HAMAMATSU
PHOTON IS OUR BUSINESS

FLAME / DISCHARGE SENSOR UVTRON®

High-sensitivity, high-speed response ultraviolet ON-OFF sensor that easily detects flames and electrical discharges!

The UVTRON® is a sensor which is sensitive only to ultraviolet light in the 185 to 300 nm wavelength range. It features high sensitivity and high-speed response and is ideal for detecting flames and electrical discharges.

Flame detection

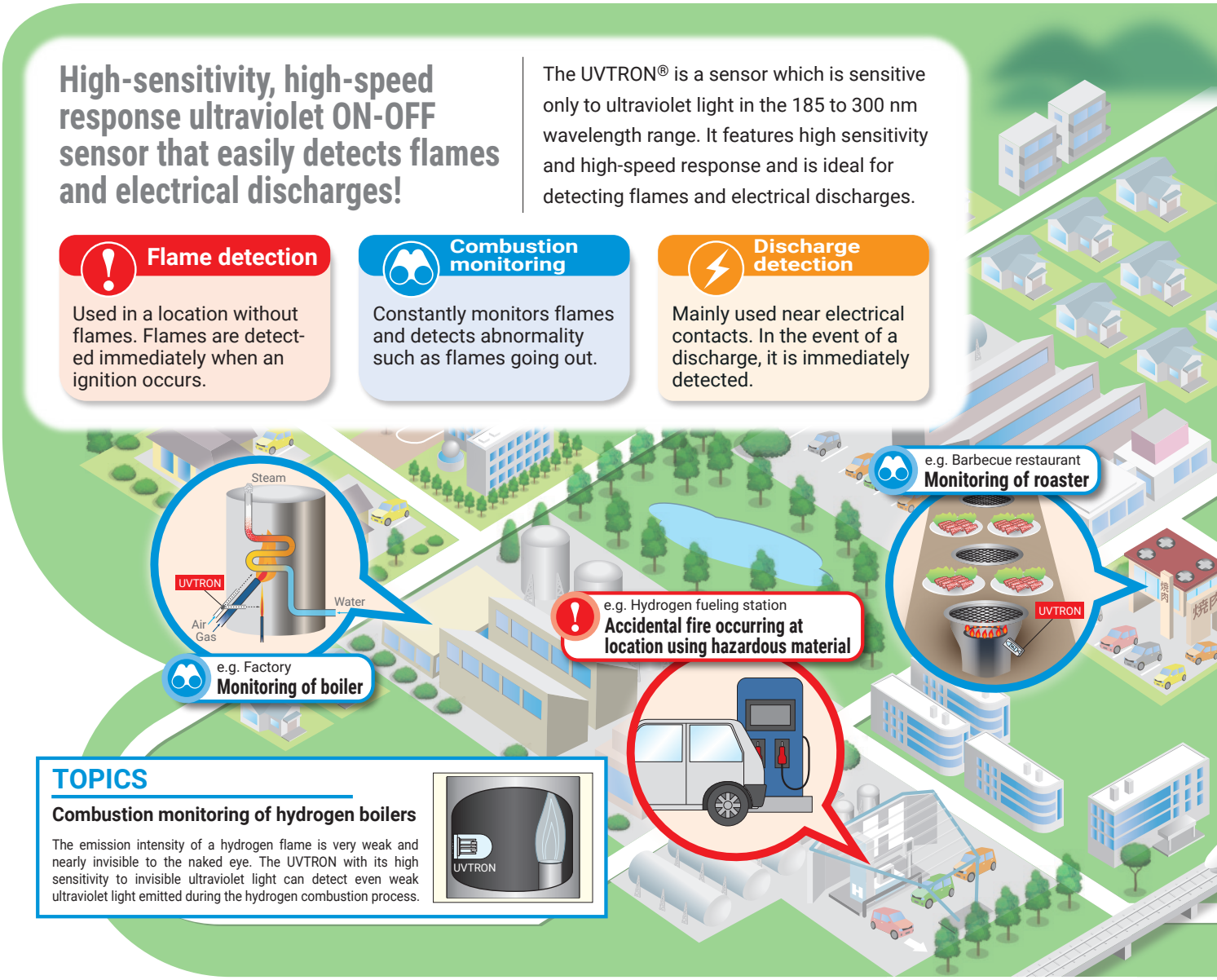
Used in a location without flames. Flames are detected immediately when an ignition occurs.

Combustion monitoring

Constantly monitors flames and detects abnormality such as flames going out.

Discharge detection

Mainly used near electrical contacts. In the event of a discharge, it is immediately detected.



TOPICS

Combustion monitoring of hydrogen boilers

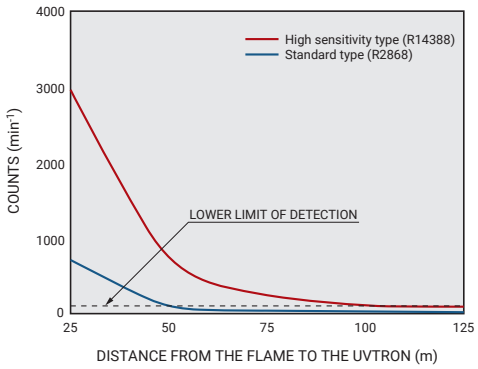
The emission intensity of a hydrogen flame is very weak and nearly invisible to the naked eye. The UVTRON with its high sensitivity to invisible ultraviolet light can detect even weak ultraviolet light emitted during the hydrogen combustion process.

High sensitivity

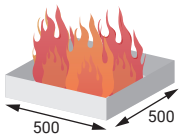
The UVTRON has high sensitivity enough to detect the tiny amounts of ultraviolet light emitted from flames.This makes it ideal for use as fire sensor for a vast range of applications including detection of small fires before they spread or accidental fires that might occur in large spaces such as gymnasiums and large industrial complexes. The UVTRON is also effective in sensing ignition or electrical discharges and so contributes to safety and security in shared spaces.

■Sensitivity vs. distance

○Flame detection from long range

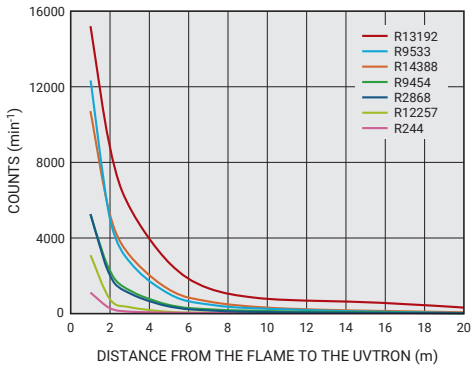


・Measurement condition



Fire tray size:
500 mm × 500 mm
Fuel: Alcohol

○Flame detection for alcohol lamps

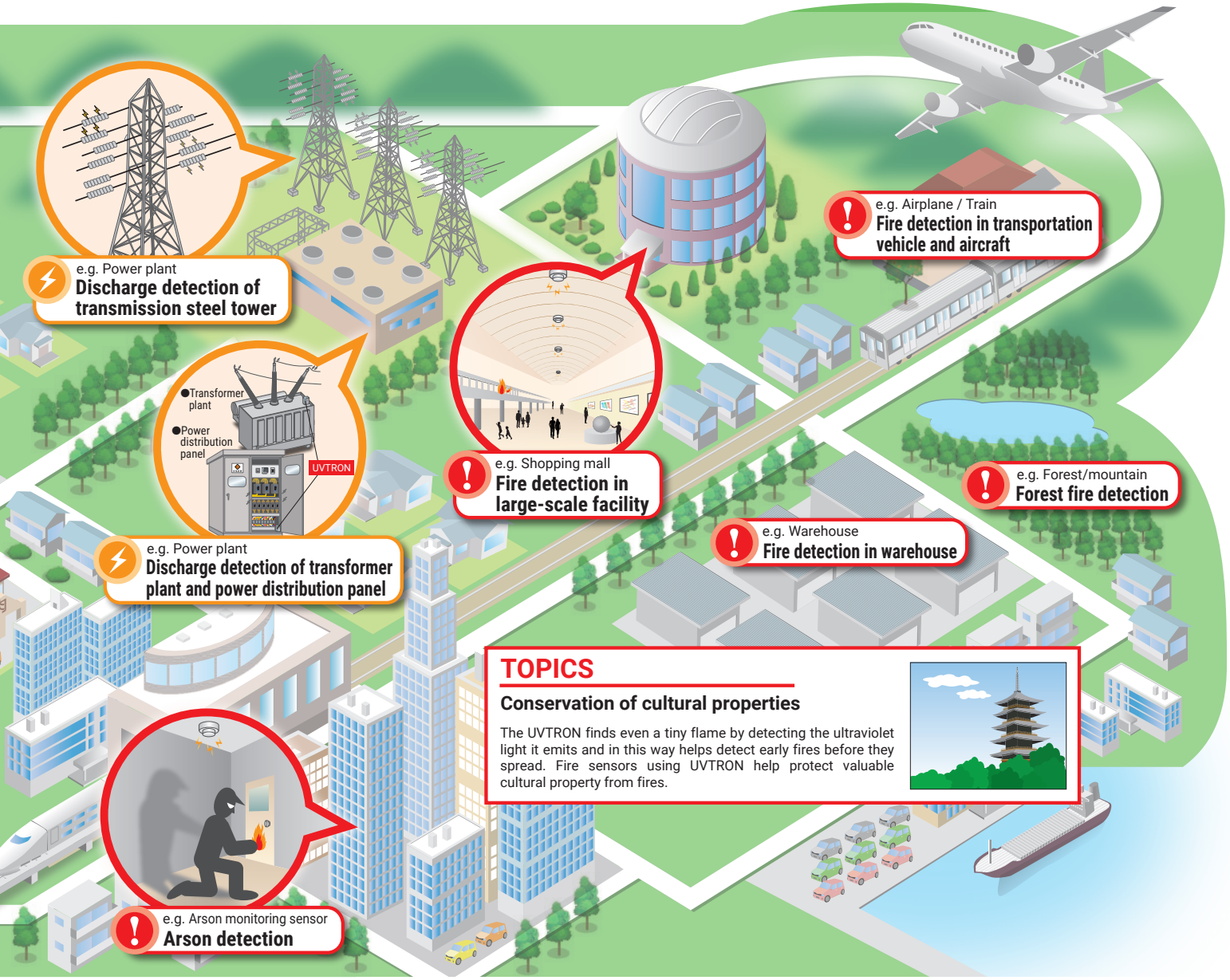


・Measurement condition

Alcohol lamp

Quick and fast detection

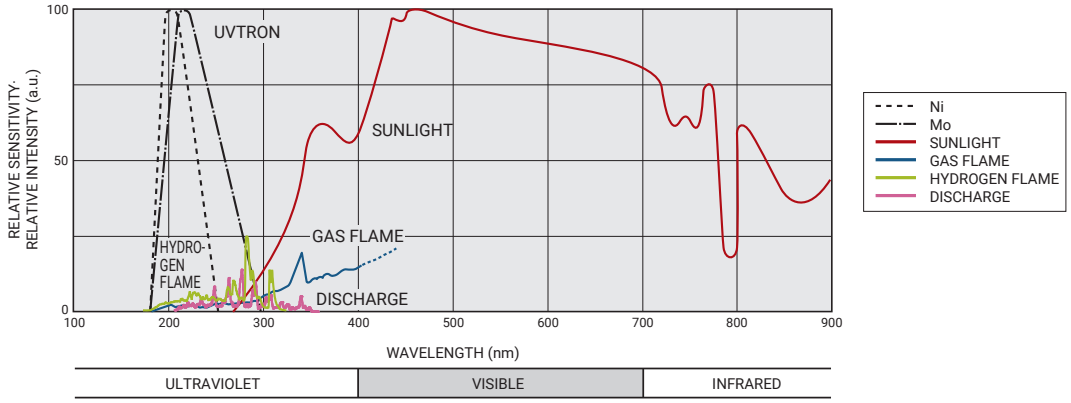
Since the UVTRON directly detects ultraviolet light emitted from flame or electrical discharges, it detects trouble faster than other methods that sense smoke or heat to detect fire or electrical discharges. This means that ignition and electrical discharges can be detected immediately after they occur to allow making a quick response in the event of emergencies such as fires.



High reliability

The UVTRON spectral response range is very narrow from 185 nm to 300 nm and insensitive to visible light. The nickel electrodes used in the UVTRON do not respond to the ultraviolet rays from sunlight.

■Spectral response

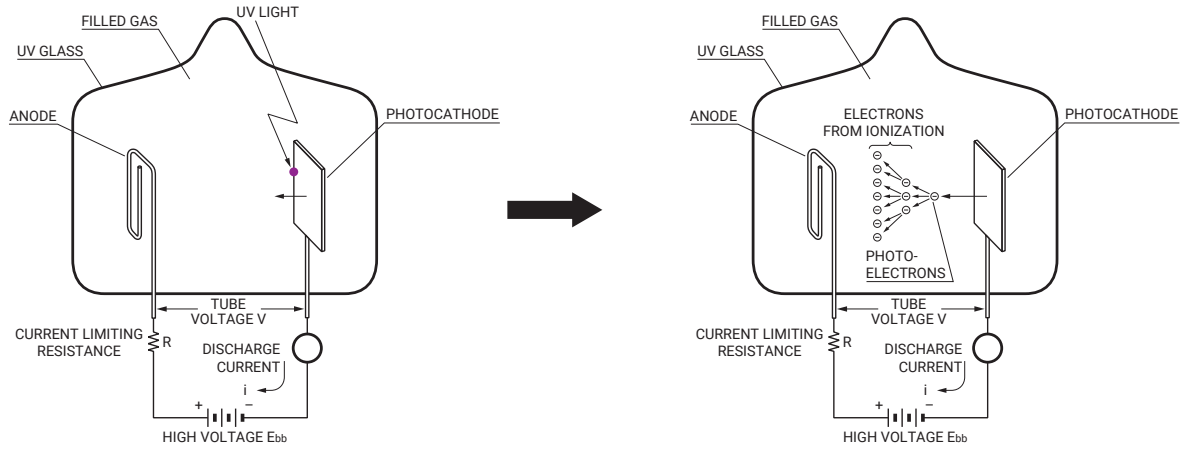


Small size and lightweight

The UVTRON is a small and lightweight sensor that can be easily installed in all types of compact equipment. Our product lineup allows you to choose the right UVTRON for your application and location.

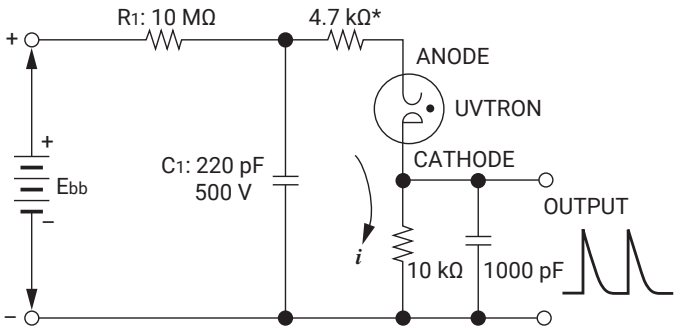
Structure and operating principle

The UVTRON is a gas-filled discharge tube that discharges when ultraviolet light is incident on it. The structure of a UVTRON is illustrated below along with a schematic diagram showing the operation. A voltage is applied across the anode and the photocathode which is sensitive only to ultraviolet light. When ultraviolet light enters the UVTRON through the UV-transmitting glass (UVTRON glass bulb) and strikes the cathode, photoelectrons (electrons) are emitted from the cathode surface due to the photoelectric effect. These photoelectrons are drawn toward the anode by the strong electric field while being accelerated to collide with gas molecules within the tube and ionize them. Among the electrons and positive ions produced by ionization, the electrons repeatedly collide with and ionize other gas molecules until they finally reach the anode. Meanwhile, the positive ions are accelerated toward the cathode and the resulting collisions with the cathode generate secondary electrons. As this process repeats, a large current suddenly flows between the anode and the cathode, creating an electric discharge. This phenomenon is called gas multiplication. The UVTRON amplifies the current by using gas multiplication and outputs it as a signal.



Recommended circuit

When ultraviolet light is incident on a UVTRON operated at a supply voltage higher than the discharge starting voltage (V_L), photoelectrons are generated and cause gas multiplication in the UVTRON. The tube of the UVTRON is full of electrons and ions once electric discharge has begun in the UVTRON, and the electric discharge will continue regardless of whether ultraviolet light is incident or not, unless the supply voltage is reduced below the discharge sustaining voltage (V_S). To prevent the continuous discharge, the UVTRON drive circuit must reduce the supply voltage by a process called “quenching.” A typical external quenching circuit is shown on the right. In this circuit, adjusting the C_1 and R_1 constants changes the quenching time (t_q) required for the anode potential to rise to the discharge starting voltage (V_L) again.



$$t_q = C_1 \cdot R_1 \cdot \ell n \frac{E_{bb}-V_S}{E_{bb}-V_L}$$

Note: When E_{bb} is at the recommend supply voltage,

$$\ell n \frac{E_{bb}-V_S}{E_{bb}-V_L} \fallingdotseq 0.5$$

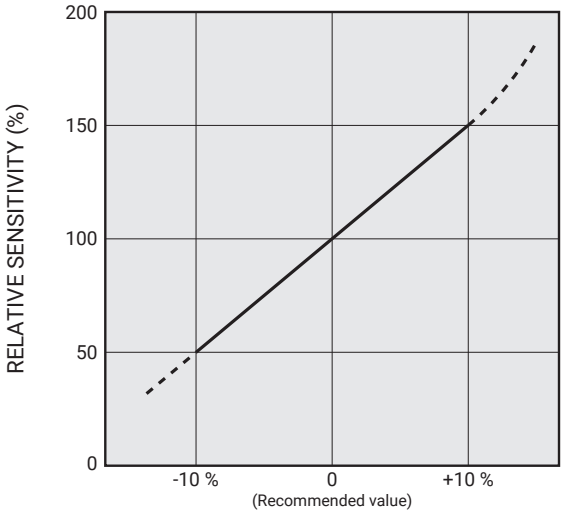
* To reduce the effect of lead wire’s stray capacitance, connect the 4.7 kΩ resistor within 25 mm of the tip of the UVTRON anode lead.

Supply voltage and sensitivity

The graph on the right shows the relation between the supply voltage and sensitivity in a typical UVTRON. The higher the supply voltage, the higher the sensitivity, but the background noise also increases at the same time. So the supply voltage should be set within the recommended range.

■Supply voltage and sensitivity

e.g.) R2868 at 200 nm (325 V supplied)



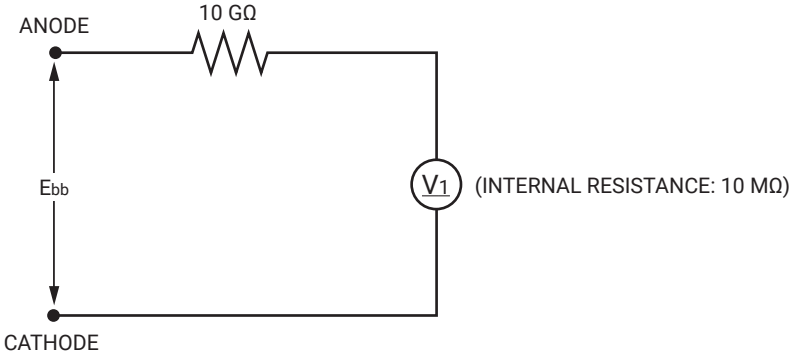
Supply voltage measurement method

The UVTRON drive circuit has high impedance so when a multimeter (voltmeter) is connected directly across the anode and cathode terminals, a voltage division occurs according to the drive circuit and multimeter internal impedance ratio that prevents accurate measurement.
In this case, placing a high resistance (10 GΩ) in series with the multimeter reduces the voltage drop inside the driver circuit, allowing accurate measurement. For example, when a multimeter with a typical internal resistance of 10 MΩ is used, the value displayed on the voltmeter is calculated as follows:

$$V_1 = E_{bb} \times \frac{10\ M\Omega}{10\ G\Omega + 10\ M\Omega}$$

The value displayed is about 1/1000 of the actual value. (For example, an actual value of 350 displayed as 350 mV.)
Note that the internal resistance of voltmeters may differ, so check the specification sheet of the voltmeter you are using. The UVTRON should be disconnected when measuring the supply voltage. (Measurement itself can still be made even if the UVTRON is connected, unless ultraviolet light is incident.)

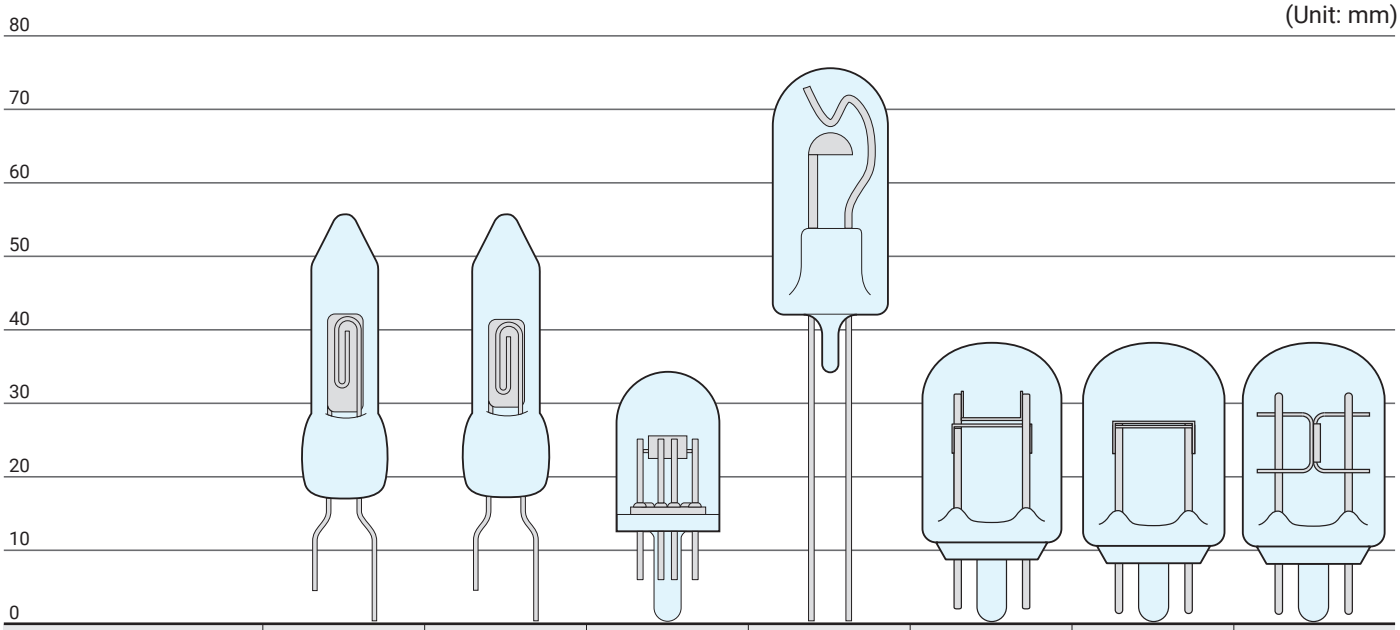
■Voltage measurement circuit with a high resistance inserted in series



UVTRON line-up

Quick reference

(Unit: mm)



Type No.		R2868	R9454	R9533	R244	R14388	R13192	R12257
Spectral response range (nm)		185 to 260	185 to 260	185 to 260	185 to 260	185 to 260	185 to 260	185 to 300
Sensitivity (min^{-1}) at 25 °C		5000	4000	10 000	480	10 000	15 000	1200
Supply voltage (V DC)		325 ± 25	400 ± 25	350 ± 25	500 ± 50	325 ± 25	325 ± 25	310 ± 25
Quenching time (ms)		2	2	1	3	2	2	1
Estimated life (h) at 25°C		25 000	25 000	25 000	25 000	25 000	25 000	10 000
[Maximum ratings] Operation ambient temperature (°C)		-40 / +125	-40 / +125	-40 / +125	-40 / +125	-40 / +125	-40 / +125	-40 / +125
Purpose	Arson surveillance	●	●					
	Indoor fire detection	●	●					
	Fire detection in large spaces					●	●	
	Fire detection for public transportation and facilities			●				
	Boiler combustion monitoring			●	●			●
	Hydrogen flame monitoring			●		●	●	
Reference		p.7	p.8	p.9	p.10	p.11	p.12	p.13

* See each product's page for detailed specifications.

R2868

Features

- Solar blind spectral response
- Side-on
- Small size

Applications

- Arson surveillance
- Fire detection in facilities, etc.

Specifications

Parameter			Description / Value	Unit
Electrode material			Ni	—
Spectral response range			185 to 260	nm
Recommended operating parameters	Supply voltage (DC)		325 ± 25	V
	Average discharge current		0.3	mA
	Quenching time Ⓐ	Min.	2	ms
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	280	V
	Discharge sustaining voltage (DC)	Typ.	240	V
	Sensitivity Ⓑ	Typ.	5000	min^{-1} Ⓖ
	Background Ⓒ	Max.	10	min^{-1} Ⓖ
	Estimated life Ⓓ		25 000	h
Maximum ratings	Supply voltage (DC)	Max.	400	V
	Average discharge current Ⓔ	Max.	1	mA
	Peak current Ⓕ	Max.	30	mA
	Operation ambient temperature	Max.	-40 / +125	°C
Weight			1.5	g
Suitable socket (Sold separately)			—	—
Suitable driver circuit (Sold separately)			C10807	—

Ⓐ When configuring the tube with an external quenching circuit, use circuit constants so that the quenching time becomes longer than these values listed. When using a pulse driven circuit using C-R, if the applied voltage is in the recommended range, the quenching time t_q can be calculated with the following formula. (Refer to the diagram of the recommended operating circuit.)

$t_q \fallingdotseq 0.5 \times C_1 \cdot R_1$

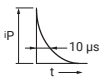
Ⓑ These are typical values for a wavelength of 200 nm and a light input of 10 pW/cm². Think of these values as relative sensitivity values. In actual use, the sensitivity will vary with the wavelength of the ultraviolet radiation and the drive circuitry employed.

Ⓒ Measured under room illuminations (approximately 500 lux) and recommended operating conditions. Note that these values may increase slightly when used outdoors due to external disturbance or the like.

Ⓓ The service life varies depending on the driver circuit and ambient temperature. These values are for when the UVTRON is used at normal discharge under recommended operating conditions. Since high ambient temperature reduces the service life, when high temperature is expected such as in a burner monitor application, consider taking cooling measures such as air-cooling. The UVTRON is covered by warranty for one year after delivery.

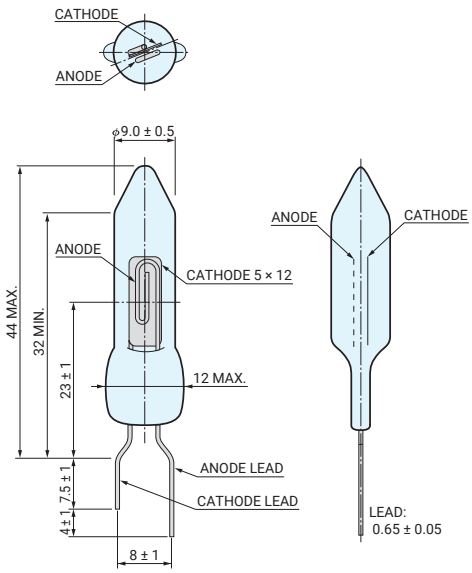
Ⓔ Even at these current values, the electrodes are not consumed immediately, but the service life is noticeably reduced. Use the tube within the recommended current values.

Ⓕ This is the maximum momentary current that can be handled if its full width at half maximum is less than 10 µs.



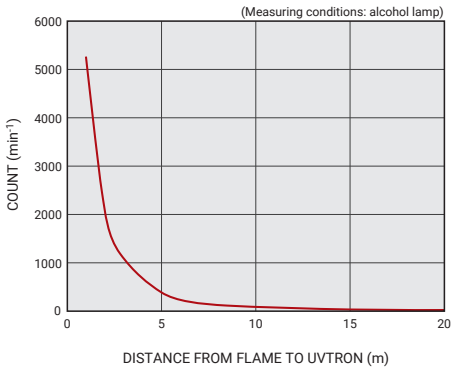
Ⓖ min^{-1} indicates a counts/min.

Dimensional outline (Unit: mm)

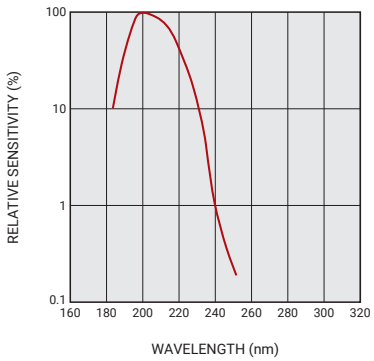


TPT A0056ED

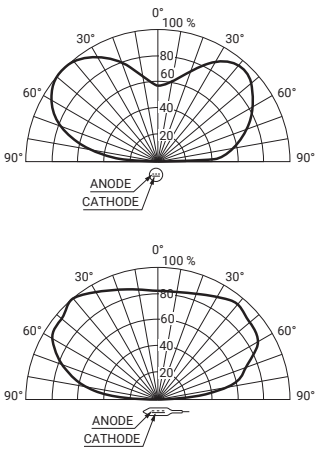
Sensitivity vs. distance (Typ.)



Spectral response (Typ.)



Angular sensitivity characteristics (Typ.)



TPT B0010EB

R9454

Features

- Solar blind spectral response
- Side-on
- Small size
- Improved impact resistance compared to R2868

Applications

- Arson surveillance
- Fire detection in facilities, etc.

Specifications

Parameter			Description / Value	Unit
Electrode material			Ni	—
Spectral response range			185 to 260	nm
Recommended operating parameters	Supply voltage (DC)		400 ± 25	V
	Average discharge current		0.3	mA
	Quenching time Ⓐ	Min.	2	ms
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	360	V
	Discharge sustaining voltage (DC)	Typ.	300	V
	Sensitivity Ⓑ	Typ.	4000	min^{-1} Ⓖ
	Background Ⓒ	Max.	10	min^{-1} Ⓖ
	Estimated life Ⓓ		25 000	h
Maximum ratings	Supply voltage (DC)	Max.	500	V
	Average discharge current Ⓔ	Max.	1	mA
	Peak current Ⓕ	Max.	30	mA
	Operation ambient temperature	Max.	-40 / +125	°C
Weight			1.5	g
Suitable socket (Sold separately)			—	—
Suitable driver circuit (Sold separately)			C10423	—

Ⓐ When configuring the tube with an external quenching circuit, use circuit constants so that the quenching time becomes longer than these values listed. When using a pulse driven circuit using C·R, if the applied voltage is in the recommended range, the quenching time t_q can be calculated with the following formula. (Refer to the diagram of the recommended operating circuit.)

$t_q \fallingdotseq 0.5 \times C_1 \cdot R_1$

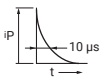
Ⓑ These are typical values for a wavelength of 200 nm and a light input of 10 pW/cm². Think of these values as relative sensitivity values. In actual use, the sensitivity will vary with the wavelength of the ultraviolet radiation and the drive circuitry employed.

Ⓒ Measured under room illuminations (approximately 500 lux) and recommended operating conditions. Note that these values may increase slightly when used outdoors due to external disturbance or the like.

Ⓓ The service life varies depending on the driver circuit and ambient temperature. These values are for when the UVTRON is used at normal discharge under recommended operating conditions. Since high ambient temperature reduces the service life, when high temperature is expected such as in a burner monitor application, consider taking cooling measures such as air-cooling. The UVTRON is covered by warranty for one year after delivery.

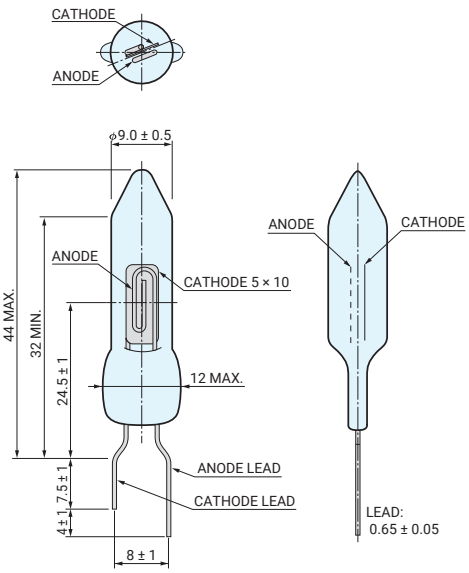
Ⓔ Even at these current values, the electrodes are not consumed immediately, but the service life is noticeably reduced. Use the tube within the recommended current values.

Ⓕ This is the maximum momentary current that can be handled if its full width at half maximum is less than 10 µs.



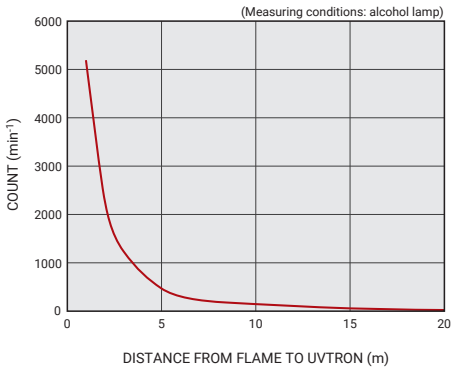
Ⓖ min^{-1} indicates a counts/min.

Dimensional outline (Unit: mm)

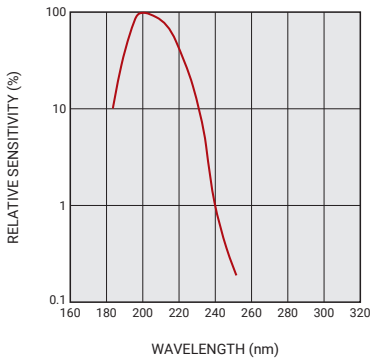


TPT A0036ED

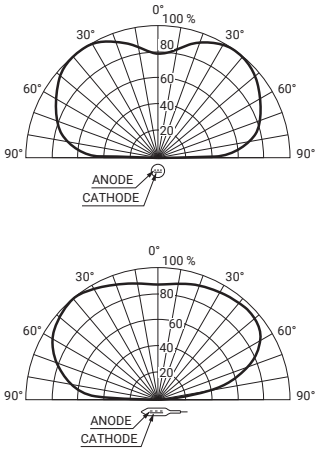
Sensitivity vs. distance (Typ.)



Spectral response (Typ.)



Angular sensitivity characteristics (Typ.)



TPT B0033EB

R9533

Features

- Solar blind spectral response
- Head-on
- Small size

Applications

- Boiler combustion monitoring
- Hydrogen flame monitoring
- Fire detection for public transportation and facilities

Specifications

Parameter			Description / Value	Unit
Electrode material			Ni	—
Spectral response range			185 to 260	nm
Recommended operating parameters	Supply voltage (DC)		350 ± 25	V
	Average discharge current		0.3	mA
	Quenching time Ⓐ	Min.	1	ms
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	280	V
	Discharge sustaining voltage (DC)	Typ.	230	V
	Sensitivity Ⓑ	Typ.	10 000	min^{-1} Ⓖ
	Background Ⓒ	Max.	10	min^{-1} Ⓖ
	Estimated life Ⓓ		25 000	h
Maximum ratings	Supply voltage (DC)	Max.	400	V
	Average discharge current Ⓔ	Max.	1	mA
	Peak current Ⓕ	Max.	30	mA
	Operation ambient temperature	Max.	-40 / +125	°C
Weight			2.5	g
Suitable socket (Sold separately)			E678-8F	—
Suitable driver circuit (Sold separately)			C10807	—

Ⓐ When configuring the tube with an external quenching circuit, use circuit constants so that the quenching time becomes longer than these values listed. When using a pulse driven circuit using C·R, if the applied voltage is in the recommended range, the quenching time t_q can be calculated with the following formula. (Refer to the diagram of the recommended operating circuit.)

$t_q \fallingdotseq 0.5 \times C_1 \cdot R_1$

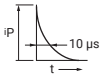
Ⓑ These are typical values for a wavelength of 200 nm and a light input of 10 pW/cm². Think of these values as relative sensitivity values. In actual use, the sensitivity will vary with the wavelength of the ultraviolet radiation and the drive circuitry employed.

Ⓒ Measured under room illuminations (approximately 500 lux) and recommended operating conditions. Note that these values may increase slightly when used outdoors due to external disturbance or the like.

Ⓓ The service life varies depending on the driver circuit and ambient temperature. These values are for when the UVTRON is used at normal discharge under recommended operating conditions. Since high ambient temperature reduces the service life, when high temperature is expected such as in a burner monitor application, consider taking cooling measures such as air-cooling. The UVTRON is covered by warranty for one year after delivery.

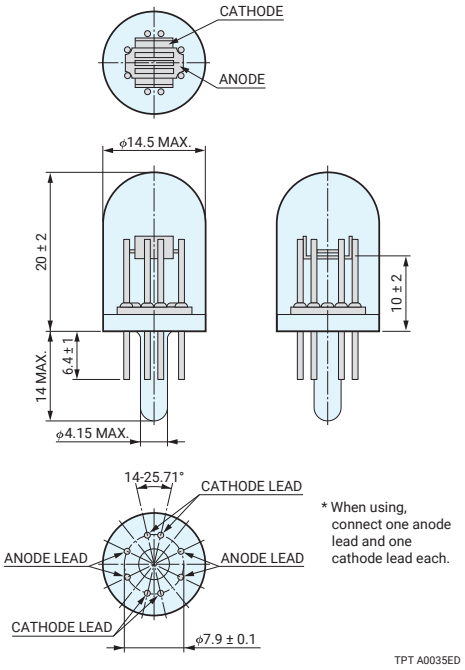
Ⓔ Even at these current values, the electrodes are not consumed immediately, but the service life is noticeably reduced. Use the tube within the recommended current values.

Ⓕ This is the maximum momentary current that can be handled if its full width at half maximum is less than 10 µs.



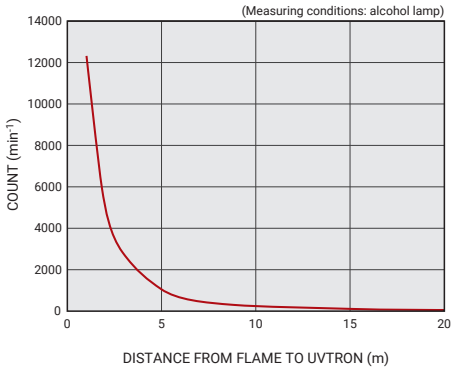
Ⓖ min^{-1} indicates a counts/min.

Dimensional outline (Unit: mm)

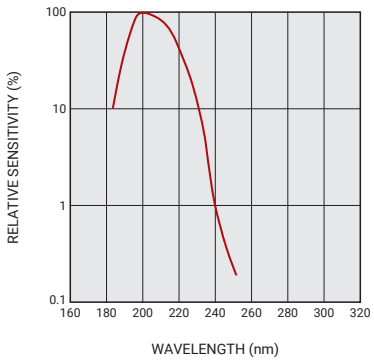


TPT A0035ED

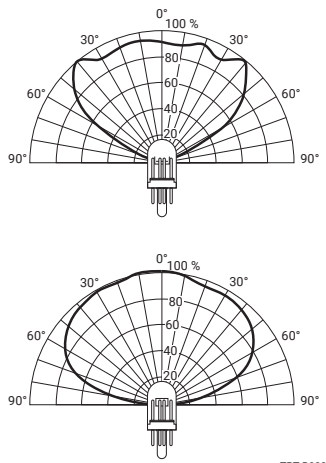
Sensitivity vs. distance (Typ.)



Spectral response (Typ.)



Angular sensitivity characteristics (Typ.)



TPT B0032EB

R244

Features

- Solar blind spectral response
- Head-on
- Flexible leads

Applications

- Boiler combustion monitoring

Specifications

Parameter			Description / Value	Unit
Electrode material			Ni	—
Spectral response range			185 to 260	nm
Recommended operating parameters	Supply voltage (DC)		500 ± 50	V
	Average discharge current		0.3	mA
	Quenching time Ⓐ	Min.	3	ms
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	440	V
	Discharge sustaining voltage (DC)	Typ.	330	V
	Sensitivity Ⓑ	Typ.	480	min^{-1} Ⓖ
	Background Ⓒ	Max.	5	min^{-1} Ⓖ
	Estimated life Ⓓ		25 000	h
Maximum ratings	Supply voltage (DC)	Max.	575	V
	Average discharge current Ⓔ	Max.	3	mA
	Peak current Ⓕ	Max.	50	mA
	Operation ambient temperature	Max.	-40 / +125	°C
Weight			2.7	g
Suitable socket (Sold separately)			—	—
Suitable driver circuit (Sold separately)			—	—

Ⓐ When configuring the tube with an external quenching circuit, use circuit constants so that the quenching time becomes longer than these values listed. When using a pulse driven circuit using C·R, if the applied voltage is in the recommended range, the quenching time t_q can be calculated with the following formula. (Refer to the diagram of the recommended operating circuit.)

$t_q \fallingdotseq 0.5 \times C_1 \cdot R_1$

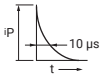
Ⓑ These are typical values for a wavelength of 200 nm and a light input of 10 pW/cm². Think of these values as relative sensitivity values. In actual use, the sensitivity will vary with the wavelength of the ultraviolet radiation and the drive circuitry employed.

Ⓒ Measured under room illuminations (approximately 500 lux) and recommended operating conditions. Note that these values may increase slightly when used outdoors due to external disturbance or the like.

Ⓓ The service life varies depending on the driver circuit and ambient temperature. These values are for when the UVTRON is used at normal discharge under recommended operating conditions. Since high ambient temperature reduces the service life, when high temperature is expected such as in a burner monitor application, consider taking cooling measures such as air-cooling. The UVTRON is covered by warranty for one year after delivery.

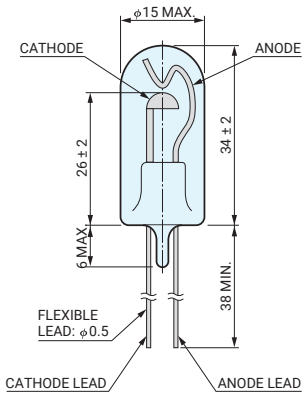
Ⓔ Even at these current values, the electrodes are not consumed immediately, but the service life is noticeably reduced. Use the tube within the recommended current values.

Ⓕ This is the maximum momentary current that can be handled if its full width at half maximum is less than 10 µs.



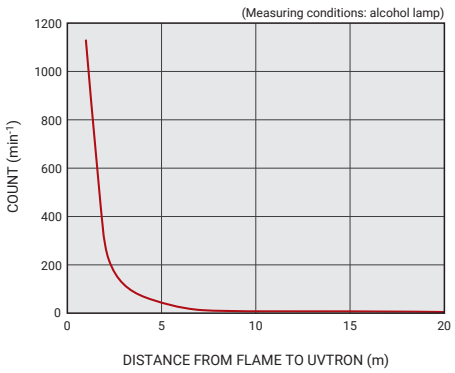
Ⓖ min^{-1} indicates a counts/min.

Dimensional outline (Unit: mm)

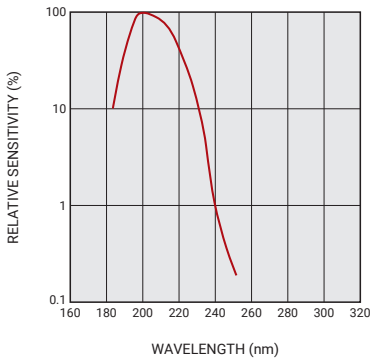


TPT A0038EB

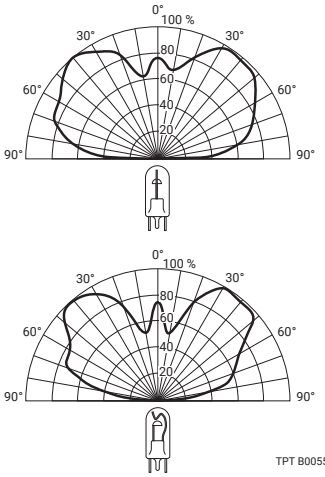
Sensitivity vs. distance (Typ.)



Spectral response (Typ.)

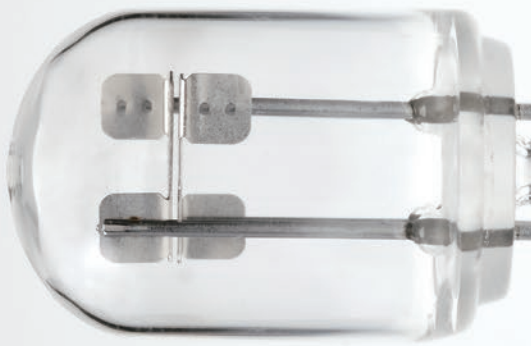


Angular sensitivity characteristics (Typ.)



TPT B0055EA

R14388



Features

- Solar blind spectral response
- Head-on
- High sensitivity

Applications

- Hydrogen flame monitoring
- Fire detection in large complexes

Specifications

Parameter			Description / Value	Unit
Electrode material			Ni	—
Spectral response range			185 to 260	nm
Recommended operating parameters	Supply voltage (DC)		325 ± 25	V
	Average discharge current		0.3	mA
	Quenching time Ⓐ	Min.	2	ms
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	260	V
	Discharge sustaining voltage (DC)	Typ.	185	V
	Sensitivity Ⓑ	Typ.	10 000	min^{-1} Ⓖ
	Background Ⓒ	Max.	5	min^{-1} Ⓖ
	Estimated life Ⓓ		25 000	h
Maximum ratings	Supply voltage (DC)	Max.	420	V
	Average discharge current Ⓔ	Max.	3	mA
	Peak current Ⓕ	Max.	50	mA
	Operation ambient temperature	Max.	-40 / +125	°C
Weight			5.3	g
Suitable socket (Sold separately)			E678-9C	—
Suitable driver circuit (Sold separately)			C10807	—

Ⓐ When configuring the tube with an external quenching circuit, use circuit constants so that the quenching time becomes longer than these values listed. When using a pulse driven circuit using C·R, if the applied voltage is in the recommended range, the quenching time t_q can be calculated with the following formula. (Refer to the diagram of the recommended operating circuit.)

$t_q \fallingdotseq 0.5 \times C_1 \cdot R_1$

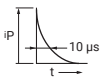
Ⓑ These are typical values for a wavelength of 200 nm and a light input of 10 pW/cm^2. Think of these values as relative sensitivity values. In actual use, the sensitivity will vary with the wavelength of the ultraviolet radiation and the drive circuitry employed.

Ⓒ Measured under room illuminations (approximately 500 lux) and recommended operating conditions. Note that these values may increase slightly when used outdoors due to external disturbance or the like.

Ⓓ The service life varies depending on the driver circuit and ambient temperature. These values are for when the UVTRON is used at normal discharge under recommended operating conditions. Since high ambient temperature reduces the service life, when high temperature is expected such as in a burner monitor application, consider taking cooling measures such as air-cooling. The UVTRON is covered by warranty for one year after delivery.

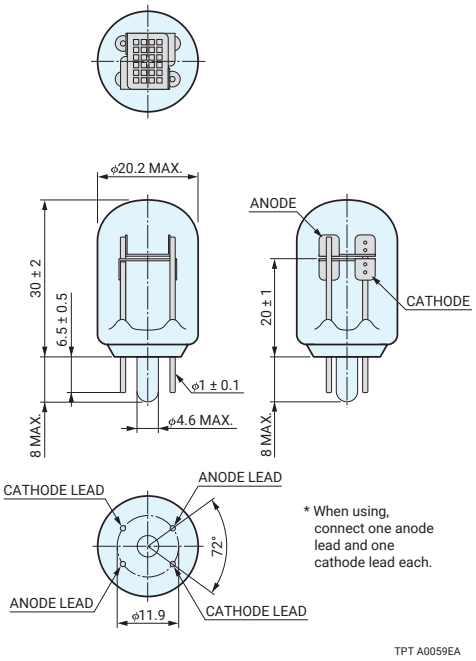
Ⓔ Even at these current values, the electrodes are not consumed immediately, but the service life is noticeably reduced. Use the tube within the recommended current values.

Ⓕ This is the maximum momentary current that can be handled if its full width at half maximum is less than 10 µs.



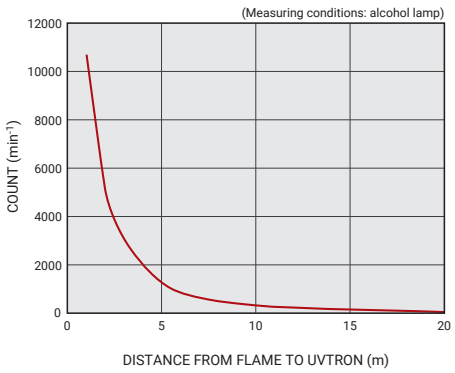
Ⓖ min^{-1} indicates a counts/min.

Dimensional outline (Unit: mm)

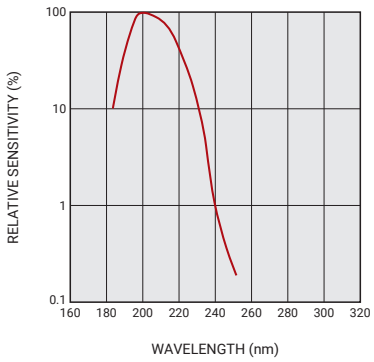


TPT A0059EA

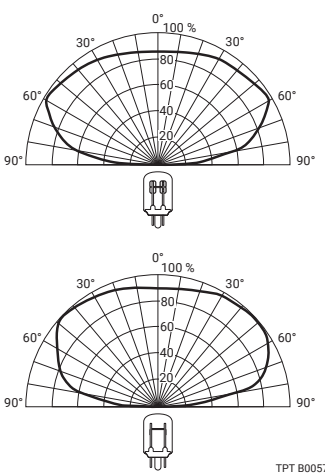
Sensitivity vs. distance (Typ.)



Spectral response (Typ.)

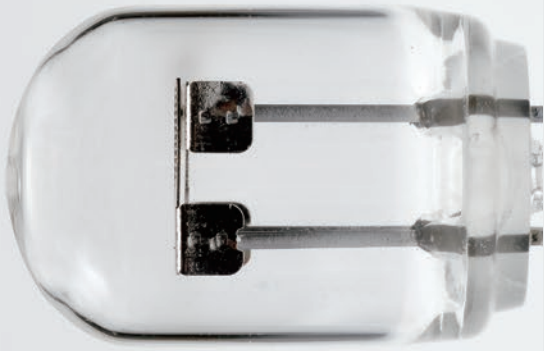


Angular sensitivity characteristics (Typ.)



TPT B0057EA

R13192



Features

- Solar blind spectral response
- Head-on
- High sensitivity

Applications

- Hydrogen flame monitoring
- Fire detection in large complexes

Specifications

Parameter			Description / Value	Unit
Electrode material			Ni	—
Spectral response range			185 to 260	nm
Recommended operating parameters	Supply voltage (DC)		325 ± 25	V
	Average discharge current		0.3	mA
	Quenching time Ⓐ	Min.	2	ms
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	260	V
	Discharge sustaining voltage (DC)	Typ.	185	V
	Sensitivity Ⓑ	Typ.	15 000	min^{-1} Ⓖ
	Background Ⓒ	Max.	5	min^{-1} Ⓖ
	Estimated life Ⓓ		25 000	h
Maximum ratings	Supply voltage (DC)	Max.	420	V
	Average discharge current Ⓔ	Max.	3	mA
	Peak current Ⓕ	Max.	50	mA
	Operation ambient temperature	Max.	-40 / +125	°C
Weight			5.25	g
Suitable socket (Sold separately)			E678-9C	—
Suitable driver circuit (Sold separately)			C10807	—

Ⓐ When configuring the tube with an external quenching circuit, use circuit constants so that the quenching time becomes longer than these values listed. When using a pulse driven circuit using C·R, if the applied voltage is in the recommended range, the quenching time t_q can be calculated with the following formula. (Refer to the diagram of the recommended operating circuit.)

$t_q \fallingdotseq 0.5 \times C_1 \cdot R_1$

Ⓑ These are typical values for a wavelength of 200 nm and a light input of 10 pW/cm². Think of these values as relative sensitivity values. In actual use, the sensitivity will vary with the wavelength of the ultraviolet radiation and the drive circuitry employed.

Ⓒ Measured under room illuminations (approximately 500 lux) and recommended operating conditions. Note that these values may increase slightly when used outdoors due to external disturbance or the like.

Ⓓ The service life varies depending on the driver circuit and ambient temperature. These values are for when the UVTRON is used at normal discharge under recommended operating conditions. Since high ambient temperature reduces the service life, when high temperature is expected such as in a burner monitor application, consider taking cooling measures such as air-cooling. The UVTRON is covered by warranty for one year after delivery.

Ⓔ Even at these current values, the electrodes are not consumed immediately, but the service life is noticeably reduced. Use the tube within the recommended current values.

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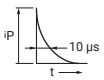
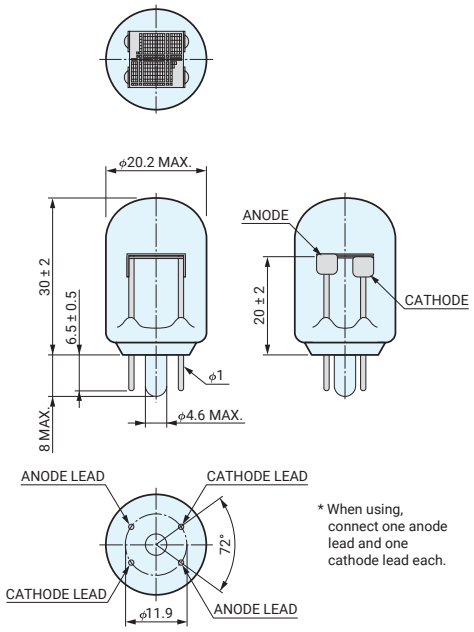


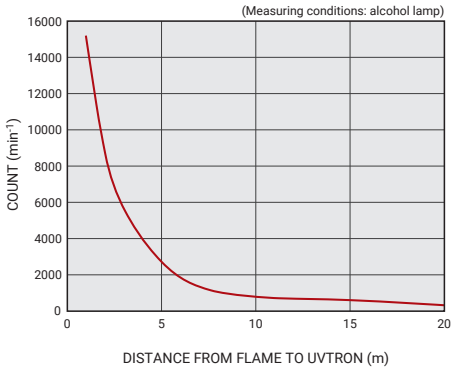
Ⓖ min^{-1} indicates a counts/min.

Dimensional outline (Unit: mm)

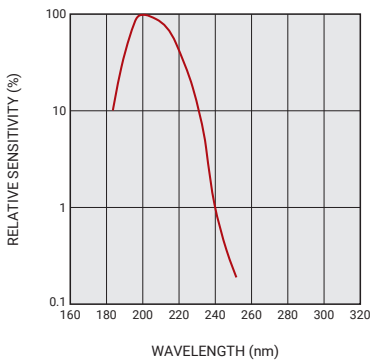


TPT A0055EB

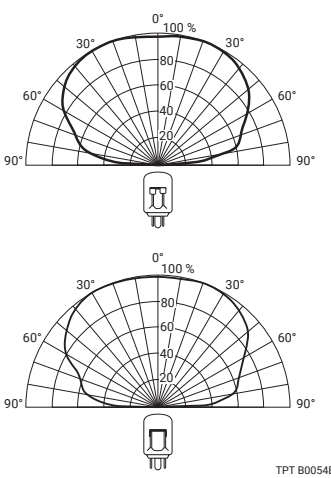
Sensitivity vs. distance (Typ.)



Spectral response (Typ.)

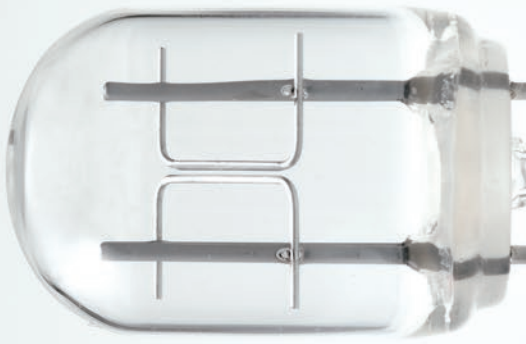


Angular sensitivity characteristics (Typ.)



TPT B0054EA

R12257



Features

- Head-on / Side-on
- Mo (molybdenum) electrode

Applications

- Boiler combustion monitoring

Specifications

Parameter			Description / Value	Unit
Electrode material			Mo	—
Spectral response range			185 to 300	nm
Recommended operating parameters	Supply voltage (DC)		310 ± 25	V
	Average discharge current		2	mA
	Quenching time Ⓐ	Min.	1	ms
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	240	V
	Discharge sustaining voltage (DC)	Typ.	170	V
	Sensitivity Ⓑ	Typ.	1200	min^{-1} Ⓖ
	Background Ⓒ	Max.	10	min^{-1} Ⓖ
	Estimated life Ⓓ		10 000	h
Maximum ratings	Supply voltage (DC)	Max.	425	V
	Average discharge current Ⓔ	Max.	10	mA
	Peak current Ⓕ	Max.	200	mA
	Operation ambient temperature	Max.	-40 / +125	°C
Weight			5	g
Suitable socket (Sold separately)			E678-9C	—
Suitable driver circuit (Sold separately)			C10807	—

Ⓐ When configuring the tube with an external quenching circuit, use circuit constants so that the quenching time becomes longer than these values listed. When using a pulse driven circuit using C-R, if the applied voltage is in the recommended range, the quenching time t_q can be calculated with the following formula. (Refer to the diagram of the recommended operating circuit.)

$t_q \fallingdotseq 0.5 \times C_1 \cdot R_1$

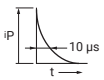
Ⓑ These are typical values for a wavelength of 200 nm and a light input of 10 pW/cm^2. Think of these values as relative sensitivity values. In actual use, the sensitivity will vary with the wavelength of the ultraviolet radiation and the drive circuitry employed.

Ⓒ Measured under room illuminations (approximately 500 lux) and recommended operating conditions. Note that these values may increase slightly when used outdoors due to external disturbance or the like.

Ⓓ The service life varies depending on the driver circuit and ambient temperature. These values are for when the UVTRON is used at normal discharge under recommended operating conditions. Since high ambient temperature reduces the service life, when high temperature is expected such as in a burner monitor application, consider taking cooling measures such as air-cooling. The UVTRON is covered by warranty for one year after delivery.

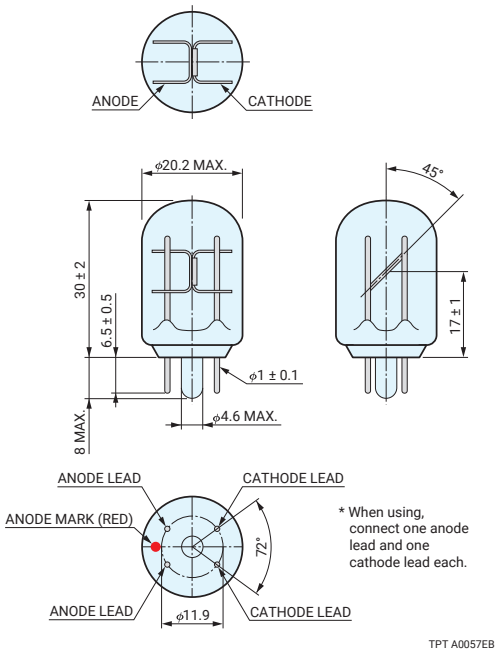
Ⓔ Even at these current values, the electrodes are not consumed immediately, but the service life is noticeably reduced. Use the tube within the recommended current values.

Ⓕ This is the maximum momentary current that can be handled if its full width at half maximum is less than 10 µs.



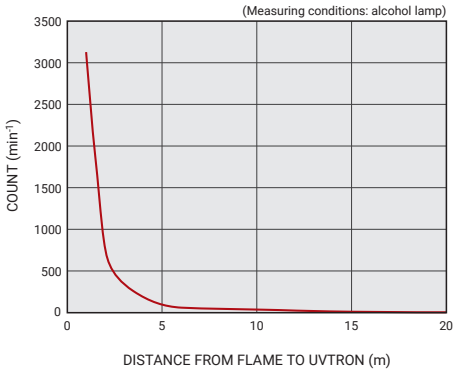
Ⓖ min^{-1} indicates a counts/min.

Dimensional outline (Unit: mm)

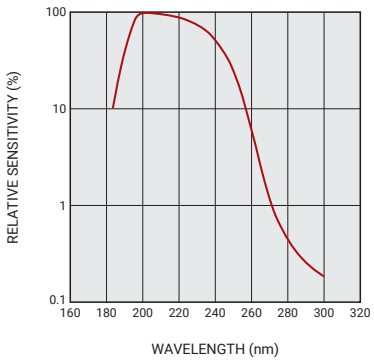


TPT A0057EB

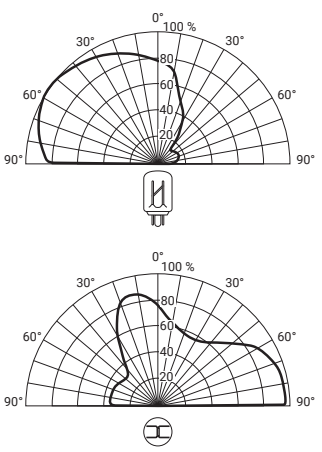
Sensitivity vs. distance (Typ.)



Spectral response (Typ.)



Angular sensitivity characteristics (Typ.)



TPT B0056EA

Related products

Driver circuits for UVTRON

C10807, C10423

The C10807 and C10423 are compact high-voltage power supplies with a signal processing circuit for driving a UVTRON.
Operation starts by connecting a UVTRON and applying a low voltage. Since the signal processing circuit cancels out the UVTRON's sporadic background noise (caused by cosmic rays or unexpected ultraviolet light, etc.), and minimize false detection. Therefore the signal output can be used without any additional processing.

Parameter			Description / Value		Unit
Type No.			C10807	C10423	—
UVTRON supply voltage (DC) ①			350	400	V
Signal output			Open collector output		—
	Output voltage	Max.	50		V
	Output current	Max.	80		mA
	Output pulse time width ②		10		ms
Quenching time			Approx. 25		ms
Supply voltage (DC)			+12 to +24		V
Current consumption			4		mA
Operating temperature range		Max.	-10 / +50		°C
Operating humidity range			Below 80 % (no condensation)		—
Storage temperature range		Max.	-10 / +50		°C
Dimensions (W × H × D)			50 × 12 × 36		mm

NOTE: ①Since the power impedance of the power supply is very high, the supply voltage cannot be measured with an ordinary voltmeter.
A measuring instrument with a 10 GΩ or higher input impedance is necessary to measure high voltage. (See p.5)
②The output pulse width can be extended up to about 10 s by adding a capacitor to the circuit board.

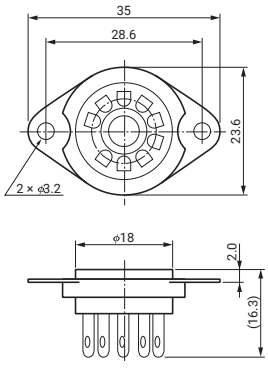
Sockets for UVTRON

E678-9C, E678-8F

Unit: mm

▲(Left) E678-9C, (Right) E678-8F

E678-9C



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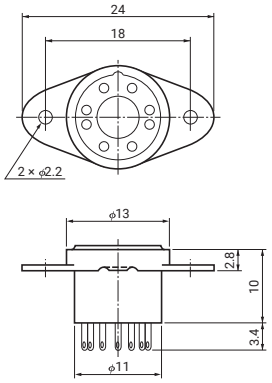
E678-8F



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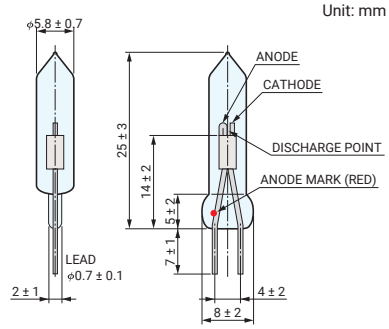
Checker lamp

L9657-03

The L9657-03 is a lamp designed to check UVTRON operation. It emits a spectrum optimized for checking UVTRON operation and can be assembled along with a UVTRON into equipment. Checking UVTRON operation helps improve the reliability of security equipment that incorporates the UVTRON.

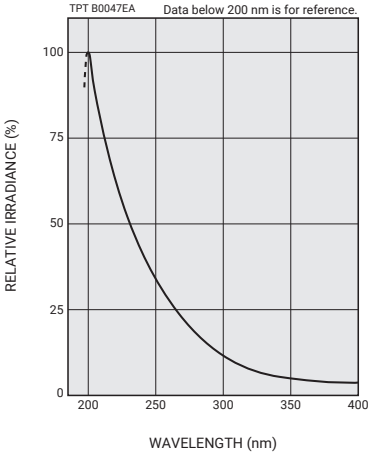
Unit: mm



Parameter			Description / Value	Unit
Spectral distribution			185 to 400	nm
Weight			0.7	g
Maximum ratings	Supply voltage (DC)		600	V
	Peak current ①		200	μA
	Operating temperature range	Max.	-40 / +125	°C
	Storage temperature range	Max.	-20 / +60	°C
Recommended operating conditions and characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	260	V
	Recommended supply voltage (DC)		300	V
	Recommended discharge current		150	μA
	Guaranteed life ②		1000	h

NOTE: ①Operating at a current higher than this value may drastically shorten the operating life.
②Life end is defined as the time that the radiant intensity falls to 50 % of its initial value.
* Use in a dark environment may cause an operation delay longer than 0.5 s after a lamp-on command signal is received.

Spectral distribution



Driver circuit for checker lamp

C13428

The C13428 is a driver circuit for the L9657 series checker lamps. Supplying a voltage (5.5 V to 12 V DC) to this driver circuit allows the checker lamp to operate and illuminate (light up) at a constant current of 150 μA. The LED on this driver circuit momentarily lights up to help the checker lamp start lighting up. The LED turns off once the checker lamp is lit.

Parameter		Description / Value	Unit
Supply voltage		+5.5 to +12	V
Current consumption		40	mA
Operating temperature range		-10 / +50	°C
Operating humidity range		Below 80 % (no condensation)	—
Storage temperature range	Max.	-10 / +50	°C
Lamp current	Max.	150 (Can be adjusted by the trimmer)	μA
Lamp not lit		LED lighting	—
Lamp lit		LED extinction	—
Dimensions (W × H × D)		45 × 6.5 × 33	mm

■PRECAUTIONS

●Background (BG)

When a voltage is applied to a UVTRON, electric discharge may sporadically occur in the UVTRON even if no ultraviolet is incident on it. This phenomenon is called background. Major causes of background are:

①Radiation such as cosmic rays

②Static electricity

To prevent false operation caused by background, a correctly designed signal processing circuit is required. Please contact our sales office for further details.

●Ultraviolet light sources in living environment

The UVTRON might not operate correctly when exposed to extraneous ultraviolet light. There are many different sources of ultraviolet light sources even in everyday life. The following are some examples of sources that emit ultraviolet light.

①Sparks from arc welding (These emit high-intensity ultraviolet light.)

②Electric sparks such as from train pantographs (train overhead line power collector) and motors

③Sterilization lamps (low-pressure mercury lamps, etc.)

④Halogen lamps (display spotlights, etc.)

⑤High color rendering lamps such as xenon lamps and metal halide lamps

⑥UVTRON installed within a 5-meter distance (When UVTRON detects ultraviolet light and initiates discharge, it also emits ultraviolet light.)

CAUTION: Since the UVTRON has very high sensitivity, it can detect even weak ultraviolet light leaking from unexpected sources. Be sure to first deal with any stray UV light in the surrounding environment when installing the UVTRON.

●Humidity

Humidity around the UVTRON leads may cause current leakage and voltage drops in the anode that could stop the UVTRON from operating. Dirt or dust deposits around the leads are especially likely to absorb moisture, so keep the area around the leads clean. When used in locations with high humidity (above 80 % RH), apply a moisture-proofing agent to the UVTRON connection points.

●Dirt on the window

Contamination or dirt on the UVTRON (light input) window (glass bulb) reduces ultraviolet transmittance and causes the sensitivity to drop. When handling a UVTRON, wear clean gloves to keep stains such as from oils on your fingers and hands away from the window. After installing the UVTRON into a unit, periodically clean the light input window with gauze moistened with alcohol.

●Soldering

Heating the leads excessively during soldering may cause the glass bulb to crack or the electrodes to deteriorate, leading to faulty operation so be extra careful when soldering. For UVTRON with hard pins, it is recommended to use a dedicated socket available from Hamamatsu. When soldering a UVTRON directly on a printed circuit board, use a pair of tweezers or similar tools to grip the root of the leads to prevent heat from conducting to the leads, and then solder at a soldering iron temperature of 350 °C or less within 5 seconds. Avoid using a solder tank. When finished soldering, be sure to completely wipe away the soldering flux with alcohol, etc.

●Vibration and mechanical shock

All UVTRON and driver circuits have passed the shock and vibration tests shown in the table below. However, if exposed to excessive physical shocks such as from dropping, the glass bulb may crack or internal electrodes may deform causing poor electrical characteristics. So please use plenty of care and caution when handling them. Also, cutting the lead wires with nippers or other ways may subject the internal electrodes to mechanical stress or vibrations much higher than the test conditions in the following table. This may seriously degrade the electrical characteristics the same as if the bulb was dropped. To safely cut the leads without applying excessive mechanical stress to the internal leads, cut the lead with the nipper cutting tips facing perpendicular to the lead or instead of trying to cut the lead all at once, sever the lead slowly by making 2 or 3 cuts.

		Vibration test (sine wave) IEC 60068-2-6	Shock test IEC 60068-2-27
UVTRON	R9454, R9533	3.0 mm peak to peak, 200 m/s^2, 10 Hz to 2000 Hz	10 000 m/s^2, 1 ms
	Others	1.5 mm peak to peak, 100 m/s^2, 10 Hz to 500 Hz	1000 m/s^2, 11 ms
Driving circuit		0.7 mm peak to peak, 10 Hz to 55 Hz	1000 m/s^2, 11 ms

●Polarity

The UVTRON has an anode and a cathode so be sure to connect them at the correct polarity. Mistakenly reversing the connection polarity may cause faulty operation or other problems.

●Lead wires

The UVTRON leads can easily break off at the roots (portion where lead seals to the glass). When bending the leads, grip by the root of the lead with a pair of long-nose pliers or similar tool and just bend the tip portion of that lead. The leads can be bent, and then bent back only once, so bend it correctly the first time.

●Voltage

The optimum supply voltage range is specified for each type of UVTRON. Be sure to operate the UVTRON within the rated voltage range after first referring to the specifications. Operating it at a supply voltage outside the rated range may cause malfunctions or faulty operation.

■Warranty period and scope

The UVTRON is covered by warranty for a period of 1 year after delivery. If defects traceable to poor workmanship or material occur in this period, Hamamatsu will repair or replace the defective product free of charge. The warranty is limited to repair or replacement of defective products.

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