

### FEATURES

- Compact Size: 13 mm (1/2 inch) Diameter (Effective area:  $\phi$ 10 mm)
- Low and Stable Dark Count
- R12421 with HA Treatment (R12421-00-01)
- R12421 with HA Treatment and Magnetic Shield (R12421-00-03, R12421P)
- R12421 with Voltage Divider Circuit, HA Treatment and Magnetic Shield (H12690 Series)
- High Sensitivity Type in 500 nm to 700 nm: R12421-300

### APPLICATIONS

- Biomedical Applications (Bioluminescence, Chemiluminescence)
- Scintillation Counting (Radiation monitor)
- Light Scatter Detection



Left: R12421, Right: H12690

### GENERAL

Parameter		R12421 Series	H12690 Series	Unit
Spectral Response	Range	R12421-300: 300 to 700, Others: 300 to 650		nm
	Peak Wavelength	420		nm
Window Material		Borosilicate glass		—
Photocathode	Material	R12421-300: Extended Green Bialkali, Others: Bialkali		—
	Minimum Effective Area	$\phi$ 10		mm
Dynode	Structure	Linear-focused		—
	Number of Stages	10		—
Operating Ambient Temperature		-30 to +50	0 to +50	°C
Storage Temperature		R12421, R12421-300: -80 to +50 Others: -30 to +50	-15 to +50	°C
Suitable Socket		E678-13F (supplied)		—

### MAXIMUM RATINGS (Absolute Maximum Values)

Parameter		R12421 Series	H12690 Series	Unit
Supply Voltage	Between Anode and Cathode	1250	-1250	V
Average Anode Current		0.1	0.016	mA

### CHARACTERISTICS (at 25 °C)

Parameter		R12421 Series / H12690 Series			R12421-300			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Cathode Sensitivity	Luminous (2856 K)	80	110	—	120	160	—	$\mu$ A/lm
	Radiant	—	80	—	—	105	—	mA/W
	Quantum Efficiency at Peak	—	25	—	—	31	—	%
	Blue Sensitivity Index (CS 5-58)	—	10	—	12	14	—	—
Anode Sensitivity	Luminous (2856 K)	100	220	—	100	320	—	A/lm
Gain		—	$2.0 \times 10^6$	—	—	$2.0 \times 10^6$	—	—
Anode Dark Current (after 30 min storage in darkness) <sup>(A)</sup>		—	0.5	2	—	1	5	nA
Dark Count (after 30 min storage in darkness) <sup>(B)</sup>		—	80 (P type: 40)	400 (P type: 200)	—	400	1200	s <sup>-1</sup>
Time Response	Anode Pulse Rise Time	—	1.2	—	—	1.2	—	ns
	Electron Transit Time	—	14	—	—	14	—	ns
	Transit Time Spread (FWHM)	—	1.4	—	—	1.4	—	ns
Pulse Linearity	$\pm 2$ % deviation	—	3	—	—	3	—	mA
	$\pm 5$ % deviation	—	12	—	—	12	—	mA

NOTE: (A) Anode characteristics are measured at 1000 V (H12690 series: -1000 V) with the voltage distribution ratio shown below.

(B) Dark count is a guaranteed value.

### VOLTAGE DISTRIBUTION RATIO AND SUPPLY VOLTAGE

Electrodes	K	Dy1	Dy2	Dy3	Dy4	Dy5	Dy6	Dy7	Dy8	Dy9	Dy10	P
Ratio	2	1	1	1	1	1	1	1	1	1	1	1

Supply Voltage: 1000 V (H12690 series: -1000 V), K: Cathode, Dy: Dynode, P: Anode

# PHOTOMULTIPLIER TUBES AND PHOTOMULTIPLIER TUBE ASSEMBLIES

## R12421 SERIES / H12690 SERIES

Figure 1: Typical Spectral Response

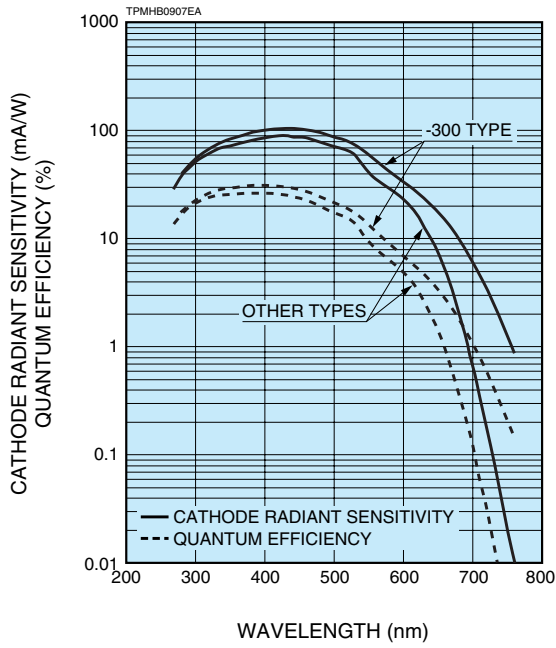


Figure 2: Typical Gain

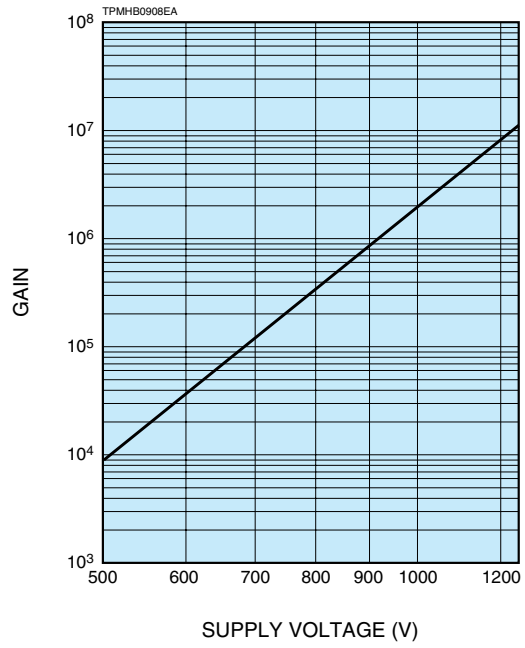


Figure 3: Time Response (Example)

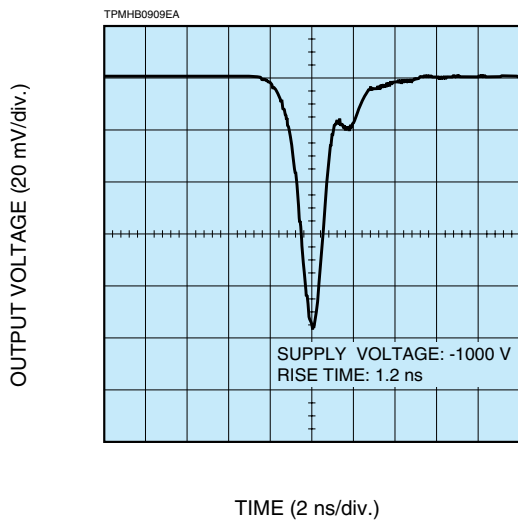


Figure 4: Single Photon Pulse Height Distribution (Example)

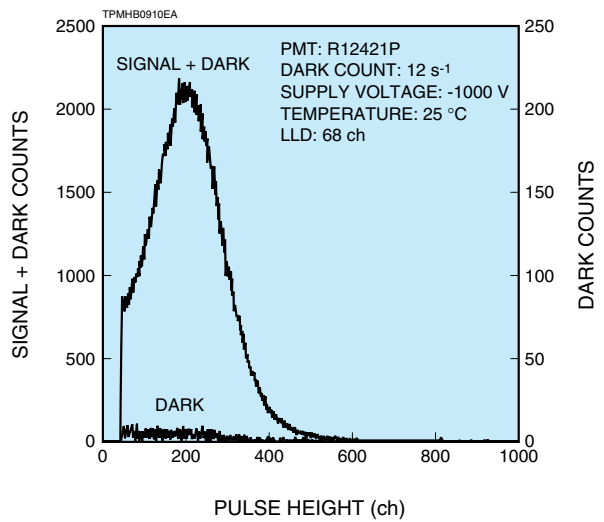


Figure 5: Plateau Characteristics (Example)

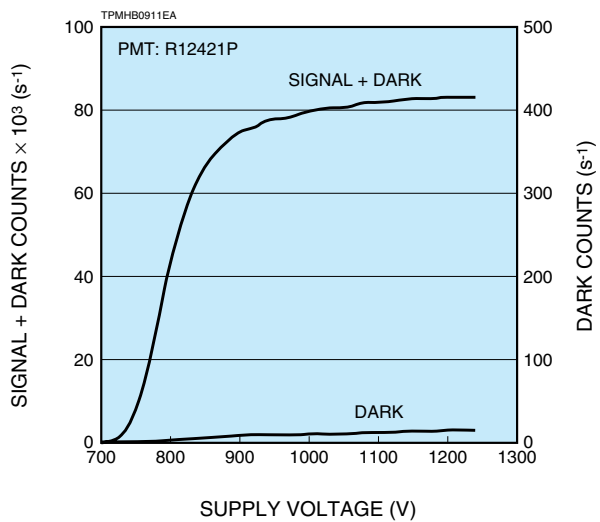


Figure 6: Dark Count Stability (Example)

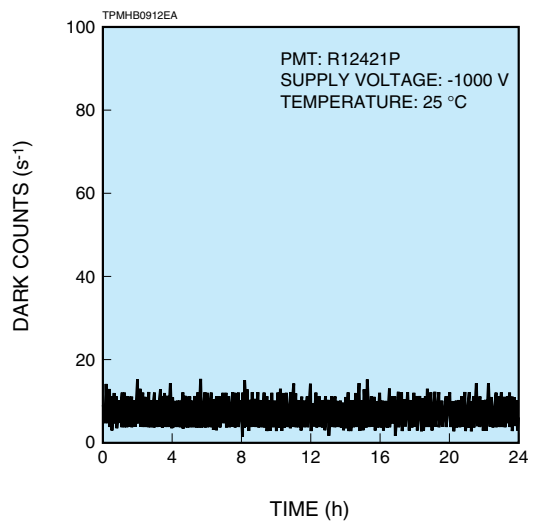


Figure 7: Dark Count vs. Temperature (Example)

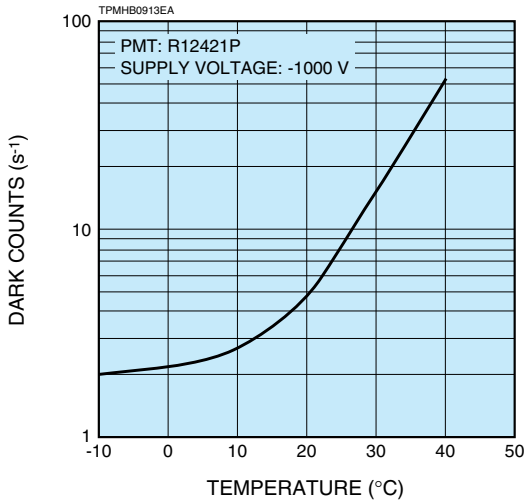


Figure 8: Block Diagram for Photon Counting

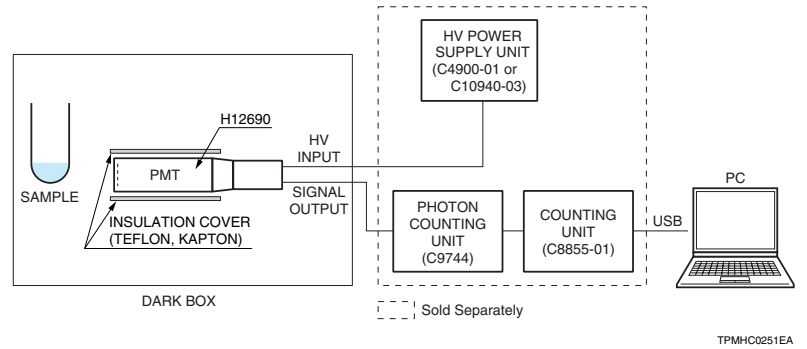
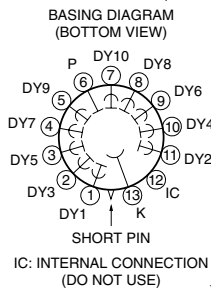
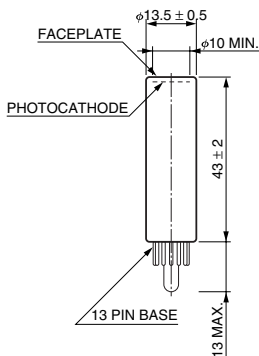
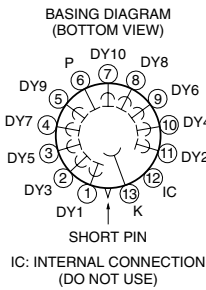
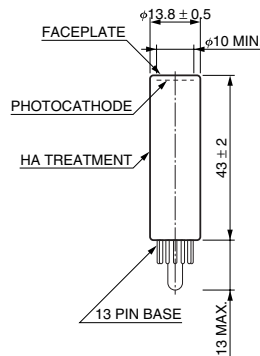


Figure 9: Dimensional Outline and Basing Diagram (Unit: mm)

●R12421, R12421-300



●R12421-00-01



●R12421-00-03, R12421P

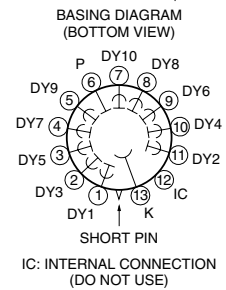
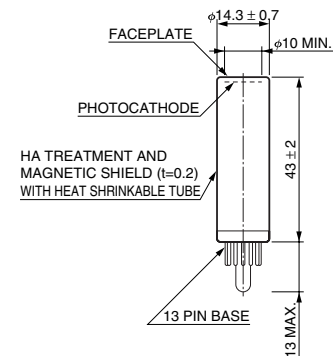


Figure 10: Socket (Supplied)

E678-13F

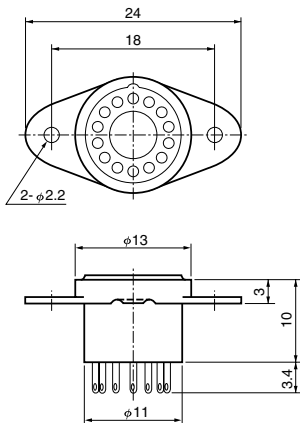
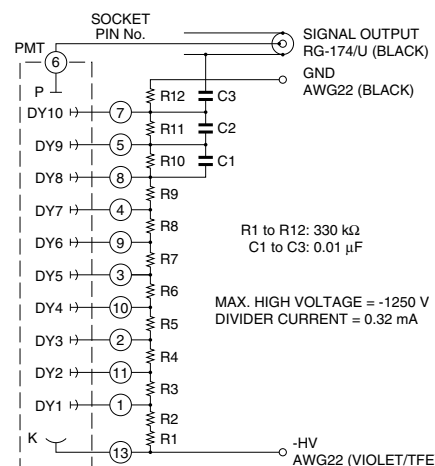
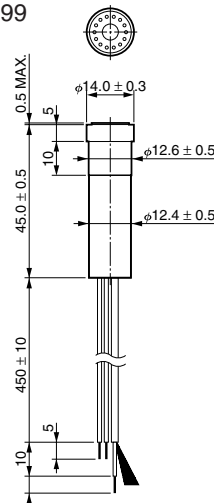


Figure 11: Socket Assembly (Sold Separately)

●E849-99



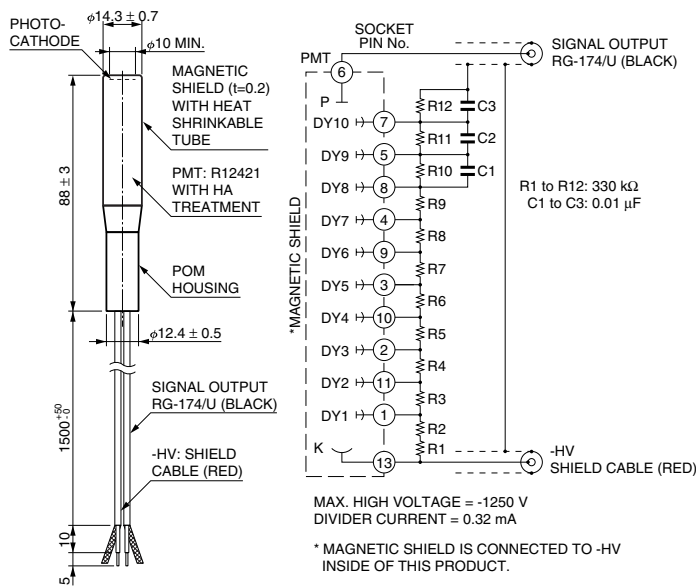
\* HAMAMATSU also provides C4900 series and C10940 series high voltage power supply modules.

# PHOTOMULTIPLIER TUBES AND PHOTOMULTIPLIER TUBE ASSEMBLIES

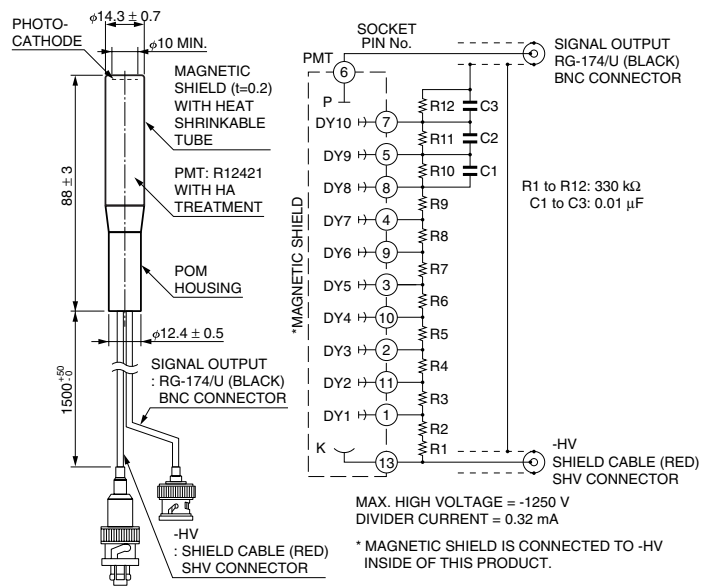
## R12421 SERIES / H12690 SERIES

Figure 12: Dimensional Outline and Diagram (Unit: mm)

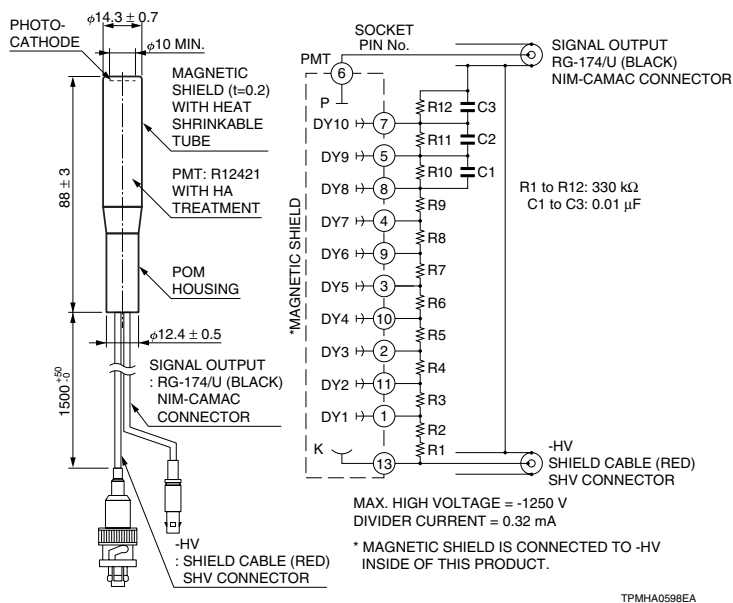
### ●H12690



### ●H12690-00-01



### ●H12690-00-02



Photon counting head H12775 consisting of R12421, high voltage power supply circuit, divider circuit, and photon counting circuit, is also available.

## HAMAMATSU PHOTONICS K.K. [www.hamamatsu.com](http://www.hamamatsu.com)

### HAMAMATSU PHOTONICS K.K., Electron Tube Division

314-5, Shimokanzo, Iwata City, Shizuoka Pref., 438-0193, Japan, Telephone: (81)539/62-5248, Fax: (81)539/62-2205

U.S.A.: Hamamatsu Corporation; 360 Foothill Road, Bridgewater, N.J. 08807-0910, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218 E-mail: [usa@hamamatsu.com](mailto:usa@hamamatsu.com)

Germany: Hamamatsu Photonics Deutschland GmbH; Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-2658 E-mail: [info@hamamatsu.de](mailto:info@hamamatsu.de)

France: Hamamatsu Photonics France S.A.R.L.; 19, Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10 E-mail: [infos@hamamatsu.fr](mailto:infos@hamamatsu.fr)

United Kingdom: Hamamatsu Photonics UK Limited; 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, United Kingdom, Telephone: (44)1707-294888, Fax: (44)1707-325777 E-mail: [info@hamamatsu.co.uk](mailto:info@hamamatsu.co.uk)

North Europe: Hamamatsu Photonics Norden AB; Torshamnsgatan 35 SE-164 40 Kista, Sweden, Telephone: (46)8-509-031-00, Fax: (46)8-509-031-01 E-mail: [info@hamamatsu.se](mailto:info@hamamatsu.se)

Italy: Hamamatsu Photonics Italia S.r.l.; Strada della Moia, 1 int. 6, 20020 Arese (Milano), Italy, Telephone: (39)02-93581733, Fax: (39)02-93581741 E-mail: [info@hamamatsu.it](mailto:info@hamamatsu.it)

China: Hamamatsu Photonics (China) Co., Ltd.; B1201 Jiaming Center, No.27 Dongsanhuan Beilu, Chaoyang District, Beijing 100020, China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866 E-mail: [hpc@hamamatsu.com.cn](mailto:hpc@hamamatsu.com.cn)

TPMH1347E03  
 OCT. 2015 IP