

Hybrid Photo Diodes



PHOTONIS products have led the industry in electro-optics and image intensifiers for over 35 years. We supply standard and custom products and offer expert, personal service designed to meet the rigorous demands of signal amplification and night vision applications.

Our unrivaled expertise in designing and manufacturing Hybrid Photo Diodes and related technology allows us to combine the sensitivity of photomultiplier tubes with the excellent spatial and energy resolution of silicon sensors. PHOTONIS HPDs ensure the most sensitive and highly-integrated systems available.

PHOTONIS | INDUSTRY | SCIENCE | MEDICAL For more information, please visit www.photonis.com

PHOTONIS Netherlands B.V.

Visit address
Dwazziweg 2
9301 ZR Roden
The Netherlands

Mail address

P.O. Box 60
9300 AB Roden
The Netherlands

T +33 (0)50 501 8808
F +33 (0)50 501 1456

Email: sales@nl.photonis.com

PHOTONIS USA Inc.

Visit address
Strubridge Business Park
660 Main street
Sturbridge, MA 01566
United States of America

Mail address

P.O. Box 1159
Sturbridge, MA 01566
United States of America

T +1 800 648 1800 (US & Can)
T +1 508 347 4000 (Intl calls)
F +1 508 347 3849

Email: sales@usa.photonis.com

The information furnished is believed to be accurate and reliable, but is not guaranteed and is subject to change without notice. No liability is assumed by PHOTONIS for its use. Performance data represents typical characteristics as individual product performance may vary. Customers should verify that they have the most current PHOTONIS product information before placing orders. No claims or warranties are made as to the application of PHOTONIS products. Pictures may not be considered as contractually binding. This document may not be reproduced, in whole or in part, without the prior written consent of PHOTONIS.

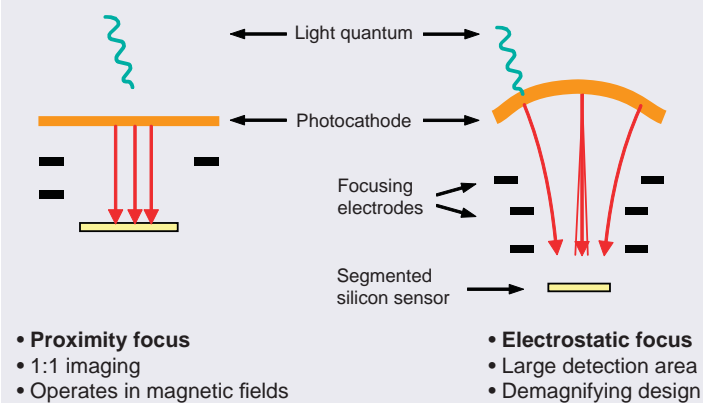
HPD-MAY2010

PHOTONIS | INDUSTRY | SCIENCE | MEDICAL



PHOTONIS brings you the most advanced detection solutions in the world.

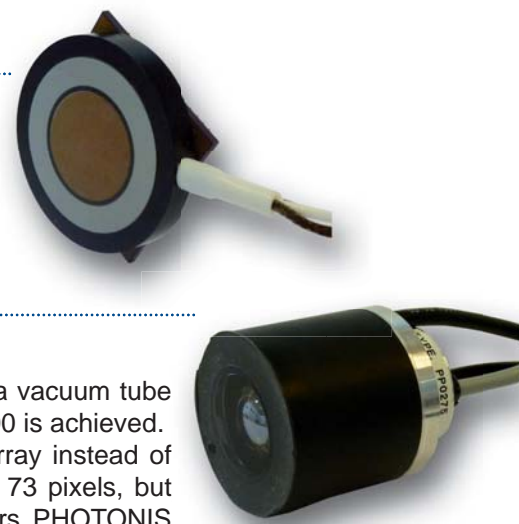
Classical HPD designs



Photon counters are used to detect each photo-electron almost without any noise in many different types of applications.

A photon counter is able to record each event. Each event will then be judged by the electronics: low gain events will be rejected. The low gain tail of the PHD is noise. The peaked part represents the real events. By putting the discrimination level in the valley, the optimal setting for a photon counter is achieved. A low valley characterises a high quality photon counter.

PHOTONIS offers two types of photon counters: Multi-MCP Image Intensifiers and Hybrid PhotoDiodes.



Multi-MCP Image Intensifiers

They have a saturated Pulse Height Distribution (PHD). They are characterised by a very high MCP gain, a large peak/valley ratio and a small gain spread. As for single MCP Image Intensifiers, different formats are manufactured and the photocathode can be matched to the spectral range of the application.

Hybrid Photo Diodes

Hybrid Photo Diodes are an alternative technique. They amplify an electron in a vacuum tube and bombard it onto a silicon diode. For each impact a gain of about 2000 to 3000 is achieved. The simplest HPD has only one diode (one pixel). By incorporating a diode array instead of a single diode, multipixel versions are obtained. The standard HPDs go up to 73 pixels, but customized ones could offer many more. For signals coming out of scintillating fibers, PHOTONIS also offers fiber optic entry window to avoid any coupling loss in the connection.

HPDs are available in many different formats, proximity or electrostatically focused. They all show excellent single photon detection capability, with an extremely good linearity and fast timing.

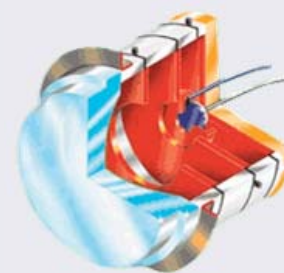
The following table lists standard HPD configurations. It will help you to select the right configuration for your specific application. If you have any questions or need assistance, do not hesitate to contact us.

HPD Focus	Size	Number of pixels	Pixel size (mm)	Pixel configuration	Operating voltage (kV)	Entry window
Electrostatic	18	1	2	Single	15	Quartz
Electrostatic	40	1	2	Single	15	Quartz
Electrostatic	72	1	2	Single	20	Quartz
Electrostatic	72	61	2	Hexagonal	20	Quartz
Electrostatic	72	163	1.4	Hexagonal	20	Quartz
Proximity	18	32		In 2 circles	12	Quartz / F.O
Proximity	18	61	2	Hexagonal	12	Quartz / F.O
Proximity	18	163	1	Hexagonal	12	Quartz / F.O
Proximity	25	19	5.4	Hexagonal	12	Quartz / F.O
Proximity	25	73	2.7	Hexagonal	12	Quartz / F.O

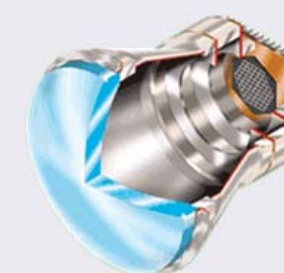
- Electrostatically focused HPDs of 18 & 40 mm can be offered with Integrated Pre-amplifiers.
- Hot S20, S20, S20UV, S25 and Solarblind photocathodes are available on Quartz entry window.
- Photocathode Hot S20, S20 and S25 are available on Fibre-optic entry windows.

HPD overview

- Electrostatically focused HPDs



1 pixel



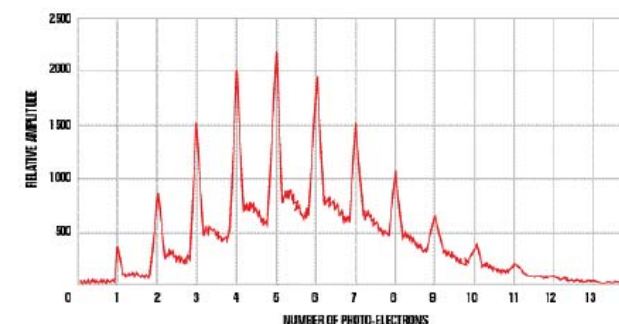
Multi-pixel

- Proximity focused HPDs

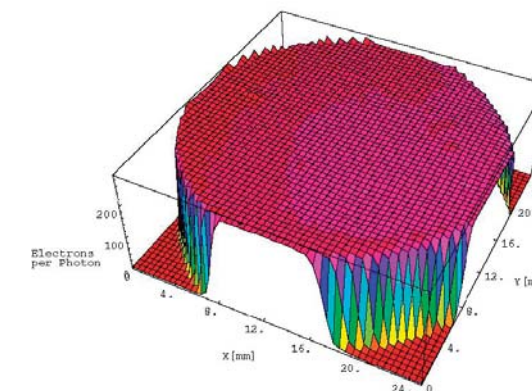


Other (custom designed) pixel layouts are possible

HPD photon electron spectrum



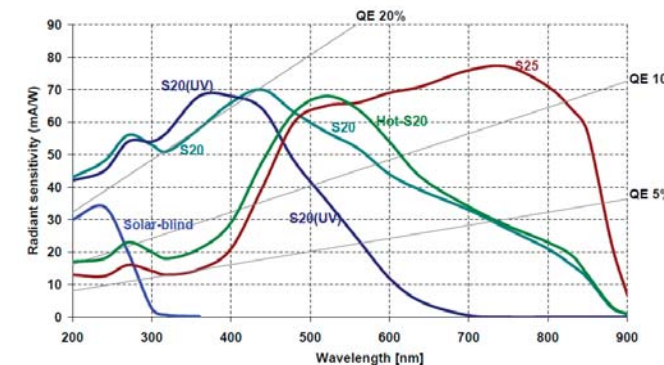
HPD Uniformity plot



Typical dark count rate levels

Photocathode	DCR (counts/cm ² /sec) at 20°C
Solar blind	< 5
S20UV	< 150
S-20	< 1500
Hot-S25	< 50000

Photocathode spectrum characteristics (on quartz)



Photocathodes deposited on Fibre optic window are ~20% less sensitive and cut at 400nm



HPD 72mm