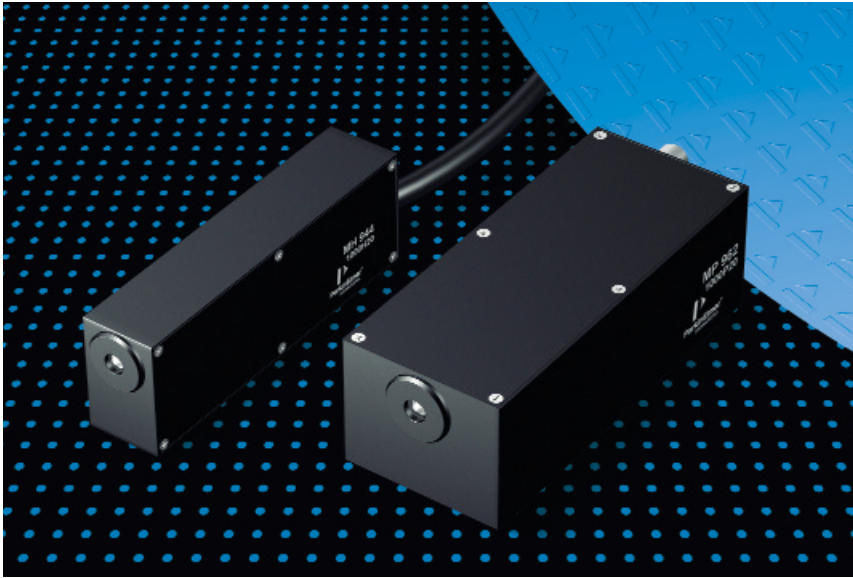


# MD Series CPM Modules

## Ultra High Sensitivity Gateable Channel Photomultiplier DC-Modules



### Description

The Channel Photomultiplier DC-Module series is designed for all low light applications e.g. in industries, life science or medical analysis, in high energy physics or pure research.

It is an easy to use module, containing the Channel Photomultiplier, a high voltage power supply, an amplifier with I/U conversion and an active quenching circuit for high light protection. It is also possible to apply an external gate function. Strong variations in light levels are possible due to the high dynamic range of the installed CPM. The exceptional low noise and high sensitivity facilitates detection of extremely low light levels.

### Features

- High dynamic range
- No cooling required
- Very high stability in noise level
- Adjustable gain
- Active quenching
- Circuit for high light protection
- Gateable CPM input (only Bialkali types)
- Optical fiber read-out possible
- 5 volts operating voltage
- Monitor voltage output

# MD 900 Series 1/3" DC Photosensor Module

## Technical Specifications

Model *) (also order no.)	Detector type	Installed CPM type	Photocathode diameter	Photocathode material	Window material	Spectral response / nm	Quantum efficiency	Equivalent noise input, ENI (W)	Dark current/Offset voltage @ $1 \times 10^6$ gain & $1V/20nA$
MD 942	CPM-Channel Photomultiplier	C942	min. 5 mm	Bialkali	Quartz	165-650	20% typical (ext. red MA: 10% typ.)	$1 \times 10^{-17}$	3 pA/150 $\mu$ V
MD 943		C943		Bialkali	UV glass	185-650		$1 \times 10^{-17}$	3 pA/150 $\mu$ V
MD 952		C952		Low noise Multialk.	Quartz	165-750		$2.5 \times 10^{-17}$	10 pA/500 $\mu$ V
MD 953		C953		Low noise Multialk.	UV glass	185-750		$2.5 \times 10^{-17}$	10 pA/500 $\mu$ V
MD 962		C962		Multialk.	Quartz	165-850		$4 \times 10^{-17}$	30 pA/1.5 mV
MD 963		C963		Multialk.	UV glass	185-850		$4 \times 10^{-17}$	30 pA/1.5 mV
MD 972		C972		Extended red Multialk.	Quartz	165-900		$1.5 \times 10^{-16}$	200 pA/10 mV
MD 973		C973		Extended red Multialk.	UV glass	185-900		$1.5 \times 10^{-16}$	200 pA/10 mV
MD 982		C982		Low noise Bialkali	Quartz	165-650		$6 \times 10^{-18}$	1 pA/50 $\mu$ V
MD 983		C983		Low noise Bialkali	UV glass	185-650		$6 \times 10^{-18}$	1 pA/50 $\mu$ V

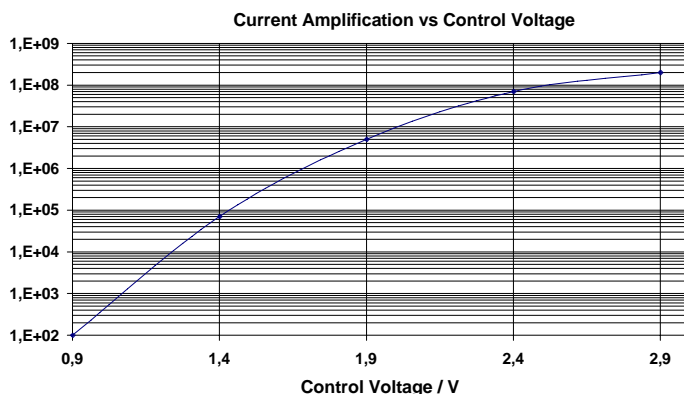
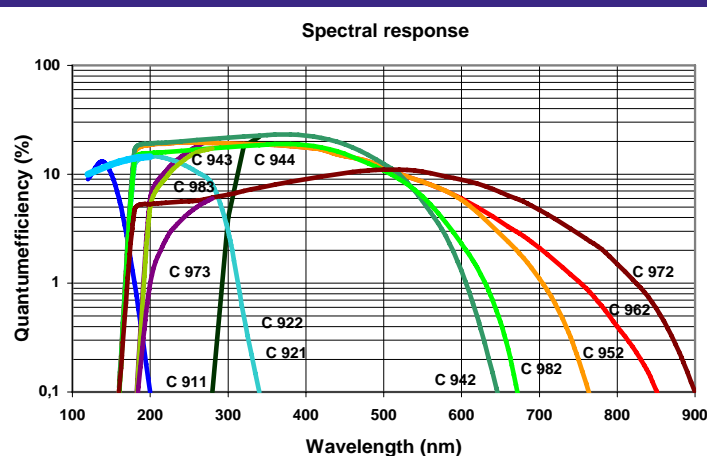
\*) Additional models on request

## Operating Conditions

Supply voltage	5 V dc
Supply current	< 280 mA
Settling time	< 1s (time to stabilize HV after supply voltage applied)
Over-illumination protection:	active quenching control (internal)
Current to voltage conversion factor	1 V/ 20nA (other values on request)
Output signal	0 ... 10 V dc **)
Output offset	$\pm$ 3mV
Gain	up to $1 \times 10^8$ , via internal potentiometer (or by external control voltage 0...3 V via ext. OpAmp circuit)
Active Quenching Control	TTL-Pulse, active high, RESET: internal via timer, typ. 1 s, external via 5 V-pulse
Frequency bandwidth	DC to 1 kHz (other values on request, max. 20 kHz)
GATE voltage $V_{gate}$	5 V: h to l set time $V_{ca}$ to $V_{ch-ent}$ +100 V : $\sim$ 150 $\mu$ s 5 V: l to h set time $V_{ca}$ to $V_{ch-ent}$ - 100 V : $\sim$ 150 $\mu$ s
High voltage pre-adjusted	1500 volts
<b>Maximum ratings</b>	
Input voltage	+5.5 V
Operating temperature	5 to 40 $^{\circ}$ C
Storage temperature	-20 to 50 $^{\circ}$ C
Weight	$\sim$ 350 g

\*\*\*) for long term operation: max. average output voltage of < 5 V (anode current of <100 nA) is recommended

## Performance Characteristics



# MD 1300 Series 1/2" DC Photosensor Module

## Technical Specifications

Model *)	Detector type	Installed CPM type	Photocathode diameter	Photocathode material	Window material	Spectral response / nm	Quantum efficiency	Equivalent noise input, ENI (W)	Dark current/Offset voltage @ $1 \times 10^6$ gain & $1V/20nA$
MD1342	CPM-Channel Photomultiplier	C1342	min. 9 mm	Bialkali	Quartz	165-650	20% typical (ext. red MA: 10% typ.)	$2 \times 10^{-17}$	12 pA/600 $\mu$ V
MD1343		C1343		Bialkali	UV glass	185-650		$2 \times 10^{-17}$	12 pA/600 $\mu$ V
MD1352		C1352		Low noise Multialk.	Quartz	165-750		$4 \times 10^{-17}$	40 pA/2 mV
MD1353		C1353		Low noise Multialk.	UV glass	185-750		$4 \times 10^{-17}$	40 pA/2 mV
MD1362		C1362		Multialk.	Quartz	165-850		$8 \times 10^{-17}$	120 pA/6 mV
MD1363		C1363		Multialk.	UV glass	185-850		$8 \times 10^{-17}$	120 pA/6 mV
MD1372		C1372		Extended red Multialk.	Quartz	165-900		$3 \times 10^{-16}$	800 pA/40 mV
MD1373		C1373		Extended red Multialk.	UV glass	185-900		$3 \times 10^{-16}$	800 pA/40 mV
MD1382		C1382		Low noise Bialkali	Quartz	165-650		$1 \times 10^{-17}$	4 pA/200 $\mu$ V
MD1383		C1383		Low noise Bialkali	UV glass	185-650		$1 \times 10^{-17}$	4 pA/200 $\mu$ V

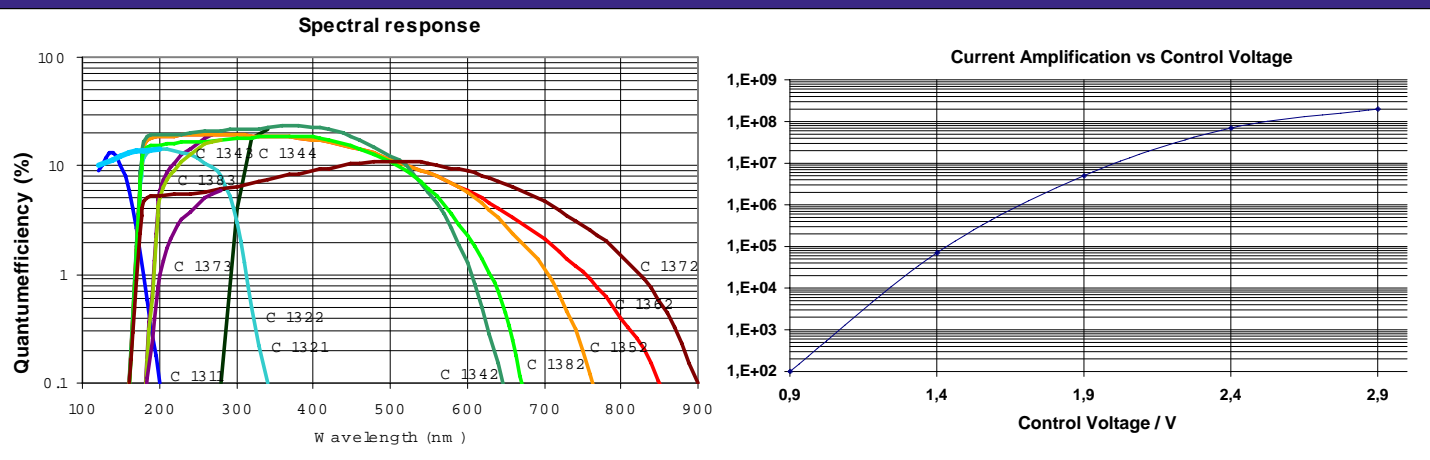
\*) Additional models on request

## Operating Conditions

Supply voltage	5 V dc
Supply current	< 280 mA
Settling time	< 1s (time to stabilize HV after supply voltage applied)
Over-illumination protection:	active quenching control (internal)
Current to voltage conversion factor	1 V/ 20nA (other values on request)
Output signal	0 ... 10 V dc **)
Output offset	$\pm$ 3mV
Gain	up to $1 \times 10^8$ , via internal potentiometer (or by external control voltage 0...3 V via ext. OpAmp circuit)
Active Quenching Control	TTL-Pulse, active high, RESET: internal via timer, typ. 1 s, external via 5 V-pulse
Frequency bandwidth	DC to 1 kHz (other values on request, max. 20 kHz)
GATE voltage $V_{gate}$	5 V: h to l set time $V_{ca}$ to $V_{ch-ent}$ +100 V : ~ 150 $\mu$ s 5 V: l to h set time $V_{ca}$ to $V_{ch-ent}$ - 100 V : ~ 150 $\mu$ s
High voltage pre-adjusted	1500 volts
Maximum ratings	
Input voltage	+5.5 V
Operating temperature	5 to 40 °C
Storage temperature	-20 to 50 °C
Weight	~ 420 g

\*\*) for long term operation: max. average output voltage of < 5 V (anode current of <100 nA) is recommended

## Performance Characteristics



# MD 1900 Series 3/4" DC Photosensor Module

## Technical Specifications

Model *) (also order no.)	Detector type	Installed CPM type	Photocathode diameter	Photocathode material	Window material	Spectral response / nm	Quantum efficiency	Equivalent noise input, ENI (W)	Dark current/Offset voltage @ 1x 10 <sup>6</sup> gain & 1V/20nA
MD1942	CPM-Channel Photomultiplier	C1942	min. 13 mm	Bialkali	Quartz	165-650	20% typical (ext. red MA: 10% typ.)	3x10 <sup>-17</sup>	30 pA/1.5 mV
MD1943		C1943		Bialkali	UV glass	185-650		3x10 <sup>-17</sup>	30 pA/1.5 mV
MD1952		C1952		Low noise Multialk.	Quartz	165-750		8x10 <sup>-17</sup>	100 pA/5 mV
MD1953		C1953		Low noise Multialk.	UV glass	185-750		8x10 <sup>-17</sup>	100 pA/5 mV
MD1962		C1962		Multialk.	Quartz	165-850		1x10 <sup>-16</sup>	300 pA/15 mV
MD1963		C1963		Multialk.	UV glass	185-850		1x10 <sup>-16</sup>	300 pA/15 mV
MD1972		C1972		Extended red Multialk.	Quartz	165-900		5x10 <sup>-16</sup>	2 nA/100 mV
MD1973		C1973		Extended red Multialk.	UV glass	185-900		5x10 <sup>-16</sup>	2 nA/100 mV
MD1982		C1982		Low noise Bialkali	Quartz	165-650		2x10 <sup>-17</sup>	10 pA/500 μV
MD1983		C1983		Low noise Bialkali	UV glass	185-650		2x10 <sup>-17</sup>	10 pA/500 μV

\*) Additional models on request

## Operating Conditions

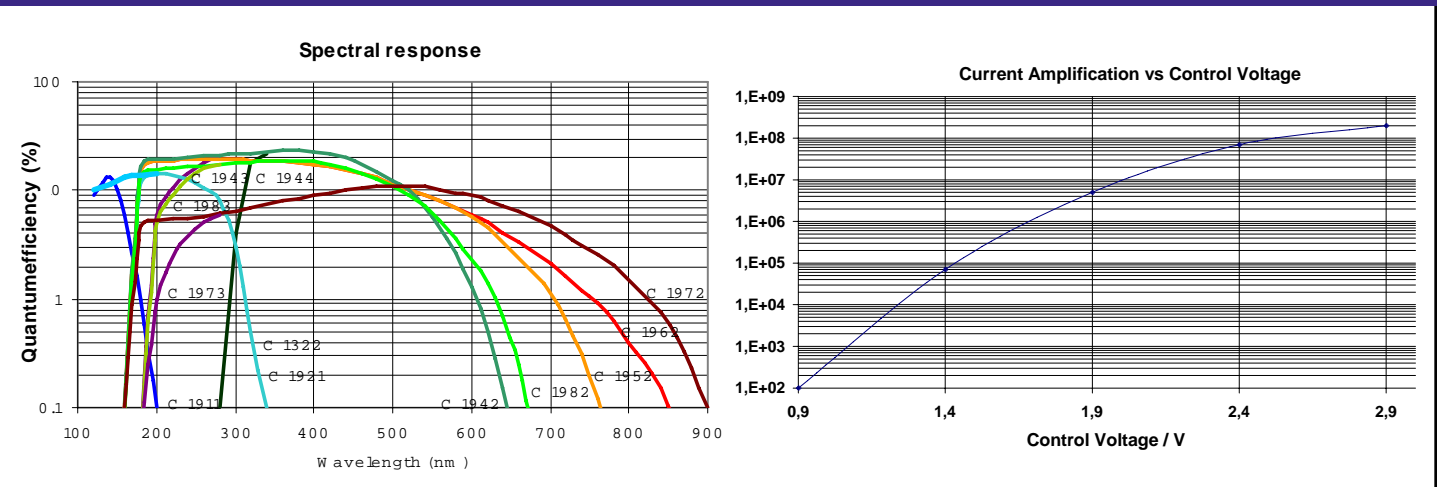
Supply voltage	5 V dc
Supply current	< 280 mA
Settling time	< 1s (time to stabilize HV after supply voltage applied)
Over-illumination protection:	active quenching control (internal)
Current to voltage conversion factor	1 V/ 20nA (other values on request)
Output signal	0 ... 10 V dc **)
Output offset	± 3mV
Gain	up to 1 x 10 <sup>8</sup> , via internal potentiometer (or by external control voltage 0...3 V via ext. OpAmp circuit)
Active Quenching Control	TTL-Pulse, active high, RESET: internal via timer, typ.1s, external via 5 V-pulse
Frequency bandwidth	DC to 1 kHz (other values on request, max. 20 kHz)
GATE voltage V <sub>gate</sub>	5 V: h to l set time V <sub>ca</sub> to V <sub>ch-ent</sub> +100 V : ~ 150 μs 5 V: l to h set time V <sub>ca</sub> to V <sub>ch-ent</sub> - 100 V : ~ 150 μs
High voltage pre-adjusted	1500 volts

### Maximum ratings

Input voltage	+5.5 V
Operating temperature	5 to 40 °C
Storage temperature	-20 to 50 °C
Weight	~ 450 g

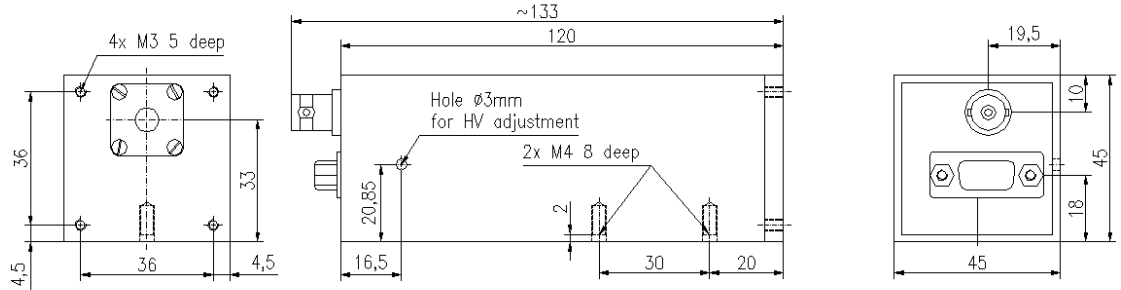
\*\*) for long term operation: max. average output voltage of < 5 V (anode current of <100 nA) is recommended

## Performance Characteristics

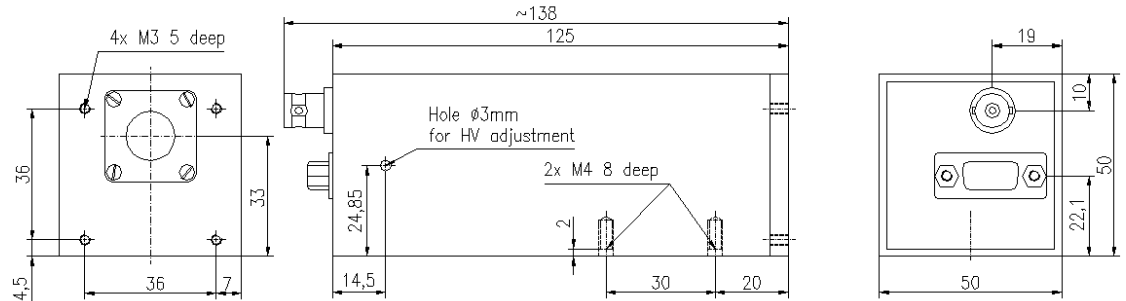


## Dimensions (mm)

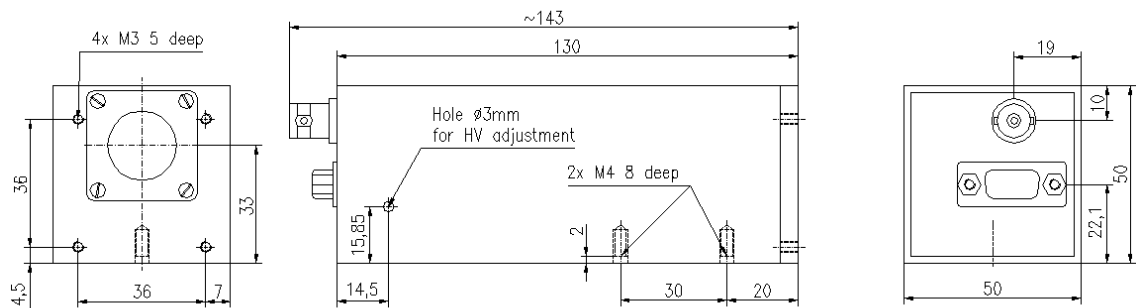
### MD 900 Series



### MD 1300 Series



### MD 1900 Series



## Connections

Red: Vcc, input (+5 V to +5.5 V DC)  
 Black: GND  
 Coax: External Gate in (TTL, active high)  
 Yellow: Monitor voltage output ( $I_{V_{ch-ent}}/1000$ )  
 Green: Control voltage input via ext. OpAmp (ref. to manual)

### BNC Connector:

- DC 0 - 10 V Signal Output
- GND



### CAUTION: HIGH VOLTAGE WARNING

This product operates at high voltage. Extreme care must be taken to ensure operator safety and to avoid damage to other instruments. Avoid direct contact with the entrance window of the built in CPM when high voltage is applied. Avoid placing conductive material close to the cathode.

Ensure that no light levels are applied, generating higher anode currents than specified.

All given values are nominal/typical @ 20 °C ambient temperature; specification subject to change without notice

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