HXD

Hyperspectral X-ray Detector

HXD (Hyperspectral X-ray Detector) is a spectroscopic detector for measuring X-rays in hyperspectral mode. It is equipped with an innovative semiconductor sensor capable of delivering new performance standards compared with radiation detection technologies currently available on the market.

The HXD sensor can be combined with a suitable X-ray source for in-line monitoring of the relative density of manufactured products such as wood panels (MDF, OSB, etc.), ceramics, nonwoven fabric, and plastics/rubber.

The detector consists of a crystalline sensor (CdZnTe, CZT) and signal readout electronics for single-photon counting, capable of accurately measuring both the radiation flux — the number of photons per unit of time — and the energy of each individual photon, with excellent energy resolution.

The HXD detector has been designed for industrial applications requiring reliable Non-Destructive Testing (NDT) instruments. X-ray transmission spectroscopy makes it possible to investigate and monitor key parameters in many production processes where control of relative density, composition, or contamination values is essential.

The analysis of the detector's output data is designed to be plug and play, with several Ethernet-based communication protocols available, allowing easy integration into various industrial environments.

HXD represents a major evolution compared with traditional scintillation and ionization chamber detectors: in addition to its higher performance, it does not degrade over time, enabling a medium-term return on investment and reducing production downtime for maintenance.

Key Features and Benefits

- High-energy-resolution spectroscopic X-ray acquisition
- Improved signal-to-noise ratio compared with ionization chambers and scintillators
- Compact and long-lasting sensor
- High X-ray sensitivity up to 250 keV
- Data transmission via RJ45 Ethernet using EtherCAT or PROFINET protocol

Fields of application

- Monitoring of density variations for the wood industry — including MDF, OSB, particleboard, and plywood panels — as well as for the ceramics industry, the fiber and nonwoven fabric sector, and the rubber and plastics industry.

MADE IN ITALY

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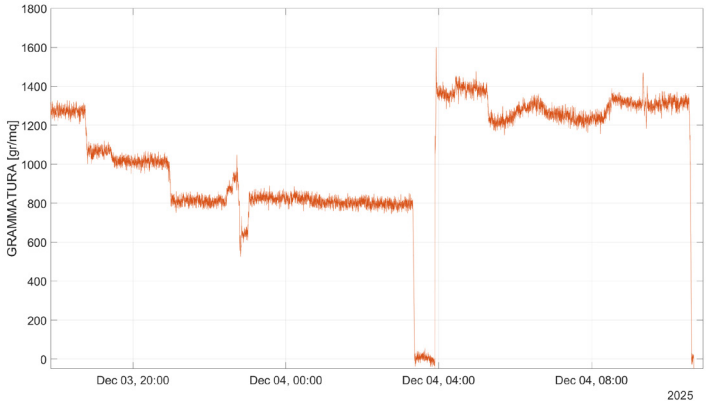
D U E 2 L A B . C O M

X-rays as you've never seen before

Radiation detection technology based on CZT sensors (CdZnTe, cadmium zinc telluride) and single-photon counting represents a new paradigm in the field of in-line non-destructive testing. DUE2LAB is the only company in Italy that designs and manufactures industrial sensors and systems based on CZT single-photon counting detectors. DUE2LAB combines pioneering expertise developed through R&D projects in aerospace, the circular economy, and X-ray/gamma-ray sensing for synchrotrons and particle accelerators with more than ten years of experience in designing tailor-made industrial solutions for the wood, rubber, paper, and packaging industries.

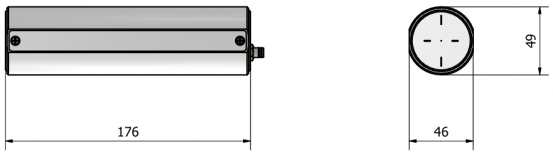
DUE2LAB solutions represent a true evolution of current X-ray systems in terms of performance, reliability, and service life, while also making it possible to measure in real time material properties that have so far been inaccessible.

EXAMPLE OF MONITORING THE TEMPORAL VARIATION IN THE DENSITY OF NONWOVEN FABRIC ON A PRODUCTION LINE

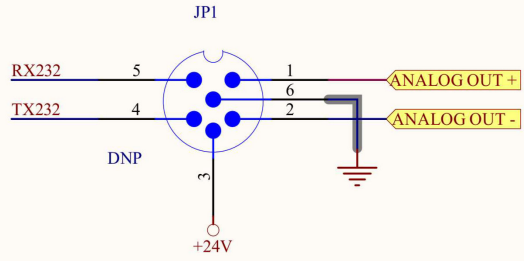


Detector dimensions

Length: 176 mm
Diameter: 49 mm



Electrical and data connection diagram



Technical Specifications

Sensor:	CdZnTe, single pixel (0.032 cc) or wide single pixel (0.12 cc)
Operating mode:	Single-photon counting
X-ray energy range:	5 ÷ 250 keV
Energy resolution:	< 4% FWHM ^{241}Am (59keV)
Dark current:	< 1nA (@ 25°C)
Sensor efficiency:	> 99% ^{241}Am (59keV) > 70% ^{57}Co (122 keV)
Incident radiation flux:	Up to 1.5 Mcps
Minimum integration time:	1 ms
Sensor lifetime:	does not degrade (>> scintillator)
Communication interface:	EtherCAT/PROFINET via Ethernet RJ45
Power supply:	24 Vdc; 0.5 A
Power consumption:	12 W
Housing structure:	Anodized aluminum
Dimensions (L x Ø):	176 mm x 49 mm Ø
Weight:	0.5 kg
Operating temperature:	max 40°C (environment)
Protection rating:	IP5X

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