HAMAMATSU

PHOTON IS OUR BUSINESS

LINEAR MULTIANODE PMT ASSEMBLIES AND MODULES

APPLICATIONS

- **Biomedical fluorescence detection**
- **Laser scanning detection**
- **Spectroscopy**
- **Environmental monitoring**

H17320-20
H17321-20

H7260 series

H11460 series

PRODUCT LINEUP

Model name	H17320	H17321	H7260	H11460
Number of channels ①	6-channel		32-channel	
Effective area per channel ①	5 mm × 5 mm		0.8 mm × 7 mm	
Channel pitch ①	1 mm			
Output type	Voltage	Current	Current	Voltage

NOTE: ①Described in the dimensional outlone drawing

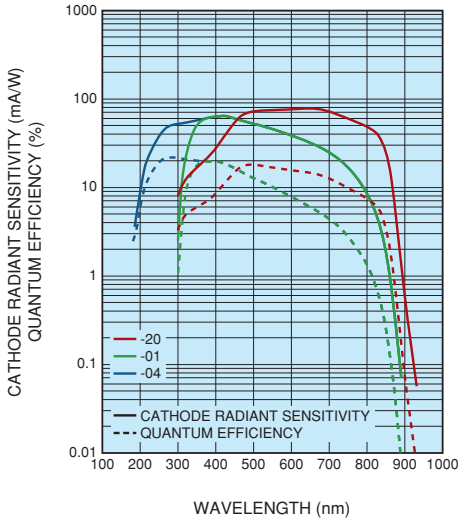
PHOTOCATHODE LINEUP

Type No.	-01	-04	-20 *	-100	-103	-200	Unit
Photocathode material ①	MA		ERMA	SBA		UBA	—
Spectral response range	300 to 880	185 to 880	300 to 920	300 to 650	185 to 650	300 to 650	nm
Peak wavelength	420		630	400			nm
Window material	Borosilicate glass	UV glass	Borosilicate glass		UV glass	Borosilicate glass	—

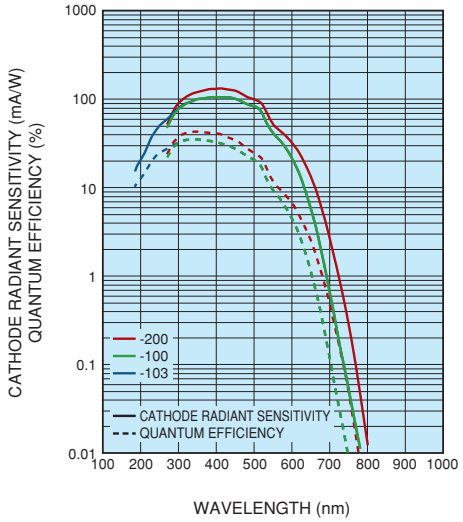
NOTE: ①MA: Multialkali, ERMA: Extended red multialkali, SBA: Super bialkali, UBA: Ultra bialkali
* H17320 and H17321 are "-20" only. Consult us for other photocathode options.

Figure 1: Typical spectral response

●-01, -04 and -20 types



●-100, -103 and -200 types



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SPECIFICATIONS

6 Channel model photomultiplier tube modules

Parameter				H17320-20	H17321-20	Unit
Supply voltage	-HV	+5 V INPUT		+4.5 to +5.5		V
	AMP	+5 V INPUT		+4.5 to +5.5	—	V
		-5 V INPUT		-4.5 to -5.5	—	V
Supply current ①	-HV	+5 V INPUT		+80		mA
	AMP	+5 V INPUT		+30	—	mA
		-5 V INPUT		-30	—	mA
Max. supply voltage	-HV	+5 V INPUT		+5.5		V
	AMP	+5 V INPUT		+5.5	—	V
		-5 V INPUT		-5.5	—	V
Max. control voltage ②	-HV control			+0.9		V
	Individual gain control			+4.2		V
Max. total average anode current ③				—	100	μA
Max. average anode current per channel ③				—	25	μA
Max. output signal voltage / ch ③④⑤				0.5	—	V
Recommended control voltage adjustment range ②	-HV control			+0.5 to +0.8		V
	Dynode control			+0 to +4.0		V
Dynode structure / Number of stages ⑥				MC/10		—
Window material				Borosilicate glass		—
Photocathode material ⑦				ERMA		—
Spectral response range				300 to 920		nm
Peak wavelength				630		nm
Cathode characteristics	Luminous sensitivity		Min.	350		μA/lm
			Typ.	500		μA/lm
	Red/White ratio		Typ.	0.45		—
	Radiant sensitivity ⑧		Typ.	78		mA/W
Anode characteristics ⑨	Luminous sensitivity		Min.	—	175	A/lm
			Typ.	—	500	A/lm
	Gain		Typ.	1×10^6		—
	Dark current per channel ⑩		Typ.	—	5	nA
			Max.	—	50	nA
	Voltage output depending on PMT dark current per channel ⑩⑪		Typ.	0.1	—	mV
			Max.	1	—	mV
	Cross-talk		Typ.	0.5		%
	Uniformity between each anode		Typ.	1 : 1.7		—
			Max.	1 : 2.5		—
Offset voltage			Max.	0.5	—	mV
Ripple noise (peak to peak)			Typ.	0.3	—	mV
Insulation cover material				Al		—
Frequency bandwidth				DC to 1	—	MHz
Current-to-voltage conversion factor				0.02	—	—
Operating ambient temperature ⑫				+5 to + 45		°C
Storage temperature ⑫				-20 to + 50		°C
Weight				104		g

Note: ①At 5 V input voltage in darkness
②Input impedance = 400 kΩ
③Averaged over any interval of 30 s maximum.
④Load resistance = 10 kΩ
⑤Maximum pulse output signal voltage = +2 V, The pulse width is 10 μs and the repetition rate is 1 kHz.
⑥MC: Metal channel
⑦ERMA: Extended red multialkali, Consult us for other photocathode options.
⑧Measured at the peak sensitivity wavelength
⑨Anode characteristics are measured with the supply/contlor voltage.
⑩After 30 min storage in darkness.
⑪The actual output value in darkness is the sum of dark current and offset voltage.
⑫No condensation

Figure 2: Typical gain

●H17320-20, H17321-20

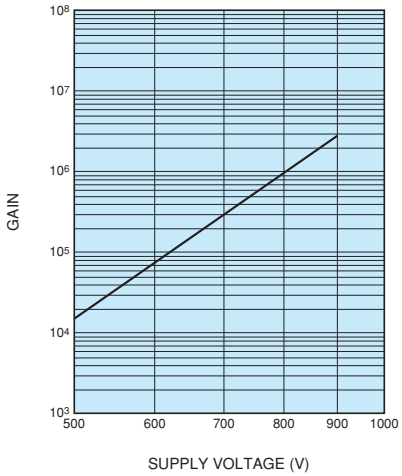


Figure 3: Typical frequency response

●H17320-20

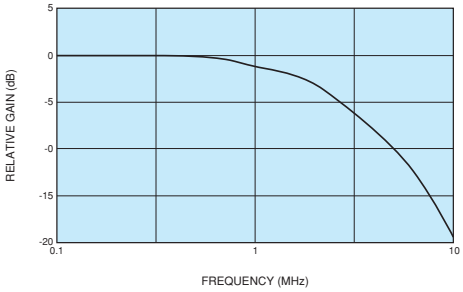


Figure 4: Typical ripple noise

●H17320-20

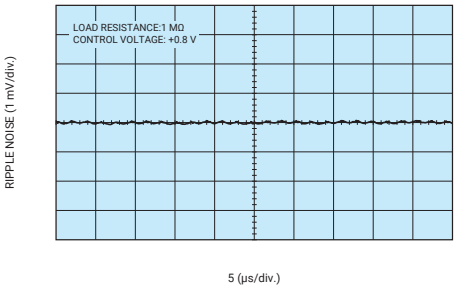


Figure 5: Typical time response

●H17321-20

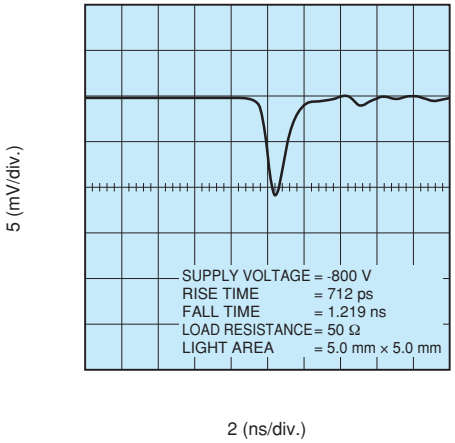


Figure 6: Typical transit time spread characteristics

●H17321-20

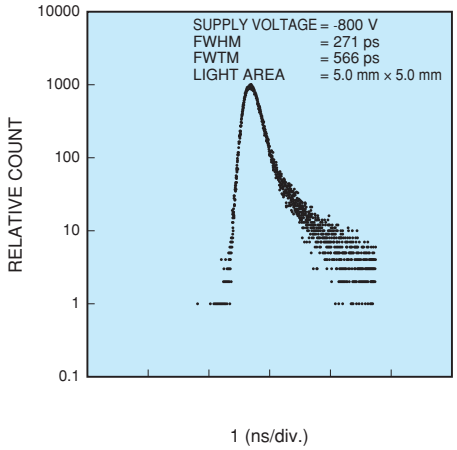
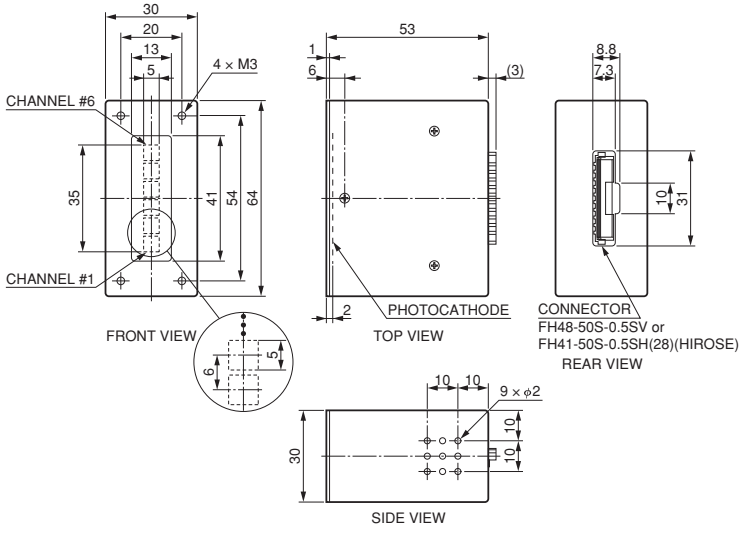
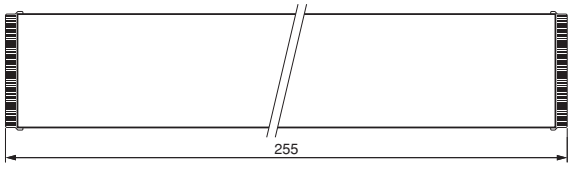


Figure 7: Dimensional outline (Unit: mm)

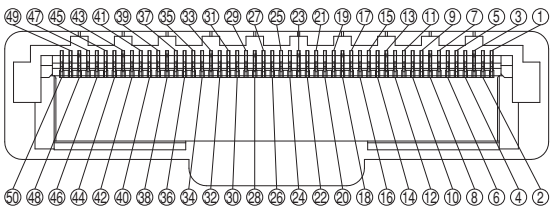


●Ribbon cable (supplied)



(BANDO: ASFBIC-S-P=0.5-K1U-50-250T)

CONNECTOR (HIROSE: FH48-50S-0.5SV or FH41-50S-0.5SH(28))



PIN No.	Name	PIN No.	Name
1	Vcc (+5 V INPUT)	26	CH2 - SIGNAL GND
2	Vcc (+5 V INPUT)	27	CH1 - SIGNAL OUTPUT
3	Vcc GND	28	CH1 - SIGNAL GND
4	Vcc GND	29	GND
5	Vcon (+0.5 V to +0.9 V INPUT)	30	CH6 - GC (0 to +4.0 V INPUT)
6	Vcon GND	31	CH6 - GC GND
7	Vref (+1.25 V OUTPUT)	32	CH5 - GC (0 to +4.0 V INPUT)
8	Vref GND	33	CH5 - GC GND
9	Vref (+4.5 V OUTPUT)	34	CH4 - GC (0 to +4.0 V INPUT)
10	Vref GND	35	CH4 - GC GND
11	Do not use	36	CH3 - GC (0 to +4.0 V INPUT)
12	GND	37	CH3 - GC GND
13	Do not use	38	CH2 - GC (0 to +4.0 V INPUT)
14	Do not use	39	CH2 - GC GND
15	GND	40	CH1 - GC (0 to +4.0 V INPUT)
16	GND	41	CH1 - GC GND
17	CH6 - SIGNAL OUTPUT	42	AVcc (+5 V INPUT)
18	CH6 - SIGNAL GND	43	AVcc (+5 V INPUT)
19	CH5 - SIGNAL OUTPUT	44	AVcc (+5 V INPUT)
20	CH5 - SIGNAL GND	45	AVcc GND
21	CH4 - SIGNAL OUTPUT	46	AVcc GND
22	CH4 - SIGNAL GND	47	AVcc GND
23	CH3 - SIGNAL OUTPUT	48	-AVcc (-5 V INPUT)
24	CH3 - SIGNAL GND	49	-AVcc (-5 V INPUT)
25	CH2 - SIGNAL OUTPUT	50	-AVcc (-5 V INPUT)

SPECIFICATIONS

32 Channel model photomultiplier tube assemblies

Parameter				H7260-01	H7260-04	H7260-20	H7260-100	H7260-103	H7260-200	Unit
Supply voltage				-800						V dc
Max. supply voltage				-900						V dc
Max. total average anode current ①				100						μA
Max. average anode current per channel ①				6						μA
Max. voltage divider current ②				0.37						mA
Dynode structure / Number of stages ③				MC/10						—
Window material ④				B	U	B		U	B	—
Photocathode material ⑤				MA		ERMA	SBA		UBA	—
Spectral response range				300 to 880	185 to 880	300 to 920	300 to 650	185 to 650	300 to 650	nm
Peak wavelength				420		630	400			nm
Cathode characteristics	Luminous sensitivity		Min.	150		350	90		110	μA/lm
			Typ.	250		500	105		135	
	Blue sensitivity index		Typ.	—			13.5		15.5	—
	Red/White ratio		Typ.	0.3		0.45	—			—
	Radiant sensitivity ⑥		Typ.	65		78	110		130	mA/W
Anode characteristics ⑦	Luminous sensitivity		Min.	75		175	90		110	A/lm
			Typ.	250		500	210		270	
	Gain		Typ.	1×10^6			2×10^6			—
	Dark current per channel ⑧		Typ.	0.5		1	0.2			nA
			Max.	5		10	2			
	Time response	Rise time	Typ.	0.6						ns
		T.T.S.	Typ.	0.18						
	Pulse linearity per channel ⑨⑩			0.6						mA
	Cross-talk		Typ.	3						%
	Uniformity between each anode		Typ.	1: 1.7			1: 1.5			—
			Max.	1: 2.5			1: 2			
Insulation cover material				P.O.M. (Polyoxymethylene)						—
Socket ⑪				SD-108-T-22 × 2 pcs						—
Operating ambient temperature ⑫				0 to +50						°C
Storage temperature ⑫				-15 to +50						°C
Weight				62						g

Note: ①Averaged over any interval of 30 s maximum.
②Measured with the maximum supply voltage.
③MC: Metal channel
④B: Borosilicate glass, U: UV glass
⑤MA: Multialkali, ERMA: Extended red multialkali, SBA: Super bialkali, UBA: Ultra bialkali
⑥Measured at the peak sensitivity wavelength
⑦Anode characteristics are measured with the supply voltage.
⑧After 30 min storage in darkness.
⑨The pulse width is 50 ns and the repetition rate is 1 kHz.
⑩±2 % deviation
⑪Supplied
⑫No condensation

Figure 8: Typical gain

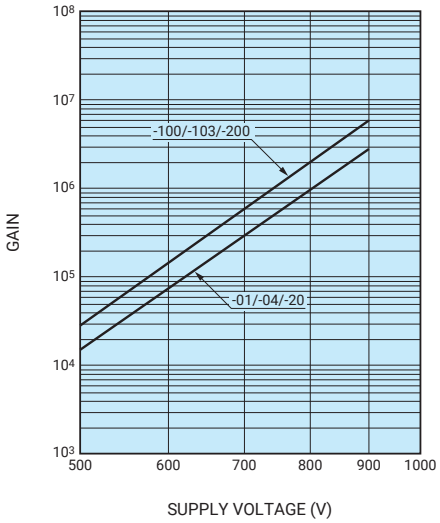


Figure 9: Typical time response

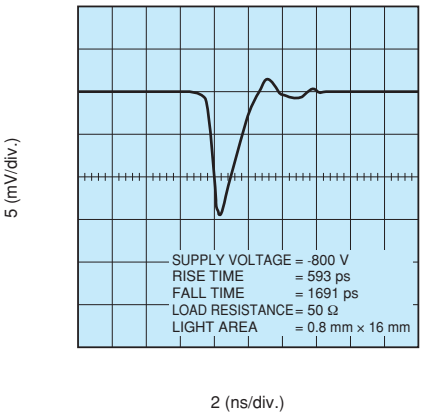


Figure 10: Typical transit time spread characteristics

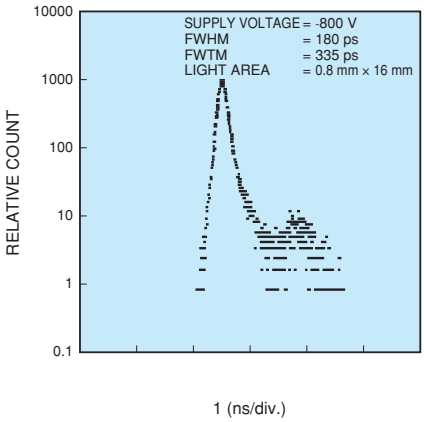
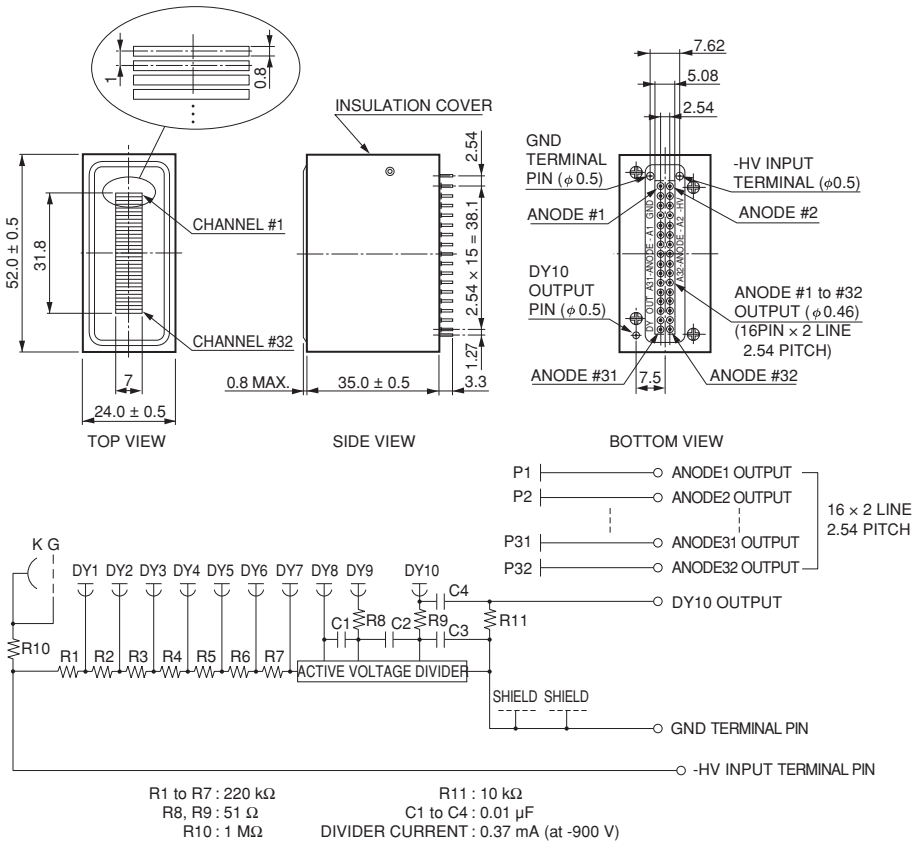
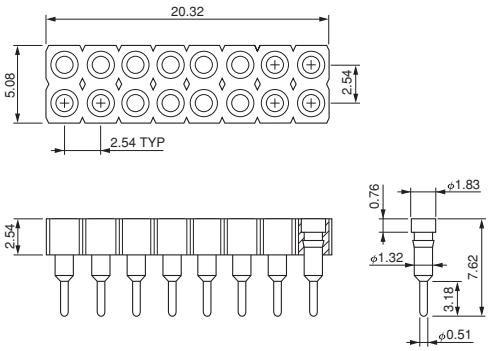


Figure 11: Dimensional outline and circuit diagram (Unit: mm)

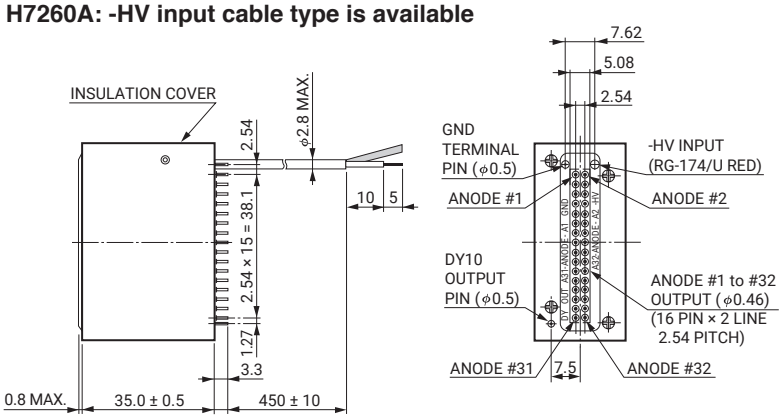


R1 to R7 : 220 kΩ
R8, R9 : 51 Ω
R10 : 1 MΩ
R11 : 10 kΩ
C1 to C4 : 0.01 μF
DIVIDER CURRENT : 0.37 mA (at -900 V)

Socket: SD-108-T-22 (supplied)



H7260A: -HV input cable type is available



SPECIFICATIONS

32 Channel model photomultiplier tube modules

Parameter			H11460-01	H11460-04	H11460-20	H11460-100	H11460-103	H11460-200	Unit
Input voltage			±11.5 to ±15.5						V
Input current ①			+127 / -83						mA
Max. input voltage			±16						V
Max. control voltage ②			3.6						V
Max. output signal voltage /ch ③④			0.6						V
Recommended control voltage adjustment range ②			+2.0 to +3.2						V
Window material ⑤			B	U	B		U	B	—
Photocathode material ⑥			MA		ERMA	SBA		UBA	—
Spectral response range			300 to 880	185 to 880	300 to 920	300 to 650	185 to 650	300 to 650	nm
Peak wavelength			420		630	400			nm
Cathode characteristics	Luminous sensitivity	Min.	150		350	90		110	μA/lm
		Typ.	250		500	105		135	
	Blue sensitivity index	Typ.	—			13.5		15.5	—
	Red/White ratio	Typ.	0.3		0.45	—			—
	Radiant sensitivity ⑦	Typ.	65		78	110		130	mA/W
Anode characteristics ⑧	Luminous sensitivity	Min.	7.5×10^6		1.75×10^7	9.0×10^6		1.1×10^7	V/lm
		Typ.	2.5×10^7		5.0×10^7	2.1×10^7		2.7×10^7	
	Gain	Typ.	1×10^6			2×10^6			—
	Voltage output depending on PMT dark current per channel ⑨	Typ.	0.05		0.1	0.02			mV
		Max.	0.5		1	0.2			
	Cross-talk	Typ.	3						%
	Uniformity between each anode	Typ.	1: 1.7			1: 1.5			—
		Max.	1: 2.5			1: 2			
Offset voltage		Max.	2						mV
Ripple noise (peak to peak)		Typ.	1						mV
Frequency bandwidth			DC to 1 MHz						—
Current-to-voltage conversion factor			0.1						V/μA
Operating ambient temperature			+5 to +45						°C
Storage temperature			-20 to +50						°C
Weight			246						g

Note: ①At 15 V input voltage in darkness
②Input impedance = 400 kΩ
③Load resistance = 10 kΩ, Average over any interval of 30 s maximum.
④Maximum pulse output signal voltage = +10 V, The pulse width is 10 μs and the repetition rate is 1 kHz.
⑤B: Borosilicate glass, U: UV glass
⑥MA: Multialkali, ERMA: Extended red multialkali, SBA: Super bialkali, UBA: Ultra bialkali
⑦Measured at the peak sensitivity wavelength
⑧Control voltage = +3.2 V
⑨After 30 min storage in darkness. The actual output value in darkness is the sum of dark current and offset voltage.

Figure 12: Typical gain

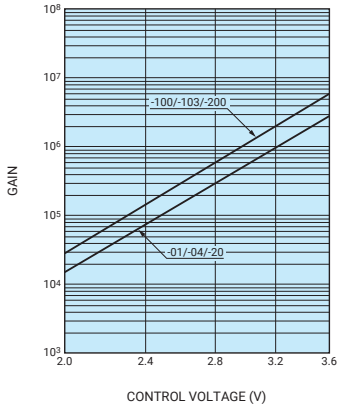


Figure 13: Typical frequency rewsponse

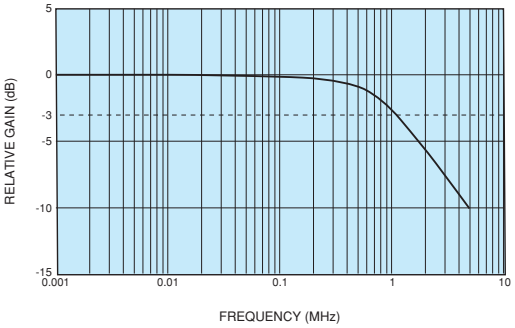


Figure 14: Typical ripple noise

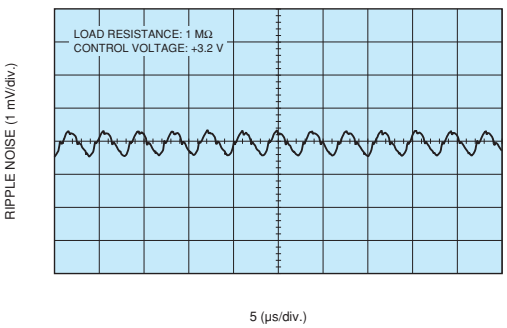
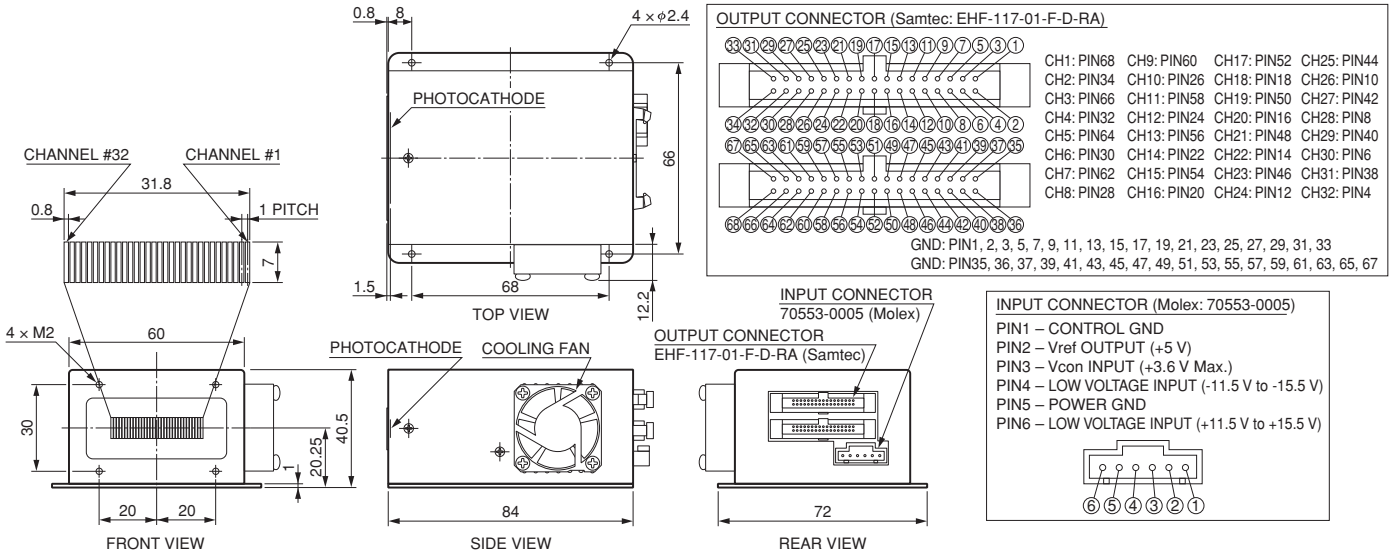
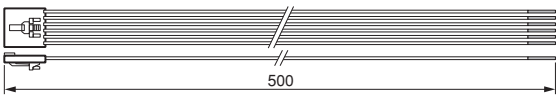


Figure 15: Dimensional outline and circuit diagram (Unit: mm)

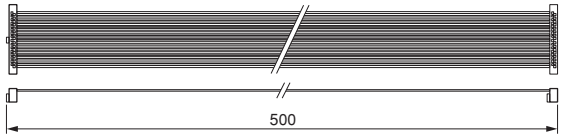


Power cable (supplied)



(Molex: 50-57-9406)

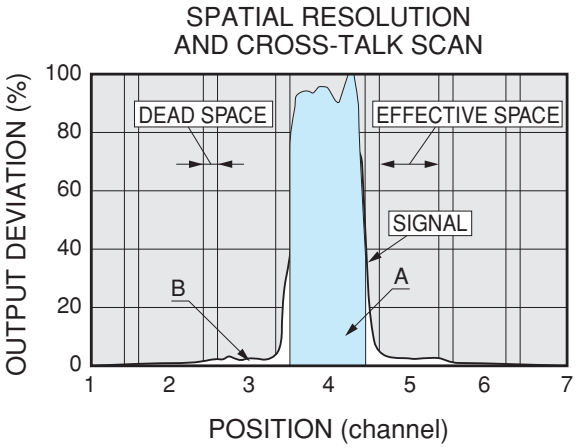
Ribbon cable (supplied)



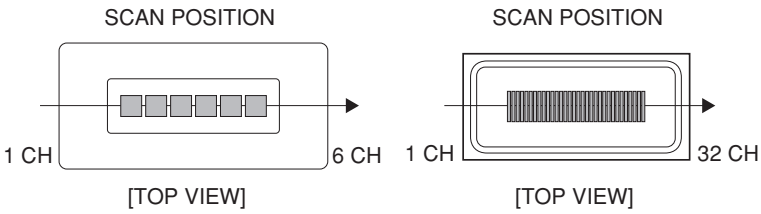
(Samtec: FFSD-17-D-20.00-01-N)

CROSS-TALK

●Example



* LIGHT SOURCE : TUNGSTEN LAMP
SPOT DIAMETER: 100 µm
SCAN PITCH : 50 µm



●32 channel

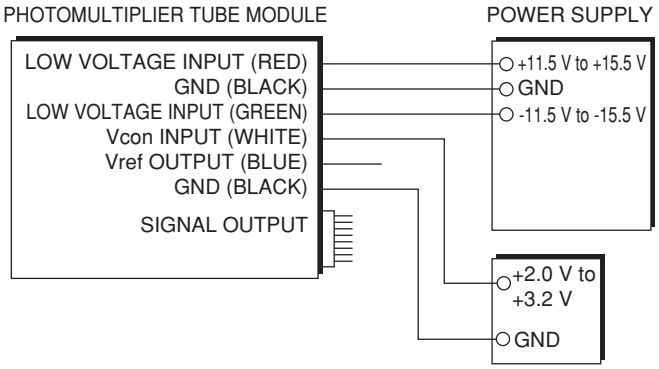
CROSS-TALK RATIO (%)				
100	3.0	0.6	0.2	0.1
2.7	100	3.0	0.6	0.2
0.8	2.9	100	2.9	0.6
0.3	0.8	2.9	100	2.9
0.1	0.3	0.8	3.1	100

* Supply voltage -800 V
Cross-talk
Area B / Area A × 100

* 6 Channel: The adjacent channel shows a crosstalk ratio of 0.5 %, while the next channel over is effectively at 0 %.

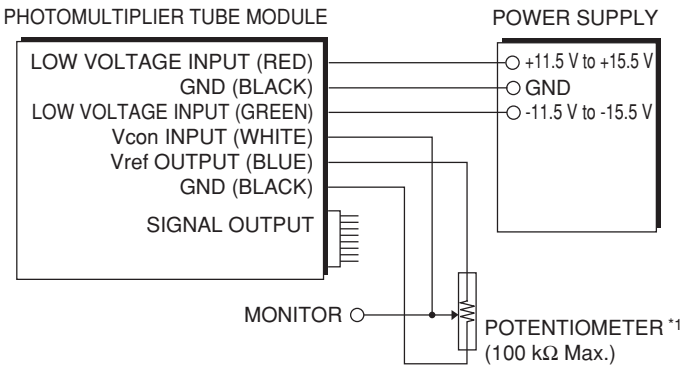
SENSITIVITY ADJUSTMENT METHOD

VOLTAGE PROGRAMMING



- Adjust the control voltage to adjust the sensitivity.
- Electrically insulate the reference voltage output.

RESISTANCE PROGRAMMING



*1: When using a potentiometer to adjust sensitivity, monitor the control voltage so that it does not exceed +3.6 V (H11459 / H11460).

RELATED PRODUCTS

High voltage power supply modules for PMT assembly

C10940-03

- Max. output voltage : -1200 V
- Output current : 0.6 mA
- Input voltage : +5 V ± 0.5 V
- Dimensions (W × H × D) : 15 × 18 × 15 mm
- Ripple noise (peak to peak) : 50 mV
- Weight : 7.7 g

C13890-15

- Max. output voltage : -1250 V
- Output current : 0.6 mA
- Input voltage : +11 V to +16 V
- Dimensions (W × H × D) : 46 × 24 × 12 mm
- Ripple noise (peak to peak) : 38 mV
- Weight : 28.3 g

C11152, C11152-01

- Max. output voltage : -1500 V
- Output current : 1 mA
- Input voltage : +15 V ± 1 V (C11152)
  +12 V ± 0.5 V (C11152-01)
- Dimensions (W × H × D) : 41 × 10 × 41 mm
- Ripple noise (peak to peak) : 5 mV (>5 kHz)
  8 mV (≦5 kHz)
- Weight : 38 g

Drive circuit for multichannel PMT module

C16770

This is a starter kit for H17320 and H17321, and operates via bus power. The starter kit has a USB port for connecting to a PC to use the sample software acquired from the web that controls DC power supply, -HV control voltage, individual gain adjustment voltage, and data acquisition. It also has an SMB terminal that outputs a signal for making measurements with an oscilloscope, etc.

High sensitivity compact spectrometer

A10766

This is a polychromator that is specially designed to couple with 32 channel linear array multianode PMT series. The most suitable PMT assembly or PMT module is determined depending upon required dispersion and spectral width.

- Grating type : Reflective
- Features : Selectable grating type
- Compatible products : H11460 series, H7260 series

MEMO

MEMO

LINEAR MULTIANODE PMT ASSEMBLIES AND MODULES

⚠ WARNING ~ High Voltage ~

The product is operated at high voltage potential. Further, the metal housing of the product is connected to the photocathode (potential) so that it becomes a high voltage potential when the product is operated at a negative high voltage (anode grounded).
Accordingly, extreme safety care must be taken for the electrical shock hazard to the operator or the damage to the other instruments.

* PATENT: USA Pat. No. 5410211 PATENT PENDING: JAPAN 12, USA 8, EUROPE 9

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Cat. No. TPMH1325E06
Jul. 2026 IP
Created in Japan