

Dexela Flat Panel CMOS X-ray Detectors



Advantages of detectors based on CMOS technology

The Dexela flat panel CMOS X-ray detector family employs an innovative CMOS sensor design to provide a new level of performance and reliability for OEMs operating in medical, dental and industrial X-ray markets.

The detectors are suitable for a range of applications including mammography, breast tomosynthesis, breast CT, dental cone beam CT, fluoroscopy, vascular imaging, bone densitometry and non-destructive testing.

The major advantages of the technology are: high frame-rate, low noise, high reliability, reduced image lag and high spatial resolution. The clinical benefits in medical applications are lower radiation dose to the patient combined with superior image quality when compared with flat panel detectors based on amorphous silicon technology.

Key Features:

- **High Speed: 26 – 86 fps**
- **High resolution: 75 - 300 μm pixel pitch**
- **Superior image quality: high DQE, high contrast, high dynamic range**
- **Reduced image lag**
- **Ready-to-run software and drivers**
- **Flexible, reliable, stable and robust**

A new CMOS detector design



The Dexela detectors' main components are: CMOS image sensor, scintillator (structured CsI or Gadox), control electronics, readout electronics and communications with the workstation.

The Dexela CMOS image sensor consists of a photodiode array with a pixel size of 75 μm . The sensor has very low dark current and read noise, with high linearity and consistency of response. The detector is capable of multi-resolution readout with pixels binned 1x2, 2x2, 1x4, 2x4 and 4x4. The frame rate of the largest model ranges from 26 frames per second at full resolution to 86 frames per second at 300x300 μm over the whole active area. Smaller models are even faster.

The versatility of CMOS allows advanced electronics to be integrated alongside the light-sensing function. Non-destructive readout of pixels for dose monitoring, and dynamically configurable on-chip binning, are standard features on all Dexela detectors. The pixel gain can also be varied dynamically.

The high fill factor, efficiency and low noise of the sensor combine to produce a high DQE of 0.7 at low spatial frequency. This results in lower patient dose and superior image quality.

The Dexela CMOS X-ray detectors are inherently stable, have a wide storage temperature range and are resilient to shock and vibration.

Detector Models

The Dexela family of CMOS X-ray detectors is built from a highly modular technology platform that allows Dexela to produce detectors of different dimensions using the same basic building blocks. Sizes currently offered are: 12x7, 15x12, 23x15, 23x21 and 29x23 cm. A 35x29 detector is planned for 2010.

Model	Active area size, mm	Clinical applications
1207	115 x 65	Small field mammography, CBCT
1512	115 x 145	Small field mammography, CBCT, fluoroscopy
2315	230 x 145	CBCT, fluoroscopy, bone densitometry
2321	230 x 210	CBCT, fluoroscopy
2923 2923MAM	290 x 230	Mammography and tomosynthesis, breast CT, CBCT, fluoroscopy

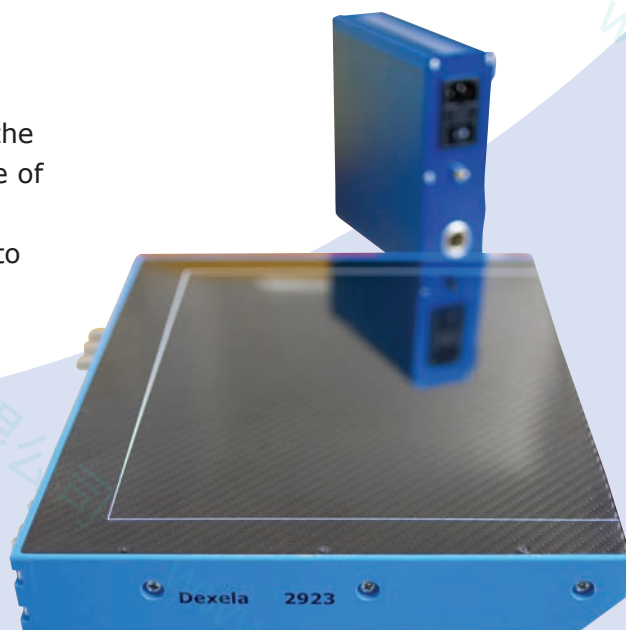
Breast Imaging: FFDM, tomosynthesis and breast CT

The 2923MAM is specially designed for full-field breast imaging applications: FFDM, tomosynthesis and breast CT. The 2923MAM has an enclosure optimised for FFDM and tomosynthesis:

- Detector is wedge shaped at the chest wall to aid patient positioning for craniocaudal views
- Distance from active area to edge of enclosure is <2 mm to aid patient positioning for MLO views

Breast CT and tomosynthesis both benefit enormously from the high speed, high spatial resolution, high DQE, virtual absence of image lag and low read noise of the 2923MAM in its specially designed low noise mode. These technical features combine to provide these clinical benefits:

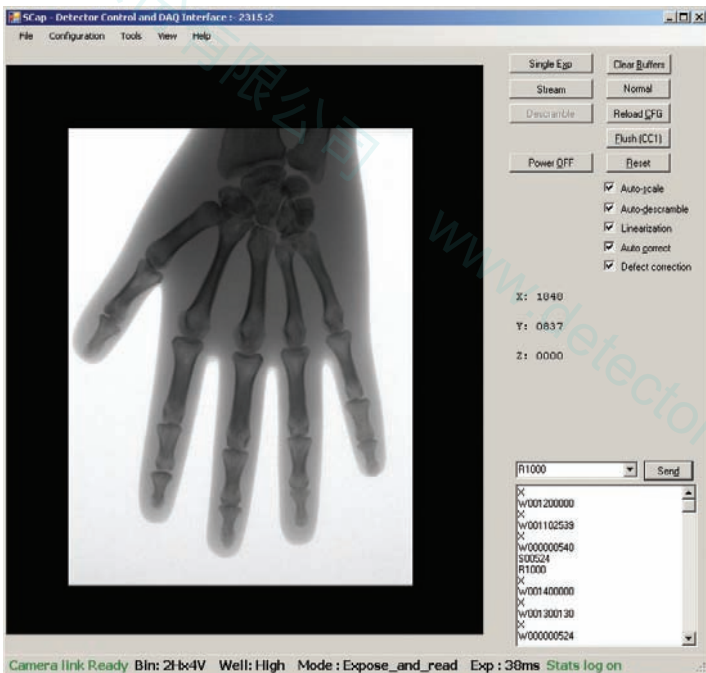
- minimise the incidence of re-takes and blurring in tomosynthesis caused by patient motion
- reduce the radiation dose of breast imaging procedures
- enable small structures such as spiculations and micro-calcifications to be better visualised
- allow additional projection images to be acquired in a very short time to enhance tomosynthesis image quality



Scintillator options

The Dexela flat panel X-ray detectors can be used in a range of applications employing different X-ray energy ranges. This is achieved by offering a choice of scintillators: 150 μm structured CsI or fine Gadox screen for mammography, 600 μm structured CsI for dental CBCT and fluoroscopy and DRZ screens for high energy industrial applications. The scintillator can be customised for specific OEM applications.

Software



Dexela provides software drivers and companion software with its detectors. The software includes a basic application for image acquisition and viewing on a workstation or laptop running Microsoft Windows XP or Vista (x32 or x64). The development kit includes the Dexela SCAP software application that performs detector calibration, sensor set-up, image acquisition and image corrections. SCAP includes file translators for smv, raw and tif formats.

Dexela also offers DexView image processing software for mammography and other forms of radiography. DexView enhances the visibility of structures, removes noise and compensates for variations in exposure within an image.

- Noise reduction whilst preserving tiny structures
- Image enhancement (contrast, edge)
- Peripheral Equalization

DexView image processing software can be customised for specific OEM products.

Interface options

Interface options include high speed Camera Link (full configuration for the 2923, medium configuration for the 2315 and basic configuration for the 1512) and USB 2.0. Gigabit Ethernet will be offered in 2010. Images are displayed instantaneously on a user-supplied workstation fitted with the appropriate frame-grabber or a standard USB port. The aluminium housing is shock and vibration resistant. The detector is highly robust with a storage temperature range of -5 to $+50^{\circ}\text{C}$ and an operating temperature range $+10$ to $+40^{\circ}\text{C}$.



Optional accessories

Dexela can supply these optional accessories with its detectors:

- Detector power supply unit (PSU)
- Camera Link interface card

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