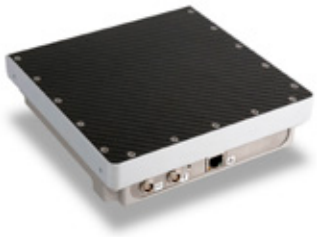
TELEDYNE | Teledyne DALSA

HIGH PERFORMANCE X-RAY DETECTORS

for Dental Imaging Systems



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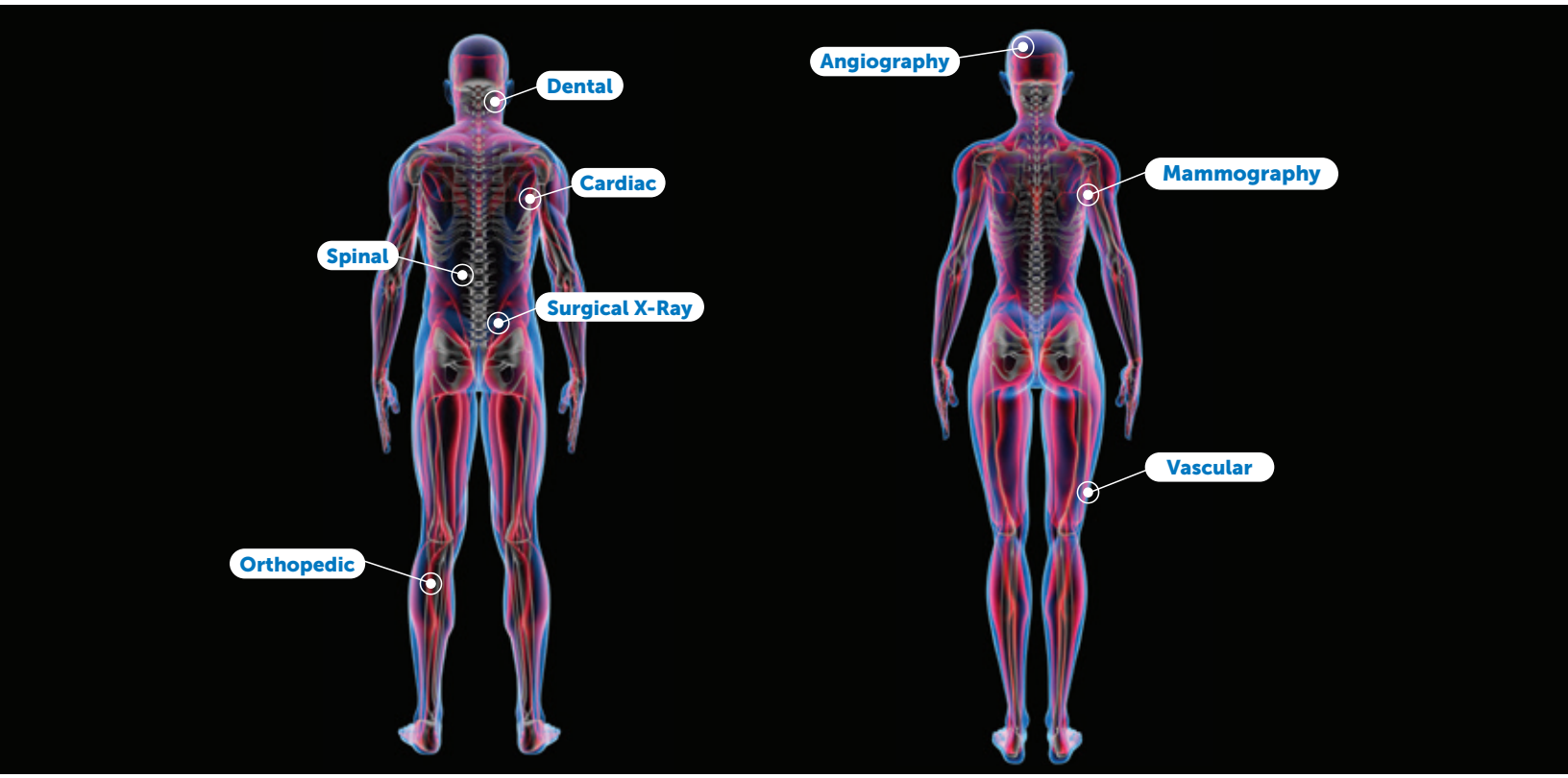
www.teledynedalsa.com

At Teledyne Healthcare & Life Sciences, We Help Save and Improve Lives

Teledyne offers powerful, innovative X-Ray detectors that combine industry-leading performance with cutting-edge features for applications such as orthopedic and surgical radiology, mammography, extra-oral dental radiology, CT, and bone densitometry. Teledyne's dynamic X-Ray detectors serve diagnostic procedures for the entire body – from the top of your head to the tips of your toes and everywhere in between.

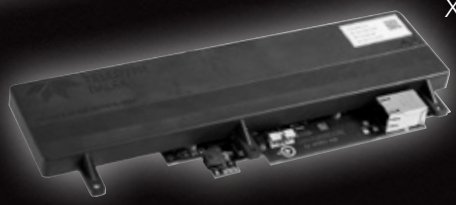
Whether you are designing systems for diagnostics, analysis, or treatment, we provide insight like no one else. Our detectors are at the heart of many dental imaging applications, including General Dentistry, Orthodontic Procedures, Oral Surgery, Ear, Nose and Throat (ENT) and Veterinary Dentistry. Whether you need to complete a cone beam computed tomography (CBCT) 3D-scan to prepare for an implant treatment, or a panoramic or cephalometric 2D-scan to check the dental anatomy, you can rely on the benchmark low dose image quality provided by Teledyne's X-Ray detectors. Every time.

Our innovation extends to our unmatched portfolio of X-Ray detectors tailored specifically for minimally invasive surgeries that enable increased accuracy, smaller incisions, lower risk of infection, shorter hospital stays and faster healing. Our X-Ray detectors for surgical and orthopedic procedures minimize exposure for both patients and practitioners. And Teledyne's high-resolution mammography and breast tomosynthesis X-Ray detectors unleash early diagnosis and treatment opportunities, with improved patient comfort.

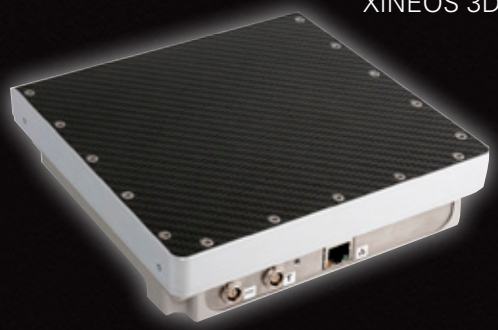


AXIOS 3D

XINEOS 2D



XINEOS 3D



XINEOS 3D FAMILY:

- XINEOS-1515
- XINEOS-1511
- XINEOS-1313

AXIOS 3D FAMILY:

- AXIOS-3030
- AXIOS-2222
- AXIOS-2317
- AXIOS-1717

XINEOS 2D FAMILY:

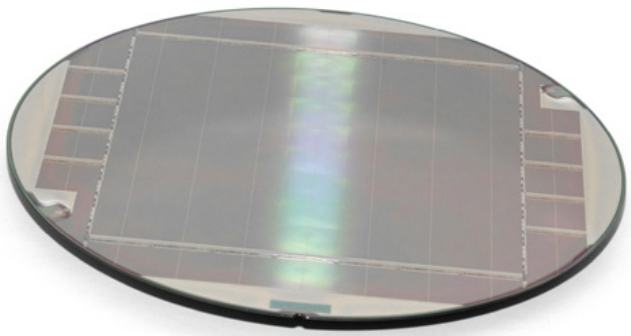
- XINEOS-2301S
- XINEOS-2301
- XINEOS-1501S
- XINEOS-1501

Premium 3D – **XINEOS**

Active Pixel Sensor technology and expertise in low noise circuit design are the hallmarks of **Teledyne DALSA's** CMOS X-Ray image sensors. Our CMOS image sensors exhibit unrivalled low readout noise levels and deliver superior image quality at the lowest dose levels, contributing to the high image quality required to support challenging medical diagnostics. Our CMOS detectors set the industry benchmark for low-dose image quality, rivalling the golden standard of legacy image intensifiers, and provide the form factor and patient comfort advantages offered by flat detectors.

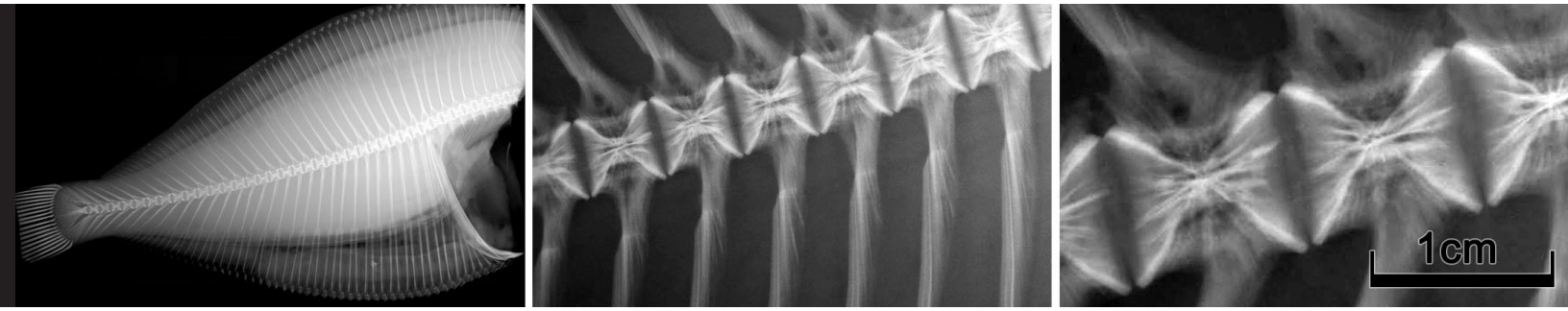
On a system level, the low-noise raw images from Teledyne DALSA's CMOS detectors require less pre-processing before the diagnostics image enhancements, preserving image detail, and reducing system processing overhead and calibration complexity.

Unlike amorphous imaging technologies, the advanced crystalline CMOS design and manufacturing process supports the integration of sensor control, readout and signal digitization functionality from the peripheral electronics into the pixel array. This ability reduces electrical signal degradation and improves final image quality, while the reduction of components and interconnects improves product reliability at the same time.



XINEOS ADVANTAGES

- Small pixels enable high spatial resolution, detecting smaller features
- Low electronic noise, delivering better image quality at low dose levels
- No image lag, absence of motion blur supports higher contrast
- Low dark signal, stable calibration over extended temperature ranges
- Low power consumption, easing system thermal management challenges



XINEOS PREMIUM 3D

Parameter	Unit	Xineos-1515 CD76M212	Xineos-1511 CD41M112	Xineos-1313 CD55M112
PIXEL ARRAY				
Technology		CMOS	CMOS	CMOS
Design		Active Pixel	Active Pixel	Active Pixel
Output		Digital	Digital	Digital
Control & ADC		CMOS integrated	CMOS integrated	CMOS integrated
Pixel Pitch	[µm]	99	99	99
Pixel capacity modes	[#]	2	2	2
Active Area	[pixels]	1548x1548	1488x1148	1316x1312
Active Area	[mm]	153x153	147x114	130x130
Panoramic ROI height (max)	[mm]	153	147	130
IMAGE QUALITY (RQA5)				
MTF @ 1lp/mm	[%]	60%	60%	60%
DQE @ 0lp/mm	[%]	70%	70%	70%
Saturation Dose (per mode)	[µGy]	2 | 10	2 | 10	2 | 10
Sensitivity (per mode)	[DN/nGy]	8.2 | 1.6	8.2 | 1.6	8.2 | 1.6
Random Noise (per mode)	[DN]	4.5 | 2.9	4.7 | 2.7	4.5 | 2.5
Dynamic Range (per mode)	[levels]	3600 | 5500	3400 | 5900	3600 | 6500
Image Lag, first frame	[%]	0.1%	0.1%	0.1%
OUTPUT				
Data Interface	[-]	GigE (1Gbps)	GigE (1Gbps)	GigE (1Gbps)
ADC Conversion	[bits]	14	14	14
Frame Rate - 1x1, 100% zoom	[fps]	21	30	30
Frame Rate - 2x2, 100% zoom	[fps]	60	60	60
Frame Rate - 1x1, Panoramic	[fps]	300	300	300
Flexible ROI	[-]	yes	yes	yes
POWER CONSUMPTION				
Power Supply	[Vdc]	11..26	11..26	11..16
Power Consumption	[W]	10	8	11
INTEGRATION				
Footprint (WxH)	[mm]	196x170	178x176	188x150
Thickness (in/outside IO)	[mm]	44	45 | 22	58 | 36
Weight	[kg]	2.4	2.3	2.4
Image pre-processing*	[-]	FFC & DPC	FFC & DPC	no
Downloadable defect maps	[-]	yes	yes	yes
Frame buffer	[-]	no	no	no
Digital TDI mode	[-]	no	no	no

3D/CBCT

PANORAMIC

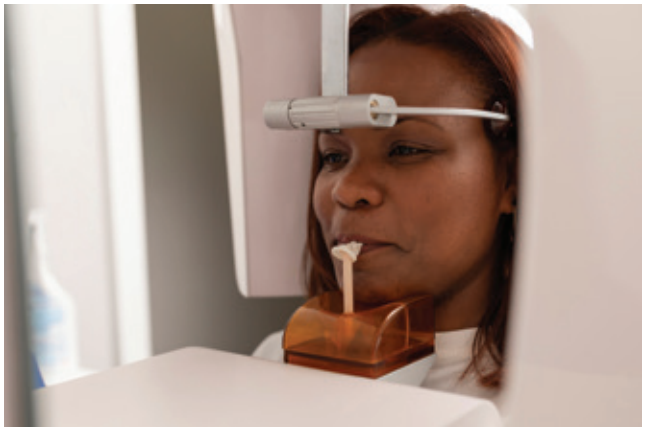
* DPC : Defect Pixel Correction (vector interpolation) | FFC: Flat Field Correction (offset & gain)

FIND OUT MORE!

Performance 3D – **AXIOS**

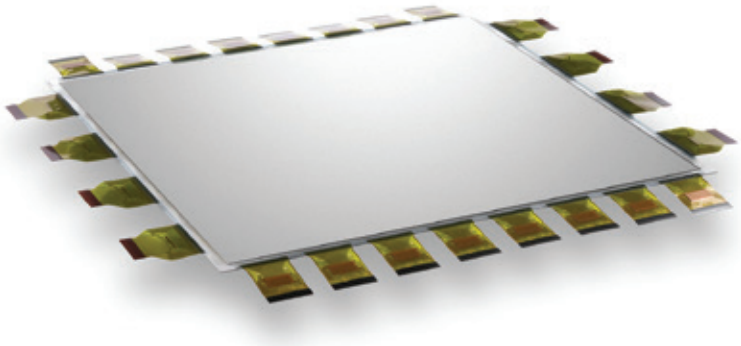
Passive pixel IGZO (indium gallium zinc oxide) technology uses thin films of IGZO coated onto glass substrates to create large format X-Ray sensors. Although the process features are less refined compared to CMOS image processes, the technology can produce sensors with sufficient spatial resolution and frame rate to address the requirements of dynamic clinical applications like fluoroscopy, interventional, panoramic imaging and cone beam computed tomography.

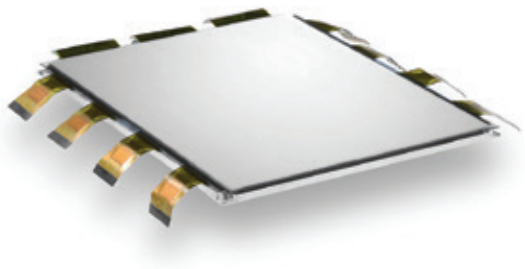
Leveraging 40+ years of image sensor design experience and low-signal image processing know-how, Teledyne DALSA recognized early on the importance of keeping end-to-end control of signal processing, from X-Ray photon conversion through readout up to electrical signal digitization. Next to our proprietary pixel design features, we developed a dedicated imaging chain that protects the integrity of the captured image information. Optimized to the electrical properties of the IGZO pixel array, this dedicated imaging chain controls the high-speed readout and digitization of the signals while minimizing image fidelity loss due to added electronic noise and other disturbances.



AXIOS ADVANTAGES

- Glass substrate processing, more economical for large formats
- Teledyne DALSA dedicated imaging chain, optimizing low dose signal-to-noise performance
- High readout bandwidth, enabling smart lag correction readout schemes
- Detector design optimized for high image contrast and thermal stability





AXIOS PERFORMANCE 3D

Parameter	Unit	Axios-3030 TD02M116	Axios-2222 TD05M116	Axios-2317 TD03M116	Axios-1717 TD04M116
PIXEL ARRAY					
Technology		IGZO	IGZO	IGZO	IGZO
Design		Passive Pixel	Passive Pixel	Passive Pixel	Passive Pixel
Output		Analog	Analog	Analog	Analog
Control & ADC		Teledyne DALSA imaging chain	Teledyne DALSA imaging chain	Teledyne DALSA imaging chain	Teledyne DALSA imaging chain
Pixel Pitch	[µm]	146	146	110	110
Pixel capacity modes	[#]	1	1	1	1
Active Area	[pixels]	2048x2048	1536x1536	2048x1536	1536x1536
Active Area	[mm]	299x299	224x224	226x170	170x170
Panoramic ROI height (max)	[mm]	not supported	not supported	226	170
IMAGE QUALITY (RQA5)					
MTF @ 1lp/mm	[%]	56%	56%	58%	58%
DQE @ 0lp/mm	[%]	72%	72%	73%	73%
Saturation Dose (per mode)	[µGy]	3 | 55	3 | 55	4 | 17	4 | 17
Sensitivity (per mode)	[DN/nGy]	21 | 1.2	21 | 1.2	15 | 3.9	15 | 3.9
Random Noise (per mode)	[DN]	32 | 5	32 | 5	47 | 13	47 | 13
Dynamic Range (per mode)	[levels]	2000 | 13100	2000 | 13100	1400 | 5000	1400 | 5000
Image Lag, first frame	[%]	1%	1%	1%	1%
BANDWIDTH					
Data Interface	[-]	NBASE-T (5Gbps)	NBASE-T (5Gbps)	NBASE-T (5Gbps)	NBASE-T (5Gbps)
ADC Conversion	[bits]	16	16	16	16
Frame Rate - 1x1, 100% zoom	[fps]	44	44	40	40
Frame Rate - 2x2, 100% zoom	[fps]	88	88	80	80
Frame Rate - 1x1, Panoramic	[fps]	not supported	not supported	400	400
Flexible ROI	[-]	yes (center zoom)	yes (center zoom)	yes	yes
POWER CONSUMPTION					
Power Supply	[Vdc]	11..28	11..28	11..28	11..28
Power Consumption	[W]	24	24	21	21
INTEGRATION					
Footprint (WxH)	[mm]	330x338	255x255	253x200	196x200
Thickness (in/outside IO)	[mm]	40	40	40	40
Weight	[kg]	8.9	5.2	3.2	2.6
Image pre-processing*	[-]	no	no	DPC	DPC
Downloadable defect maps	[-]	yes	yes	yes	yes
Frame buffer	[-]	no	no	yes (8GB)	yes (8GB)
Digital TDI mode	[-]	no	no	no	no

3D/CBCT

PANORAMIC

* DPC : Defect Pixel Correction (vector interpolation) | FFC: Flat Field Correction (offset & gain)

FIND OUT MORE!

Premium 2D – **XINEOS**

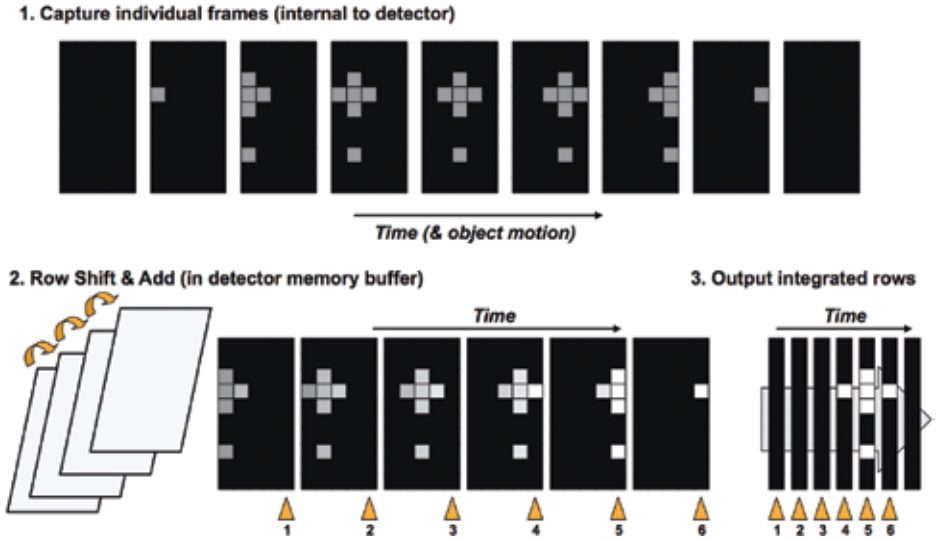
Critical to low dose and high speed applications like panoramic and cephalometric imaging, the purity of the crystalline CMOS material and the proprietary active pixel architecture of the Teledyne DALSA's CMOS detectors assure factors higher signal-to-noise ratio (SNR) in comparison to a-Si-based and even other CMOS-based competing products. The integrated on-chip analog-to-digital converter (ADC) assures extremely low read out noise levels, and provides the highest image contrast thanks to the absence of image lag.

XINEOS ADVANTAGES

- Excellent image quality at low dose
- Highest sensitivity (signal per unit dose)
- High speed, full resolution readout
- Supports real-time Digital TDI mode

CMOS Digital TDI (DTDI) Acquisition Mode

To maximize signal-to-noise by effectively extending integration time and accumulated dose, acquired images are summed using a single pixel pitch shift-and-add method. Emulating traditional analog CCD-TDI modes, this greatly reduces data bandwidth requirements to the host computer. To maintain spatial resolution, the relative motion of the anatomy on the image plane needs to be precisely synchronized with the image readout.



XINEOS PREMIUM 2D

Parameter	Unit	Xineos-2301S CD75M212	Xineos-2301 CD52M212	Xineos-1501S CD6M112	Xineos-1501 CD51M112
PIXEL ARRAY					
Technology		CMOS	CMOS	CMOS	CMOS
Design		Active Pixel	Active Pixel	Active Pixel	Active Pixel
Output		Digital	Digital	Digital	Digital
Control & ADC		CMOS integrated	CMOS integrated	CMOS integrated	CMOS integrated
Pixel Pitch	[µm]	99	99	99	99
Pixel capacity modes	[#]	2	2	2	2
Active Area	[pixels]	2304x68	2304x68	1536x68	1536x68
Active Area	[mm]	228x6.7	228x6.7	152x6.7	152x6.7
Panoramic ROI height (max)	[mm]	228	228	152	152
IMAGE QUALITY (RQA5)					
MTF @ 1lp/mm	[%]	60%	60%	60%	60%
DQE @ 0lp/mm	[%]	70%	70%	70%	70%
Saturation Dose (per mode)	[µGy]	0.6 | 2.6	2.5 | 12	0.6 | 2.6	2.5 | 12
Sensitivity (per mode)	[DN/nGy]	29 | 6.2	6.3 | 1.4	29 | 6.2	6.3 | 1.4
Random Noise (per mode)	[DN]	10 | 4.5	4.0 | 2.5	10 | 4.5	4.0 | 2.5
Dynamic Range (per mode)	[levels]	1600 | 3600	4000 | 6400	1600 | 3600	4000 | 6400
Image Lag, first frame	[%]	0.1%	0.1%	0.1%	0.1%
BANDWIDTH					
Data Interface	[-]	GigE (1Gbps)	GigE (1Gbps)	GigE (1Gbps)	GigE (1Gbps)
ADC Conversion	[bits]	14	14	14	14
Frame Rate - 1x1, 100% zoom	[fps]	300	300	300	300
Frame Rate - 2x2, 100% zoom	[fps]	600	600	600	600
Frame Rate - 1x1, Panoramic	[fps]	300	300	300	300
Flexible ROI	[-]	yes	yes	yes	yes
POWER CONSUMPTION					
Power Supply	[Vdc]	10..16	10..16	10..16	10..16
Power Consumption	[W]	8	8	8	8
INTEGRATION					
Footprint (WxH)	[mm]	91x240	91x240	91x240	91x240
Thickness (in/outside IO)	[mm]	22	21	21	21
Weight	[kg]	0.6	0.6	0.6	0.6
Image pre-processing*	[-]	no	no	no	no
Downloadable defect maps	[-]	yes	yes	yes	yes
Frame buffer	[-]	no	no	no	no
Digital TDI mode	[-]	yes	yes	yes	yes

CEPHALOMETRIC

PANORAMIC

* DPC : Defect Pixel Correction (vector interpolation) | FFC: Flat Field Correction (offset & gain)

FIND OUT MORE!

2D IMAGE RECONSTRUCTION TECHNOLOGY
A Revolution in Tomographic Image Visualization

Teledyne DALSA patented a revolutionary reconstruction technology to deliver maximum sharpness to your daily panoramic images. By applying tomographic stack algorithms known from 3D reconstruction, the focal depth through the relevant patient anatomy is substantially enlarged.

UNSURPASSED SHARPNESS

The X-Ray image optimization algorithms automatically combine the sharpest regions from each tomographic plane to produce a fully optimized and enhanced visualization of the patient's anatomy.

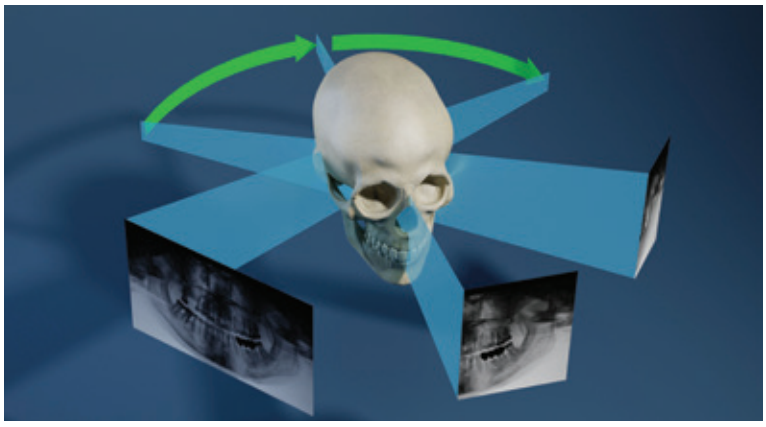
Unlike the conventional reconstruction methods where some regions of the reconstruction image might not be completely sharp, Teledyne DALSA's X-Ray image reconstruction technology offers a sharper result at every position. The incredible fidelity of the Premium CMOS and Performance IGZO detectors combined with our proprietary X-Ray image processing technology ensure you get the highest image quality at the lowest dose.

The result is an image of unsurpassed sharpness, enabling better diagnosis and improved patient treatment opportunities. It allows the dentist to benefit from improved image quality or for reducing patient dose at the same image quality.

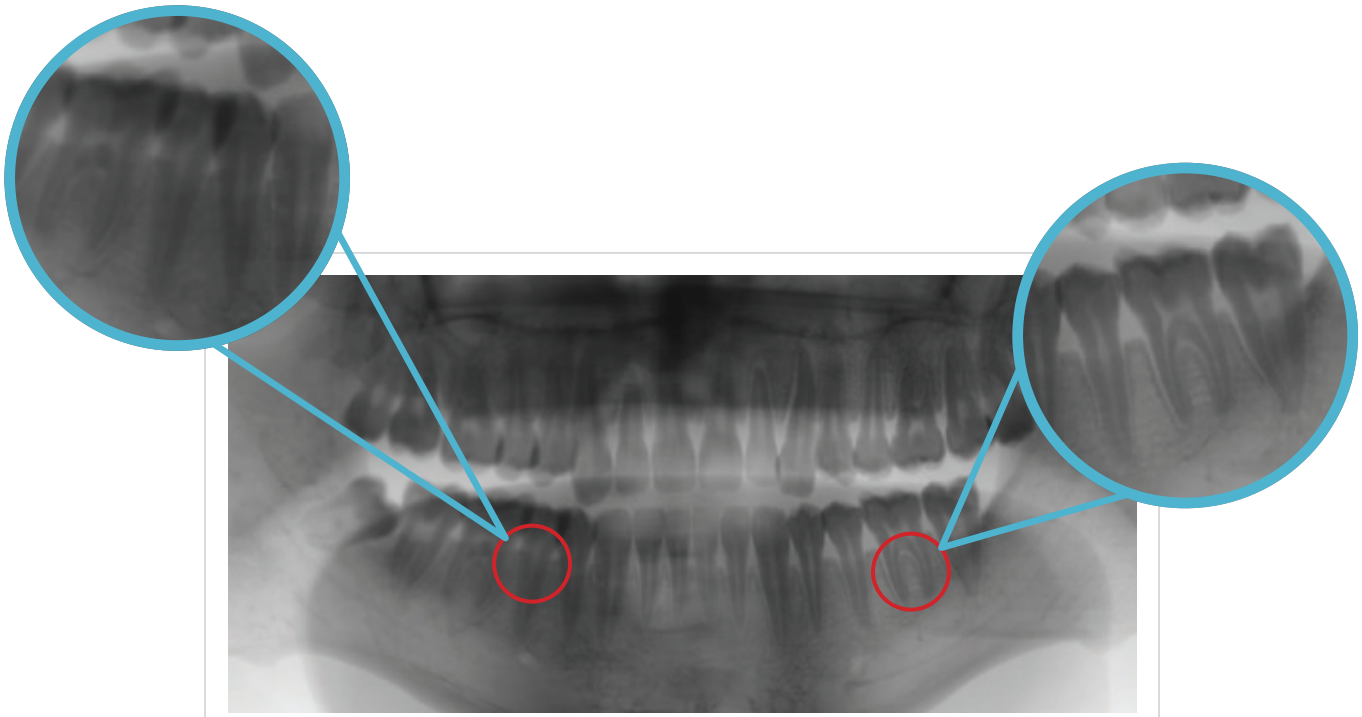
COST SAVING AND EFFICIENT

Teledyne DALSA's X-Ray image reconstruction technology also improves the overall robustness of the reconstruction, helping to mitigate image quality issues caused by factors like improper patient alignment or challenging anatomy. Moreover, our tomographic reconstruction technology can lower the overall costs of a panoramic imaging system by simplifying the complex scan motion trajectory required by traditional methods. There is no need for re-scan (re-taking scans), which reduces the average patient dose and increases the productivity in the dental practice (workflow efficiency).

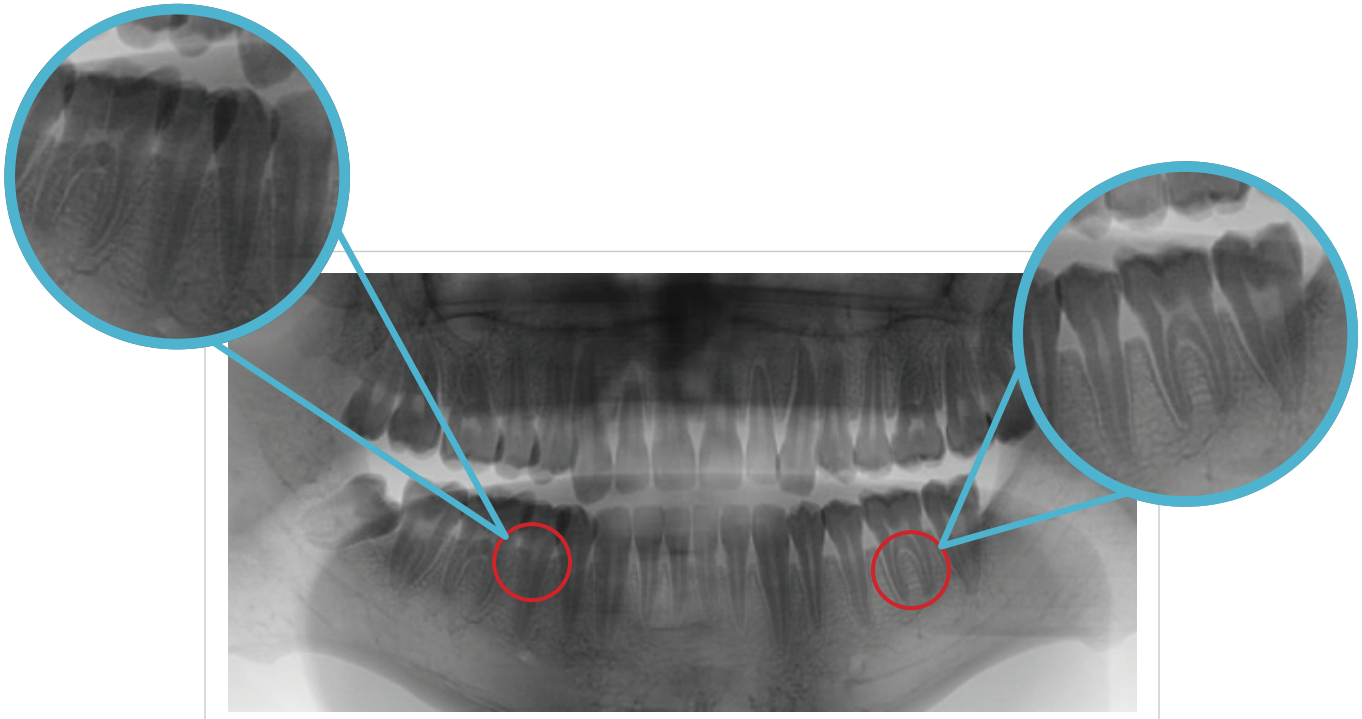
The 2D image reconstruction library can be integrated as part of the OEM's system software.



Panoramic X-Ray scanning principle



Without Teledyne's image reconstruction technology. Image not sharp in multiple places as indicated on the picture.



The image is sharp at every place of the image – with Teledyne's X-Ray 2D image reconstruction technology.

FIND OUT MORE!

TELEDYNE DALSA

OFFICE LOCATIONS

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North America, Europe, and Asia.
teledynedalsa.com/offices

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