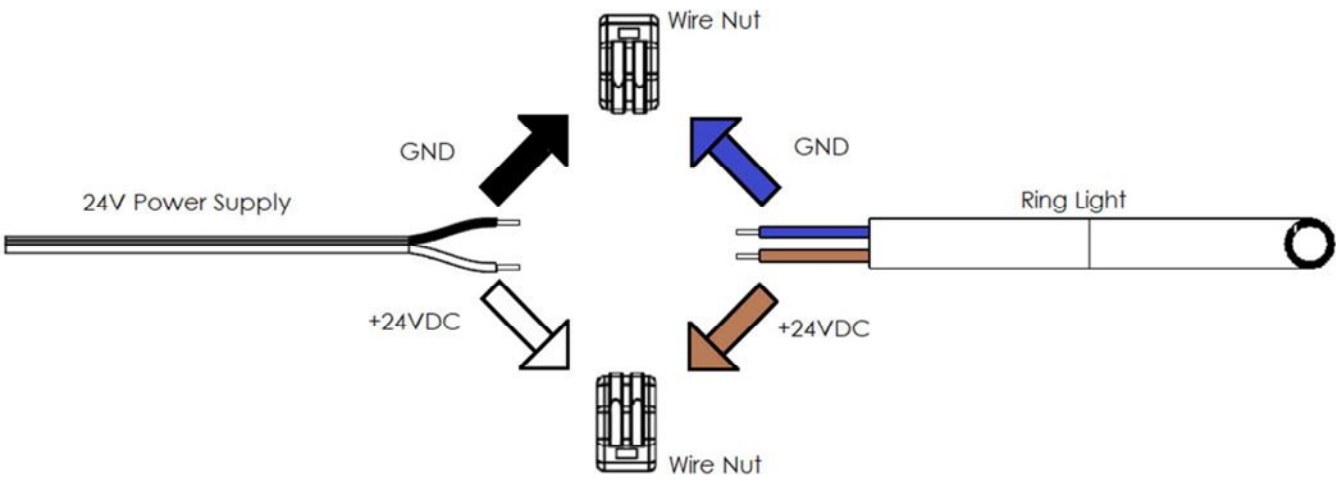

Figure 8. Connecting Power Supply and Ring Light

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Application Examples

Metal Object Inspection

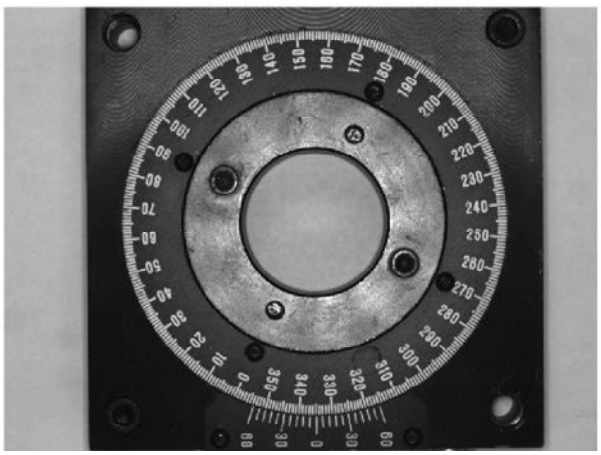

Figure 10. Character Recognition Inspection

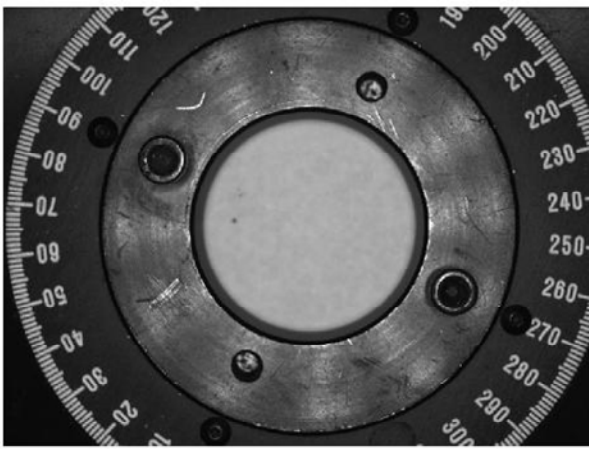

Figure 9. Metallic Defect/Scratches Inspection.

Wellplate Inspection

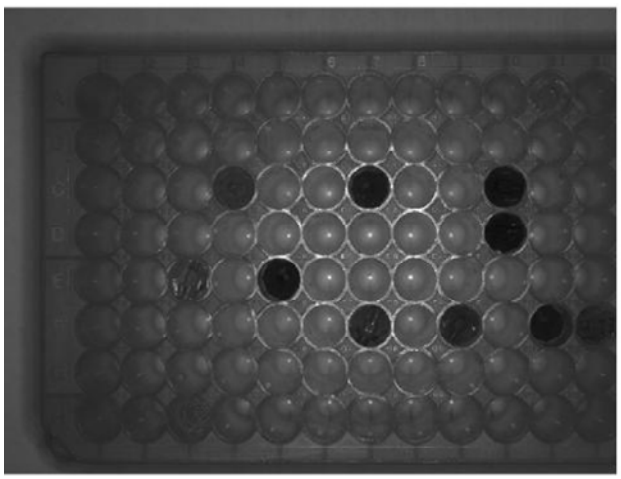

Figure 11. Presence Inspection

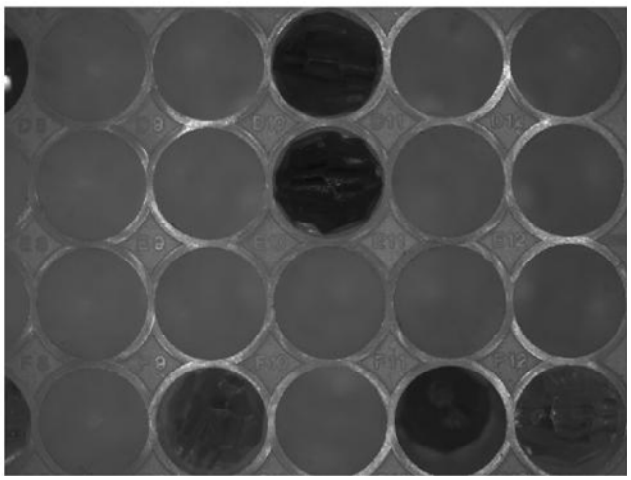

Figure 12. Object Location Inspection

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Packing Slip Inspection

Figure 13. Packing Slip Imaging Inspection

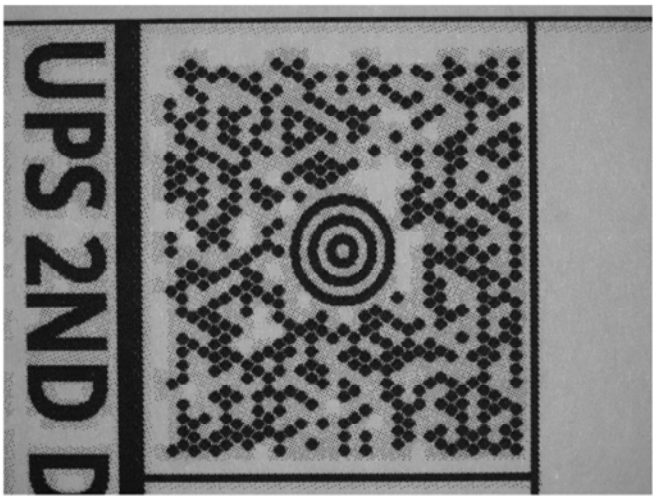

Figure 14. Optical Character Recognition.

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Appendix

One of the main benefits of this kit is the fixed focal length lens which provides the ability to focus over a wide range of working distances, giving an equally wide range of fields of view and magnifications. The system will function effectively and provide good image quality from a working distance of about 100mm out to infinity. This allows for a versatile spatial positioning of the imaging system with respect to the objects being imaged. The versatility of the system is further seen in the variable aperture nature of the lens, allowing for varying light throughput for the lens. The user is then able to balance the light throughput, aberration control, diffraction limit, and depth of field of the system. This kit is also targeted to have a small form factor to limit the effect of spatial limitations. This compact kit is able to provide high resolution as the imaging lens was designed with this specific sensor in mind. The ON Semi AR0521 sensor chip is able to provide a very impressive Nyquist frequency due to its 2.2µm, backside illuminated pixels. This works well with the 16mm UC series lens as the lens is designed to reach a contrast at or above 20% out to 227lp/mm over a large working distance range. The ring light also works well with this kit as it integrates onto the front of the lens which reduces shadowing. The nature of ring lights as a lighting geometry makes them ideal for a wide range of applications involving matte objects.

Ring Light – Coaxial illumination that mounts directly on a lens.	
Pros	Mounts directly to lens and reduces shadowing. Uniform illumination when used at proper distances.
Cons	Circular glare pattern from reflective surfaces. Works only in relatively short working distances.
Useful Products	Fiber optic ring light guides and fluorescent ring lights; LED ring lights.
Application	Wide variety of inspection and measurement systems with matte objects.