# X-ray TDI Camera
# C12200-321

## Evolutional high speed scanning with TDI new standard.

▲ C12200-321

X-ray TDI camera C12200-321 is useful for in-line applications requiring high-speed operation with high sensitivity. TDI is a special image acquisition method that has been used extensively in machine vision applications for industrial inspection. TDI imaging is appropriate for applications where it is desired to record a linear movement, or where the aspect ratio of the subject being imaged is significantly asymmetric.
Low brightness under high resolution usage, a problem with conventional line sensor cameras, is improved with this X-ray TDI camera, making it suitable for applications which require high resolution.

## FEATURES

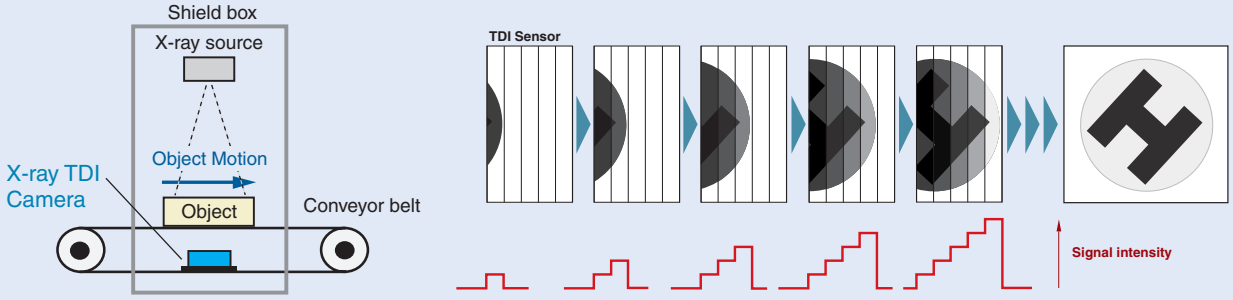
- **Wide detection width for in-line inspection**
  (Detection width: 221 mm)
- **High resolution / high sensitivity**
  (Horizontal spatial resolution with 128 (V) TDI stages)
  **- C12200-321: 4608 (H) × 128 (V)**
- **High-speed readout approx. 36.8 m/min with 2 × 2 binning**
- **High S/N ratio with 12 bit output**
- **Camera Link interface (Base configuration)**
- **Single power supply (+15 V) operation**
- **Real time dark current / shading correction function**
- **Frame readout mode for easy installation alignment**

## APPLICATIONS

- **Printed circuit board (PCB) inspection**
- **Battery inspection**
- **Medicine inspection**
- **Surface-mounted component inspection**
- **High-resolution in-line non-destructive inspection**

## OPERATING PRINCIPLE OF TDI

**TDI** (Time Delay Integration):
Time Delay Integration is a technique in which signal charges in each line are vertically transferred during charge readout. By synchronizing the vertical transfer timing with the movement of the object, the signal charges are integrated without smear. As a result, TDI provides higher sensitivity than standard line scan cameras. It is an ideal technology for high-throughput X-ray applications that require high sensitivity and high resolution simultaneously.

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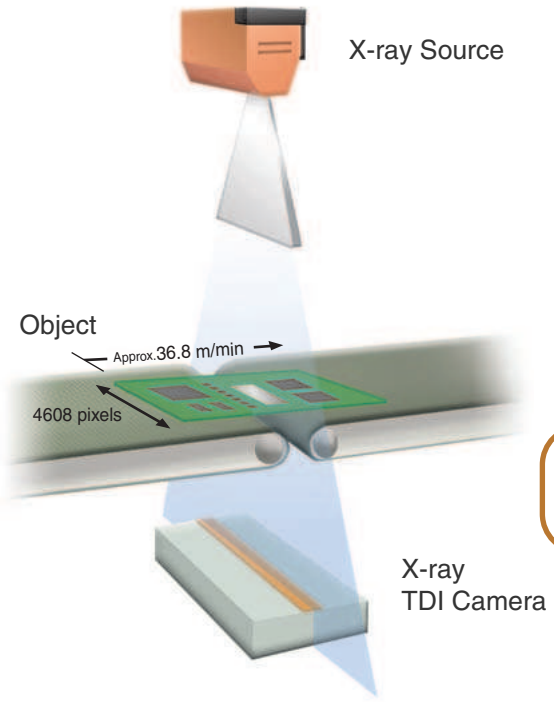
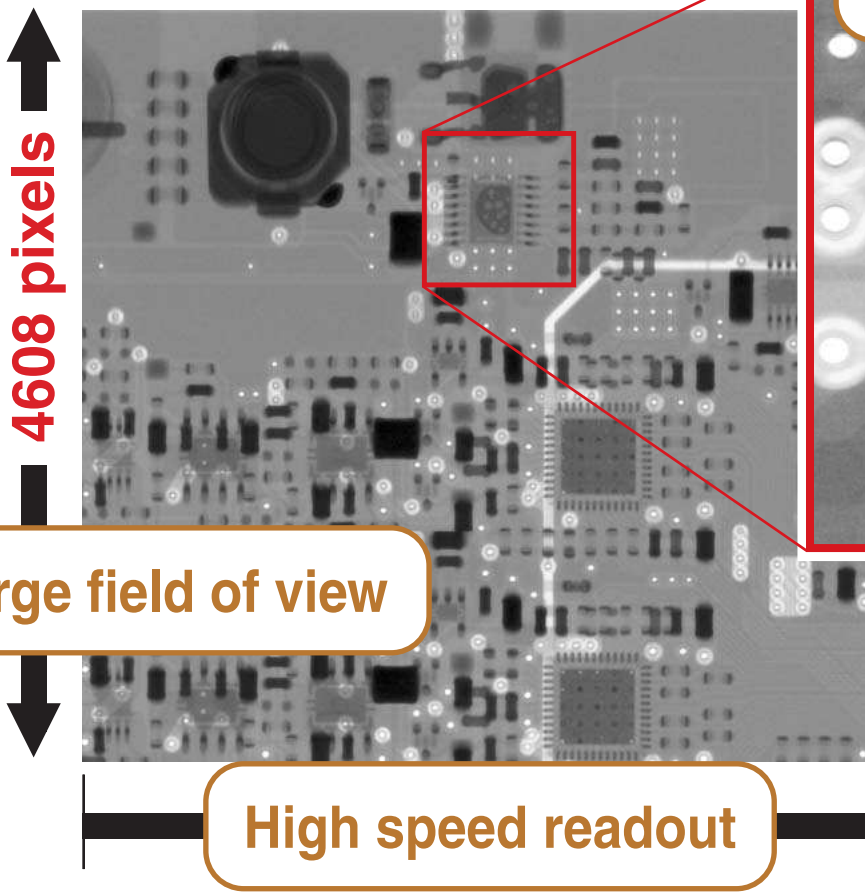
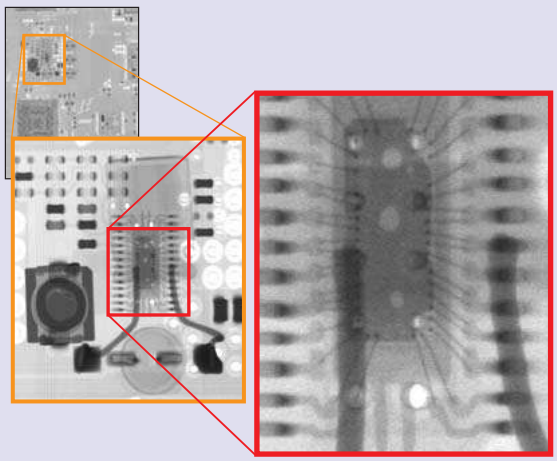
# High-resolution, High-speed Camera with a Wide



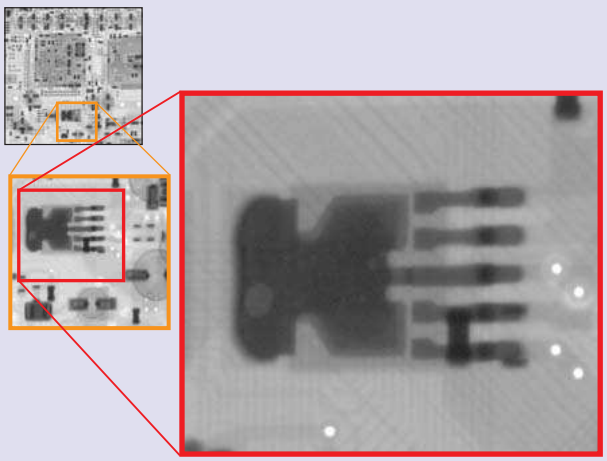




## MEASUREMENT EXAMPLES

### 1 PC Board



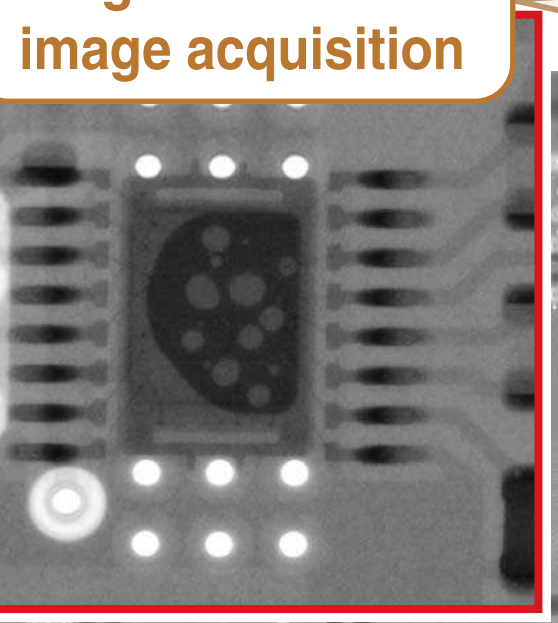
▲ Back fillet under stacked parts, wire bonding in the IC, void in die-bond pad and lapping films can be seen.



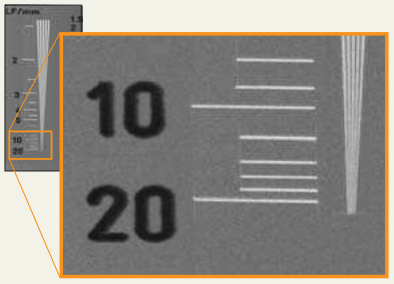
▲ Void in solder surface mount device and condition of solder fillet can clearly be seen.

# e Field of View for In-line 100% X-ray Inspection

## High resolution image acquisition



● **Resolution chart** (2× magnification)




▲ < 16 Line Pair / mm
= 31 µm resolution
* When the focal size of the X-ray source is large, this value gets worse.

**High Speed**

**High Sensitivity**

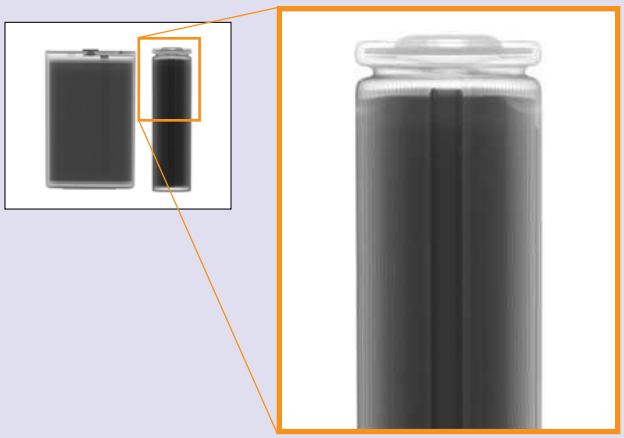
**High Resolution**

**TDI technology offers all three simultaneously.**

**Approx. 36.8 m/min**

Web Image Galleries
www.sales.hamamatsu.com/c10650

### 2 Lithium-ion Battery



▲ By imaging the internal structure of a lithium battery, foreign materials can be detected.

### 3 Medical

▲ Possible replacement for film in human X-ray imaging
* The C12200 camera has a narrow irradiation area and performs high-speed imaging, so it requires a reduced dosage. Because it is a digital system, film processing is not required and it is easy to capture and transfer images remotely.

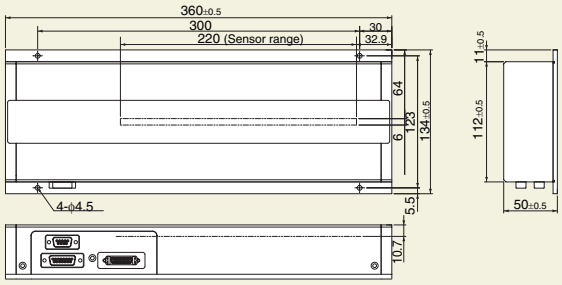
## SPECIFICATIONS

| Type number | | C12200-321 |
|---|---|---|
| CCD pixel number | | 4608 (H) × 128 (V) |
| Active CCD pixel number | | 4608 (H) × 110 (V) |
| CCD pixel size | | 48 µm × 48 µm |
| X-ray sensitive area | | 221 mm (H) × 6 mm (V) |
| Window | | FOS (Fiber optic plate with scintillator) |
| X-ray detection range | | Approx. 25 kV to 130 kV |
| X-ray tolerance range | | 130 kV, 80 µA (max.) |
| CCD pixel clock | | 5.0 MHz |
| TDI line rate | 1 × 1 | Max. 8 kHz (23.040 m/min) |
| | binning 2 × 2 | Max. 6.4 kHz (36.864 m/min) |
| A/D converter | | 12 bit |
| Data output | | 12 bit |
| Interface (Camera Link) | | Base Configuration |
| Pixel clock (Camera Link) | | 40.0 MHz |
| TDI line rate control * | | External mode or internal mode |
| A/D gain value | | 0 dB to 14 dB (64 steps) |
| Power requirements | | DC +15 V (±1 V) |
| Power consumption | | 40 VA (max.) |

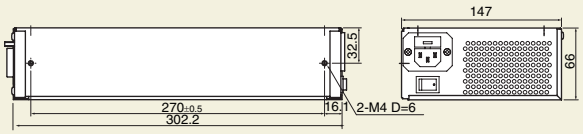
* Selectable by serial command

## DIMENSIONAL OUTLINES (Unit: mm)

● **C12200-321** (approx. 5 kg)




● **AC adapter A8206-35 (option)** (approx. 2 kg)




## OPTIONS

● **AC adaptor: A8206-35** ● **Power cable: A10847-05** ● **Software API Support (Microsoft Windows): DCAM-API (http://www.dcamapi.com)**
● **Digital interface cable: A9262-05**



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