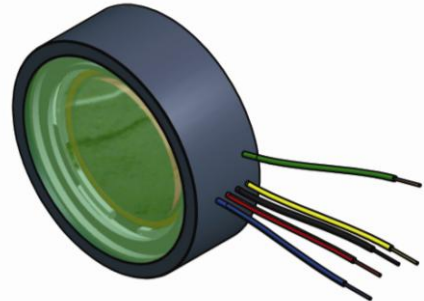


## Image Intensifiers

### Features

- Customised for specific applications
- Proximity focused – low distortion
- 18 mm, 25 mm, 40 mm, 75 mm & 150 mm
- Single, chevron or z-stack MCP options
- Compact size
- X-ray, UV, Solar Blind, Visible and NIR responses
- Fast gating to 2 ns
- Ideal for high magnetic field environments



### Applications

- Bioluminescence
- Corona imaging
- Fluorescence lifetime imaging
- High speed imaging
- Low light level imaging
- Missile warning systems
- Photon counting
- Security detection systems
- Space science
- Spectroscopy
- Threat detection systems
- Time resolved imaging



### General Description

Photek’s range of image intensifiers provides the highest performance in terms of resolution, speed of response and in-service reliability to deliver photonic measurements for world-class scientific research. Photek manufactures 18, 25, 40 and 75 mm image intensifiers and the world’s largest image intensifier with 150 mm active diameter.

A range of photocathodes and input window materials enables a wide choice of spectral responses to suit many applications. The standard fibre optic output ensures a defined output focal plane and allows efficient coupling to CCDs and linear image sensors. A variety of MCP configurations satisfies all gain requirements.

Our image intensifiers can be supplied with integral high voltage power supplies and ultra-high speed gate units customised to meet the requirements of your specific application.

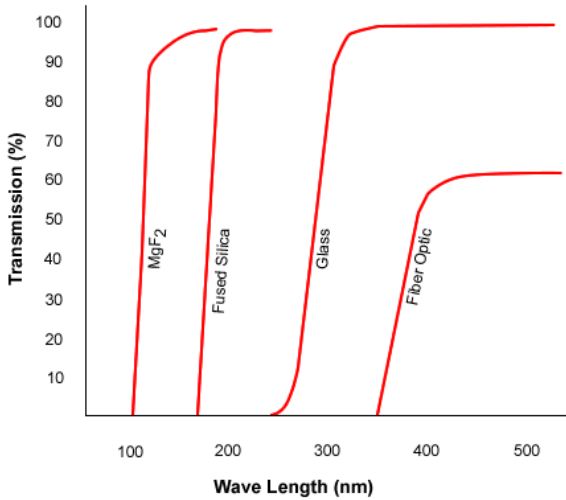
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Datasheet No.	DS001
Issue	DR
Date	24 August 2010

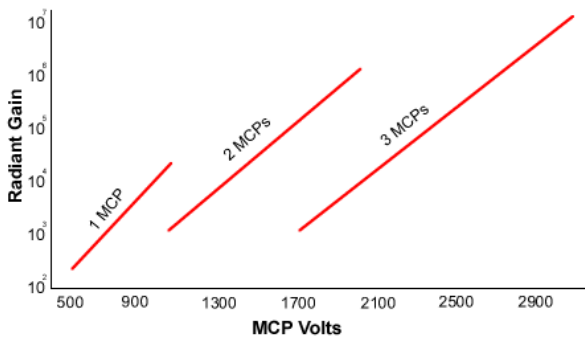
Input Window

Photek image intensifiers are available with a choice of input window materials. These include MgF<sub>2</sub>, fused silica, glass and fibre optic



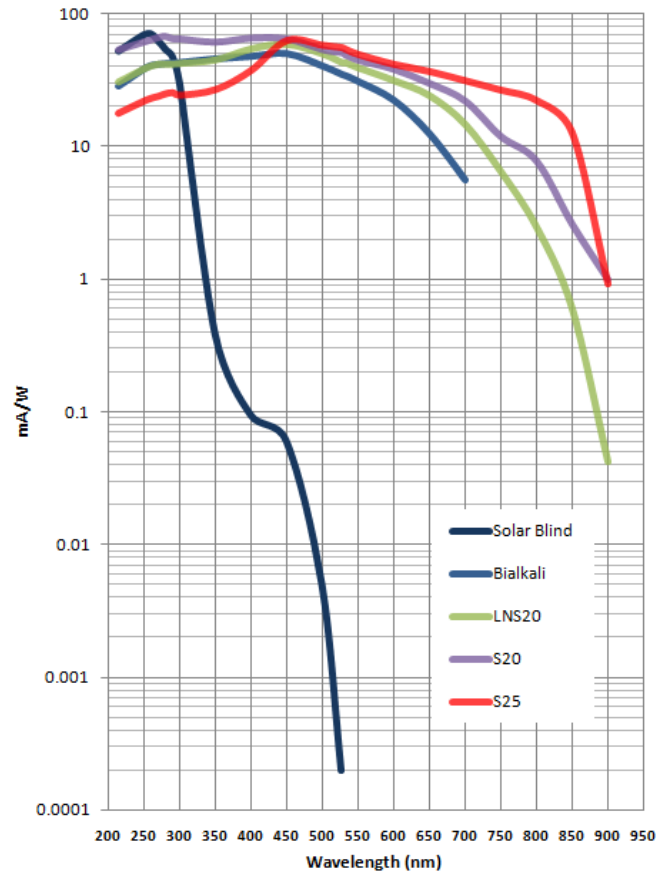
Gain

The photek image intensifier can be provided with 1, 2 or 3 micro channel plates for gain up to 10<sup>7</sup>.



Spectral Response

Photek offer a full range of Gen II photocathodes, these include CsI, Solar Blind, Bialkali, Low Noise S20, S20 and S25.



The above curves represent the broad spectral response that you would expect to achieve with Photek’s range of Gen II photocathodes. Please note that input window material and fast gating requirement will affect overall sensitivity.

Where fast gating below 10 ns is required Photek will provide a photocathode with mesh underlay.

Phosphor Anodes

Photek can offer three types of phosphor anode substrates; glass, fibre optic or integral fibre optic taper for applications where direct coupling of a sensor is required. ITO is standard on all fibre optic anodes and is used to discharge static charge that can build up on the anode to ground.

Our standard phosphors include P20, P43, P46, P47 & FS depending on the brightness and decay time required. Other phosphors are available on request.

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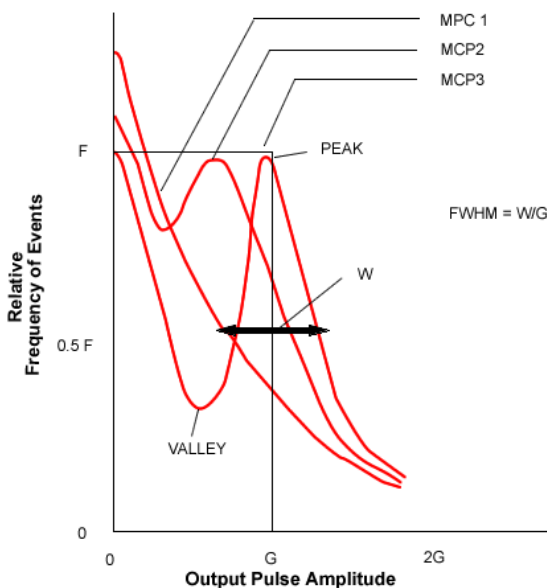
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Type (wavelength nm)	Anode efficiency % ( Optical Watts / Electrical Watt )	Photons / Electron @ 5 kV	Decay Characteristic
P20 (540)	12	320	Fast initial decay with long decay at low level. 1 ms to 1%
P43 (548)	8.7	240	1.2 ms/decade, true exponential
P46 (530)	1.8	55	300 ns
P47 (410)	3	64	80 ns
FS (513, 668, 768)	4.2	96	12 $\mu$ s to 10 %

**PHD**

The diagram below shows how the pulse height distribution changes with gain. Both the peak/valley ratio and the full width half maximum (FWHM) of the pulse height distribution are used to characterise photon counting tubes. It can be seen that both of these parameters improve as the number of MCPs is increased.



**Uniformity**

Non-uniformity is mainly caused by gain variations in the MCP and can be removed by digitisation in photon counting applications. Uniformity can be measured by scans across the complete tube in x-y axis, or in a defined zone using standard Deviation/Mean measurement:

Size	X-Y Scan	Standard Deviation
18 mm	$\pm 10\%$ Typical	7%
25 mm	$\pm 12\%$ Typical	10%
40 mm	$\pm 15\%$ Typical	12%
75 mm	$\pm 17\%$ Typical	15%

**Blemishes**

Size	MCPs	Dark Spots 75-100 $\mu$ m	Dark Spots 101-150 $\mu$ m
25 mm	1	<3	<2
25 mm	2	3	2
40 mm	1	4	2
40 mm	2	6	2
75 mm	1	10	5

**Resolution**

The resolution of an image intensifier is determined by several factors, including pore size and number of MCPs. As the pore size and the number of MCPs increase the resolution reduces. The table below shows typical resolution for single plate image intensifiers.

Tube Size	MCP Pore Size	Typical Limiting Resolution with P43 Phosphor
18 mm	6 $\mu$ m	40-50 lp/mm
25 mm	6 $\mu$ m	32-40 lp/mm
40 mm	10 $\mu$ m	26-36 lp/mm
75 mm, 150 mm	25 $\mu$ m	10-15 lp/mm

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**Environmental testing**

For applications where the image intensifier is exposed to temperature and shock conditions Photek has the appropriate facilities to offer environmental stress screening. Our vibration system offers shock, sine, random and sine on random testing. Our thermal chamber has a temperature range of -75 °C to +160 °C and can measure humidity from 10% to 98%.

**Environmental**

Operational Limits: -40 °C to +45 °C  
Storage: -40 °C to +60 °C

**Power Supply & Gate Modules**

Photek designs and manufactures a range of power supplies and gate modules for our image intensifiers. Our power supplies use the very latest in power supply design and are available in either flat pack or wrap around formats. Our gate modules can gate down to 3 ns with a 200 KHz repetition rate (model dependant) and are used for high brightness or fast optical shutter applications.

**Part Numbers**

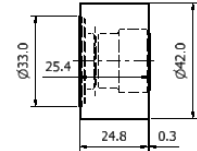
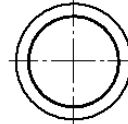
Image intensifier part numbers start with MCP, the part number is then built up in the following way:

MCP	Size	Input	Cathode	Phosphor	Output
1	18	F (fibre)	CsI	P20	IFO (fibre optic)
2	25	Q (fused silica)	SB	P43	GL (glass)
3	40	M (MgF2)	BI	P46	ITA (fibre taper)
	75	S (sapphire)	LNS20	P47	
	150		S20 S25	FS	

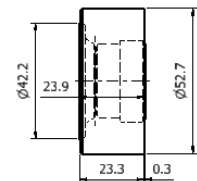
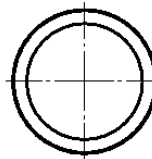
Example: MCP125/Q/S20/P43/IFO

**Mechanical**

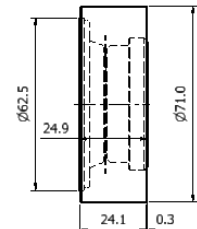
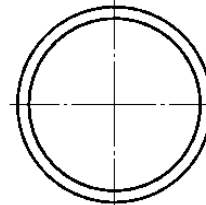
18 mm



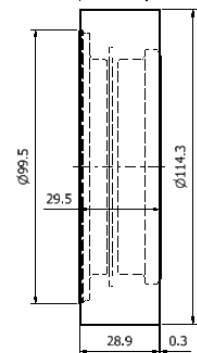
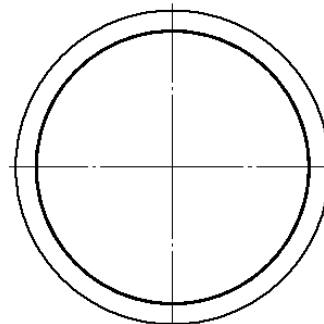
25 mm



40 mm



75 mm



Dimensions are indicative and may vary depending on the optics, number of MCP's and housing required.

Photek Ltd reserves the right to update and improve this specification without prior notice

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