

X-ray TDI Camera C10650 Series

High speed readout

Large field of view

High resolution

High sensitivity



High quality image output with high resolution achieved by TDI technology

High speed readout

10.7
m/min.

Detection area

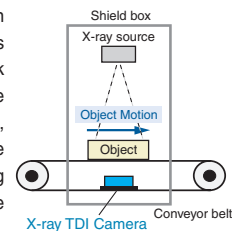
Max.
586
mm

Horizontal spatial resolution

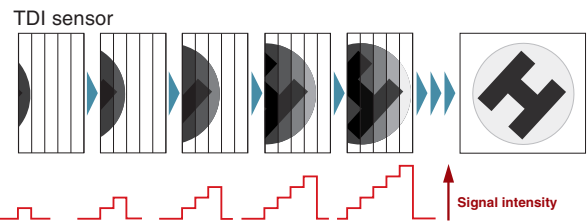
Max.
6144x2
pixels

TDI technology

Time Delay Integration is a scanning technology in which a frame transfer device produces a continuous video image of a moving object by means of a stack of linear arrays aligned with and synchronized to the motion of the object to be imaged in such a way that, as the image moves from one line to the next, the integrated charge moves along with it, providing higher resolution at lower light levels than is possible with a line-scan camera.



X-ray TDI camera C10650 series is useful for in-line applications requiring high-speed operation with high sensitivity. 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. Vertical X-ray TDI cameras that can be installed in narrow spaces are new additions to the series.



Printed circuit board (PCB) inspection

Surface-mounted component inspection

Lithium-ion battery inspection

High-resolution in-line non-destructive inspection

Features

- High S/N ratio with 12 bit / 16 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

HAMAMATSU

PHOTON IS OUR BUSINESS

High-resolution, High-speed Camera with a Wide Field of View for In-line 100 % X-ray Inspection

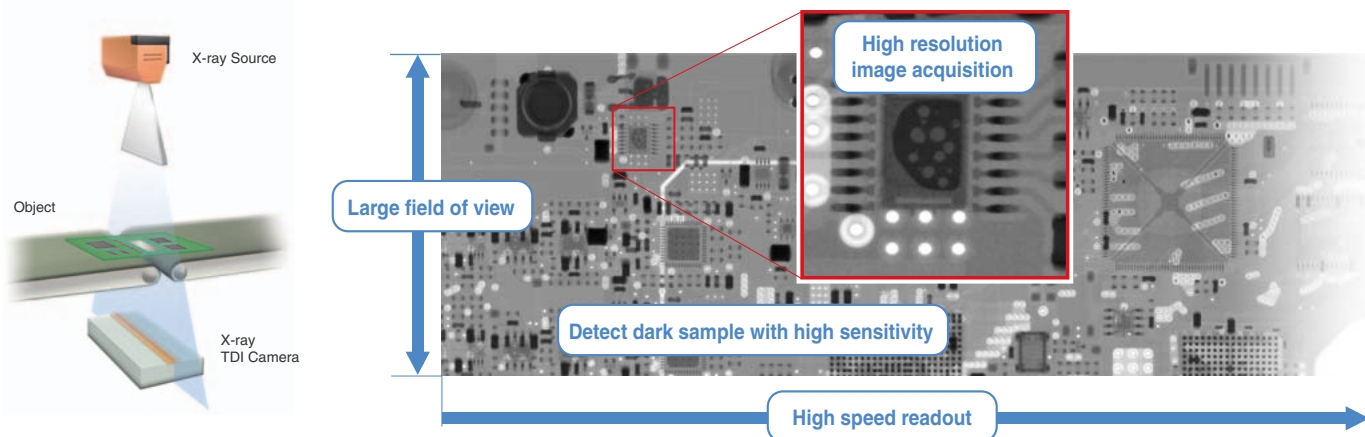
High speed readout

Large field of view

High resolution

High sensitivity

TDI technology offers all four simultaneously.



PRODUCT LINEUP

Standard type

Type number	C10650-221	C10650-321
Sensor number	2	3
X-ray sensitive area	145 mm	221 mm

Overlapped horizontal type

Type number	C10650-261	C10650-361	C10650-461
Sensor number	2	3	4
X-ray sensitive area	146 mm	220 mm	293 mm

Overlapped vertical type

Type number	C10650-261V	C10650-361V	C10650-461V
Sensor number	2	3	4
X-ray sensitive area	146 mm	220 mm	293 mm

Overlapped vertical type (2 cameras)

Type number	C10650-261W	C10650-361W	C10650-461W
Sensor number	6	7	8
X-ray sensitive area	439 mm	513 mm	586 mm

SPECIFICATIONS

Type number	C10650-221	C10650-321	C10650-461	C10650-461V	C10650-461W
CCD pixel number	3072(H) × 128(V)	4608(H) × 128(V)	6144(H) × 128(V)		6144 × 2(H) × 128(V)
Active CCD pixel number	3040(H) × 128(V)	4608(H) × 128(V)	6144(H) × 128(V) *1		6144 × 2(H) × 128(V) *1
CCD pixel size	48 μm × 48 μm				
X-ray sensitive area	145 mm(H) × 6 mm(V)	221 mm(H) × 6 mm(V)	293 mm(H) × 6 mm(V) *1		586 mm(H) × 6 mm(V) *1
Window	FOS (Fiber optic plate with scintillator)				
Recommended use range	Approx. 25 kV to 90 kV *2				
CCD pixel clock	4.0 MHz				
TDI line rate	1 × 1	Max. 2.109 kHz (6.073 m/min)			
	binning 2 × 2	Max. 1.858 kHz (10.702 m/min)			
A/D converter	12 bit		16 bit		
Data output	12 bit		16 bit		
Interface (Camera Link)	Base Configuration				
Pixel clock (Camera Link)	16.0 MHz				
A/D gain value *3	0 dB to 20 dB (64 steps)				
Power requirements	DC +15 V (±1 V)				
Power consumption	25 VA		30 VA		30 VA + 30 VA *4

*1 "Active CCD pixel number" is all outputting pixel number including overlapped pixel. When the overlapped pixels are deleted, actual pixel numbers will vary. And also, X-ray sensitive area will vary.

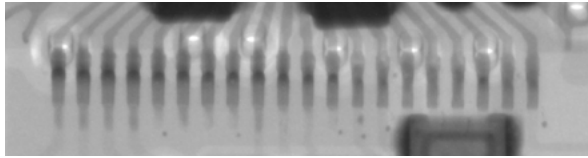
*2 Usable range of X-ray strength may vary depending on the tube current, the tube voltage and the distance.

*3 Multiple gain option (M8815-01) is optional.

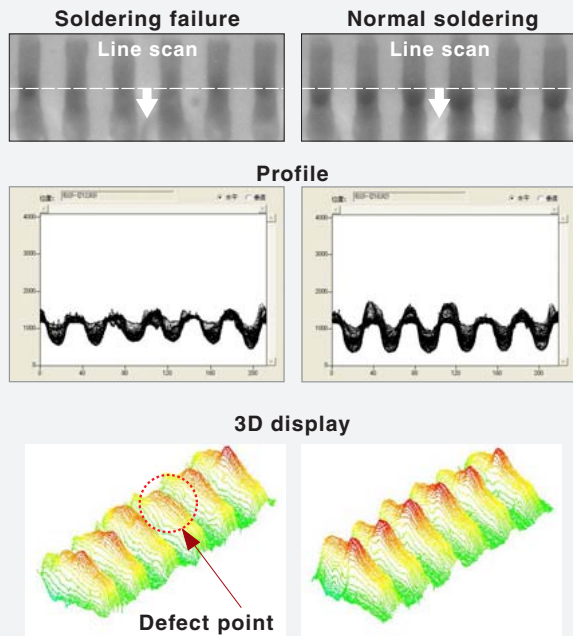
*4 2 units of the power supply unit and the power cable are necessary for C10650-461W.

MEASUREMENT EXAMPLES

Inspection of a solder's back fillet



If the back fillet of the solder on a PCB has a defect, a connection error will occur even with small vibrations. For observation of the back fillet part, X-ray transmission technique has been applied but only with an off-line system. Our X-ray TDI camera realizes in-line inspection because it can acquire high speed profile data with high sensitivity. 3D brightness level can be displayed using software.



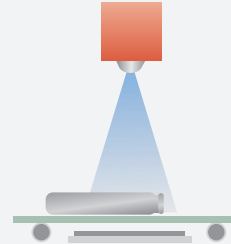
Lithium-ion battery inspection

In case of 2D sensor, the dimensional measurement cannot be implemented correctly because the image is distorted on the corner areas of the X-ray irradiation. The long length sample needs to be located on center of X-ray source, so the sample has to be relocated each time. X-ray TDI camera can capture the image with no distortion by line scan method, so it is not necessary to relocate the samples and it enables the continuous inspection for long length object without stopping.



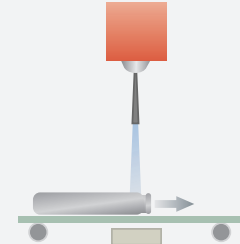
Not necessary to relocate the samples and possible to inspect the long length object with no distortion.

Inspection by 2D sensor

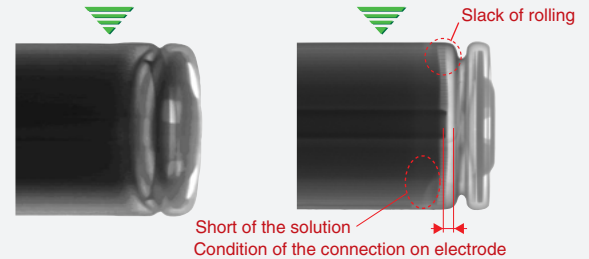


X-ray image intensifier (I.I.) camera :
The image is distorted on the corner areas in thickness direction, and the dimensional measurement cannot be implemented correctly.

Inspection by X-ray TDI camera

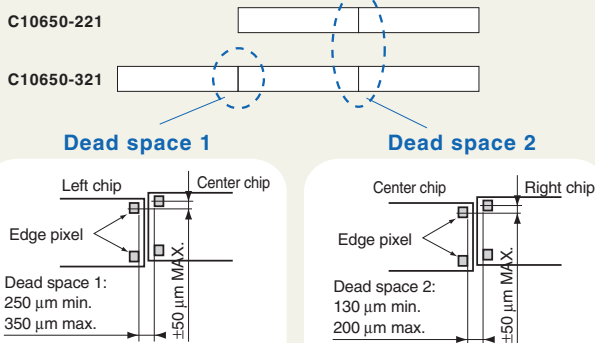


X-ray TDI camera:
The non-distortion image can be realized since X-ray is radiated vertically to the object and the dimensional measurement can be implemented correctly.



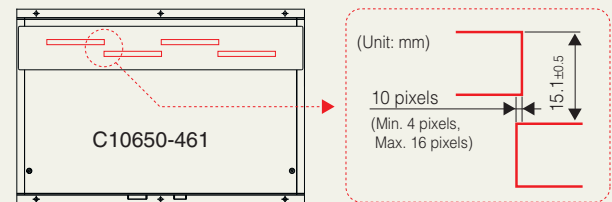
Dead space between chips

Standard type have dead space between chips as shown below. The effect of the dead space on an X-ray image depends on the measurement conditions such as X-ray magnification ratio and X-ray source's focus size.

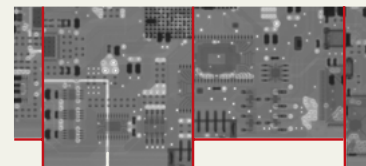


Wide detection width with no dead areas.

The overlapped type offers a wide detection area with no dead areas due to its staggered sensors.

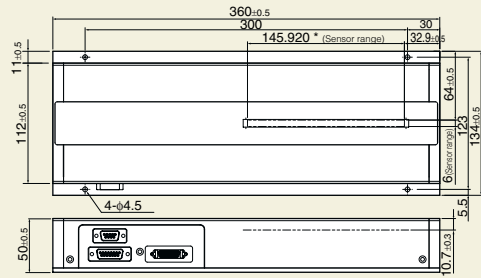


Overlapped type measurement example

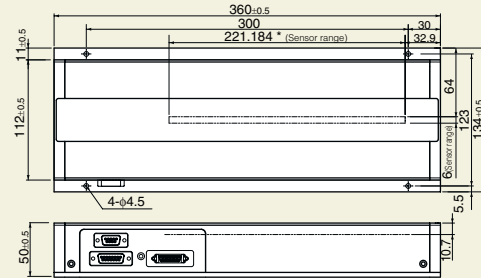


DIMENSIONAL OUTLINES (Unit: mm)

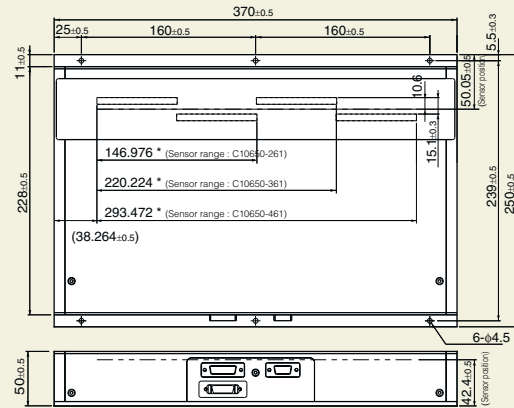
● C10650-221 (Approx. 5 kg)



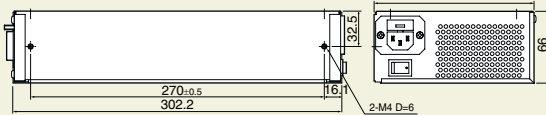
● C10650-321 (Approx. 5 kg)



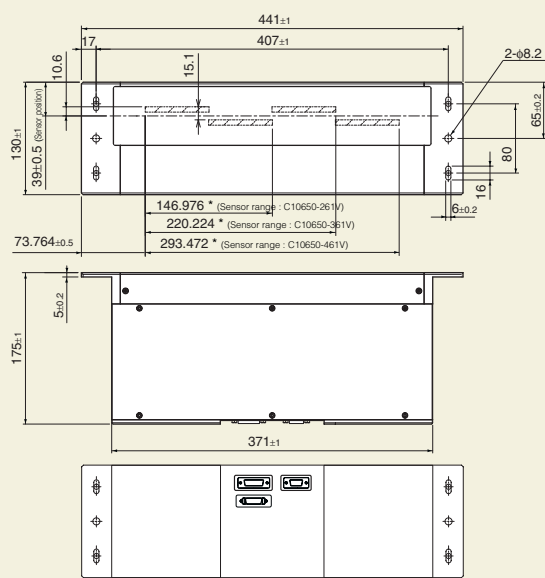
● C10650-261, -361, -461 (Approx. 7 kg)



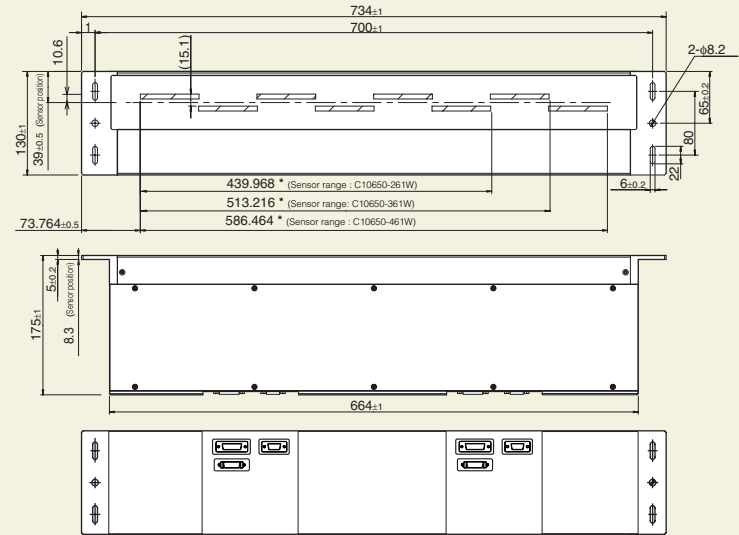
● A8206-35 (Option) (Approx. 2 kg)



● C10650-261V, -361V, -461V (Approx. 7 kg)



● C10650-261W, -361W, -461W (Approx. 16 kg)



* Sensor length is a theoretical value and does not include the dead space between CCDs. In case of overlapped type, the overlapped pixels are defined as 10 pixels.

OPTIONS

- Power supply unit : A8206-35
- Power cable : A10847-05 (5 m)
- Software API Support (Microsoft Windows) : DCAM-API (<http://www.dcamapi.com>)
- Multiple gain option : M8815-01

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