

# PHOTOMULTIPLIERS FOR MOLECULAR DETECTION IN ANALYTICAL APPLICATIONS & MEDICAL DIAGNOSTICS

## MODULES AND OPTICAL RECEIVERS ■

Channel Photomultipliers  
& Modules (CPM)



## Channel Photomultipliers & Modules

### Applications

- Photon counting
- Luminescence & fluorescence spectroscopy
- Microplate readers
- Clinical diagnostics
- DNA & cell analysis
- Particle measurements
- Industrial spectroscopy
- Nucleic acid amplification (PCR)

### Features and Benefits

- Extremely low background noise
- Best low light level detection limits
- High dynamic range & gain
- Low microphonic & magnetic sensitivity
- Compact size & rugged design
- Multiple photocathode and window selections
- Plug and play for shortest design-in and time-to-market
- Customizations and added features available

### Product Description

Excelitas' Channel Photomultiplier (CPM) Technology offers a portfolio of ultra-high sensitivity optical detectors designed for extremely low noise, high dynamic range, highest gain and fast response for analytical, scientific and clinical diagnostic applications. A variety of easy-to-use modules with different read-out electronics is available, enabling customers to benefit from the unique performance characteristics of the CPM technology.

Depending on the application requirements, customers can select plug-and-play modules for photon counting, DC applications, photon-counting detection up to gigacount range or any other method of photon detection. Added features like thermoelectric cooling, shuttering and other sorts of customization are available upon request. The CPM modules are ideally suited for use in human and environmental health, supporting the market needs for ever smaller sample sizes and lower detection limits in applications like microplate readers, nucleic acid amplification (PCR), luminescence or fluorescence spectroscopy.

Product Table

### Channel Photomultipliers & Modules

CPM Tube Model (also as P-Type <sup>1,2</sup> )	Spectral Response	Active Diameter (min.)	Remarks, Other Available Types	Dark Current / pA @ 1e5	Equivalent Noise Input (ENI)/W <sub>1/2</sub> (Hz) at Peak Resp. Wavel. (typ.)	Peak Wavelength (typ., nm)	Dark Counts for -P Type and MH-P (typ.)
Unit	nm	mm		Gain (typ.)			
<b>C911</b>		5		0.1	1.0 e <sup>-17</sup>		0.1
<b>C1311</b>	115-200	9		0.2	2.0 e <sup>-17</sup>	140	0.4
<b>C1911</b>		15		0.5	3.0 e <sup>-17</sup>		1
<b>C922</b>		5		0.5	1.0 e <sup>-17</sup>		1
<b>C1322</b>	165-320	9	MgFl window available	1	2.0 e <sup>-17</sup>	200	4
<b>C1922</b>		15		2	3.0 e <sup>-17</sup>		10
<b>C943</b>		5		2	1.0 e <sup>-17</sup>		10
<b>C1343</b>	185-650	9		8	2.0 e <sup>-17</sup>	400	40
<b>C1943</b>		15		20	3.0 e <sup>-17</sup>		100
<b>C984</b>		5		1	6.0 e <sup>-18</sup>		2
<b>C1384</b>	300-670	9		4	1.0 e <sup>-17</sup>	350	10
<b>C1984</b>		15		10	2.0 e <sup>-17</sup>		20
<b>C993</b>		5		2	1.0 e <sup>-17</sup>		5
<b>C1393</b>	185-750	9	Quartz, Boro. window available	8	2.0 e <sup>-17</sup>	450	20
<b>C1993</b>		15		20	3.0 e <sup>-17</sup>		50
<b>C963</b>		5		20	4.0 e <sup>-17</sup>		100
<b>C1363</b>	185-850	9	Quartz window available	80	8.0 e <sup>-17</sup>	450	400
<b>C1963</b>		15		200	1.0 e <sup>-16</sup>		1000
<b>C973</b>		5		100	1.5 e <sup>-16</sup>		500
<b>C1373</b>	185-900	9	Quartz window available	400	3.0 e <sup>-16</sup>	500	2000
<b>C1973</b>		15		1000	5.0 e <sup>-16</sup>		5000

1. P- types are photon counting suitable CPM or module types. When ordering please add -P : e.g.: C993-P, MH984-P

2. Also order number

### Ordering Guide

Series	All modules are available with optical input aperture of 9 mm (9xx-series), 13 mm (13xx-series) and 19 mm (19xx-series).
<b>MH series</b>	Modules with direct anode output (comprising CPM and high voltage supply only)
<b>MH P-type</b>	MH modules with CPM tube specially selected for photon-counting applications
<b>MD series</b>	Modules for DC measurement, analog output: 0 to 10 Volts
<b>MP series</b>	Modules optimized for photon counting, digitized output via TTL interface
<b>MPRS series</b>	Modules optimized for photon counting, digitized output via RS232 interface
<b>MPC series</b>	Temperature stabilized (TE-cooled) MP modules, customized OEM projects only
<b>GPDM series</b>	Highest dynamic range (single photon/s to 1G photon/s range) module with digital output for fluorescence and luminescence measurements and other demanding applications.

**General Specification**

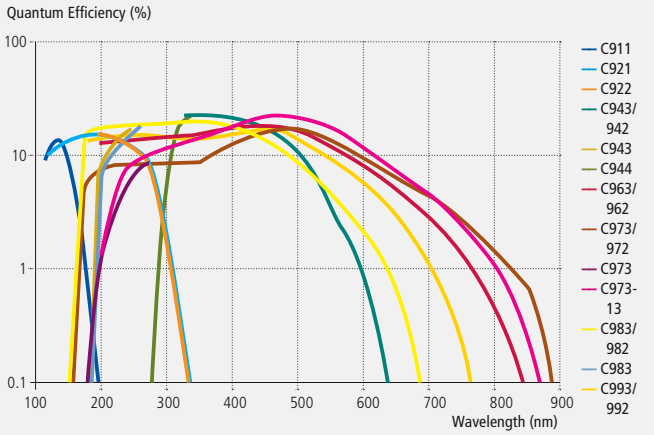
Parameter	Remarks/ Conditions	Symbol	CPM (tube)	MH-Module MH-P-Type	MD	MP MPC	MPRS	GPDM	Unit
<b>Window materials</b>	MgF2, quartz, UV glass, borosilicate		✓	✓	✓	✓	✓	✓	
<b>Photocathode materials</b>	CsI, CsTe, low noise bialkali, bialkali, yellow enhanced, multialkali, extended red multialkali		✓	✓	✓	✓	✓	✓	
<b>Max. input current</b>	Module input current	$I_{DD}$		200	250	250 <sup>2</sup>	250	300	mA
<b>Bias current (typ.)</b>	CPM input current	$I_{bias}$	40						$\mu$ A
<b>Supply voltage/ Input voltage</b>	Modules include CPM high voltage supply	$V_{DD}$	2000 V (typ.) 2600 V (max.)	+5 to +5.5 (max.)	+5 to +5.5 (max.)	+5 to +5.5 (max.)	+5 to +5.5 (max.)	+5 to +5.5 (max.)	Volts dc
<b>Current amplification</b>	6e6 (typ.), 1e8 (max.)		✓	✓	✓	✓	✓	(see note 3)	
<b>Max. anode current</b>	Output current (max. 30sec.)	$I_{anode}$	10	10					$\mu$ A
<b>Linear anode current</b>	Max. (DC linearity limit) 10% of bias current <sup>1</sup>	$I_{lin}$	✓	✓					
<b>Linear count rate (typ.)</b>	(see note 1)	CPS <sub>lin</sub>				20	10	1000	Mcps
<b>Response time</b>	Output pulse rise time	$t_{resp}$	3	3		3			ns
<b>Transit time</b>		$t_t$	17	17					ns
<b>Transit time spread</b>	Timing resolution/jitter	$t_{ts}$	2	2					ns
<b>Output pulse width (FWHM)</b>	Typical value	PW	6	6		20			ns
<b>Over-illumination protection</b>	Active gate control				✓	✓	✓	✓	
<b>Output impedance</b>	Termination for fast output pulse		50	50		50		Digital	Ohms
<b>Active gate control</b>	TTL-pulse, active high		✓	✓	✓	✓	✓	✓	
<b>GATE voltage</b>	TTL-level: low to high/high to low	$V_{gate}$		100/300	100/300	0.02/0.02		100/300	$\mu$ s
<b>Operating temperature</b>	+5 to +40° C (other temperatures on request)	$t_{op}$	✓	✓	✓	✓	✓	✓	
<b>Storage temperature</b>	-20 to +50° C	$t_{store}$	✓	✓	✓	✓	✓	✓	
<b>Weight</b>	max. 350g/420g/450g (modules 9xx-series/13xx-series/19xx-series)								
<b>Output</b>			Anode signal	Anode sig.	0–10V	TTL	RS232	USB/SPI	

1. For long term operation: max. average output count rate of < 100 Kcps (anode current of < 100 nA) is recommended  
 2. Cooling input power: 9VDC/3.5A Fan input power: 24VDC/100mA

3. Gain setting depending on operating mode – see separate datasheet

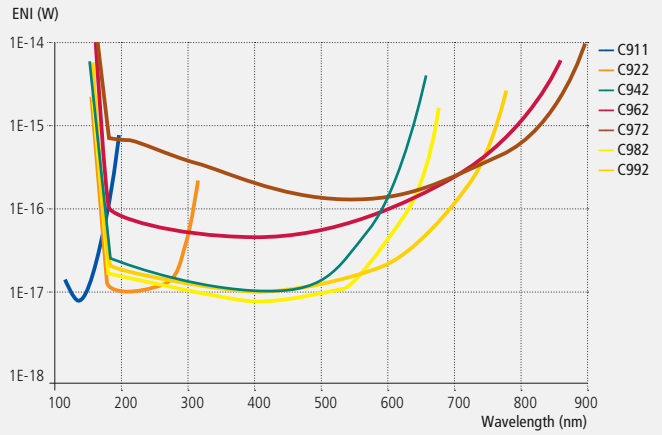
Graph 1

**Spectral Response**



Graph 2

**Equivalent Noise Input**



**Housing / Package Drawings**

Dimensions (mm) Module Type	A	B	C	D	E	F	G	H	I	J	K	L	M
<b>9xx</b>	4.5	36	4.5	33	127	120	30	20	19.5	10	18	45	45
<b>13xx</b>	4.5	36	7	33	132	125	30	20	19	10	22.1	50	50
<b>19xx</b>	4.5	36	7	33	137	130	30	20	19	10	22.1	50	50

