ADVACAM
Imaging the Unseen

WidePIX

CHROMATIC Industry
CHROMATIC SenseEdge

former name: WIDEPIX PoE G2 2(1)x5 - MPX3
Model No.: WxPM3x-Xxx

Datasheet

General features

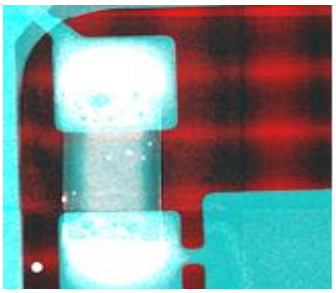


Illustration of multichannel “color” radiographs where different materials are identified and imaged in different colors

The large area imaging detector **WidePIX CHROMATIC Industry 10** (Double Row) with resolution of 512 x 1280 pixels i.e. 0.64 Mpx and **WidePIX CHROMATIC Industry 5** (Single Row) with resolution of 256 x 1280 pixels are composed of Medipix3 hybrid detectors electronics tiles. Each tile (256 x 256 pixels) is attached to a silicon or CdTe sensor. Therefore, the whole area of the **WidePIX CHROMATIC Industry** device is fully sensitive and there are no gaps between sensor tiles. **WidePIX CHROMATIC SenseEdge** shares this architecture but adds edgeless sensor technology, allowing measurements right up to the physical edge of the device for true gapless coverage in complex layouts. Each pixel has two integrated 12-bit digital counters and two energy discrimination thresholds. The counters store number of registered particles, e.g. X-ray photons, with energy above the appropriate threshold. Both counters can be joined to a single 24-bit counter providing enhanced dynamic range. The particle counting principle eliminates any additional noise generated by the sensor or electronic readout. It allows acquiring X-ray images with very high contrast and wide dynamic range. Therefore, even low contrast structures such as plastic or soft tissue are easily detectable in X-ray images.

Both devices are suitable for CT scanners, which can take advantage of large sensitive area without any gaps. The **WidePIX CHROMATIC Industry 5** (Single Row) variant, moreover, supports a hardware-based Time-Delayed-Integration mode for online (continuous) scanning applications.

The energy discrimination thresholds of Medipix3 technology allow spectral X-ray imaging. Different materials in an inspected sample could be then identified based on their spectral X-ray attenuation properties. Energy spectra could be measured typically from 5 keV upwards.

The Charge Summing Mode implemented in the pixel electronics provides hardware-based correction of signal cross talk between pixels. This further considerably improves the detector’s spectral response and therefore also quality of spectra measured in individual pixels.

Main Features

- Readout chip type Medipix3
- Pixel size[1] ..... 55 x 55 µm^2
- Sensor resolution ..... 512 (256) x 1280 pixels
- Dynamic range in one frame[2] ..... 12-bit / 24-bit
- Dark current ..... none
- Interface ..... 1 x 1 Gb/s ethernet with PoE
- Maximum frame rate[2] ..... up to 90 (170) fps
- Dimensions ..... 228,5 x 92 x 42,5 mm
- Weight ..... 1700 g

[1] 55 x 110 µm^2 at the edges and 110 x 110 µm^2 at the corners
[2] Depends on operation mode.

Device parameters

Operation conditions

Symbol	Parameter	Value	Units	Comment
T_a	Operating ambient temperature range[1]	10-55	°C	
Φ	Humidity	< 80	%	Not condensing
IP	IP rating	IP50		

[1] With temperature stabilization – see the paragraph below.

Water cooling interface

Temperature stabilization of the device required when in operation. **WidePIX CHROMATIC Industry** uses water connectors that allow for quick disconnection/reconnection. Mating connector is included as standard accessories and must be attached to 4x6 mm plastic hose.

Temperature of the cooling water must be within range 21 ± 4 °C.
Max. pressure in the water-cooling system: 1,2 bar.
The device will automatically shut down after chip or CPU temperature exceeds 55 °C.
Intended for dust free indoor use.

Electrical specification

T_a = 25 °C

Symbol	Parameter	CHROMATIC Industry (Single Row)	CHROMATIC Industry (Double Row)	Units	Comment
V_{CC}	Supply Voltage DC	48		V	
I_{CC}	Supply Current	0,4/0,8	0,5/1,0	A	Typ/Max
P	Power consumption	20/40	25/50	W	Typ/Max
A	Sensor Area	70,5 × 14,1	70,5 × 28,2	mm	
	Detector Resolution	1280 × 256	1280 × 512	Pixels	
f	Frame Rate[1]	170	90	fps	
T_{READ}	Readout Time[2]	6	11	ms	
m	Weight	1700	1700	g	Approx., depends on model

[1] Operating parameters: Shutter time = 1 ms, Mode = CSM or SPM-1CH 12bit resolution.

[2] During Readout time (or Dead time), no charge is collected from the sensor.

Sensor parameters

Symbol	Parameter	Si		CdTe	Units	Comment
	Thickness	300	500	1000	µm	
V_{BIAS}	Bias voltage	150	150	−450	V	max
	Minimum energy threshold	5,0		8,0	keV	Typical at 22 °C
	Typical detectable energy range for X-rays	up to 60		up to 600	keV	See chart below
	Pixel size	55 × 55		55 × 55	µm²	

Typical values for 300 µm Silicon sensor, T_a = 20 °C.

Range	Mode	Min. energy threshold [keV]
Super Narrow	SPM	-
	CSM	Not supported
Narrow[1]	SPM	5,0
	CSM	5,0
Broad	SPM	Not supported
	CSM	Not supported

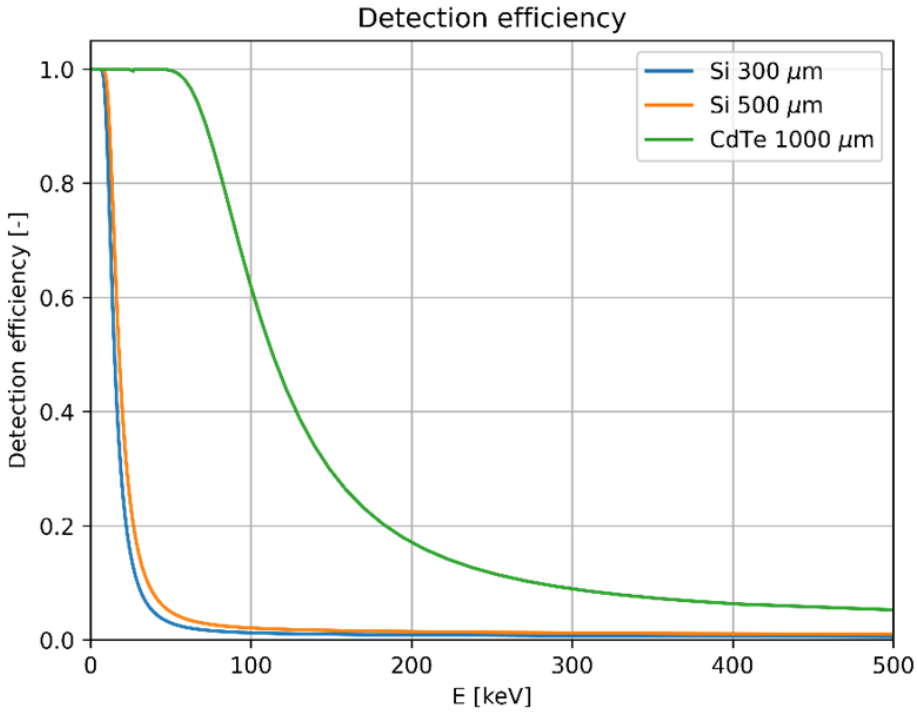
Typical values for 1000 µm CdTe sensor, T_a = 20 °C

Range	Mode	Min. energy threshold [keV]
Super Narrow	SPM	-
	CSM	-
Narrow[1]	SPM	8,0
	CSM	8,0
Broad	SPM	-
	CSM	-

[1] By default the detector will be calibrated for the Narrow Gain Mode. Additional gain modes can be added upon request. Broad range and combination of Super Narrow mode with CSM is not available with silicon detectors.

[2] To get true detector response, detectable energy and quantum efficiency of sensor chip must be combined with energy range of readout chip.

[3] 55 x 110 µm² at the edges and 110 x 110 µm² at the corners.



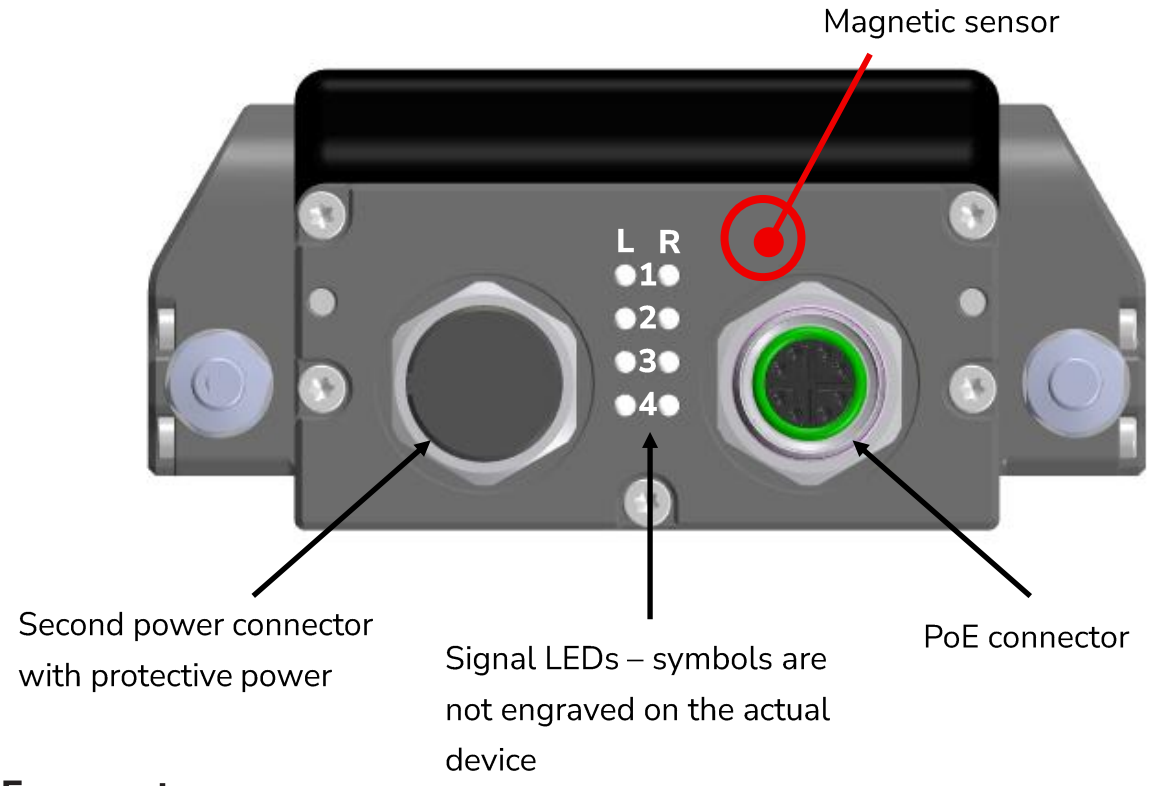
Basic principles, measurement types and operational modes

The ionizing radiation particle interacts with the sensor material creating an electric charge. This charge is collected by electric field and brought to pixel preamplifier where it is amplified and shaped forming triangular voltage pulse. The amplitude and duration of this pulse is proportional to energy deposited by particle within the pixel. The situation when the voltage pulse amplitude in particular pixel exceeds preselected threshold value is called “event” or “hit”.
Each pixel contains two digital counters (12 and 12 bits). These counters are used differently according to measurement type and mode. List of operational modes and their description is provided in the table below.

Type	Mode	Bit depth	Description
Frame (reading all pixels)	SPM-1CH	12/24 bit/frame	Single Pixel Mode using one counter: Every pixel works independently of its neighbors. One energy threshold (energy channel) is available. 1 output image: Number of events per pixel
	SPM-2CH	12 bit/frame	Single Pixel Mode using both counters: Every pixel works independently of its neighbors. Two energy thresholds (energy channels) are available. 2 output images: Number of events per pixel
	CSM	12/24 bit/frame	Charge Summing Mode: The charge from 4 adjacent pixels is summed and is assigned to the pixel with the largest charge deposition. The event is counted only if the sum of signals exceeds the second energy threshold. 1 output image: Number of events per pixel

All modes can be operated at three ranges: Broad / Narrow / Super Narrow (Except Broad range and combination of Super narrow mode with CSM with silicon detectors).

Device description



PoE connector

An Ethernet cable supporting Power over Ethernet (PoE), with an M12 X-coded connector on one end and an RJ45 modular connector on the other, is included as a standard accessory. Ethernet cable is connected to an external PoE injector or PoE-enabled switch. The injector or switch must support IEEE 802.3bt Type 3 (PoE++) and deliver at least 60 W of power. Both the power delivery and the data transfer are provided by the Ethernet cable. For more information see **WidePIX CHROMATIC Industry** manual.

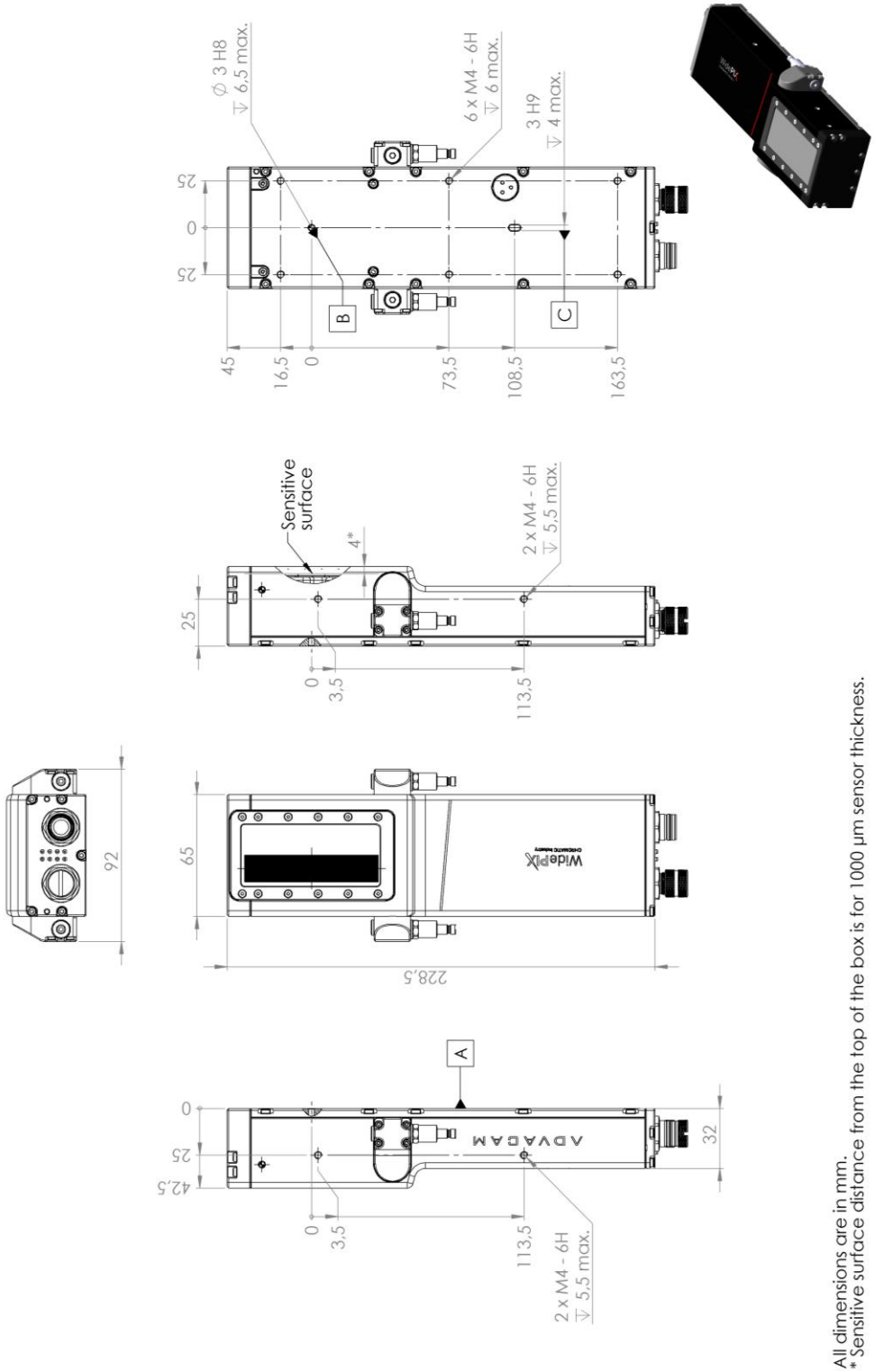
Second power connector: +48 V DC connector – without PoE

Alternative power supply via standard M12 connector. +48V DC power adapter is connected to the device's power connector. In this configuration, the Ethernet cable is used only for data transfer and should be connected directly to your computer. **Warning:** Do **NOT** combine PoE with the power adapter. For more information see WidePIX CHROMATIC Industry manual.

Mechanical dimensions

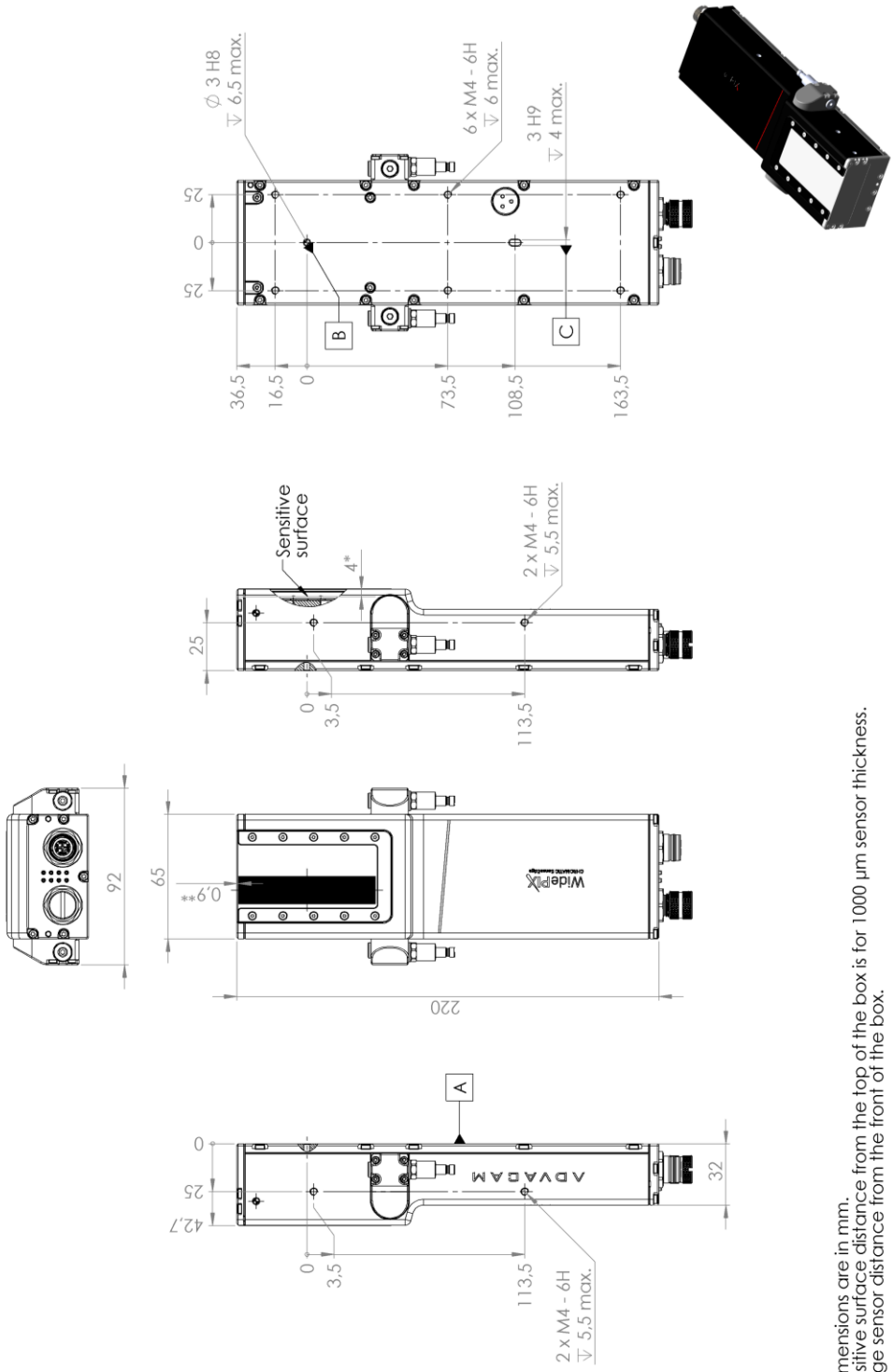
The following drawings illustrate the standard connection setup.

WidePIX CHROMATIC Industry (Single Row)



All dimensions are in mm.
* Sensitive surface distance from the top of the box is for 1000 µm sensor thickness.

WidePIX CHROMATIC SenseEdge (Single Row)



All dimensions are in mm.
* Sensitive surface distance from the top of the box is for 1000 µm sensor thickness.
** Edge sensor distance from the front of the box.

Instructions for safe use

Do not touch sensor surface!

To avoid malfunction or damage to your **WidePIX CHROMATIC** please obey the following:

- Do not expose to water or moisture **WidePIX CHROMATIC** is dust protected only.
- Do not open **WidePIX CHROMATIC** case. Detector wire-bonding connections may be irreversibly damaged.
- Do not operate detector when not properly water cooled. Otherwise, detector temperature may rise above the specified range. Recommended temperature is 22 °C.
- The protection provided by this product may be impaired if it is used in a manner not described in this document.

Disposal

Do not dispose these instruments as unsorted municipal waste. Please use separate collection facility to contact the supplier from which the instrument was purchased. Please make sure discarded electrical waste is properly recycled to reduce environmental impact.

Release history

Date (YY/MM/DD)	Changes	Changed by
25/01/17	Preliminary version (W1PM35-Xxx)	D. Doubravová, J. Baborák
25/08/01	Release	J. Baborák
25/09/15	Version update	J. Baborák
26/11/14	New graphic style of the document, rebranding and revision	P. Bloudek, S. Valtera

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