

## HE PCD

High Energy Photon Counting Detector

### A new detector for Digital Radiographic Testing

The HE PCD detector for real time digital radiographic testing, optimizes inspection duration, reduces dosimetry and facilitates data analysis.

#### Challenge

Radiographic inspections use most of the time an argentic film as receptor, limited in sensitivity and without the possibility to select the energy of photons participating to image formation.

Digital radiography is an alternative to conventional radiography in which the silver film is replaced by a capture system that provides a digitized radiographic image when read.

The PCD HE is a detector that can create an accurate digital image very quickly and select the desired energy levels.

#### Operating principle

The photon counting technology is based on direct conversion detection, which differs from that used by the majority of flat panels.

Direct conversion, associated with low noise electronics, allows to count each photon whose energy deposited is higher than a predefined threshold. It is also possible to simultaneously acquire two images at two different energy thresholds.



Every X or gamma photon generates e-/hole pairs in the sensitive layer : CdTe. The number of pairs is proportional to photon energy.

Electric charge is collected at each pixel and handled by a CMOS circuit.

Image corresponds to the number of detected photons, whose energy is superior to selected threshold.



#### User benefits

- Increased accuracy and reliability of control
- Significant reduction in inspection time
- Reduction of dosimetry
- Easy to implement (no effluents, no consumables, no dedicated laboratory...)
- Easier traceability

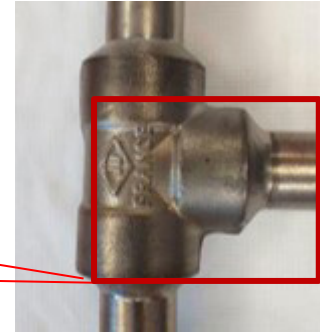
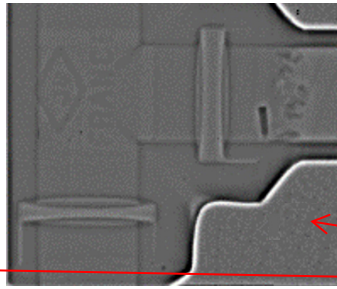
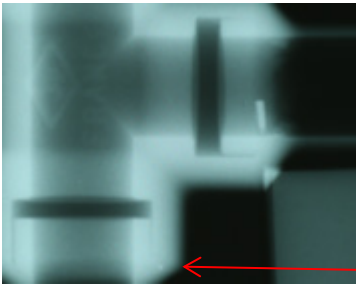
#### Advantages of HE PCD over argentic film :

Compared to argentic film, using HE PCD allows for the same image quality :

- **either to strongly reduce the exposure time**
- **or to use sources with lower energy and/or lower emission (activity) :**
  - Creation of an image in compliance with ISO 17636\_2 standard with more than 10 times lower photons or 10 times lower exposure time.
  - Drastic reduction of scattered radiation, with a consequent improvement in image quality thanks to the energy thresholding principle
  - Usable with all types of sources : radio isotope sources (Selenium 75, Iridium 192, and Cobalt 60), X-ray tubes, linear accelerators Betatrons
  - Digital image processing using algorithms to improve quality and extract information
  - Duplication, archiving and simple sharing of the image

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is **our everyday** commitment

## Comparison example HE PCD / Argentic film



'Socket' type mock-up with welding defects.  
Gamma source of Selenium 75, activity of 20Ci

	Film RT	HE PCD
Exposure time	20 minutes	
Development	10 minutes + effluent management + inactinic room	2 minutes
Shooting validation	5 minutes + ECME material (negatoscope, densitometer) + evaluation room	1 minute
Dosimetry <small>(workers present throughout the explosion to monitor the marking, information in construction mode = marking at 25µSv/h)</small>	6,25 µSv	0,625µSv

### Operating ranges

Source	Thickness to pass through (steel)	Exposure time (SDD of 500mm; 50 Ci)
Iridium 192	80mm	22 minutes
Cobalt 60	150mm	10 minutes

### Characteristics

It belongs to XC-THOR SERIES from Direct Conversion with the following two characteristics :

- active layer CdTe thickness = 3mm ;
- energy threshold can assumes values up to 1300keV.

#### OTHER TECHNICAL SPECIFICATIONS

- Pixel size : 100 µm
- Fill factor : 100%
- Maximum photon rate :  $5 \times 10^8$  photons/s per mm<sup>2</sup>
- Acquisition in single or dual imaging

#### PHYSICAL CHARACTERISTICS (adjustable to user needs)

- Dimensions l x w x h : 303 x 140 x 46 mm<sup>3</sup>
- Weight : 5 kg -- 9kg depending on filtration: without – up to 6MeV
- Protection : W/Cu (90/10 %)
- Active Surface Dimensions : 100 x 50 mm<sup>2</sup>

#### ROBUSTNESS

- Temperature Range: +5°C — +35°C (Maximum Humidity of 85%)
- Maximum Temperature gradient : 20°/h
- Handling : HE PCD can support shocks up to 20G

#### CONNECTION

- The control of the HE PCD is done with a laptop and a RJ45 CAT 6 ethernet cable
- HE PCD power supply on 220Volt socket

#### USER INTERFACE

- Acquisition GUI included : real Time Monitoring
- Calibration/Correction App included : background radiation subtraction if needed

### Field of application

NDT OF WELDS, NDT FOR CASTING  
SECURITY - EXPLOSIVES / ILLICITES  
SUBSTANCES DETECTION  
EXPERTISE, TOMOGRAPHY  
COMPLETE SYSTEMS DEVELOPPEMENT

### Composition

- Transportable equipment comprised of a :
  - HE PCD ;
  - portable PC for acquisitions monitoring and image analysis / processing ;
  - power supply box.
- Supplied as standard with the software for :
  - PCD configuration and image acquisition ;
  - correction of raw images ;
  - visualization via ImageJ or any equivalent app.

### Setting up, Implementation, Handling

- Simple software installation on the control PC without the need for a license
- Tutorials provided and a support is available
- The HE PCD does not require handling

#### INTERCONTROLE

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