InGaAs line scan camera
C15333-10E04

See beneath the surface with InGaAs camera

Suitable for in-line non-destructive inspection

SWIR (short wavelength infrared) imaging is a great solution for non-destructive inspection. It sees under the surface, differentiates materials based on their SWIR spectral signatures, and offers a safe and convenient way to ensure product quality. Example applications include checking liquid volumes in packages, inspecting contents of sealed containers, and detecting damages and contaminants in agricultural products. In addition, applications in the semiconductor industry include Si wafer pattern inspection and solar cell defect detection. Integrating SWIR imaging into production lines requires cameras such as the C15333-10E04 InGaAs line scan camera, whose high SWIR sensitivity and fast line rate are ideal for real time, in-line non-destructive inspection. Compare to the conventional model, the C15333-10E04 has improved usability by adding an edge trigger function, which can shoot with a certain exposure time even the conveyor belt speed is changed while shooting. It also becomes compatible with a trigger enable function, which shoots only when an object is passing in front of the camera.

Applications
- Food and agricultural products
damage inspection, quality screening, material discrimination etc.
- Semiconductors
Si wafer pattern inspection, solar cell inspection by EL/PL etc.
- Industry
moisture content, leak detection, container inspection etc.

Features
- SWIR sensitivity from 950 nm to 1700 nm
- 1024 pixel linear array
- Maximum line rate 40 kHz
- Interface: Employs Gigabit Ethernet
- Equipped with high quality images
  (Background subtraction, Real time shading correction)
### Contaminant detection

Stones that are difficult to detect in visible images because of their similar size and hue can be easily detected in SWIR images.

**Sample: Coffee beans**
- **Contaminant:** Stones
- **Wavelength:** 1200 nm
- **Illumination:** Reflection

![Visible image](image1) ![SWIR image](image2) Stones

### Damage inspection

It is possible to detect damages on apples that are difficult to distinguish visually.

**Sample: Apple**
- **Wavelength:** 1450 nm
- **Illumination:** Reflection

![Visible image](image3) ![SWIR image](image4) Damage

### Key features of InGaAs line scan camera C15333-10E04

**High sensitivity in SWIR**
This camera covers wavelengths from 950 nm to 1700 nm, with QE above 60% from wide range.

**High quality images**
Hamamatsu's circuit design enables low read noise and high performance. Pixel correction functions correct hot pixels, sensor variation, and intensity variation.

![Without correction](image5) ![With correction](image6)
Semiconductor wafer pattern inspection

The internal pattern of Si wafers can be observed.

Sample: Si wafer  
Wavelength: 1100 nm  
Illumination: Transmission

Container inspection

The contents of packaged plastic containers, such as instant food, can be checked.

Sample: Instant noodles  
Wavelength: 1200 nm  
Illumination: Reflection

⚠️ Employs Gigabit Ethernet interfaces

This camera employs Gigabit Ethernet interfaces, which are widely used in industrial fields. It supports GigE Vision.

☑️ Compact design

Its compact and lightweight design makes the camera easy to integrate into inspection systems.

- Size: 49 mm (W) × 49 mm (H) × 100 mm (D)*
- Weight: Approx. 250 g

*Not including protrusions.
Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product number</td>
<td>C15333-10E04</td>
</tr>
<tr>
<td>Imaging device</td>
<td>InGaAs line sensor</td>
</tr>
<tr>
<td>Effective number of pixels</td>
<td>1024 (H) x 1 (V)</td>
</tr>
<tr>
<td>Pixel size</td>
<td>12.5 μm (H) x 12.5 μm (V)</td>
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<tr>
<td>Effective area</td>
<td>12.8 mm (H) x 0.0125 mm (V)</td>
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<tr>
<td>Maximum line rate</td>
<td>Internal: 40 kHz (21 μs exposure time)</td>
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<tr>
<td></td>
<td>Edge trigger: 20 kHz (21 μs exposure time)</td>
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<tr>
<td></td>
<td>Sync readout: 40 kHz</td>
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<tr>
<td>Digital output</td>
<td>14 bit</td>
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<tr>
<td>Exposure time</td>
<td>21 μs to 1 s</td>
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<tr>
<td>External trigger input mode</td>
<td>Edge trigger, Sync readout</td>
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<tr>
<td>Trigger enable function</td>
<td>Support</td>
</tr>
<tr>
<td>Trigger input connector</td>
<td>SMA or 12 pin HIROSE connector</td>
</tr>
<tr>
<td>Interface</td>
<td>Gigabit Ethernet</td>
</tr>
<tr>
<td>Image processing</td>
<td>Background subtraction, Real time shading correction</td>
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<tr>
<td>Other function</td>
<td>Flip, Buried data</td>
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<tr>
<td>Lens</td>
<td>C-mount</td>
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<tr>
<td>Power supply</td>
<td>DC 12 V</td>
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<tr>
<td>Power consumption</td>
<td>6 W max.</td>
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<tr>
<td>Ambient operating temperature</td>
<td>0 °C to +40 °C</td>
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<tr>
<td>Ambient operating humidity</td>
<td>30 % to 80 % (with no condensation)</td>
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<tr>
<td>Ambient storage temperature</td>
<td>-10 °C to +50 °C</td>
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<tr>
<td>Ambient storage humidity</td>
<td>90 % max.  (with no condensation)</td>
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</table>

System configuration example

Options

<table>
<thead>
<tr>
<th>Options</th>
<th>Product numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camera adapter</td>
<td>A13206-03, -04</td>
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<tr>
<td>12PIN cable 5 m</td>
<td>A3194-01</td>
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<tr>
<td>Base plate</td>
<td>A15931-01</td>
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<tr>
<td>External trigger cable SMA-BNC 5 m</td>
<td>A12106-05</td>
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<tr>
<td>External trigger cable SMA-SMA 5 m</td>
<td>A12107-05</td>
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<tr>
<td>Frame grabber board with Ethernet cable (5 m)</td>
<td>M9982-38</td>
</tr>
</tbody>
</table>

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● Subject to local technical requirements and regulations, availability of products included in this brochure may vary. Please consult your local sales representative.
● The product described in this brochure is designed to meet the written specifications, when used strictly in accordance with all instructions.
● The spectral response specified in this brochure is typical value and not guaranteed.
● The measurement examples in this brochure are not guaranteed.
● Please note the near-infrared images in this brochure are taken for test purpose; the images do not reflect actual qualities of the products on the market.
● This product is used by customers in combination with belt conveyors, etc., and the inspection details may be affected by the installation location, installation environment, inspection speed, type of inspection target, etc. When building a system, it is necessary for the customer to pay close attention, and we do not guarantee that this product will meet the specific intended use of the customer.

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