

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

2x2 binning
10.7
m/min.

Detection area

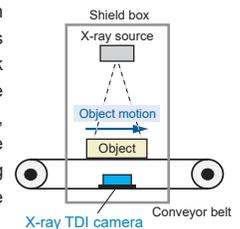
Max.
586
mm

Pixel size

48
 μm

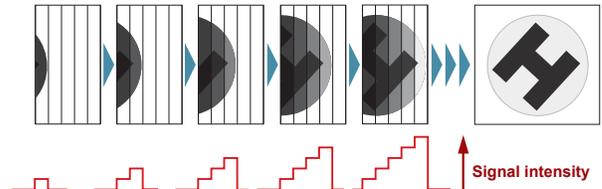
TDI technology

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.

TDI sensor



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

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

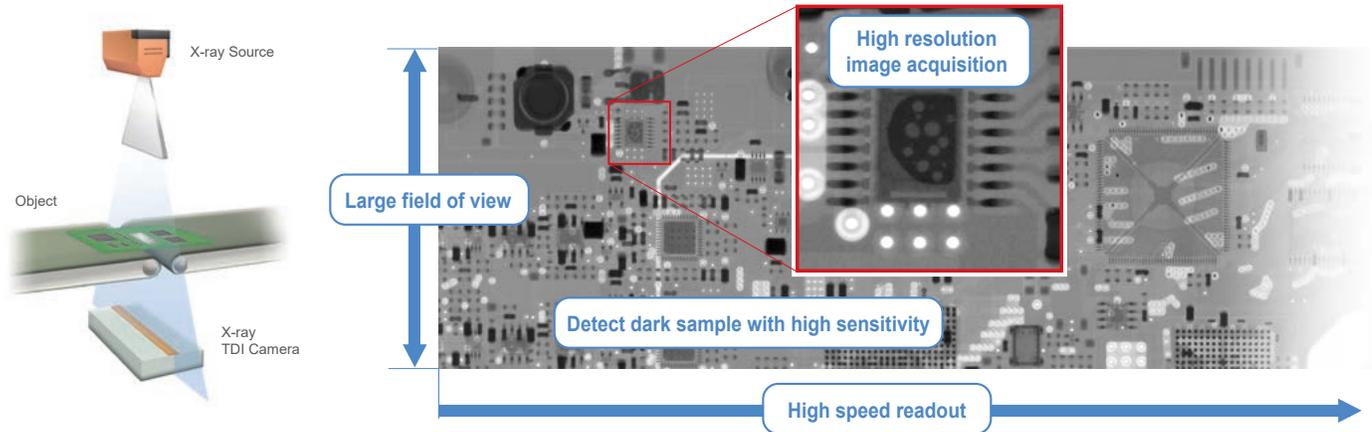
High speed readout

Large field of view

High resolution

High sensitivity

TDI technology offers all four elements simultaneously.



PRODUCT LINEUP

Standard type

Type number	C10650-221	C10650-321
Sensor number	2	3
X-ray sensitive area	145.9 mm	221.1 mm

Horizontal chassis / Overlapped type

Type number	C10650-261	C10650-361	C10650-461
Sensor number	2	3	4
X-ray sensitive area	146.9 mm	220.2 mm	293.4 mm

Vertical chassis / Overlapped type

Type number	C10650-261V	C10650-361V	C10650-461V
Sensor number	2	3	4
X-ray sensitive area	146.9 mm	220.2 mm	293.4 mm

Vertical chassis / Overlapped type (2 cameras output)

Type number	C10650-261W	C10650-361W	C10650-461W
Sensor number	6	7	8
X-ray sensitive area	439.9 mm	513.2 mm	586.4 mm

SPECIFICATIONS

Type number	C10650-221	C10650-321	C10650-461	C10650-461V	C10650-461W
Scintillator	CsI Scintillator				
Window	FOS (Fiber optic plate with scintillator)				
Effective X-ray tube voltage range	Approx. 25 kV to 90 kV *1				
CCD pixel size	48 μm × 48 μm				
Number of pixels	3040 (H) × 128 (V)	4608 (H) × 128 (V)	6144 (H) × 128 (V)*2		6144(H)×128(V)+6144(H)×128(V)*2
X-ray sensitive area	145.9 mm (H) × 6.1 mm (V)	221.1 mm (H) × 6.1 mm (V)	293.4 mm (H) × 6.1 mm (V)*2		586.4 mm (H) × 6.1 mm (V)*2
Line speed	0.178 m/min to 6.073 m/min				
TDI line rate	Max. 2.109 kHz (6.073 m/min)				
	Max. 1.858 kHz (10.702 m/min)				
A/D converter	12 bit		16 bit		
Digital interface	Camera Link				
Interface (Camera Link)	Base Configuration				
Pixel clock (Camera Link)	16.0 MHz				
Output signals (Image data)	12 bit digital output		16 bit digital output		
Power supply	DC +15 V				
Power consumption	Approx. 30 VA				Approx. 30 VA + Approx. 30 VA*3

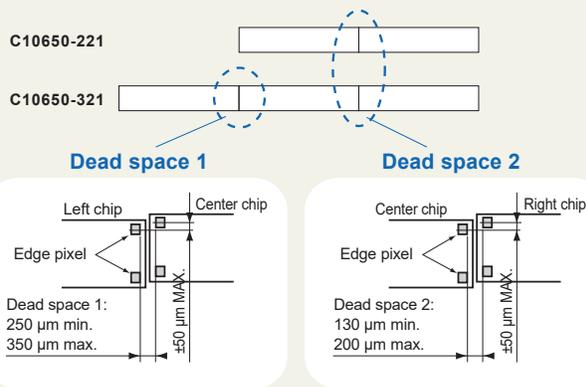
*1 Usable range of X-ray strength may vary depending on the tube current, the tube voltage and the distance.

*2 "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.

*3 2 units of the power supply unit and the power cable are necessary for C10650-461W.

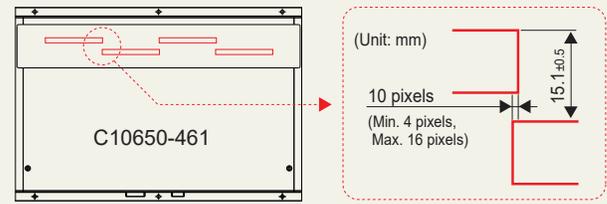
Dead space between chips

Standard type has a following dead space between chips.

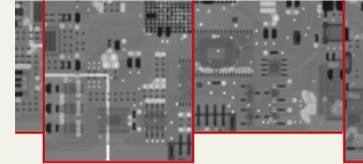


Wide detection width with no dead areas

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



Overlapped type measurement example



MEASUREMENT EXAMPLES

Internal shape inspection of lithium-ion battery (LiB)

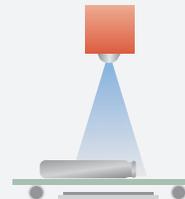
Lithium-ion batteries (LiB) are used in various fields, including smartphones and electric vehicles.

The X-ray TDI camera enables in-line inspection for defects such as electrode mispositioning and stacking errors inside the LiB. In the case of X-ray inspection using a two-dimensional detector, the image is distorted due to the angle of the X-rays incident on the object, except for the irradiation center of the X-ray source. It may be necessary to adjust the position of each imaging site to perform a precise inspection. On the other hand, the X-ray TDI camera irradiates X-rays perpendicular to the transport direction and integrates the images obtained continuously to perform imaging, so it is possible to obtain images without distortion. This enables in-line precision inspection of large objects.



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

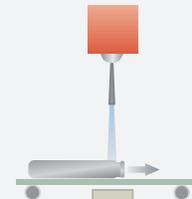
Inspection by 2D sensor



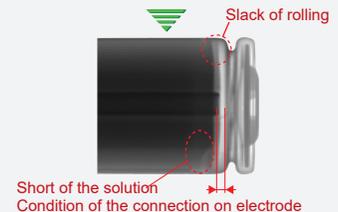
X-ray image intensifier (I.I.) camera :
The image is distorted on the corner areas in thickness direction, and the dimensional measurement cannot be implemented correctly.



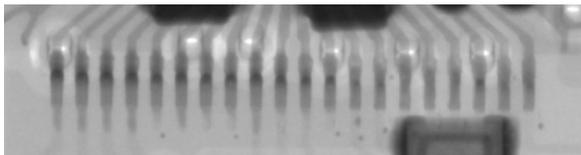
Inspection by X-ray TDI camera



X-ray TDI camera :
Since the object is moved vertically to the detector, it is possible to capture an image without distortion in the transport direction, and accurate dimensional measurement is possible.



Inspection for soldering defects of the printed circuit board (PCB)

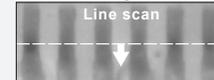


With the development of communication technology and the automobile industry, the demand for PCBs has expanded, and they have become an indispensable part of supporting people's comfortable lives.

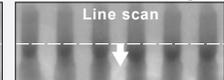
The X-ray TDI camera enables non-destructive inspection of defects such as voids, cracks, and uneven coating that occur in the soldering of electronic components on the PCB. The C12300 series contributes to the improvement of tact time for in-line inspection by achieving both high sensitivity and high line speed.

For example, in soldering inspection of the back fillet, it is possible to perform a high-speed inspection of defective parts by performing 3D analysis using a brightness profile acquired with high sensitivity.

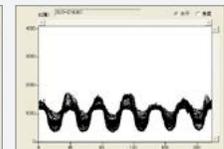
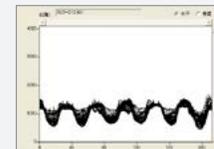
Soldering failure



Normal soldering



Profile



3D display



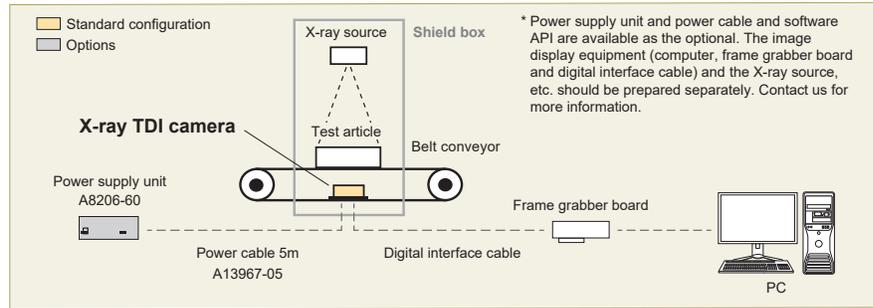
OPTIONS

Model name	Product name
A8206-60	Power supply unit
A13967-05	Power cable 5 m
M8815-01	Additional function module 64 gain

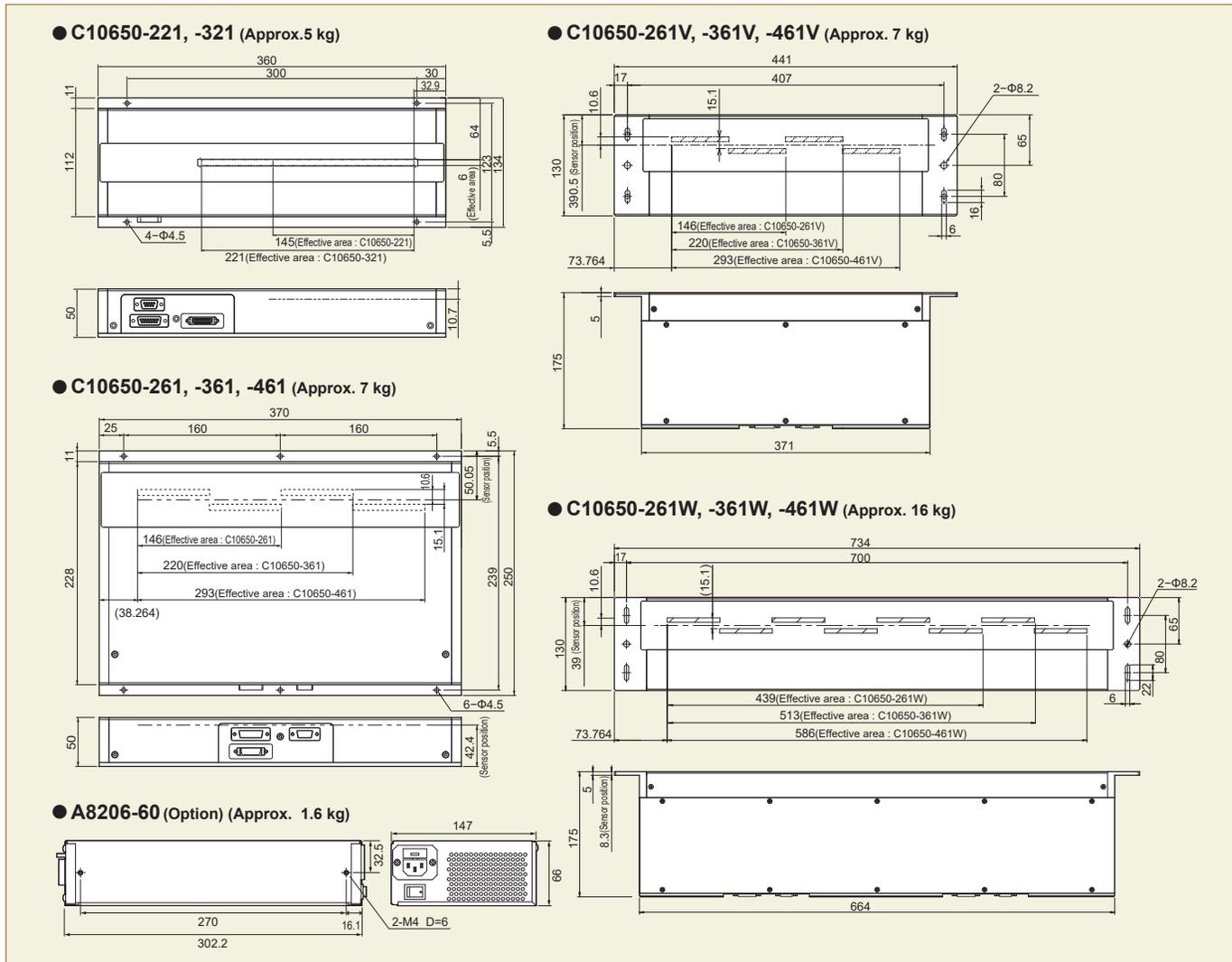
Software

- DCAM-API <https://www.dcam-api.com/>
Software API Support (Microsoft Windows)

SYSTEM CONFIGURATION



DIMENSIONAL OUTLINES (Unit: mm)



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