Detectors
Single Wavelength

PM100
PM140

PM100 Detector

PM140 Detector

Features and Benefits

- Cost-effective and compact through the use of interference filters
- Enables measurement in low light applications through high-gain photomultiplier tube
- Adjusts for varying light conditions through automatic gain control feature when used with Verity's system controllers
- Simple installation through a KF40 flange or mounting bracket

Description

The PM100/140 Series detectors are used to measure a single fixed wavelength in the range of 185–830nm. When used with Verity's system controllers, the PM100/140 Series provides robust endpoint detection when used in the appropriate applications. This series is most commonly used in applications where the chemistry is simple enough that a fixed 10nm bandpass detector is suitable. At some wavelengths, alternative filters with a lower bandpass may be available.

The PM100 mounts to a viewport and includes an integral light aperture located on the bottom of the instrument. The PM140 includes a KF40 flange for mounting to the vacuum chamber. A quartz or sapphire window provides vacuum isolation. A sapphire window provides better resistance to window etching than the quartz window.

PM100/140 Pin-Out Assignments

DB9M D-Subminiature Connector	
Pin	**Description**
1	[1]Remote high voltage programming, 2–10VDC
2	Power input line, –12 to –15VDC (1mA), polarity protected
3	Power input line, +12 to +15VDC (7mA), polarity protected
4	Not used
5	Signal output, 0–10VDC
6	Not used
7	Circuit Ground Return
8	Not used
9	Circuit Ground Return

[1]This enables automatic gain control when used with any of Verity's system controllers.

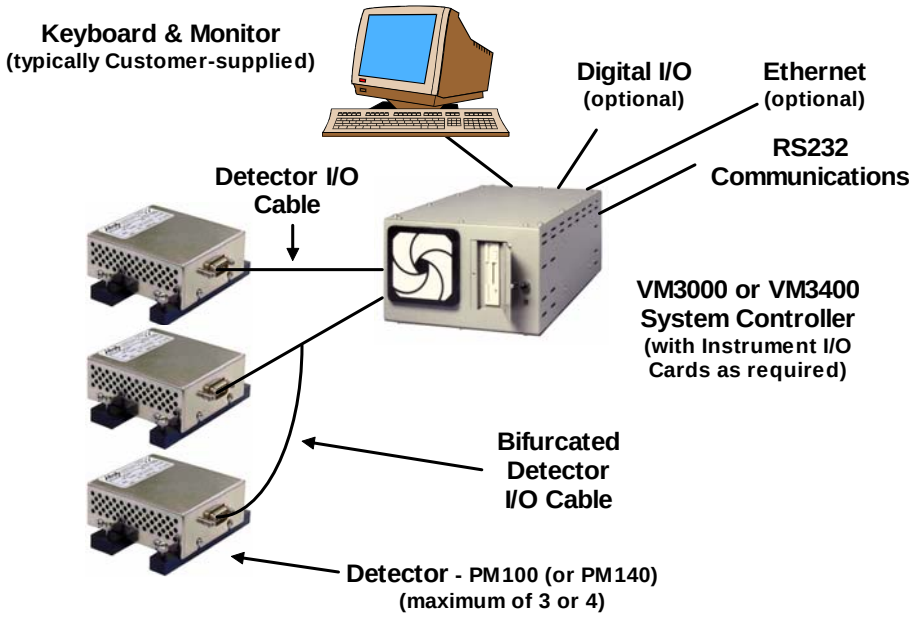
Operation

In the PM100, light enters the aperture, is filtered, and then detected by the high-gain photomultiplier tube (PMT). Similarly, in the PM140, light enters through the quartz or sapphire window, is filtered by the 10nm bandpass filter, and then detected by the high-gain PMT.

When used with any of Verity's system controllers, automatic gain control of the detector is enabled. The system controller provides for automatic gain control by driving the PMT's high voltage power supply to obtain the desired detector output. This compensates for the effects of both short and long-term optical signal deterioration. See page

System Schematic

Depicted below is a typical system schematic. A wide range of configurations are possible to meet the needs of different applications.



System Controller

The system controller provides for:

- Endpoint detection using proprietary Neural Network or threshold software
- A graphical user interface
- External communications through digital I/O, RS232, and Ethernet
- Power to detector
- Automatic gain control of photomultiplier tube

System controller platforms include:

- VM3400 provides asynchronous control using Windows NT-based ScanView IV software
- VM3000 provides synchronous control using DOS-based ScanView III software
- SDC2001 provides an OEM synchronous embedded control of manual monochromators and detectors

Optical Connection

- Direct viewing through a KF-flanged PM140 or bracket-mounted PM100

Instrument Interface Cards Instrument Cables

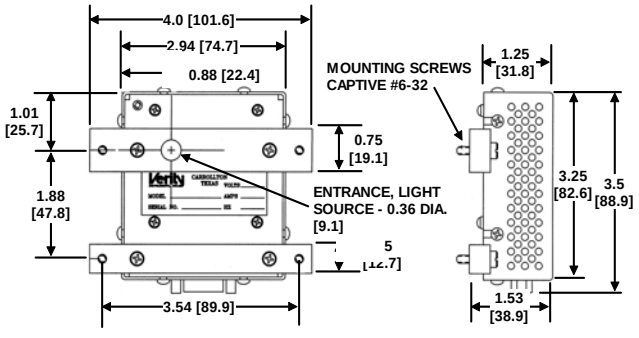
- Operation of each detector requires a dedicated interface card (DAS-205) in the VM3000/3400 and a detector I/O cable
- Two detectors can be supported by a dual interface card (DAS-225) in the VM3000/3400 and a bifurcated detector I/O cable

Specifications

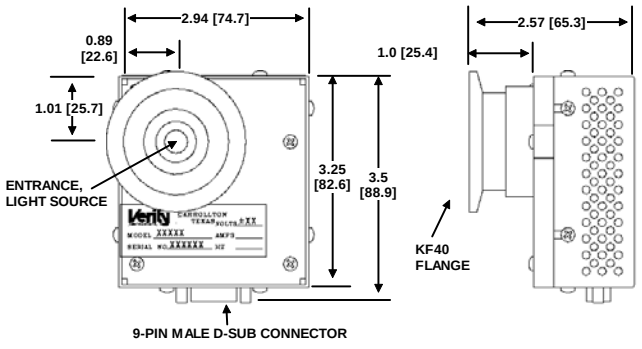
Model Number	PM100	PM140
Type	Bracket Mounted	KF40 Flange Mounted
Performance/Optics		
Range	185–830nm	
Resolution[1]	10nm FWHM	
Photomultiplier Tube	185–650nm (UV/VIS) 185–830nm (UV/VIS/NIR) (See Quantum Efficiency vs. Wavelength for each PMT in the Verity Product Catalog)	
Filter Diameter [inches (mm)]	0.5 (12.7)	
Minimum Peak Transmittance	30% to 50% typical, depends on wavelength and bandpass	
Filter Blocking	0.01%, X-ray to 3.5μm	
Temp. Coefficient of Center Wavelength	0.01 to 0.03nm/°C	
Temp. Coefficient at High Voltage	100ppm/°C typical	
Electronics		
Power[2]	+12 to +15VDC @ 7mA maximum –12 to –15VDC @ 1mA maximum	
Input Signal for PMT Gain[2]	2–10VDC	
Output Signal[2]	0–10VDC	
PMT High Voltage Output Range	–350 to –1100VDC	
Mechanical		
Dimensions [inches (mm)]	4.0 (101.6) x 1.53 (38.9) x 3.54 (89.9)	2.94 (74.7) x 2.57 (65.3) x 3.5 (88.9)
Window	None	Quartz or Sapphire
Environmental		
Operating Temperature	5 to 50°C	
Storage Temperature	–20 to 50°C	
Warm Up Time	10 minutes	
Safety		
Compliance	CE and Semi S2-93 Compliant, RoHS (for instruments configured starting Q2 2008)	

[1] Alternate bandpass filters may be available for some wavelengths on a specials basis. Consult factory.
[2] A DAS-205 or DAS-225 instrument interface card, installed in the VM3000/3400, supports the power, input signal, and output signal. For OEM applications, the SDC2001 provides the same functionality.

Outline Drawing



PM100 Detector



PM140 Detector

Ordering Information – PM100/PM140 Detectors

Part Number

PM100 – *u* *vvv* ***Bracket Mounted***

Wavelength[1]
xxx..... Select any wavelength that is a multiple of 10 from 330–900nm, or wavelengths of 220, 260, 280, 300, or 310nm

Photomultiplier Tube Range
V..... UV/VIS (185–650nm)
R ..... UV/VIS/NIR (185–830nm)

PM140*t* – *u* *vvv* ***KF40 Flange Mounted***

Wavelength[1]
xxx..... Select any wavelength that is a multiple of 10 from 330–900nm, or wavelengths of 220, 260, 280, 300, or 310nm

Photomultiplier Tube Range
V..... UV/VIS (185–650nm)
R ..... UV/VIS/NIR (185–830nm)

Window Type
Q ..... Quartz
S..... Sapphire

Ordering Information – Ancillary Equipment

1. System controller
2. Detector cable to VM3000/3400 Series system controller:

Detector I/O Cables (Select one for each detector)		***Detector I/O Bifurcated Cables[2] (Select one for two detectors)***	
Length	**Part No.**	**Length**	**Part No.**
8 ft (2.4m)	1001788	10 ft (3m), 10 ft (3.0m)	1001120
12 ft (3.6m)	1001500	10 ft (3m), 14 ft (4.2m)	1002132
18 ft (5.5m)	1002261		
32 ft (10.0m)	1002702		

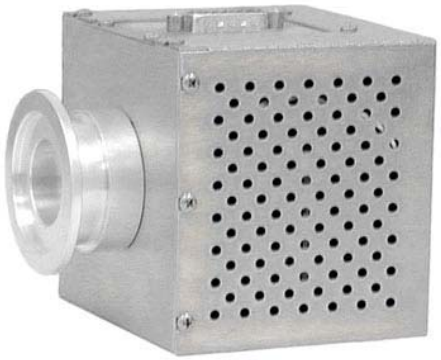
Ordering Information – Spare Parts (PM140 Only)

Description	Part No.
Spare Quartz Window	1000350
Spare Sapphire Window	1002101

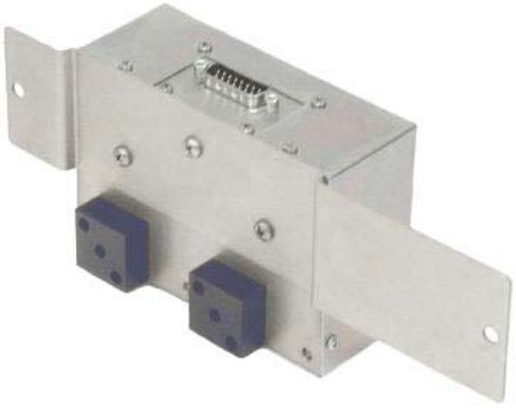
[1] Alternate wavelengths are available on a specials basis. Consult factory with specific requirements.
[2] Bifurcated Detector I/O cables can be used to support two detectors using a single interface card (DAS-225) in the VM3000/VM3400. Select one cable for each two single wavelength detectors. These cables separate at the VM3000/3400 chassis leaving two lengths as described.

Detectors
Dual Wavelength

PM220
PM225



PM220 Detector



PM225 Detector

PM220/225 Pin-Out Assignments

DB15M D-Subminiature Connector		
Pin	**Sensor**	**Connection**
1	2	Signal output, 0–10VDC
2	1	Signal output, 0–10VDC
3	2	Circuit Ground Return
4	1	Circuit Ground Return
5	2	Circuit Ground Return
6	1	Circuit Ground Return
7	N/A	Not used
8	N/A	Not used
9	2	Power input line, +12V to +15V (7mA), polarity protected
10	1	Power input line,+12V to +15V (7mA), polarity protected
11	2	Power input line, –12V to –15V (1mA), polarity protected
12	1	Power input line, –12V to –15V (1mA), polarity protected
13	2	[1]Remote high voltage programming, 2–10VDC
14	1	[1]Remote high voltage programming, 2–10VDC
15	N/A	Not used

[1]This enables automatic gain control when used with any of Verity's system controllers.

Features and Benefits

- Improved endpoint detection through measurement of two wavelengths
- Cost-effective and compact through the use of interference filters
- Enables measurement in low light applications through high-gain photomultiplier tube (PMT)
- Adjusts for varying light conditions through automatic gain control feature when used with Verity's system controllers
- Simple installation through a KF40 flange or mounting bracket

Description

The PM220/225 Series detectors are used to measure two fixed wavelengths in the range of 185–830nm. When used with Verity's system controllers, the PM220/225 Series provides robust endpoint detection in appropriate applications. This series is most commonly used in applications where the chemistry is simple enough that overlapping spectra allow the use of a 10nm bandpass filter — but where two signals are necessary to ensure endpoint, or where two wavelengths are useful for alternative process recipes.

The PM225 detector accommodates two light emission inputs through fiber optic cables. The PM220 detector includes a KF40 flange for direct mounting to the vacuum chamber. A quartz or sapphire window provides vacuum isolation, although the sapphire window provides better resistance to window etching than the quartz window.

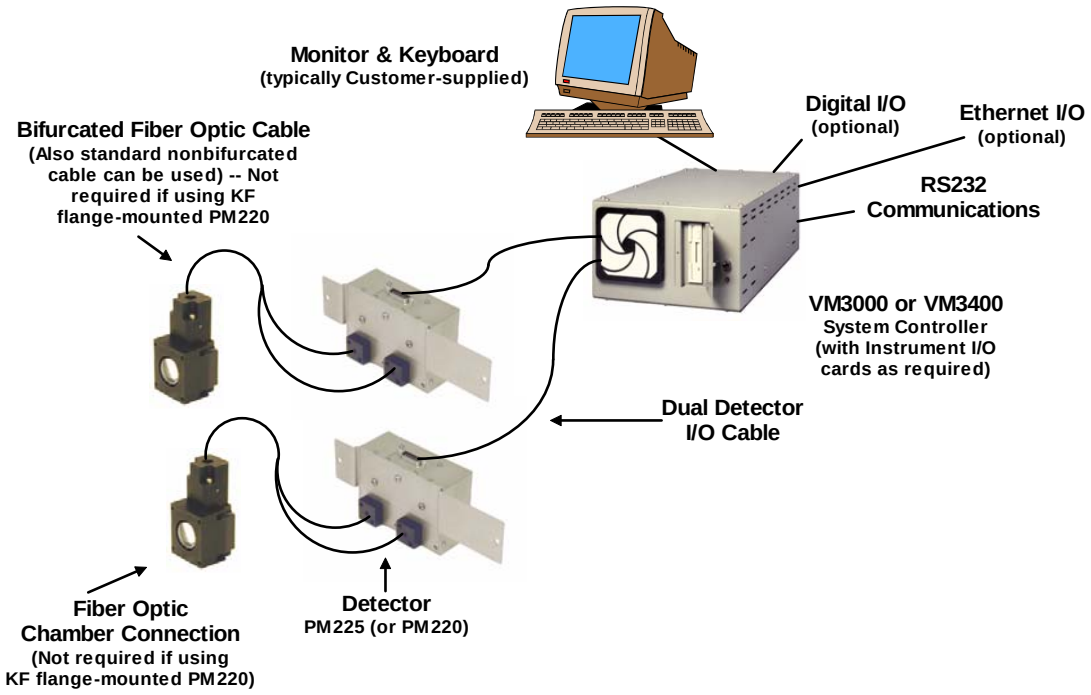
Operation

In the PM220, light enters through a quartz or sapphire window and is then split into two beams. The resultant beams are filtered and are then detected by two high-gain photomultiplier tubes (PMTs). Similarly, in the PM225, fiber optic cables transmit light signals to the instrument. The light then passes through the bandpass filter and is detected by the high-gain PMT.

When used with any of Verity's system controllers, automatic gain control of the detector is enabled. The system controller provides automatic gain control by driving the PMT's high voltage power supply to obtain the desired detector output. This compensates for the effects of both short and long-term optical signal deterioration.

System Schematic

Depicted below is a typical system schematic. A wide range of configurations are possible to meet the needs of different applications.



System Controller

The system controller provides:

- Endpoint detection using proprietary Neural Network or threshold software
- A graphical user interface
- External communications through digital I/O, RS232, and Ethernet
- Power to detector
- Automatic gain control of photomultiplier tube

System controller platforms include:

- VM3400 provides asynchronous control using Windows NT-based ScanView IV software
- VM3000 provides synchronous control using DOS-based ScanView III software
- SDC2001 provides an OEM synchronous embedded control of manual monochromators and detectors

Optical Connection

- Direct viewing through a KF-flanged PM220
- Fiber optic cable-based using PM225. Bifurcated fiber optic cables are available to simplify installation

Instrument Interface Cards/Instrument Cables

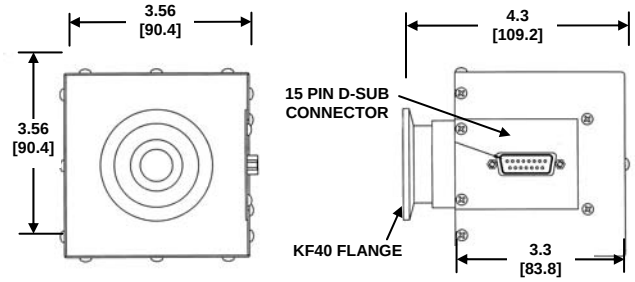
- Operation of each detector requires a dedicated dual detector interface card (DAS-225) in the VM3000/3400 and a dual detector I/O cable interface

Specifications

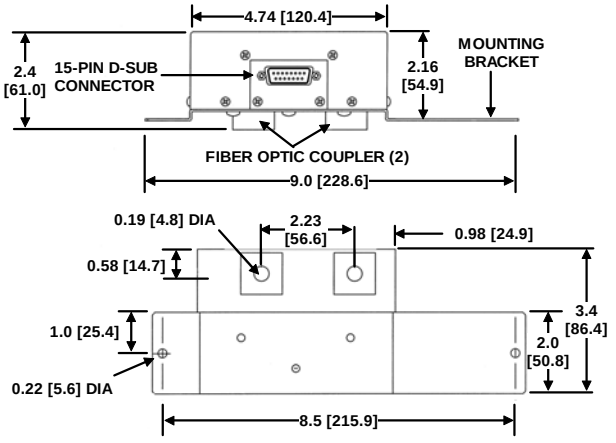
Model Number	PM220	PM225
Type	KF40 Flange Mounted	Bracket Mounted
Performance/Optics		
Range	185–830nm	
Resolution[1]	10nm FWHM	
Photomultiplier Tube	185–650nm (UV/VIS) 185–830nm (UV/VIS/NIR) (See Quantum Efficiency vs. Wavelength for each PMT in the Verity Product Catalog)	
Filter Diameter [inches (mm)]	0.5 (12.7)	
Min. Peak Transmittance	30% to 50% typical, depends on wavelength and bandpass	
Filter Blocking	0.01%, X-ray to 3.5µm	
Temp. Coefficient of Center Wavelength	0.01 to 0.03nm/°C	
Temp. Coefficient at High Voltage	100ppm/°C typical	
Electronics		
Power[2]	+12 to +15VDC @ 7mA maximum (Two) –12 to –15VDC @ 1mA maximum (Two)	
Input Signal for PMT Gain[2]	2–10 VDC (Two)	
Output Signal[2]	0–10 VDC (Two)	
Mechanical		
Dimensions [inches (mm)]	3.56 (90.4) x 3.56 (90.4) x 4.3 (109.2)	9.0 (228.6) x 2.4 (61) x 3.4 (86.4)
Window	Quartz or Sapphire	None
Environmental		
Operating Temperature	5 to 50°C	
Storage Temperature	–20 to 50°C	
Warm Up Time	10 minutes	
Safety		
Compliance	CE and Semi S2-93 Compliant, RoHS (for instruments configured starting Q2 2008)	

[1] Alternate bandpass filters may be available on a specials basis. Consult factory.
[2] A DAS-225 dual instrument card interface card, installed in a VM3000/3400, supports the power, input signals, and output signals. For OEM applications, the SDC2001 provides the same functionality.

Outline Drawing



PM220



PM225

Ordering Information – PM220/PM225 Detectors

Part Number

PM220*b* – *c* *ddd* – *g* *hhh* ***KF40 Flange Mounted***

Wavelength #2
xxx..... Select any wavelength that is a multiple of 10 from 330–900nm, or from wavelengths of 220, 260, 280, 300, or 310nm

Photomultiplier Tube Range #2
V..... UV/VIS (185–650nm)
R ..... UV/VIS/NIR (185–830nm)

Wavelength #1
xxx..... Select any wavelength that is a multiple of 10 from 330–900nm, or from wavelengths of 220, 260, 280, 300, or 310nm

Photomultiplier Tube Range #1
V..... UV/VIS (185–650nm)
R ..... UV/VIS/NIR (185–830nm)

Window Type
Q ..... Quartz
S..... Sapphire

Please note that the model code PM221S (and PM220-S) is equivalent to PM220S (PM220 with a sapphire window).

PM225 – *c* *ddd* – *g* *hhh* ***Bracket Mounted***

Wavelength #2
xxx..... Select any wavelength that is a multiple of 10 from 330–900nm, or from wavelengths of 220, 260, 280, 300, or 310nm

Photomultiplier Tube Range #2
V..... UV/VIS (185–650nm)
R ..... UV/VIS/NIR (185–830nm)

Wavelength #1
xxx..... Select any wavelength that is a multiple of 10 from 330–900nm, or from wavelengths of 220, 260, 280, 300, or 310nm

Photomultiplier Tube Range #1
V..... UV/VIS (185–650nm)
R ..... UV/VIS/NIR (185–830nm)

Ordering Information – Ancillary Equipment

3. System controller
4. **PM225 Series Only:** Fiber optic cable and chamber connector
5. Dual detector cable to VM3000/3400 Series system controller:

Dual Detector I/O Cables (Select one for each dual detector)		
Length		**Part No.**
3 ft	(0.9m)	1000312
9 ft	(2.7m)	1000313
12 ft	(3.6m)	1002131

Ordering Information – Spare Parts (PM220 Only)

Description	Part No.
Spare Quartz Window	1000350
Spare Sapphire Window	1002101