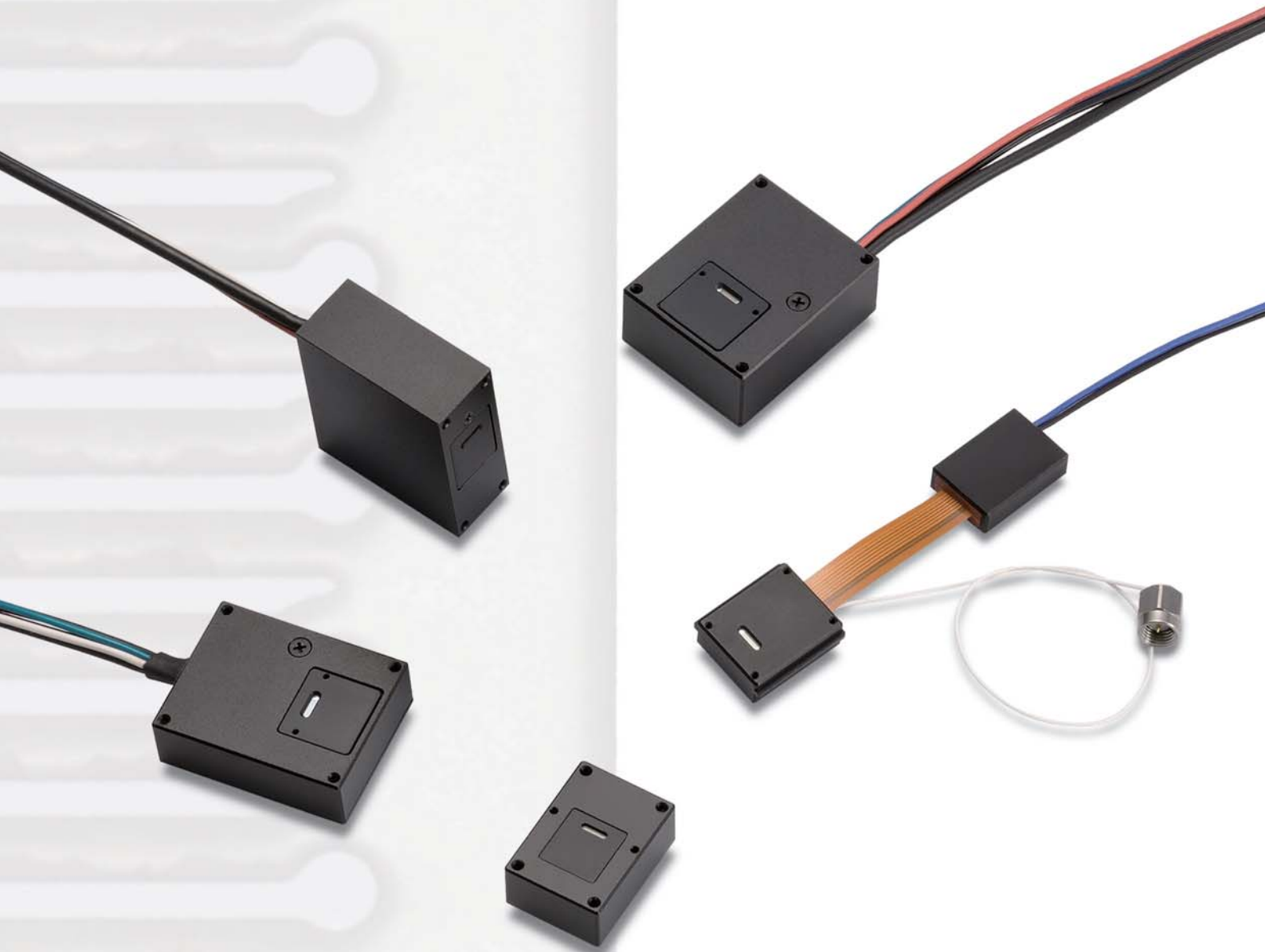


micro
μPMT®
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MICRO PMT ASSEMBLY
MICRO PMT MODULES
MICRO PMT PHOTON COUNTING HEAD



World's smallest and lightest photomultiplier tube*

Micro PMT™

* By our research (as of December 2015)

Easy to mass produce

Micro PMT can be produced in high volume while still maintaining high reliability and performance. What makes this possible is overall integrated usage of our in-house advanced technologies for MEMS (micro-electro-mechanical systems), semiconductor manufacturing, electron trajectory design, vacuum sealed packaging, and vacuum processing.

Tiny dimensions

Micro PMT has a three-layer structure where a silicon substrate is sandwiched between two glass substrates. Utilizing only three components gives tiny dimensions impossible up until now.

High shock resistance

Micro PMT devices offer strong shock resistance since anodic bonding by MEMS technology is utilized to join the silicon substrate to the glass substrates. This high cushioning or shock resistance makes them ideal for developing high-performance, hand-held testing and analysis devices.

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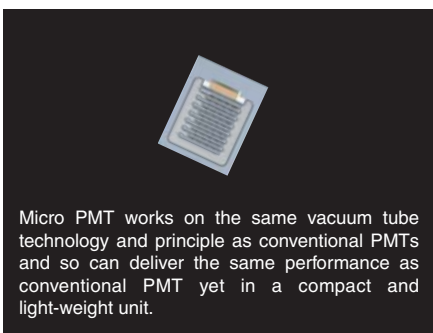
Customizing support

Feel free to consult with us on customizing to match customer usage conditions and environments.

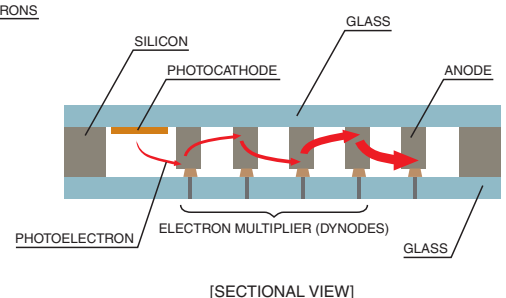
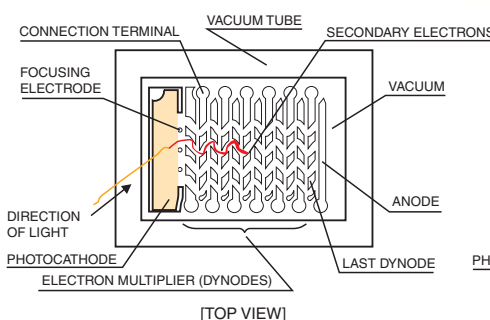
High sensitivity and fast response

Micro PMT utilizes the same high precision structure for electrode arrangement as conventional PMTs and so provides the high sensitivity and fast response needed from a PMT.

Full-scale Micro PMT image!



Micro PMT internal structure



What is a PMT (photomultiplier tube)?

The PMT is a photosensor delivering superb high sensitivity and response speed compared with other types of photosensors. The PMT makes use of the secondary emission effect for electron multiplication and so achieves extremely high sensitivity and low noise compared to other photosensors currently in use to measure UV light, visible light, and near-infrared light. These features allow the PMT to be used in a broad range of applications including high-performance medical equipment and environmental monitors, etc.

Medical care

Medical diagnosis in the home or at the bedside

Bringing high-tech closer to the patient via compact and portable medical devices

Tests and inspections normally held in examination rooms or labs can now be made in emergency rooms or small clinics by using the advantages offered by Micro PMT. Performing sophisticated exams in the home could also allow detecting major diseases while still in their early stage. This means the Micro PMT could prove ideal not only for early stage disease diagnosis but also daily health care management.






Measurement

Making environmental pollution measurements on an individual or regional scale

Measurements under various environments and any type of location

Micro PMT also proves ideal as a photosensor for environmental monitoring tasks. Environmental problems including abnormal weather phenomenon and wide-scale natural disasters are recently occurring at places all around the world. If compact measurement devices were readily available, then environmental phenomena could be quickly detected at diverse locations to keep damage and losses to a be minimum.

microPMT® PRODUCT CONFIGURATION

	Assembly type	Module type			
Basic configuration	Micro PMT + Divider circuit	Micro PMT + Divider circuit + High voltage power supply circuit			
Additional function	Current output		Voltage output	Photon counting	
Appearance					
	H12400 series	H14066 series	H12402/H12403 series	H12404/H12405 series	H12406 series
Spectral response (nm)	300 to 650 300 to 850 300 to 920	300 to 650 300 to 850	300 to 650 300 to 850 300 to 920	300 to 650 300 to 850 300 to 920	300 to 650 300 to 850 300 to 920

MICRO PMT ASSEMBLY

H12400 SERIES

The H12400 series is a high sensitivity photosensor that combines a Micro PMT with a voltage divider circuit. The H12400 series can be installed even in narrow spaces due to its small size.



PRODUCT VARIATIONS

Type No.	Spectral response	Photocathode material	Features
H12400-00-01	300 nm to 650 nm	Bialkali	for visible range
H12400-01-01	300 nm to 850 nm	Multialkali	for visible to near IR range
H12400-20-01	300 nm to 920 nm	Extended red multialkali	for visible to near IR range

SPECIFICATIONS

(at +25 °C)

Parameter			H12400-00-01	H12400-01-01	H12400-20-01	Unit	
Peak sensitivity wavelength			420			nm	
Window material			3(X) × 1(Y)			mm	
Effective area			Borosilicate glass			—	
Dynode number of stages			12			—	
Maximum ratings	Supply voltage	Between anode and cathode	-1150			V	
	Divider current		126			μA	
	Average output signal current		5			μA	
Cathode	Luminous sensitivity	Min.	50	100	300	μA/lm	
		Typ.	80	200	400		
	Blue sensitivity index (CS 5-58)	Typ.	8.0	—	—	—	
	Red / White ratio	Typ.	—	0.2	0.45	—	
Radiant sensitivity ^①		Typ.	80	62	60	mA/W	
Anode ^②	Luminous sensitivity	Min.	30	15	30	A/lm	
		Typ.	160	70	100		
	Radiant sensitivity ^①	Typ.	1.6 × 10 ⁵	2.1 × 10 ⁴	1.5 × 10 ⁴	A/W	
		Dark current ^③	Typ.	0.3	0.6		nA
	Time response	Rise time	Typ.	1.2			
		Transit time	Typ.	8.0			
T.T.S. ^④		Typ.	1.3				
Gain ^②		Typ.	2.0 × 10 ⁶	3.5 × 10 ⁵	2.5 × 10 ⁵	—	
Operating ambient temperature ^⑤			+5 to +50			°C	
Storage temperature ^⑤			-20 to +50			°C	
Weight			11			g	

① Measured at the peak sensitivity wavelength

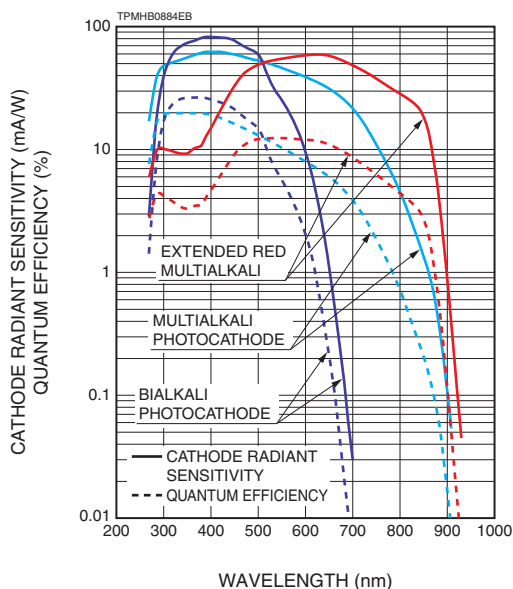
② Supply Voltage: -900 V

③ After 30 minutes storage in darkness

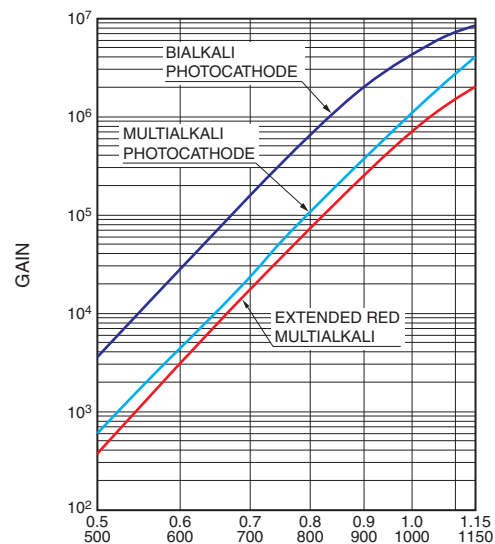
④ T.T.S.=Transit Time Spread (FWHM)

⑤ No condensation

SPECTRAL RESPONSE



GAIN



* Control voltage of a Micro PMT module.

MICRO PMT MODULE

H14066 SERIES

The H14066 series is a high sensitivity photosensor module that contain a Micro PMT, a voltage divider circuit, and a high-voltage power supply circuit. This module output type can board mounting, which can be easily operated with a low voltage supply.



PRODUCT VARIATIONS

Type No.	Spectral response	Photocathode material	Features
H14066	300 nm to 650 nm	Bialkali	for visible range
H14066-01	300 nm to 850 nm	Multialkali	for visible to near IR range

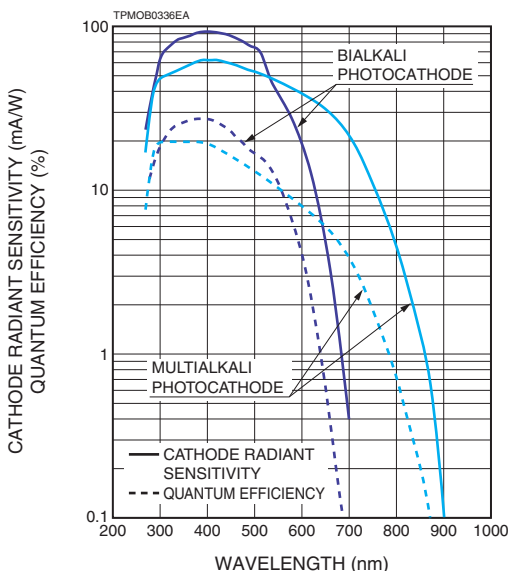
SPECIFICATIONS

(at +25 °C)

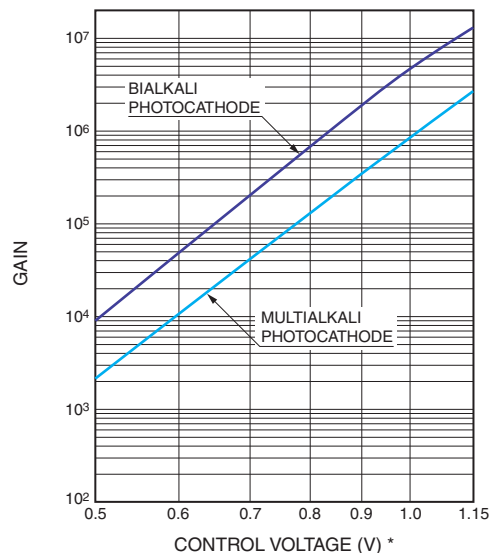
Parameter		H14066	H14066-01	Unit
Peak sensitivity wavelength		420		nm
Effective area		4(X) × 1(Y)		mm
Window material		Borosilicate glass		—
Dynode number of stages		10		—
Input voltage		+4.75 to +5.25		V
Maximum input voltage		+5.5		V
Maximum input current ^①		5		mA
Maximum average output signal current		5		μA
Maximum control voltage		+1.15		V
Recommended control voltage adjustment range		+0.5 to +1.0	+0.5 to +1.1	V
Control voltage input impedance		1		MΩ
Cathode	Luminous sensitivity	Min. 70 Typ. 100	100 200	μA/lm
	Blue sensitivity index (CS 5-58)	Typ. 11.5	—	
	Red / White ratio	Typ. —	0.2	—
	Radiant sensitivity ^②	Typ. 93	62	mA/W
Anode ^②	Luminous sensitivity ^③	Min. 30 Typ. 200	15 70	A/lm
	Radiant sensitivity ^{②③}	Typ. 1.9 × 10 ⁵	2.2 × 10 ⁴	
	Dark current ^{③④}	Typ. 0.3 Max. 3	—	nA
	Time response Rise time	Typ. 1.2	—	
Gain	Typ. 2.0 × 10 ⁶	3.5 × 10 ⁵	—	
Ripple noise ^{③⑤} (peak to peak)	Max. 0.3	—	mV	
Settling time ^⑥	Max. 10	—	s	
Operating ambient temperature ^⑦	+5 to +50		°C	
Storage temperature ^⑦	-20 to +50		°C	
Weight	10		g	

- ① At +5 V input voltage, +0.9 V control voltage, and output current equal to dark current ② Measured at the peak sensitivity wavelength
 ③ +0.9 V control voltage ④ After 30 minutes storage in darkness.
 ⑤ Cable RG-174/U, Cable length 450 mm, Load resistance=1 MΩ, Load capacitance=22 pF
 ⑥ The time required for the output to reach a stable level following a change in the control voltage from +1.0 V to +0.5 V. ⑦ No condensation

SPECTRAL RESPONSE



GAIN



* See page 6 for sensitivity adjustment method.

MICRO PMT MODULE H12402/H12403 SERIES

The H12402/H12403 series are high sensitivity photosensor modules that contain a Micro PMT, a voltage divider circuit, and a high-voltage power supply circuit. These modules can be easily operated with a low voltage supply.



▲ Left: H12403 series
Right: H12402 series

PRODUCT VARIATIONS

Type No.	Spectral response	Photocathode material	Features
H12402 / H12403	300 nm to 650 nm	Bialkali	for visible range
H12402-01 / H12403-01	300 nm to 850 nm	Multialkali	for visible to near IR range
H12402-20 / H12403-20	300 nm to 920 nm	Extended red multialkali	for visible to near IR range

SPECIFICATIONS

(at +25 °C)

Parameter			H12402 / H12403	H12402-01 / H12403-01	H12402-20 / H12403-20	Unit
Peak sensitivity wavelength			420			nm
Effective area			3(X) × 1(Y)			mm
Window material			Borosilicate glass			—
Dynode number of stages			12			—
Input voltage			+4.5 to +5.5			V
Maximum input voltage			+5.5			V
Maximum input current ^①			20			mA
Maximum average output signal current ^②			5			μA
Maximum control voltage			+1.15			V
Recommended control voltage adjustment range			+0.5 to +1.0	+0.5 to +1.1		V
Control voltage input impedance			1			MΩ
Cathode	Luminous sensitivity	Min.	50	100	300	μA/lm
		Typ.	80	200	400	
	Blue sensitivity index (CS 5-58)	Typ.	8.0	—	—	—
	Radiant sensitivity ^③	Typ.	80	62	60	mA/W
Anode ^②	Luminous sensitivity	Min.	30	15	30	A/lm
		Typ.	160	70	100	
	Radiant sensitivity ^③	Typ.	1.6 × 10 ⁵	2.1 × 10 ⁴	1.5 × 10 ⁴	A/W
	Dark current ^④	Typ.	0.3			0.6
Max.		3			6	
Time response	Rise time	Typ.	1.2			ns
	Gain ^②	Typ.	2.0 × 10 ⁶	3.5 × 10 ⁵	2.5 × 10 ⁵	—
Ripple noise ^⑤ (peak to peak)		Max.	0.3			mV
Settling time ^⑥		Max.	10			s
Operating ambient temperature ^⑦			+5 to +50			°C
Storage temperature ^⑦			-20 to +50			°C
Weight		Typ.	42 (H12402 series), 52 (H12403 series)			g

① At +5 V input voltage, +0.9 V control voltage, and output current equal to dark current

② +0.9 V control voltage

③ Measured at the peak sensitivity wavelength

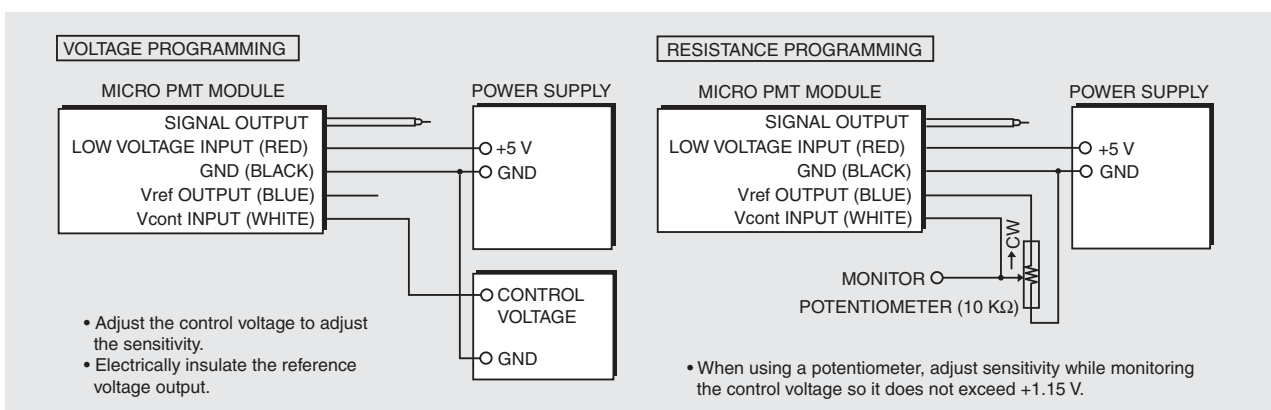
④ After 30 minutes storage in darkness.

⑤ Cable RG-174/U, Cable length 450 mm, Load resistance=1 MΩ, Load capacitance=22 pF

⑥ The time required for the output to reach a stable level following a change in the control voltage from +1.0 V to +0.5 V.

⑦ No condensation

SENSITIVITY ADJUSTMENT METHOD



MICRO PMT MODULE

H12404/H12405 SERIES

The H12404/H12405 series are high sensitivity photosensor modules that contain a Micro PMT, a voltage divider circuit, and a high-voltage power supply circuit and amplifier circuit. These modules can be easily operated with a low voltage supply.



▲Left: H12405 series
Right: H12404 series

PRODUCT VARIATIONS

Type No.	Spectral response	Photocathode material	Features
H12404 / H12405	300 nm to 650 nm	Bialkali	for visible range
H12404-01 / H12405-01	300 nm to 850 nm	Multialkali	for visible to near IR range
H12404-20 / H12405-20	300 nm to 920 nm	Extended red multialkali	for visible to near IR range

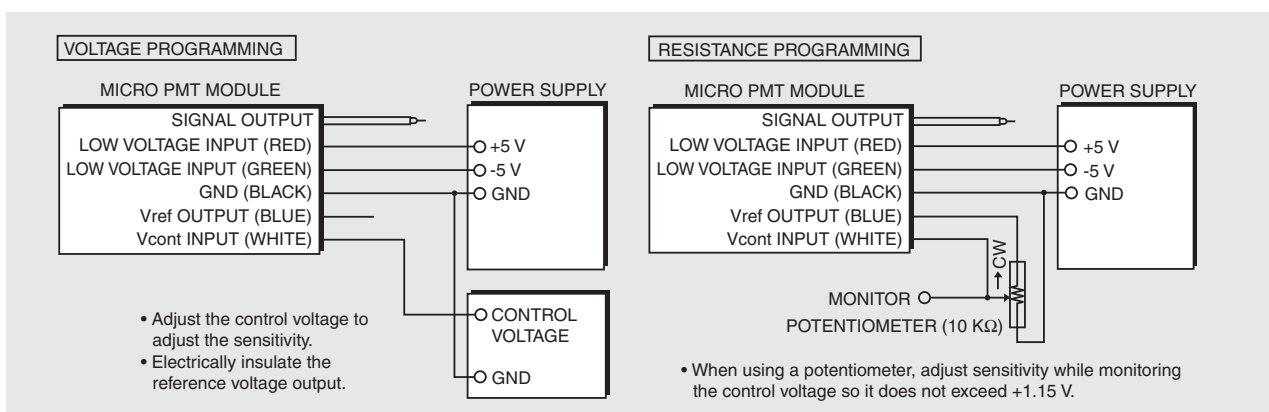
SPECIFICATIONS

(at +25 °C)

Parameter		H12404 / H12405	H12404-01 / H12405-01	H12404-20 / H12405-20	Unit	
Peak sensitivity wavelength		420			nm	
Effective area		3(X) × 1(Y)			mm	
Window material		Borosilicate glass			—	
Dynode number of stages		12			—	
Input voltage		±4.5 to ±5.5			V	
Maximum input voltage		±5.5			V	
Maximum input current ^①		+23.5 / -3.5			mA	
Maximum average output signal current		+4 (Load resistance 10 kΩ)			V	
Maximum control voltage		+1.15			V	
Recommended control voltage adjustment range		+0.5 to +1.0	+0.5 to +1.1		V	
Control voltage input impedance		1			MΩ	
Cathode	Luminous sensitivity	Min.	50	100	300	μA/lm
		Typ.	80	200	400	
	Blue sensitivity index (CS 5-58)	Typ.	8.0	—	—	—
	Red / White ratio	Typ.	—	0.2	0.45	—
Radiant sensitivity ^②		Typ.	80	62	60	mA/W
Anode ^②	Luminous sensitivity ^③	Min.	3.0 × 10 ⁷	1.5 × 10 ⁷	3.0 × 10 ⁷	V/lm
		Typ.	1.6 × 10 ⁸	7.0 × 10 ⁷	1.0 × 10 ⁸	
	Radiant sensitivity ^{②③}	Typ.	160	21	15	V/nW
	Voltage output depending on PMT dark current ^{③④}	Typ.	0.3		0.6	mV
Max.		3		6		
PMT gain		Typ.	2.0 × 10 ⁶	3.5 × 10 ⁵	2.5 × 10 ⁵	—
Frequency bandwidth		DC to 20 kHz			—	
Current-to-voltage conversion factor		1			V/μA	
Output offset voltage		Typ.	±1		mV	
Ripple noise ^{⑤⑥} (peak to peak)		Max.	1.5		mV	
Settling time ^⑥		Max.	10		s	
Operating ambient temperature ^⑦		+5 to +50			°C	
Storage temperature ^⑦		-20 to +50			°C	
Weight		44 (H12404 series), 54 (H12405 series)			g	

- ① At ±5 V input voltage, +0.9 V control voltage, and output current equal to dark current ② Measured at the peak sensitivity wavelength
 ③ +0.9 V control voltage ④ After 30 minutes storage in darkness.
 ⑤ Cable RG-174/U, Cable length 450 mm, Load resistance=1 MΩ, Load capacitance=22 pF
 ⑥ The time required for the output to reach a stable level following a change in the control voltage from +1.0 V to +0.5 V. ⑦ No condensation

SENSITIVITY ADJUSTMENT METHOD

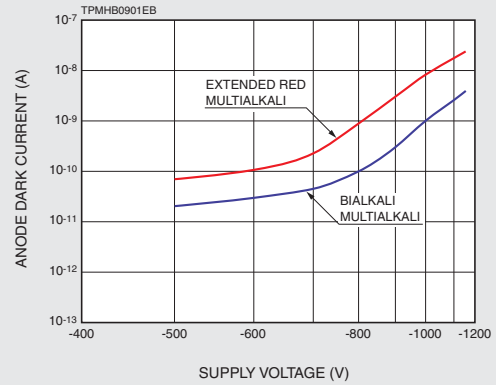


* See page 4 for spectral response and gain.

Characteristics

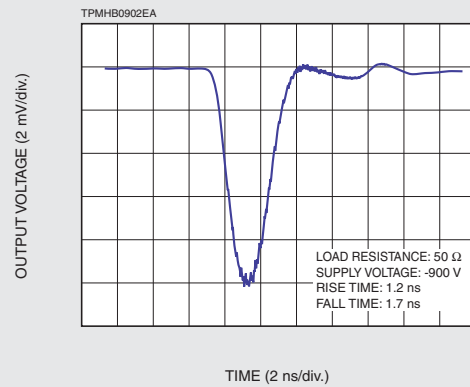
Dark current

A small amount of current is output from a photomultiplier tube even when operated in a completely dark state. This output current is called the anode dark current, and the resulting noise is a critical factor in determining the lower detection limit of photomultiplier tubes. The graph on the right shows typical dark current of a Micro PMT versus the supply voltage.



Output waveform

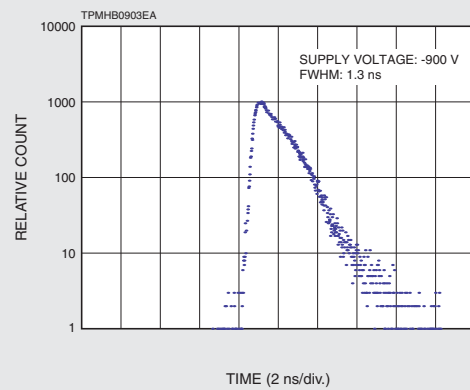
Photomultiplier tubes are photosensors with extremely high speeds. The figure on the right shows an output waveform example of a Micro PMT operating at an anode-to-cathode voltage of -900 V, measured with pulsed light (pulse width: 70 ps) that is sufficiently shorter than the response time of the PMT. This anode output pulse has a rise time of 1.2 ns and a fall time of 1.7 ns.



T.T.S. (transit time spread)

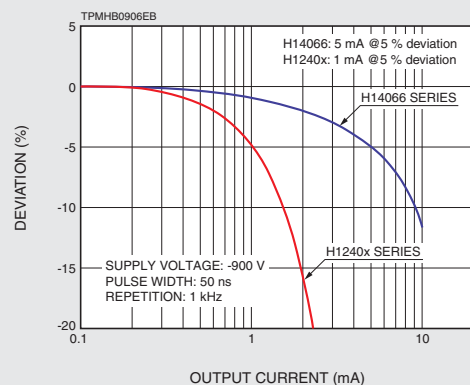
The time interval between the arrival of light at the photocathode and the instant when the anode output pulse reaches its peak amplitude is called the electron transit time.

The T.T.S. (transit time spread) indicates the fluctuations of the electron transit time measured when the photocathode is fully illuminated with single photons, and is defined as the FWHM of the histogram of the fluctuations. A typical T.T.S. of Micro PMT is 1.3 ns.



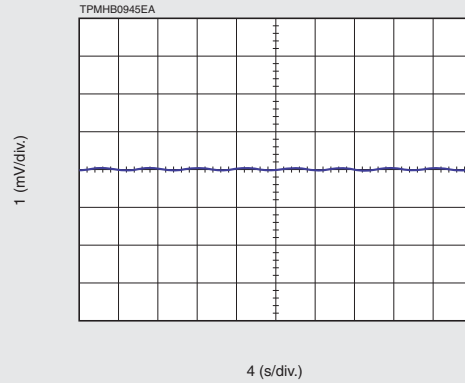
Pulse linearity

When an intense light pulse enters the photocathode of a photomultiplier tube, a large current flows in the latter dynode stages and increases the space charge density, causing current saturation. This causes the anode output to deviate from the ideal linearity. The figure below is a comparison of the pulse linearity between H1240x series and H14066 series. The pulse linearity for H14066 series is apparently improved compared with H1240x series due to the dynode structure change.



Ripple noise

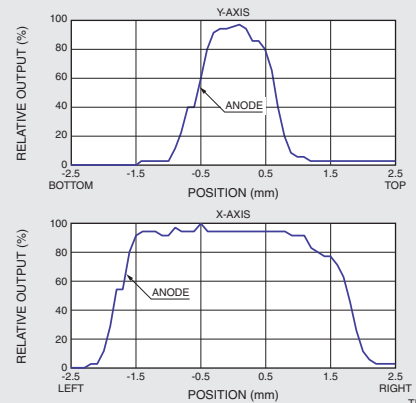
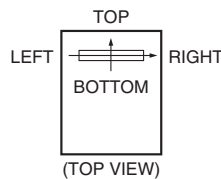
The oscillator circuit used in high-voltage power supplies in photomultiplier tube modules induces noise into the signal input due to oscillation. This induction noise is referred to as ripple. The ripple can be observed on an oscilloscope along the baseline in a low voltage range by feeding the output signal to the oscilloscope input while no light is incident on the modules. For example, under conditions where the load resistance is 1 MΩ and the load capacitance is 22 pF, you will see a signal with an output near 200 V and a frequency of approximately 220 kHz.



Uniformity

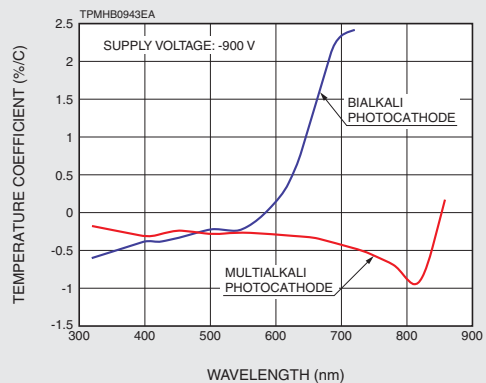
This uniformity is the variation of sensitivity with respect to the incident light position on the photocathode. The figure on the right shows an example of anode output measured by scanning a light spot of 1 mm diameter at 400 nm wavelength over the photocathode surface of a Micro PMT at a pitch of 0.1 mm in the X-axis and Y-axis directions. The output indicates relatively good uniformity.

WAVELENGTH: 400 nm
 SUPPLY : -900 V
 VOLTAGE
 SPOT DIA. : 1 mm



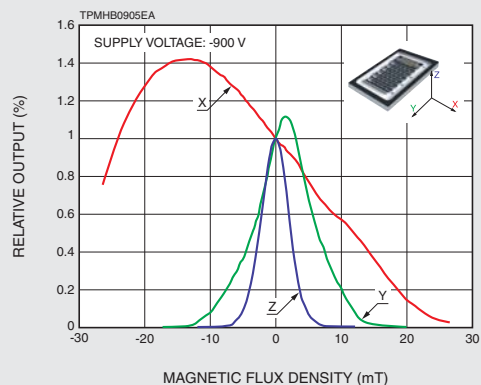
Temperature characteristics

The anode sensitivity of photomultiplier tubes is affected by the ambient temperature. Temperature characteristics for anode sensitivity are wavelength-dependent, and the temperature coefficient generally fluctuates from a negative value to a positive value near the long wavelength limit. The figure on the right shows temperature coefficient data of micro PMT with a bialkali photocathode and multialkali photocathode as a function of wavelength. The temperature coefficient for both photocathodes is approximately -0.3 %/C at a wavelength around 500 nm.



Magnetic characteristics

An external magnetic field deviates the photoelectrons traveling in a photomultiplier tube from their normal trajectories, causing a loss of gain. The extent of the loss of gain depends on the direction of the magnetic field. The figure on the right shows how magnetic fields affect the output of a Micro PMT. It is seen that the magnetic field in the Z direction most affects the output. Terrestrial magnetism which is less than 0.1 mT will have almost no effect on the output.



MICRO PMT PHOTON COUNTING HEAD H12406 SERIES

The H12406 series is a photon counting head that contain a Micro PMT, a high-voltage power supply circuit and a photon counting circuit. This photon counting head can be easily operated with a low voltage supply.



PRODUCT VARIATIONS

Type No.	Spectral response	Photocathode material	Features
H12406	300 nm to 650 nm	Bialkali	for visible range
H12406-01	300 nm to 850 nm	Multialkali	for visible to near IR range
H12406-20	300 nm to 920 nm	Extended red multialkali	for visible to near IR range

SPECIFICATIONS

(at +25 °C)

Parameter			H12406	H12406-01	H12406-20	Unit
Peak sensitivity wavelength			420		630	nm
Effective area			3(X) × 1(Y)			mm
Window material			Borosilicate glass			—
Dynode number of stages			12			—
Input voltage			+4.75 to +5.25			V
Max. Input voltage			+6			V
Max. Input current			40			mA
Count sensitivity	Typ.	300 nm	1.7×10^5	2.1×10^5	4.4×10^4	$s^{-1} \cdot \mu W^{-1}$
		400 nm	3.6×10^5	2.7×10^5	6.6×10^4	
		500 nm	2.6×10^5	2.3×10^5	2.1×10^5	
		600 nm	4.3×10^4	1.7×10^5	2.6×10^5	
		700 nm	1.4×10^2	9.6×10^4	2.1×10^5	
		800 nm	—	2.1×10^4	1.2×10^5	
		900 nm	—	—	3.9×10^3	
Count linearity ^①			5.0×10^6			s^{-1}
Dark count ^②		Typ.	10	100	500	s^{-1}
		Max.	50	500	2500	
Pulse-pair resolution			20			ns
Output pulse width			10			ns
Output pulse height (at load resistance 50 Ω)		Min.	+2.0			V
		Typ.	+2.2			
Recommended load resistance			50			Ω
Signal output logic			Positive logic			—
Excessive light detection output ^③	Excessive light incident Normally	Min.	+3.5			V
		Max.	+0.5			V
Operating ambient temperature ^④			+5 to +50			°C
Storage temperature ^④			-20 to +50			°C
Weight			46			g

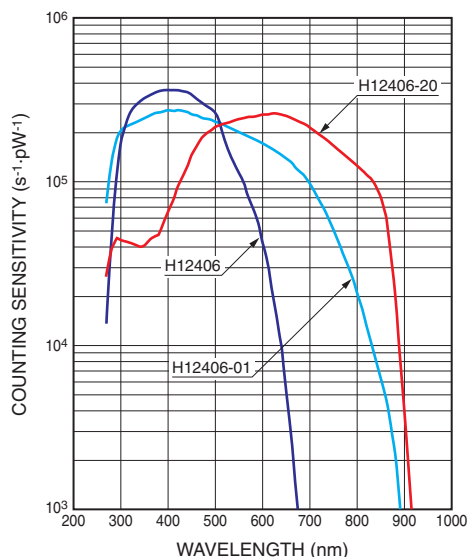
① Random pulse, at 10% count loss

② After 30 minute storage in darkness

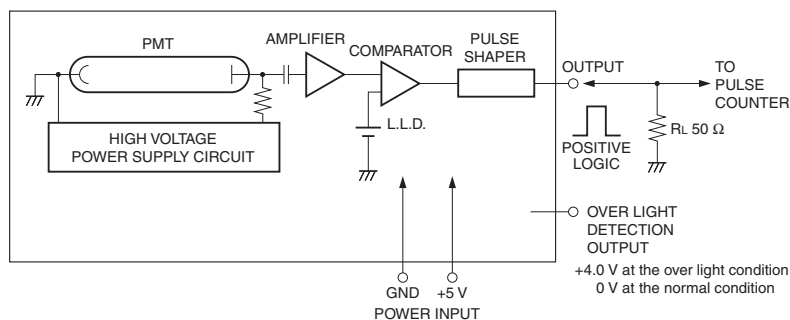
③ Load resistance 10 kΩ

④ No condensation

COUNT SENSITIVITY



BLOCK DIAGRAM

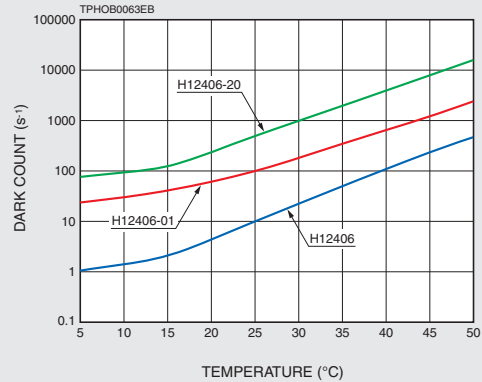


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Characteristics

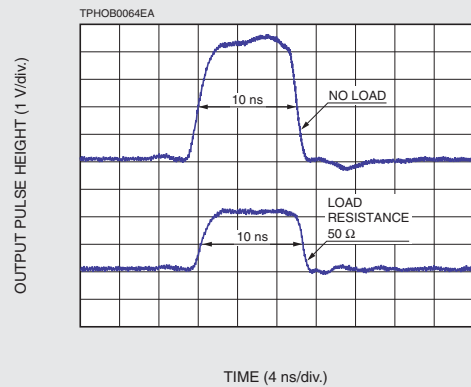
Dark count

Some dark current pulses are generated in a photomultiplier tube during operation even if no light is incident on it. These dark current pulses are amplified by an amplifier and then only those dark pulses with a height exceeding a certain discriminator threshold are output through a pulse shaper. This output, expressed in counts per second (s^{-1}), is the dark count and indicates the lower limit of signal detection.



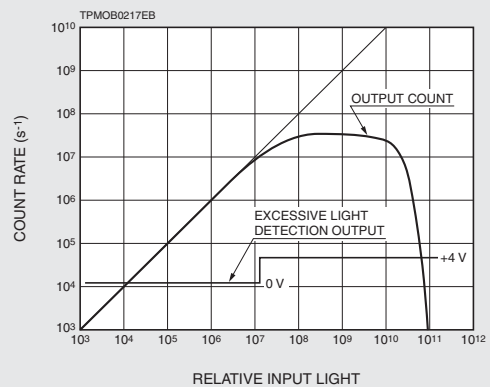
Output waveform

Output waveforms are positive logic signals. The figure on the right shows output waveforms measured with and without a load resistance of 50Ω . Since photon counting head handles high-speed signals, a 50Ω impedance cable is usually connected between a photon counting head and external device, and the input impedance of the external device should also preferably be 50Ω .



Count linearity and excessive light detection characteristics

In a random light input event, when the light level increases and exceeds a certain level, the output pulses begin to overlap each other and the count value is no longer proportional to the light level. As the light level further increases causing more pulses to overlap, the number of output pulses gradually saturates and then begins to decrease and eventually reaches 0. Count linearity is specified as the count value at which a 10% loss occurs in the counted value compared to the theoretical value. If the incident light level largely exceeds the count linearity, a signal (4.0 V) is output to indicate an excessive light input.



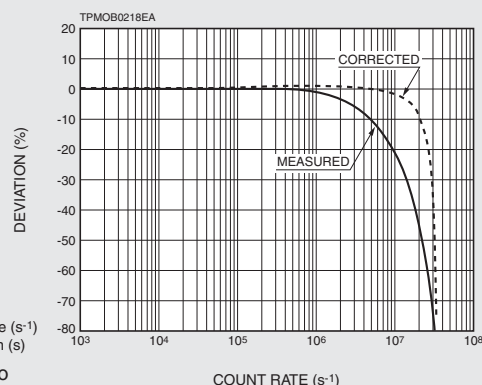
Count rate correction

When the number of pulses measured by photon counting exceeds $10^6 s^{-1}$, counting errors begin to occur due to pulse overlap. One method for improving the count linearity utilizes a correction formula to find the approximate values. The graph on the right shows improved count linearity characteristics obtained by using a correction formula to find the approximate values.

Linearity correction formula

$$N = \frac{M}{1 - Mt}$$

N : real count rate (s^{-1})
 M : measured count rate (s^{-1})
 t : pulse pair-resolution (s)

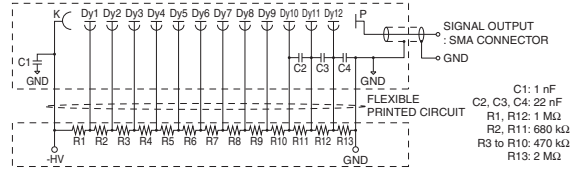
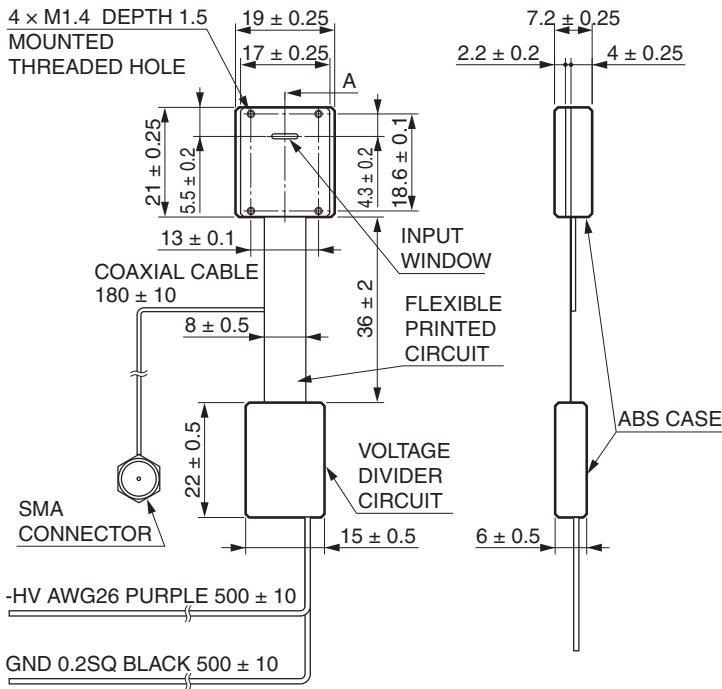


* Micro PMT photon counting head H12406 series do not have the function to automatically output a correction value.

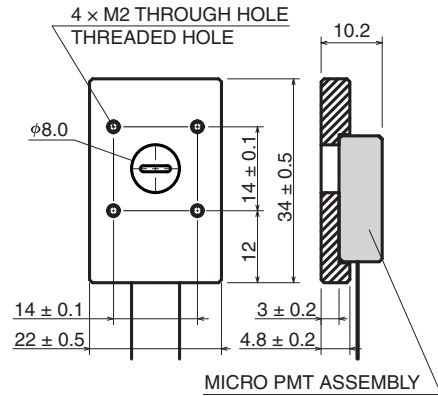
DIMENSIONAL OUTLINES (Unit: mm)

MICRO PMT ASSEMBLY

H12400 Series



DEDICATED ADAPTOR FOR OPTICAL BLOCK TO MICRO PMT ASSEMBLY *

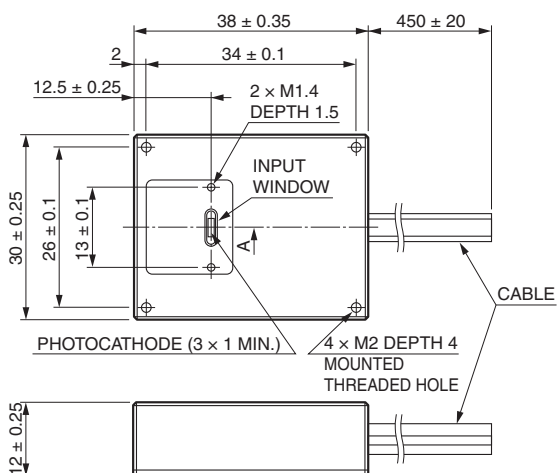


* Dedicated Adaptor for optical block is supplied.

TPMHA0590EC

MICRO PMT MODULE

H12402 Series



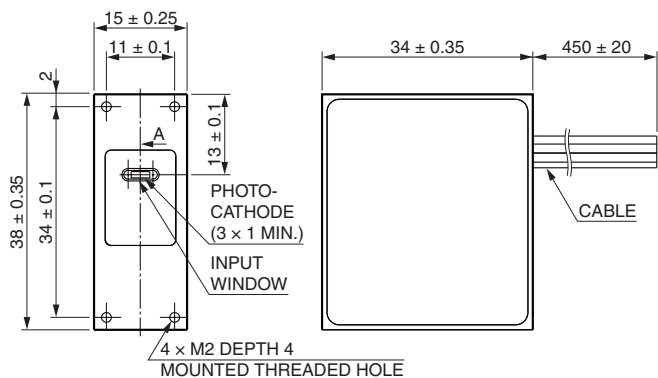
●CABLE

LOW VOLTAGE INPUT (+5 V) : UL1430 AWG26 (RED)
 GND : UL1430 AWG26 (BLACK)
 Vref OUTPUT (+1.2 V) : UL1430 AWG26 (BLUE)
 Vcont INPUT : UL1430 AWG26 (WHITE)
 No suffix (+0.5 V to +1.0 V)
 -01, -20 (+0.5 V to +1.1 V)
 SIGNAL OUTPUT : RG-174/U Weight: 42 g

TPM0A0083EE

MICRO PMT MODULE

H12403 Series



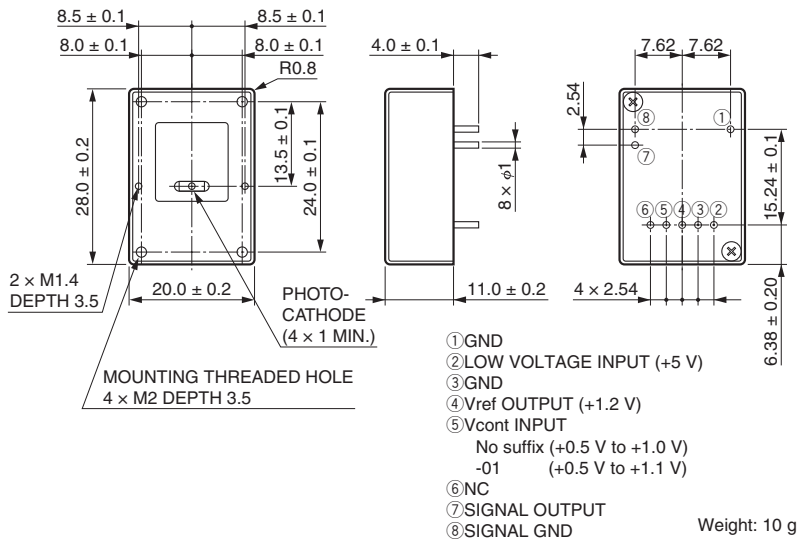
●CABLE

LOW VOLTAGE INPUT (+5 V) : UL1430 AWG26 (RED)
 GND : UL1430 AWG26 (BLACK)
 Vref OUTPUT (+1.2 V) : UL1430 AWG26 (BLUE)
 Vcont INPUT : UL1430 AWG26 (WHITE)
 No suffix (+0.5 V to +1.0 V)
 -01, -20 (+0.5 V to +1.1 V)
 SIGNAL OUTPUT : RG-174/U Weight: 52 g

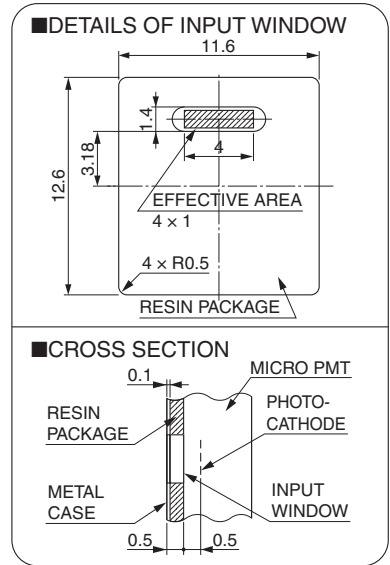
TPM0A0084EE

MICRO PMT MODULE

■ H14066 Series

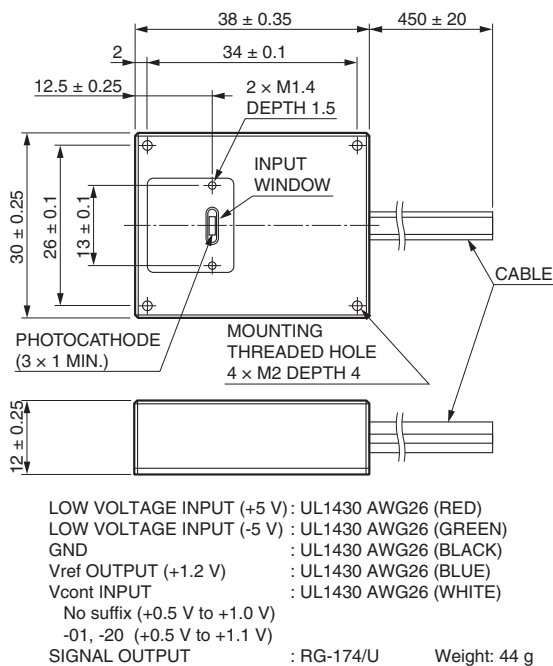


H14066



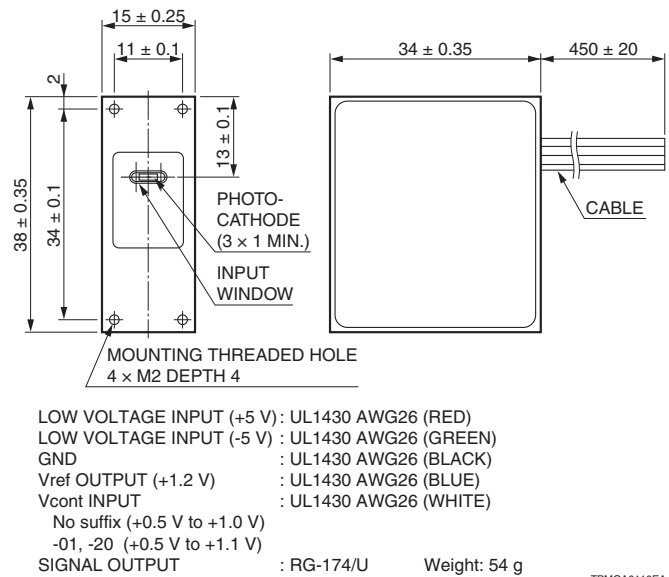
MICRO PMT MODULE

■ H12404 Series

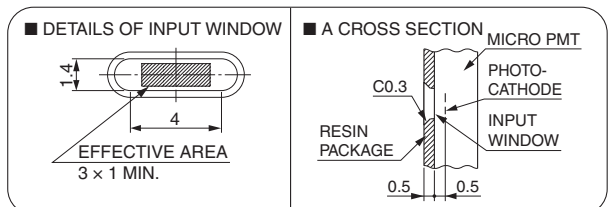


MICRO PMT MODULE

■ H12405 Series



H12402/H12403/H12404/H12405

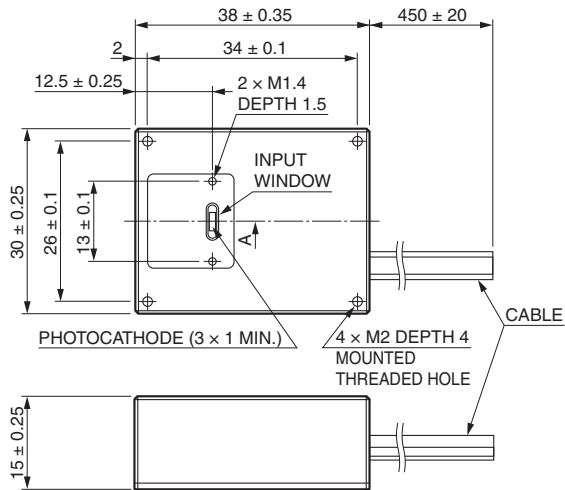


TPMHA0590EC

DIMENSIONAL OUTLINES (Unit: mm)

MICRO PMT PHOTON COUNTING HEAD

H12406 Series

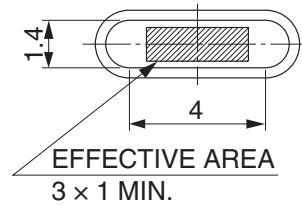


CABLE

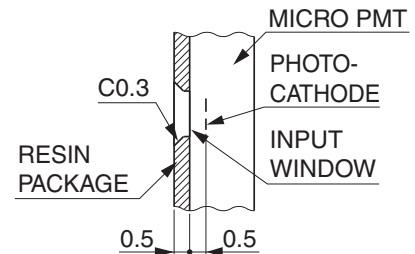
LOW VOLTAGE INPUT (+5 V) : UL1430 AWG26 (RED)
 GND : UL1430 AWG26 (BLACK)
 OVER LIGHT DETECTION OUTPUT: UL1430 AWG26 (BLUE)
 SIGNAL OUTPUT : RG-174/U Weight: 46 g

TPMOA0091EB

DETAILS OF INPUT WINDOW



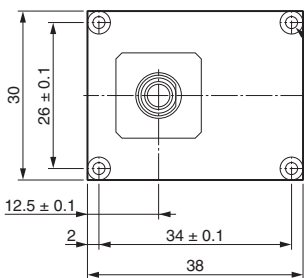
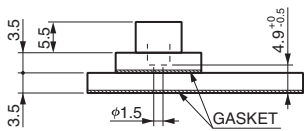
A CROSS SECTION



TPMHA0590EB

OPTION: OPTIONAL FIBER ADAPTER (sold separately)

E13561 (FC type)



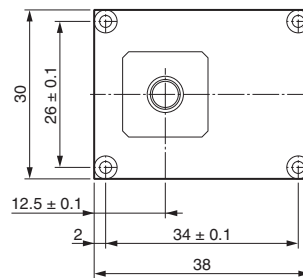
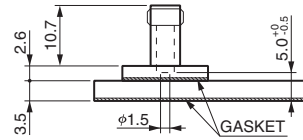
4 x $\phi 2.2$
(FOR M2 SCREW FIXING *)

* Supplied with M2 screws (4 pcs)
for fixing to model.

Weight: 17 g

TACCA0338EA

E13562 (SMA type)



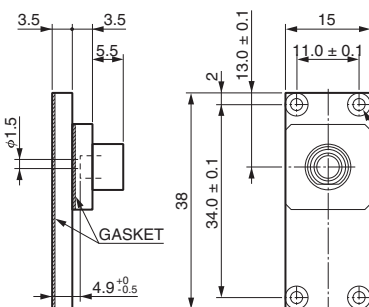
4 x $\phi 2.2$
(FOR M2 SCREW FIXING *)

* Supplied with M2 screws (4 pcs)
for fixing to model.

Weight: 15 g

TACCA0339EA

E13563 (FC type)

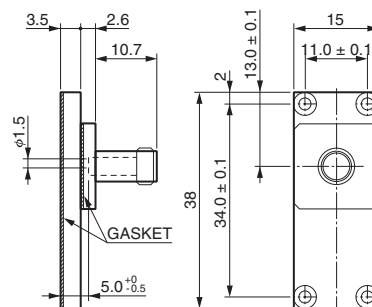


4 x $\phi 2.2$
(FOR M2 SCREW FIXING *)

* Supplied with M2 screws (4 pcs)
for fixing to model.

Weight: 12 g

E13564 (SMA type)



4 x $\phi 2.2$
(FOR M2 SCREW FIXING *)

* Supplied with M2 screws (4 pcs)
for fixing to model.

Weight: 10 g

* E13561 and E13562 are the exclusive options for H12402/H12404/H12406 series. E13563 and E13564 are the exclusive options for H12403/H12405 series.

Related Products



■ HIGH VOLTAGE POWER SUPPLY C14210-14 0.4 W output 1100 V / 0.4 mA

The C14210-14 is the world's smallest surface-mount high voltage power supply module with a stabilizing circuit for photomultiplier tubes. That is suitable for operating a H12400 series, which can reflow mounting.

Parameter	Value	Unit
Input voltage range (V_{DD})	+3.0 to +5.0	V
Input current ^①	with no load Typ.	40
	with full load Typ.	235
Specification guaranteed output voltage range	-200 to -1100	V
Output current	Max. 0.4	mA
Output voltage rise time ^②	150	ms
Line regulation	Typ. ± 0.01	%
Load regulation	Typ. ± 0.01	%
Temperature coefficient	Typ. ± 0.01	%/°C
Ripple / Noise (p-p) ^③	Typ. 50	mV
Operating ambient temperature ^⑤	0 to +50	°C
Weight	4	g
Dimensions (W × H × D)	15 × 7 × 15	mm
Protective functions	Short circuit in output / Continuous overloading / Excessive controlling voltage input	—

- ①: $V_{DD}=+3$ V, at maximum output voltage and current
 ②: Rise time (0 %→99 %)
 ③: 5 kHz or more
 ④: At ambient humidity below 80 % (no condensation)



■ HIGH VOLTAGE POWER SUPPLY C10940 SERIES 0.7 W output 1200 V / 0.6 mA

The C10940 series is a high voltage power supply module developed for compact size and high performance. This is designed to mount on a printed circuit making them suitable for use with a H12400 series Micro PMT assembly. Besides high performance and low power consumption, a variety of protective functions are also included.

Parameter	C10940-03	C10940-03-R2*	C10940-53	C10940-53-R2*	Unit
Input voltage (V_{DD})	+5.0 \pm 0.5				V
Input current ^①	with no load Typ.	60			mA
	with full load Typ.	230			
Specification guaranteed output voltage range ^②	-200 to -1200		+200 to +1200		V
Output current	Max. 0.6				mA
Line regulation ^{①③}	Typ. ± 0.02				%
Load regulation ^①	Typ. ± 0.01				%
Ripple / Noise (p-p) ^{①③}	Typ. 50				mV
Output voltage rise time (Rise time 0 %→99 %) ^{①③}	Typ. 120	300	120	300	ms
Temperature coefficient ^{①③}	± 0.01				%/°C
Operating ambient temperature ^{①③}	0 to +50				°C
Weight	7.7				g
Dimensions (W × H × D)	15 × 18 × 15				mm
Protective functions	Units protected against reversed power input, reversed / excessive controlling voltage input, continuous overloading / short circuit output				—

- ①: At maximum output voltage
 ②: The voltage from 0 V to -200 V/+200 V can be output but all characteristics are not necessarily satisfied.
 ③: At maximum output current
 ④: No condensation
 * -R2 type: RS-485 control

Related Products



▲C10709

POWER SUPPLY FOR PMT MODULE C10709

The C10709 is a power supply unit designed to operate a PMT module. This unit supplies both drive voltage and control voltage, making it ideal for operating the H12402 series, H12403 series, H12404 series, H12405 series and H14066 series Micro PMT modules.



▲ (Rear) C7319, C9663, C6438
▲ (Front) C11184, C5594-44

AMPLIFIER UNITS

These amplifier units convert the signal current input from a photomultiplier tube into a voltage output. Please select the desired type with a frequency range and current-to-voltage conversion factor that match your applications.



▲Micro PMT assembly
H12400 series

▲Micro PMT modules
H12402, H12403, H14066 series

▲Micro PMT photon counting head
H12406 series

PHOTON COUNTING CONFIGURATION EXAMPLE



▲Photon Counting Unit C9744



▲Counting Unit C8855-01



PC

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