No focus readjustment required. Industrial camera with a newly developed algorithm.

**RICOH extended depth of field camera**

- **Camera Link™** 5 Mega-Pixel Camera & Lens
  - Detailed flaw inspection
  - Substrate inspection

- **GigE Vision™** 2 Mega-Pixel / VGA Camera & Lens
  - DPM* identification
  - Distribution line inspection

*Direct Part Marking*
A fusion of RICOH optical design and image processing technology has realized a depth of field 3 to 5 times* better than conventional cameras (compared to RICOH products).

Consisting of a dedicated camera equipped with a newly developed special algorithm and a specific range of lenses, RICOH’s extended depth of field camera system requires no focus readjustment or no repositioning of the camera or subject. A new 5MP high resolution camera with 3 dedicated lenses have been added to the EDoF lineup to support a wider range of applications.

*When compared to cameras at the same working distance. The extended depth of field effect varies depending on the subject matter.

### 5 Mega-Pixel
**Camera & Lens**
- PCB substrate inspection (AOI)
- Detailed flaw inspection

- 5MP high resolution quality in a compact design
- High frame rate (up to 53 fps) capture is possible
- Newly developed image processing (adaptive reconstruction filter) suppresses noise and reproduces fine patterns
- High-speed transfer using CameraLink™ (PoCL™ model)

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**Substrate visual inspection**

With an extended depth of field camera, the entire depth of field is in focus, from the front of the foot of the substrate (indicated by the red arrow) to the back, even in substrate inspections using a high condenser.

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**EL-BC2550-5M**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EL-BC2550-5M Product specifications</strong></td>
<td><strong>EL-BC5090-5M Product specifications</strong></td>
</tr>
<tr>
<td>Focal length</td>
<td>25 mm</td>
</tr>
<tr>
<td>F number (fixed)</td>
<td>5.0</td>
</tr>
<tr>
<td>Minimum object distance</td>
<td>0.1 m</td>
</tr>
<tr>
<td>Horizontal angle of view</td>
<td>28.8°</td>
</tr>
<tr>
<td>External dimensions</td>
<td>φ42 mm×57.5 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>149 g</td>
</tr>
</tbody>
</table>
What is RICOH extended depth of field camera?

- The combination of a dedicated camera utilizing a newly developed special algorithm and a dedicated lens.
- Available camera resolutions include 5MP (up to 53 fps), 2MP (15 fps) and VGA (90 fps).
- Uses FPGA (Field Programmable Gate Array) to achieve near real-time image data processing.
- Equipped with an effective [AOI* scan mode] to improve the quality and speed of inspection.

* Area of interest: Only the part of the image required for scanning is scanned and transferred, reducing the time required to read and transfer data.

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### Foreground and background subjects are in focus, so there is no need to readjust the focus or the subject and camera positions.

#### Conventional camera imaging result

The foreground QR code cannot be recognized.

#### RICOH extended depth of field camera (example)

Both foreground and background QR codes can be recognized.

#### Comparison of the depth of field at the same focal length and F number

<table>
<thead>
<tr>
<th>Model</th>
<th>Focal length</th>
<th>F number (fixed)</th>
<th>Minimum object distance</th>
<th>Horizontal angle of view</th>
<th>External dimensions</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL-CC0817B-VG</td>
<td>6.5 mm</td>
<td>1.7 (EL-CC0817B-VG)</td>
<td>0.25 m</td>
<td>—</td>
<td>120 g</td>
<td></td>
</tr>
<tr>
<td>EL-CC0833B-VG</td>
<td>3.3 (EL-CC0833B-VG)</td>
<td>5.5 (EL-CC1255-2M)</td>
<td>0.25 m</td>
<td>—</td>
<td>120 g</td>
<td></td>
</tr>
<tr>
<td>EL-CC0866B-VG</td>
<td>6.6 (EL-CC0866B-VG)</td>
<td>2.1 (EL-CC3521-2M)</td>
<td>0.25 m</td>
<td>—</td>
<td>120 g</td>
<td></td>
</tr>
</tbody>
</table>

---

### Scale 65:100

#### Both foreground and background QR codes can be recognized.

#### Comparison of the depth of field at the same focal length and F number

<table>
<thead>
<tr>
<th>Model</th>
<th>Focal length</th>
<th>F number (fixed)</th>
<th>Minimum object distance</th>
<th>Horizontal angle of view</th>
<th>External dimensions</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL-CC1228-2M/M</td>
<td>2.8 mm</td>
<td>2.8 (EL-CC1228-2M)</td>
<td>0.25 m</td>
<td>32.6°</td>
<td>120 g</td>
<td></td>
</tr>
<tr>
<td>EL-CC1255-2M</td>
<td>5.5 (EL-CC1255-2M)</td>
<td>3.3 (EL-CC3543-2M)</td>
<td>0.25 m</td>
<td>32.6°</td>
<td>120 g</td>
<td></td>
</tr>
<tr>
<td>EL-CC3521-2M/EL-CC3543-2M</td>
<td>3.3 (EL-CC3543-2M)</td>
<td>2.1 (EL-CC3521-2M)</td>
<td>0.25 m</td>
<td>32.6°</td>
<td>120 g</td>
<td></td>
</tr>
</tbody>
</table>

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### 2 Mega-Pixel Camera & Lens

#### EV-G200B1

- VGA Camera & Lens
- Bar code and character recognition in distribution, pharmaceutical, food, and steel industries
- Direct Part Marking (DPM) identification

#### EV-G030B1

- 2 Mega-Pixel Camera & Lens
- 300,000 pixels

#### EL-C0817B-VG

- Focal length: 6.5 mm
- F number (fixed): 1.7
- Minimum object distance: 0.25 m
- Horizontal angle of view: 30°
- External dimensions: φ42×40 mm
- Weight: 120 g

#### EL-C0833B-VG

- Focal length: 3.3 mm
- F number (fixed): 2.8
- Minimum object distance: 0.25 m
- Horizontal angle of view: 32.6°
- External dimensions: φ42×40 mm
- Weight: 120 g

#### EL-C0866B-VG

- Focal length: 6.6 mm
- F number (fixed): 3.3
- Minimum object distance: 0.25 m
- Horizontal angle of view: 32.6°
- External dimensions: φ42×40 mm
- Weight: 120 g

---

### EL-HC1228-2M

- Focal length: 12 mm
- F number (fixed): 2.8
- Minimum object distance: 0.25 m
- Horizontal angle of view: 21.6°
- External dimensions: φ29.5×28.5 mm
- Weight: 55 g

#### EL-HC1255-2M

- Focal length: 35 mm
- F number (fixed): 2.1
- Minimum object distance: 0.25 m
- Horizontal angle of view: 7.5°
- External dimensions: φ29.5×35.4 mm
- Weight: 63 g

---

### EL-CC3521-2M

- Focal length: 2.1 mm
- F number (fixed): 2.1
- Minimum object distance: 0.25 m
- Horizontal angle of view: 11.4°
- External dimensions: φ29.5×35.4 mm
- Weight: 63 g

---

Note: The foreground QR code cannot be recognized.

Conventional camera imaging result

RICOH extended depth of field camera (example)

Comparison of the depth of field at the same focal length and F number

MTF*

Lower limit of MTF tolerance

MTF of RICOH extended depth of field camera

MTF of normal optical system

* Modulation Transfer Function

---

What is RICOH extended depth of field camera?

- The combination of a dedicated camera utilizing a newly developed special algorithm and a dedicated lens.
- Available camera resolutions include 5MP (up to 53 fps), 2MP (15 fps) and VGA (90 fps).
- Uses FPGA (Field Programmable Gate Array) to achieve near real-time image data processing.
- Equipped with an effective [AOI* scan mode] to improve the quality and speed of inspection.

---

Bar code and character recognition in distribution, pharmaceutical, food, and steel industries

Direct Part Marking (DPM) identification
Camera Specifications

**Image sensor**
- 1/" square pixel format UXGA progressive color CCD
- 1/1.8" square pixel format UXGA progressive monochrome CCD
- 1/5" square pixel format VGA progressive monochrome CCD

**Effective number of image output pixels (H x V)**
- EV-L500C1: 2560 x 2048
- EV-G200C1: 1624 x 1296
- EV-G200B1: 1624 x 1296
- EV-G030B1: 1624 x 1296
- VQA class: 648 x 484

**Gain**
- Programmable

**Gamma**
- 1.0, uploadable gamma table (selectable using communication)

**Exposure time**
- Preset continuous mode: 10 to 16,777,216 μs
- Preset trigger mode: 10 to 16,777,216 μs
- Pulse width trigger mode: 10 μs to infinite

**Frame rate**
- 15.3668 Hz (at full resolution)
- Max. camera frame rate (61.2667 Hz) when the vertical resolution is set to 230.

**Horizontal frequency**
- 10 kHz (at 8 bit 8 TAP)

**Vertical frequency**
- 60 Hz (at 8 bit 8 TAP)
- Max. camera frame rate (61.2667 Hz) when the vertical resolution is set to 230.

**Sync system**
- Internal

**Input voltage**
- DC 10.8 to 26.4 V (power/signal connector or Power Over Ethernet) (power supply from power/signal connector is automatically prioritized)

**Power consumption**
- Less than 3.8 W

**Weight**
- Approximately 140 g

**Dimensions**
- Excluding connector: 50 mm × 50 mm × 39.6 mm*
- 30 mm × 30 mm × 30.5 mm* (EV-L500C1, EV-G200C1, EV-G200B1, EV-G030B1)
- 60 mm × 40 mm × 53.4 mm* (EV-L500C1, EV-G200C1, EV-G200B1, EV-G030B1)

**Lens model**
- C mount

**Note**
- The special algorithm of the camera varies depending on each of the 11 lenses. You will be provided a set configured according to the algorithm to the ordered lens, so make sure to use with the fixed set.

EV-L500C1/EV-G200C1/EV-G200B1/EV-G030B1 Rear connector specifications

**Trigger input signal**
- Can be assigned either on Camera Link connector (CC1) or on the No. 2 pin of the power/IO connector through the camera setting communication.

**Input/output signal connector**
- Hirose HR10A-7R-6PB or equivalent

**Camera model**
- EV-L500C1
- EV-G200C1
- EV-G200B1
- EV-G030B1

**Pin number**

**Signal name**

**INOUT**

**Voltage**

**High Voltage**

<table>
<thead>
<tr>
<th>Pin number</th>
<th>Signal name</th>
<th>INOUT</th>
<th>Voltage</th>
<th>High Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power supply GND</td>
<td>IN</td>
<td>Open</td>
<td>open</td>
</tr>
<tr>
<td>2</td>
<td>Power supply input</td>
<td>IN</td>
<td>+10 to +24 V</td>
<td>+10 V to +24 V</td>
</tr>
<tr>
<td>3</td>
<td>Output 1</td>
<td>OUT</td>
<td>Opt. Isolated</td>
<td>Trigger operating status signal output</td>
</tr>
<tr>
<td>4</td>
<td>Output 2</td>
<td>OUT</td>
<td>Opt. Isolated</td>
<td>Exposure period signal</td>
</tr>
<tr>
<td>5</td>
<td>Output 3</td>
<td>OUT</td>
<td>Opt. Isolated</td>
<td>Output</td>
</tr>
<tr>
<td>6</td>
<td>Output 4</td>
<td>OUT</td>
<td>Opt. Isolated</td>
<td>Open</td>
</tr>
<tr>
<td>7</td>
<td>Output 5</td>
<td>OUT</td>
<td>Opt. Isolated</td>
<td>Open</td>
</tr>
<tr>
<td>8</td>
<td>Input 1</td>
<td>IN</td>
<td>Opt. Isolated</td>
<td>Tri input</td>
</tr>
<tr>
<td>9</td>
<td>Input 2</td>
<td>IN</td>
<td>Opt. Isolated</td>
<td>Open</td>
</tr>
<tr>
<td>10</td>
<td>Input 3</td>
<td>IN</td>
<td>Opt. Isolated</td>
<td>Open</td>
</tr>
<tr>
<td>11</td>
<td>Power supply input for I/O signal</td>
<td>IN</td>
<td>I/O VCC to +28.4 V</td>
<td>+28.4 V</td>
</tr>
<tr>
<td>12</td>
<td>GND for I/O signal</td>
<td>IN</td>
<td>GND</td>
<td>GND</td>
</tr>
</tbody>
</table>

**Specifications**

**Default setting**

**RICOH extended depth of field camera and supported lenses**

**Camera model**

**Lens model**

**Lens mount**
- C mount

**External dimensions (W × H × D)**
- 50 mm × 50 mm × 39.6 mm*
- 30 mm × 30 mm × 30.5 mm* (EV-L500C1, EV-G200C1, EV-G200B1, EV-G030B1)
- 60 mm × 40 mm × 53.4 mm* (EV-L500C1, EV-G200C1, EV-G200B1, EV-G030B1)

**Input/output signal connector**
- Hirose HR10A-7R-6PB or equivalent

**Camera Link connector (CC1)**

**Power supply input connector**

**Power over Ethernet**

**I/O signal connector**

**Rear connector**

**Unit: mm**

**For your safety**
- Be sure to ground the product. Malfunction or electric leakage can cause an electric shock.

**For orders and inquiries:**
- Contact us for more information.