HAMAMATSU

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UVTRON®

Flame / Discharge Sensors

UVTRON® Flame / Discharge Sensors

UVTRON® is a sensor sensitive only to UV light with wavelengths of 185 nm to 260 nm*1.
Featuring high sensitivity and quick response, UVTRON® is ideal for detecting flame and electrical discharge.

*1: For nickel (Ni) electrodes

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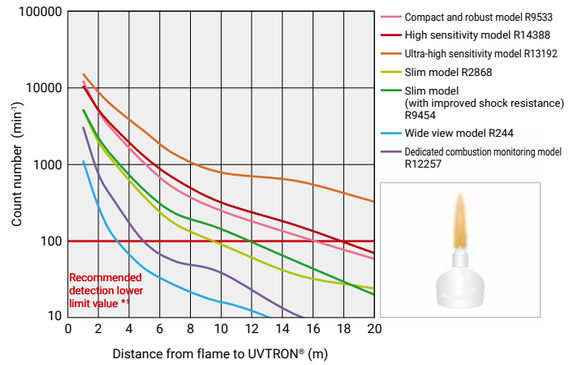
Features

High sensitivity and long-range detection

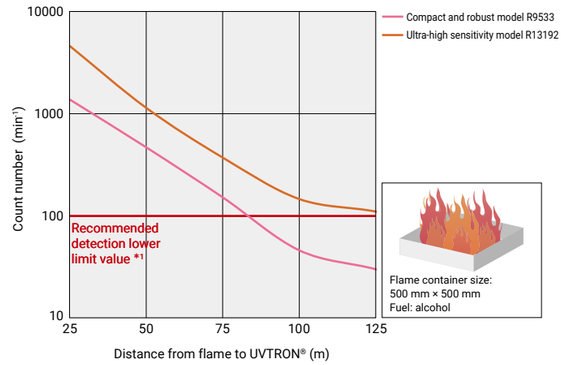
Accurately detects faint UV light from flame and electrical discharge. When detecting alcohol flame in a container of size 500 x 500 mm using the compact and robust model R9533, accurate detection is possible even from a location approximately 80 meters from the target. Furthermore, when using the ultra-high sensitivity model R13192, accurate detection is possible from a distance of approximately 125 meters, providing support for long-range detection while allowing a greater degree of freedom for where the sensor can be setup.

■ Range characteristics (Typ.)

・Alcohol burner



・Container size: 500 x 500 mm alcohol flame



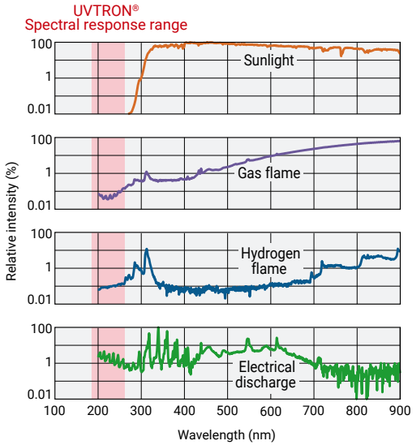
*1: Detection is possible below the recommended detection lower limit value. However, it may be difficult to distinguish between background noise and the signal output of UV light from the detection target.

Solar blind characteristics

Since UVTRON® has a spectral response range of 185 nm to 260 nm*1, it is sensitive to UV light from gas flame, hydrogen flame and electrical discharge but not sensitive to UV light from the sun. Therefore, it can accurately detect UV light from flame and electrical discharge without concern for sunlight because there is no need to use an optical cut filter.

*1: For nickel (Ni) electrodes

■ Spectral distribution (our measured values)



Quick response

The sensor can immediately detect UV light released from flame and electrical discharge in less than a few milliseconds. Therefore, the sensor can be used to instantly discover flame immediately following the outbreak of a fire and abnormal electrical discharge after it occurs, a task that is difficult for thermal and smoke detectors to do. This contributes to a high-level of safety control and a fast post-incident response time.

Compact and lightweight

The sensor is compact and lightweight to enable unrestricted design, which contributes to more compact and higher performance devices.

Application examples

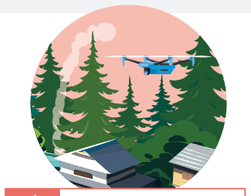
A UV light ON-OFF sensor that contributes to a wide range of applications for detecting and monitoring flame and electrical discharge

UVTRON® can instantly and accurately detect flame, monitor combustion, and detect electrical discharge.
It is being used in more areas than ever before because of its high performance.

Flame detection
Used in places where flames are not usually present. Detects flame immediately following the outbreak of a fire.

Combustion monitoring
Constant monitoring of flames. Detects abnormalities such as when a flame dies out.

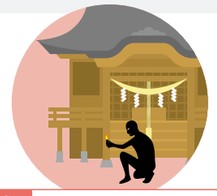
Electrical discharge detection
Used mainly near electrical contacts. Detects abnormal electrical discharge after it occurs.



1 Detect forest fires

3 Detects fires in large-scale facilities such as shopping malls

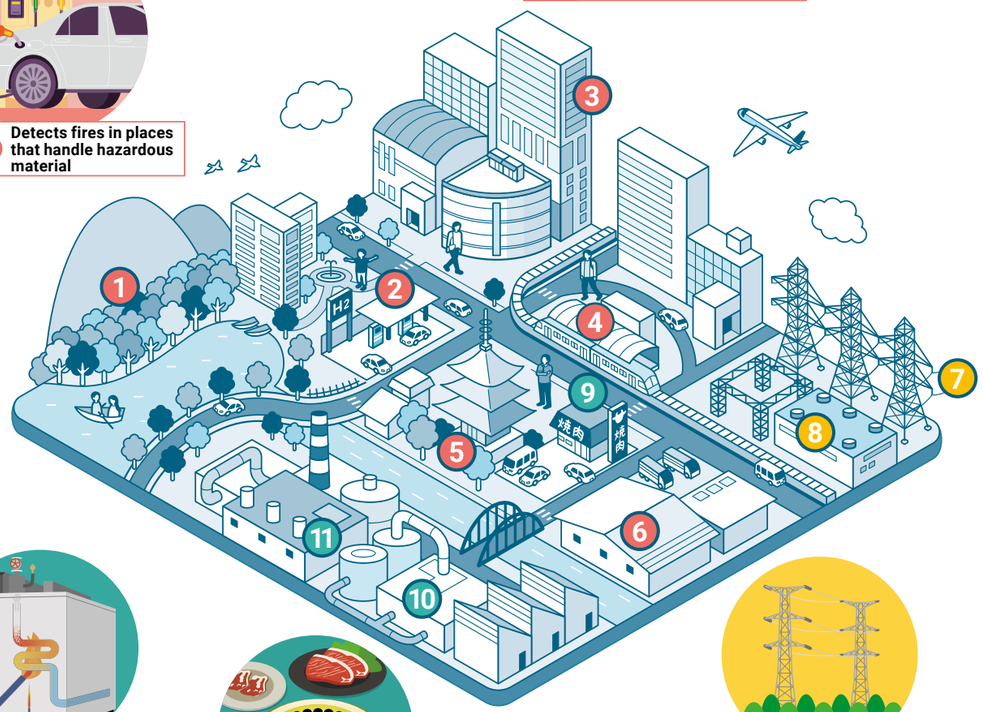
4 Detects fires on transport vehicles such as airplanes and trains



5 Detects arson in places such as cultural assets

6 Detects fires in large-scale warehouses

2 Detects fires in places that handle hazardous material



11 Monitors industrial boilers

10 Monitors industrial hydrogen boilers

9 Monitors combustion at meat grilling equipment

7 Detects electrical discharge at power lines on transmission towers

8 Detects electrical discharge at transformers and distribution boards in power plants

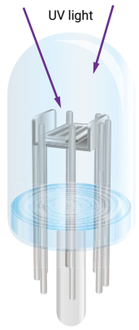
Product lineup

Item			Compact and robust model	High sensitivity model	Ultra-high sensitivity model	Slim model	Slim model (with improved shock resistance)	Wide view model	Dedicated combustion monitoring model
			R9533	R14388	R13192	R2868	R9454	R244	R12257
Sensor shape			Head-on type	Head-on type	Head-on type	Side-on type	Side-on type	Head-on type	Head-on type and Side-on type
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 *1
Characteristics (at 25 °C)	Sensitivity *2 (min^{-1})	Typ.	10000	10000	15000	5000	4000	480	1200
	Expected life (h)		25000	25000	25000	25000	25000	25000	10000
Recommended operating conditions	Input voltage (VDC)		350 ±25	325 ±25	325 ±25	325 ±25	400 ±25	500 ±50	310 ±25
	Quenching time (ms)	Min.	1	2	2	2	2	3	1
Operating temperature range (°C)			-40 to +125	-40 to +125	-40 to +125	-40 to +125	-40 to +125	-40 to +125	-40 to +125
Application *3	Long-range detection 1 3 5 6 7		★★	★★	★★★	★	★		(Not recommended)
	Short-range detection 2 8		★★★	★	★	★★	★★	★	(Not recommended)
	Detection on transport vehicles 4		★	(Not recommended)	(Not recommended)	(Not recommended)		(Not recommended)	(Not recommended)
	Combustion monitoring 9 10 11		★	★	★	★	★	★	★★★
	Hydrogen flame monitoring 10		★★	★★	★★	★	★		★
Product information page			P06	P08	P10	P12	P14	P16	P18

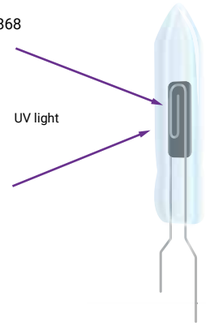
*1: Spectral response range is up to 300 nm because the electrode is made from molybdenum (Mo). Has no solar blind characteristics.
*2: min^{-1} indicates counts/min.
*3: The number of stars "★" represents the recommended level for each application.

■ Sensor shape

Head-on type
Example: R9533



Side-on type
Example: R2868

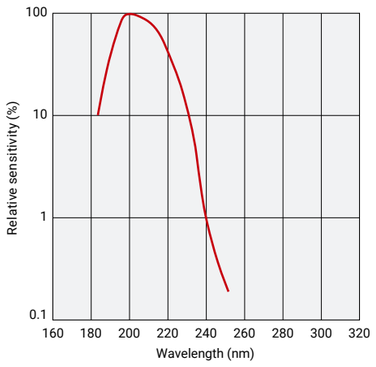


Compact and robust model

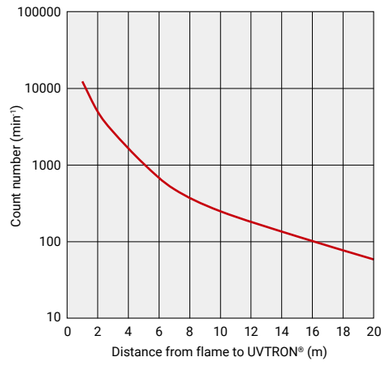
R9533

Characteristics

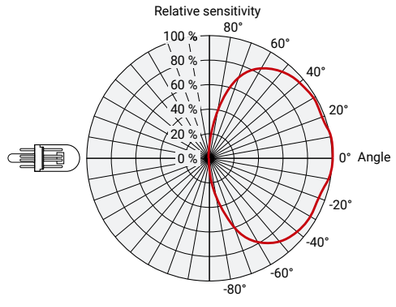
■ Spectral response characteristics (Typ.)

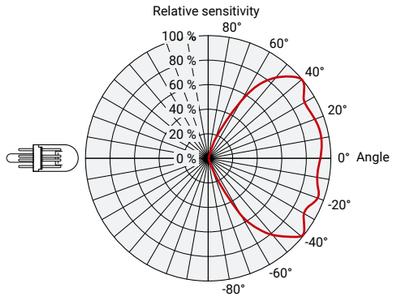


■ Range characteristics (Typ.)



■ View characteristics (Typ.)



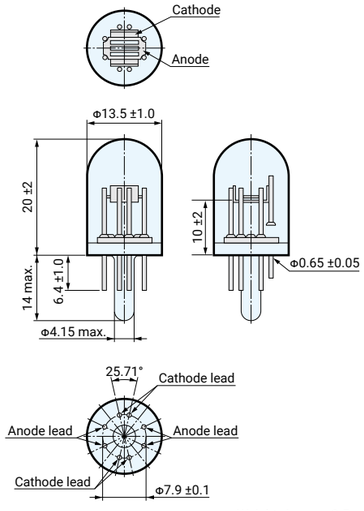


Specifications

Item			Description / Value	Unit
Sensor shape			Head-on type	–
Window material			UV transmitting glass	–
Electrode material			Nickel (Ni)	–
Spectral response range			185 to 260	nm
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	280	V
	Discharge sustaining voltage (DC)	Typ.	230	V
	Sensitivity *1	Typ.	10000	min⁻¹ *10
	Background noise *2	Max.	10	min⁻¹ *10
	Expected life *3		25000	h
Recommended operating conditions	Input voltage (DC)		350 ±25	V
	Average discharge current		0.3	mA
	Quenching time *4	Min.	1	ms
Absolute maximum rating	Input voltage (DC)		400	V
	Average discharge current *5		1	mA
	Peak current *6		30	mA
Operating temperature range			-40 °C to +125 °C	–
Applicable standards	Environmental standard (RoHS)		EN 63000	–
Shock resistance characteristics *7			10000	m/s²
Weight			Approx. 2.5	g
Socket (sold separately) *8			E678-8F	–
Driver circuit (sold separately) *9			C10807	–

*1: Value was measured at wavelength 200 nm and intensity of light 10 pW/cm².
*2: Value was measured at recommended operating conditions under indoor lighting (approx. 500 lx).
*3: Value for sustained electrical discharge at recommended operating conditions.
*4: When building an external CR quenching circuit, set the circuit constants so that the quenching time exceeds this value.
*5: If the sensor is used at this value, it will considerably reduce the life of the sensor. Therefore, use the sensor at the recommended operating conditions.
*6: This is the peak value of pulse current that can instantaneously flow. This is for when the half-value width of the peak value is 10 µs or less.
*7: Value was measured at an action time of 1 ms using the IEC 60068-2-27 shock test method.
*8: Refer to page 20 for information about the socket.
*9: Refer to page 21 for information about the driver circuit.
*10: min⁻¹ indicates counts/min.

Dimensional outline (Unit: mm)



Weight: Approx. 2.5 g

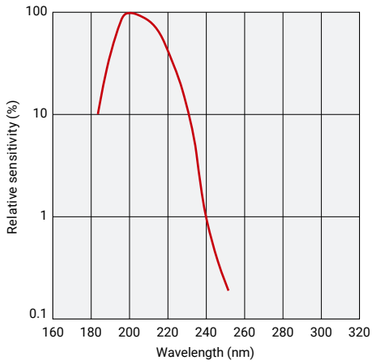
NOTE: Connect each anode lead and cathode lead when using the sensor.

High sensitivity model

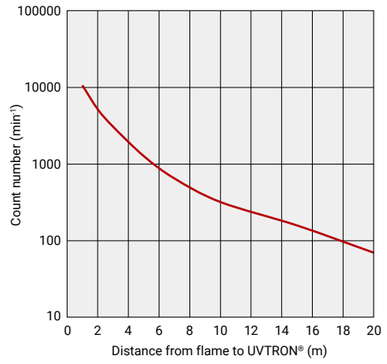
R14388

Characteristics

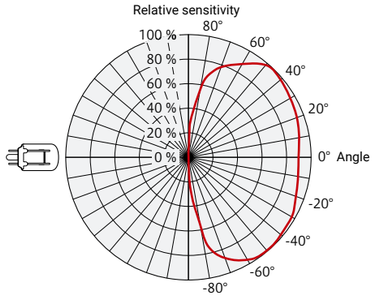
■ Spectral response characteristics (Typ.)

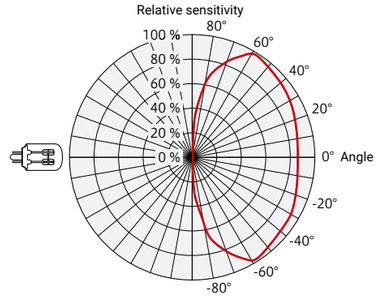


■ Range characteristics (Typ.)



■ View characteristics (Typ.)





Specifications

Item			Description / Value	Unit
Sensor shape			Head-on type	–
Window material			UV transmitting glass	–
Electrode material			Nickel (Ni)	–
Spectral response range			185 to 260	nm
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	260	V
	Discharge sustaining voltage (DC)	Typ.	185	V
	Sensitivity *1	Typ.	10000	min⁻¹ *10
	Background noise *2	Max.	5	min⁻¹ *10
	Expected life *3		25000	h
Recommended operating conditions	Input voltage (DC)		325 ±25	V
	Average discharge current		0.3	mA
	Quenching time *4	Min.	2	ms
Absolute maximum rating	Input voltage (DC)		420	V
	Average discharge current *5		3	mA
	Peak current *6		50	mA
Operating temperature range			-40 °C to +125 °C	–
Applicable standards	Environmental standard (RoHS)		EN 63000	–
Shock resistance characteristics *7			1000	m/s²
Weight			Approx. 5.3	g
Socket (sold separately) *8			E678-9C	–
Driver circuit (sold separately) *9			C10807	–

*1: Value was measured at wavelength 200 nm and intensity of light 10 pW/cm².

*2: Value was measured at recommended operating conditions under indoor lighting (approx. 500 lx).

*3: Value for sustained electrical discharge at recommended operating conditions.

*4: When building an external CR quenching circuit, set the circuit constants so that the quenching time exceeds this value.

*5: If the sensor is used at this value, it will considerably reduce the life of the sensor. Therefore, use the sensor at the recommended operating conditions.

*6: This is the peak value of pulse current that can instantaneously flow. This is for when the half-value width of the peak value is 10 µs or less.

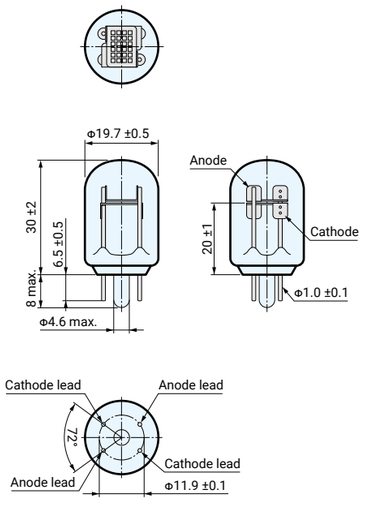
*7: Value was measured at an action time of 11 ms using the IEC 60068-2-27 shock test method.

*8: Refer to page 20 for information about the socket.

*9: Refer to page 21 for information about the driver circuit.

*10: min⁻¹ indicates counts/min.

Dimensional outline (Unit: mm)



Weight: Approx. 5.3 g

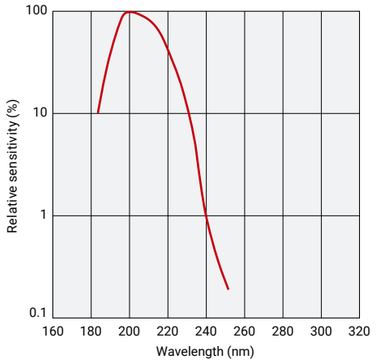
NOTE: Connect each anode lead and cathode lead when using the sensor.

Ultra-high sensitivity model

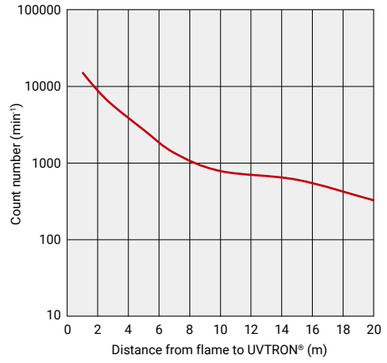
R13192

Characteristics

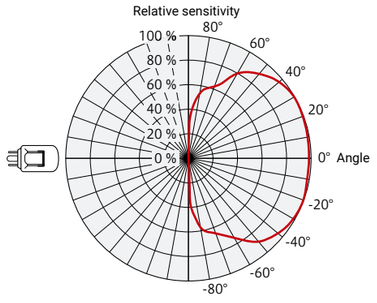
■ Spectral response characteristics (Typ.)

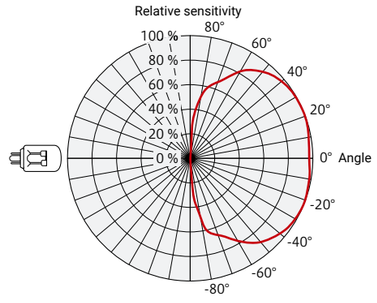


■ Range characteristics (Typ.)



■ View characteristics (Typ.)





Specifications

Item			Description / Value	Unit
Sensor shape			Head-on type	–
Window material			UV transmitting glass	–
Electrode material			Nickel (Ni)	–
Spectral response range			185 to 260	nm
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	260	V
	Discharge sustaining voltage (DC)	Typ.	185	V
	Sensitivity *1	Typ.	15000	min⁻¹ *10
	Background noise *2	Max.	5	min⁻¹ *10
	Expected life *3		25000	h
Recommended operating conditions	Input voltage (DC)		325 ±25	V
	Average discharge current		0.3	mA
	Quenching time *4	Min.	2	ms
Absolute maximum rating	Input voltage (DC)		420	V
	Average discharge current *5		3	mA
	Peak current *6		50	mA
Operating temperature range			-40 °C to +125 °C	–
Applicable standards	Environmental standard (RoHS)		EN 63000	–
Shock resistance characteristics *7			1000	m/s²
Weight			Approx. 5.25	g
Socket (sold separately) *8			E678-9C	–
Driver circuit (sold separately) *9			C10807	–

*1: Value was measured at wavelength 200 nm and intensity of light 10 pW/cm².

*2: Value was measured at recommended operating conditions under indoor lighting (approx. 500 lx).

*3: Value for sustained electrical discharge at recommended operating conditions.

*4: When building an external CR quenching circuit, set the circuit constants so that the quenching time exceeds this value.

*5: If the sensor is used at this value, it will considerably reduce the life of the sensor. Therefore, use the sensor at the recommended operating conditions.

*6: This is the peak value of pulse current that can instantaneously flow. This is for when the half-value width of the peak value is 10 µs or less.

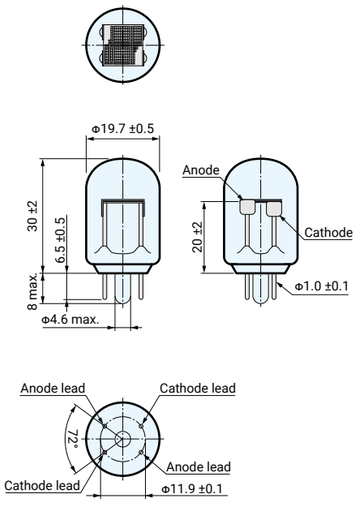
*7: Value was measured at an action time of 11 ms using the IEC 60068-2-27 shock test method.

*8: Refer to page 20 for information about the socket.

*9: Refer to page 21 for information about the driver circuit.

*10: min⁻¹ indicates counts/min.

Dimensional outline (Unit: mm)



Weight: Approx. 5.25 g

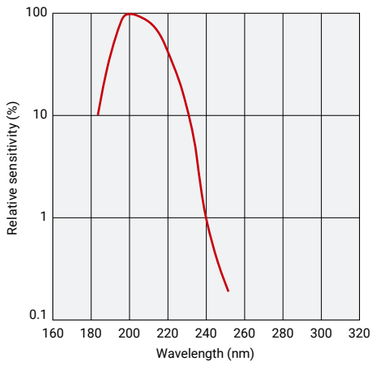
NOTE: Connect each anode lead and cathode lead when using the sensor.

Slim model

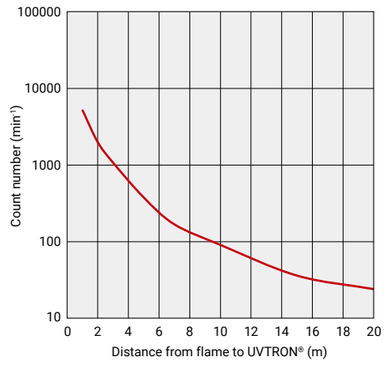
R2868

Characteristics

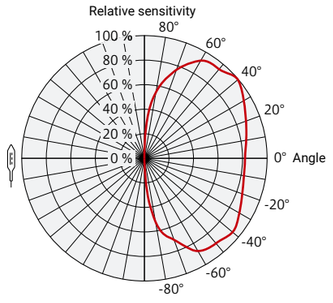
■ Spectral response characteristics (Typ.)

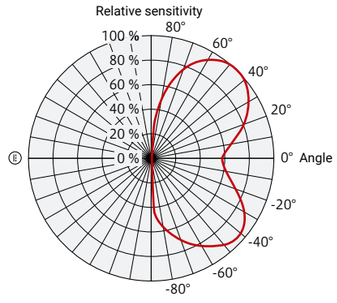


■ Range characteristics (Typ.)



■ View characteristics (Typ.)



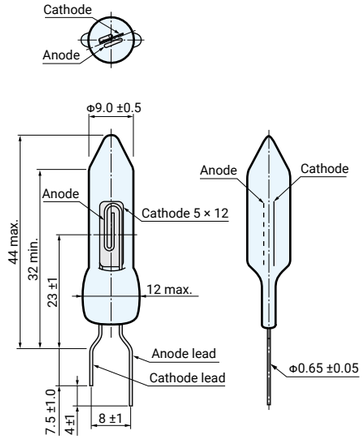


Specifications

Item			Description / Value	Unit
Sensor shape			Side-on type	–
Window material			UV transmitting glass	–
Electrode material			Nickel (Ni)	–
Spectral response range			185 to 260	nm
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	280	V
	Discharge sustaining voltage (DC)	Typ.	240	V
	Sensitivity *1	Typ.	5000	min⁻¹ *9
	Background noise *2	Max.	10	min⁻¹ *9
	Expected life *3		25000	h
Recommended operating conditions	Input voltage (DC)		325 ±25	V
	Average discharge current		0.3	mA
	Quenching time *4	Min.	2	ms
Absolute maximum rating	Input voltage (DC)		400	V
	Average discharge current *5		1	mA
	Peak current *6		30	mA
Operating temperature range			-40 °C to +125 °C	–
Applicable standards	Environmental standard (RoHS)		EN 63000	–
Shock resistance characteristics *7			1000	m/s²
Weight			Approx. 1.5	g
Socket (sold separately)			–	–
Driver circuit (sold separately) *8			C10807	–

*1: Value was measured at wavelength 200 nm and intensity of light 10 pW/cm².
*2: Value was measured at recommended operating conditions under indoor lighting (approx. 500 lx).
*3: Value for sustained electrical discharge at recommended operating conditions.
*4: When building an external CR quenching circuit, set the circuit constants so that the quenching time exceeds this value.
*5: If the sensor is used at this value, it will considerably reduce the life of the sensor. Therefore, use the sensor at the recommended operating conditions.
*6: This is the peak value of pulse current that can instantaneously flow. This is for when the half-value width of the peak value is 10 µs or less.
*7: Value was measured at an action time of 11 ms using the IEC 60068-2-27 shock test method.
*8: Refer to page 21 for information about the driver circuit.
*9: min⁻¹ indicates counts/min.

Dimensional outline (Unit: mm)



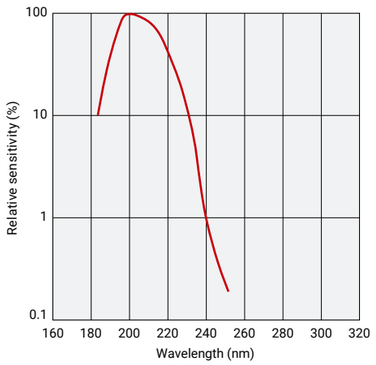
Weight: Approx. 1.5 g

Slim model
(with improved shock resistance)

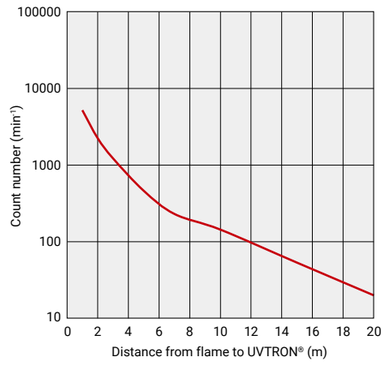
R9454

Characteristics

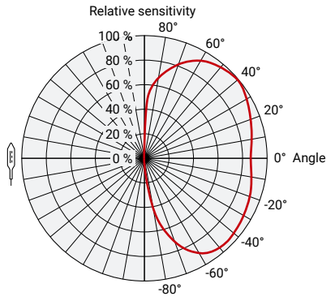
■ Spectral response characteristics (Typ.)

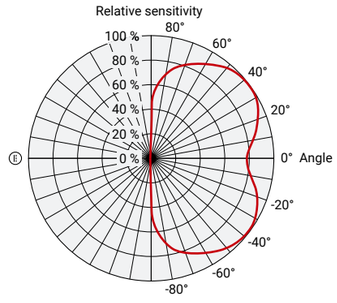


■ Range characteristics (Typ.)



■ View characteristics (Typ.)



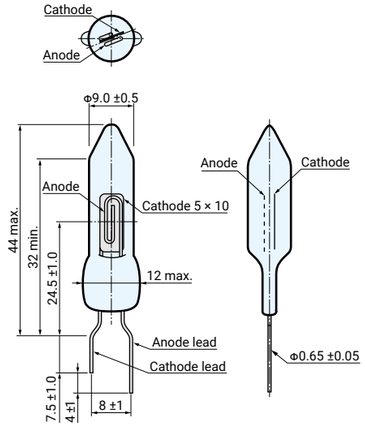


Specifications

Item			Description / Value	Unit
Sensor shape			Side-on type	–
Window material			UV transmitting glass	–
Electrode material			Nickel (Ni)	–
Spectral response range			185 to 260	nm
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	360	V
	Discharge sustaining voltage (DC)	Typ.	300	V
	Sensitivity *1	Typ.	4000	min⁻¹ *9
	Background noise *2	Max.	10	min⁻¹ *9
	Expected life *3		25000	h
Recommended operating conditions	Input voltage (DC)		400 ±25	V
	Average discharge current		0.3	mA
	Quenching time *4	Min.	2	ms
Absolute maximum rating	Input voltage (DC)		500	V
	Average discharge current *5		1	mA
	Peak current *6		30	mA
Operating temperature range			-40 °C to +125 °C	–
Applicable standards	Environmental standard (RoHS)		EN 63000	–
Shock resistance characteristics *7			10000	m/s²
Weight			Approx. 1.45	g
Socket (sold separately)			—	–
Driver circuit (sold separately) *8			C10423	–

*1: Value was measured at wavelength 200 nm and intensity of light 10 pW/cm².
*2: Value was measured at recommended operating conditions under indoor lighting (approx. 500 lx).
*3: Value for sustained electrical discharge at recommended operating conditions.
*4: When building an external CR quenching circuit, set the circuit constants so that the quenching time exceeds this value.
*5: If the sensor is used at this value, it will considerably reduce the life of the sensor. Therefore, use the sensor at the recommended operating conditions.
*6: This is the peak value of pulse current that can instantaneously flow. This is for when the half-value width of the peak value is 10 µs or less.
*7: Value was measured at an action time of 1 ms using the IEC 60068-2-27 shock test method.
*8: Refer to page 21 for information about the driver circuit.
*9: min⁻¹ indicates counts/min.

Dimensional outline (Unit: mm)



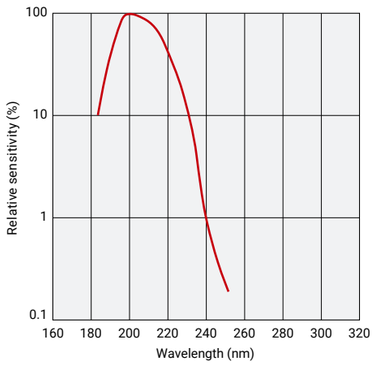
Weight: Approx. 1.45 g

Wide view model

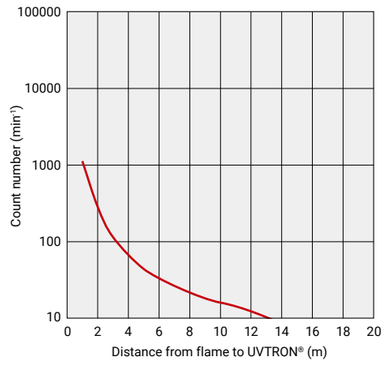
R244

Characteristics

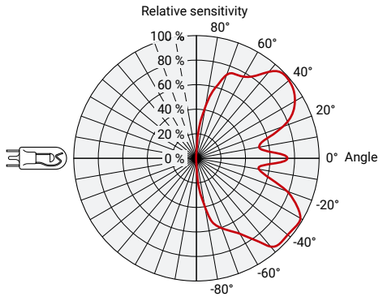
■ Spectral response characteristics (Typ.)

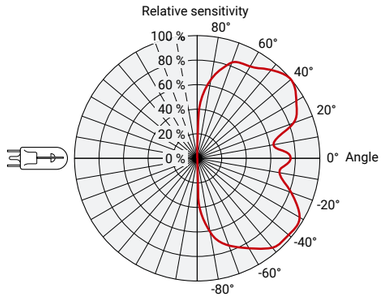


■ Range characteristics (Typ.)



■ View characteristics (Typ.)



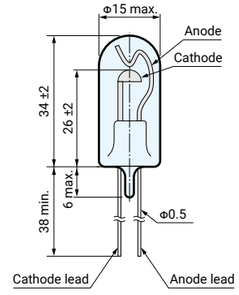


Specifications

Item			Description / Value	Unit
Sensor shape			Head-on type	–
Window material			UV transmitting glass	–
Electrode material			Nickel (Ni)	–
Spectral response range			185 to 260	nm
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	440	V
	Discharge sustaining voltage (DC)	Typ.	330	V
	Sensitivity *1	Typ.	480	min⁻¹ *8
	Background noise *2	Max.	5	min⁻¹ *8
	Expected life *3		25000	h
Recommended operating conditions	Input voltage (DC)		500 ±50	V
	Average discharge current		0.3	mA
	Quenching time *4	Min.	3	ms
Absolute maximum rating	Input voltage (DC)		575	V
	Average discharge current *5		3	mA
	Peak current *6		50	mA
Operating temperature range			-40 °C to +125 °C	–
Applicable standards	Environmental standard (RoHS)		EN 63000	–
Shock resistance characteristics *7			1000	m/s²
Weight			Approx. 2.7	g
Socket (sold separately)			–	–
Driver circuit (sold separately)			–	–

*1: Value was measured at wavelength 200 nm and intensity of light 10 pW/cm².
*2: Value was measured at recommended operating conditions under indoor lighting (approx. 500 lx).
*3: Value for sustained electrical discharge at recommended operating conditions.
*4: When building an external CR quenching circuit, set the circuit constants so that the quenching time exceeds this value.
*5: If the sensor is used at this value, it will considerably reduce the life of the sensor. Therefore, use the sensor at the recommended operating conditions.
*6: This is the peak value of pulse current that can instantaneously flow. This is for when the half-value width of the peak value is 10 µs or less.
*7: Value was measured at an action time of 11 ms using the IEC 60068-2-27 shock test method.
*8: min⁻¹ indicates counts/min.

Dimensional outline (Unit: mm)



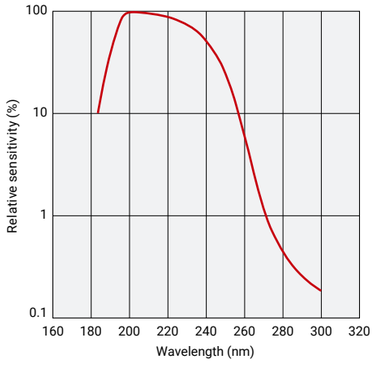
Weight: Approx. 2.7 g

Dedicated combustion monitoring model

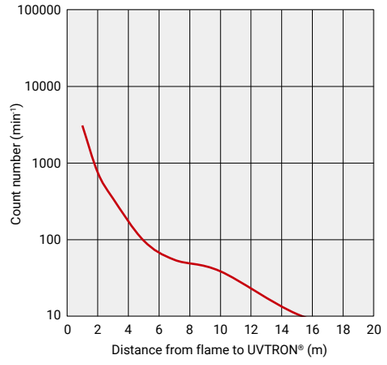
R12257

Characteristics

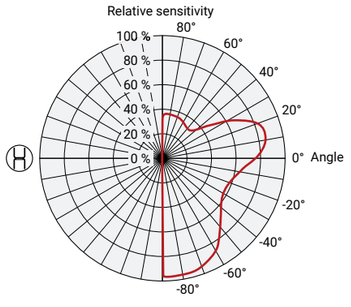
■ Spectral response characteristics (Typ.)

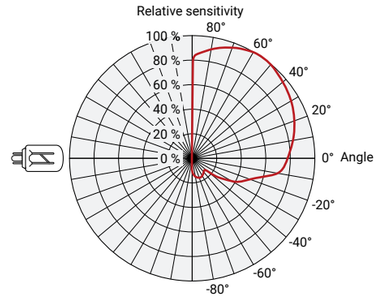


■ Range characteristics (Typ.)



■ View characteristics (Typ.)



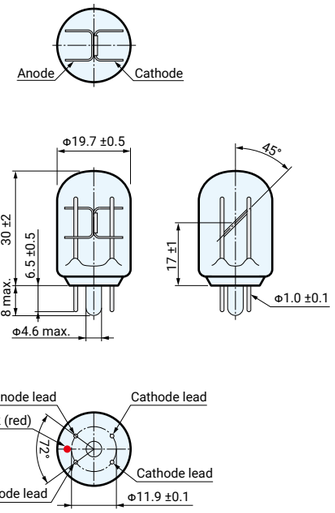


Specifications

Item			Description / Value	Unit
Sensor shape			Head-on type and Side-on type	–
Window material			UV transmitting glass	–
Electrode material			Molybdenum (Mo)	–
Spectral response range			185 to 300	nm
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	240	V
	Discharge sustaining voltage (DC)	Typ.	170	V
	Sensitivity *1	Typ.	1200	min⁻¹ *10
	Background noise *2	Max.	10	min⁻¹ *10
	Expected life *3		10000	h
Recommended operating conditions	Input voltage (DC)		310 ±25	V
	Average discharge current		2	mA
	Quenching time *4	Min.	1	ms
Absolute maximum rating	Input voltage (DC)		425	V
	Average discharge current *5		10	mA
	Peak current *6		200	mA
Operating temperature range			-40 °C to +125 °C	–
Applicable standards	Environmental standard (RoHS)		EN 63000	–
Shock resistance characteristics *7			1000	m/s²
Weight			Approx. 5.0	g
Socket (sold separately) *8			E678-9C	–
Driver circuit (sold separately) *9			C10807	–

*1: Value was measured at wavelength 200 nm and intensity of light 10 pW/cm².
*2: Value was measured at recommended operating conditions under indoor lighting (approx. 500 lx).
*3: Value for sustained electrical discharge at recommended operating conditions.
*4: When building an external CR quenching circuit, set the circuit constants so that the quenching time exceeds this value.
*5: If the sensor is used at this value, it will considerably reduce the life of the sensor. Therefore, use the sensor at the recommended operating conditions.
*6: This is the peak value of pulse current that can instantaneously flow. This is for when the half-value width of the peak value is 10 µs or less.
*7: Value was measured at an action time of 11 ms using the IEC 60068-2-27 shock test method.
*8: Refer to page 20 for information about the socket.
*9: Refer to page 21 for information about the driver circuit.
*10: min⁻¹ indicates counts/min.

Dimensional outline (Unit: mm)



Weight: Approx. 5.0 g

NOTE: Connect each anode lead and cathode lead when using the sensor.

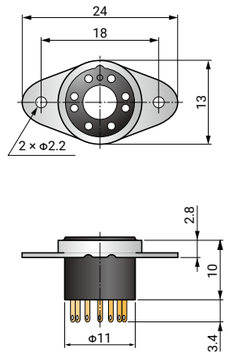
UVTRON® sockets
E678-8F/-9C

These are UVTRON® dedicated sockets.
Sockets are used when wiring the sensor to an operating circuit.

E678-8F

This socket supports R9533.
The socket is designed so that the sensor can only be inserted with the correct orientation.

Dimensional outline (Unit: mm)

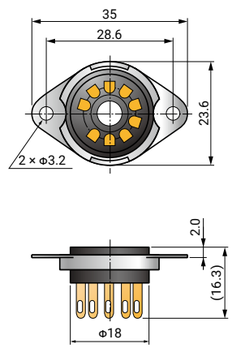


Weight: Approx. 2.0 g

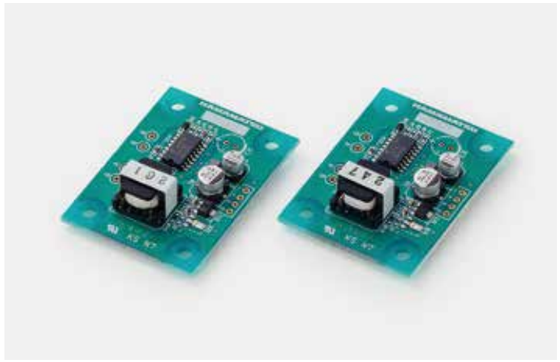
E678-9C

This socket supports R14388, R13192 and R12257.
The anode and cathode lead pins are positioned differently depending on the type of UVTRON® sensor. Therefore, perform wiring that matches each sensor type.

Dimensional outline (Unit: mm)



Weight: Approx. 4.3 g



UVTRON® driver circuits
C10807, C10423

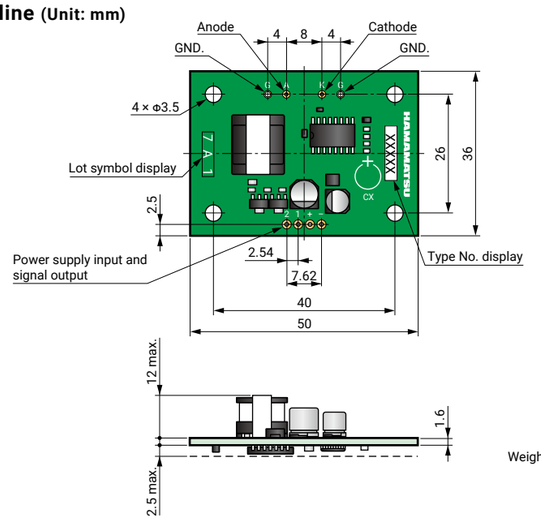
These are UVTRON® dedicated driver circuits.
These printed circuit boards are equipped with a high-voltage power supply circuit and signal processing circuit, enabling operation simply by supplying power after connecting UVTRON®.
They also cancel any background noise from UVTRON®, thereby reducing misdetection.

Specifications

Item			C10807	C10807-01	C10807-02	C10423	C10423-01	Unit
UVTRON® supply voltage (DC)			350 ±25			400 ±25		V
Signal output	Output method		Open collector output					–
	Output voltage	Max.	50					V
	Output current	Max.	80					mA
	Output pulse duration		10					ms
Recommended operating conditions	Input voltage (DC)		12 to 24	5 ±0.25	6 to 9	12 to 24	5 ±0.25	V
	Operating current	Max.	4	0.3	0.3	4	0.3	mA
	Quenching time	Min.	25					ms
Absolute maximum rating	Input voltage (DC)		30					V
Operating temperature range			-10 °C to +50 °C					–
Storage temperature range			-10 °C to +50 °C (no freezing)					–
Operating humidity range			20 % to 80 % (no condensation)					–
Applicable standards	Safety standards		IEC 61010-1/A1					–
	Environmental standard (RoHS)		EN 63000					
Shock resistance characteristics *1			1000					m/s^2
Weight			Approx. 12					g
Compatible UVTRON®			R9533 / R14388 / R13192 / R2868 / R12257			R9454		–

*1: Value was measured at an action time of 11 ms using the IEC 60068-2-27 shock test method.

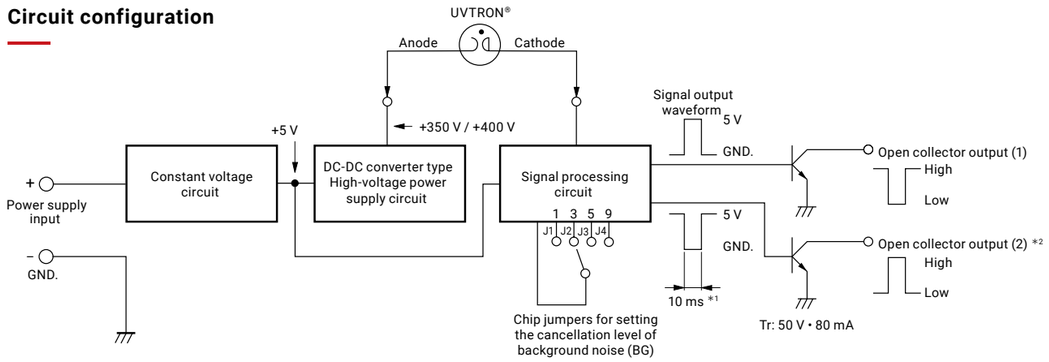
Dimensional outline (Unit: mm)



Weight: Approx. 12 g

Options

Circuit configuration

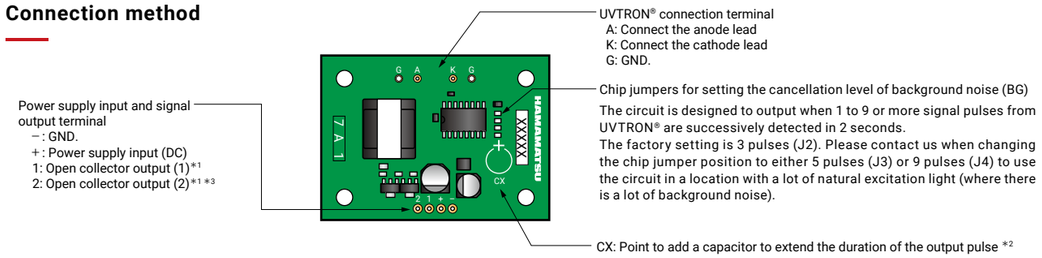


*1: The factory setting for the output pulse duration is 10 ms.
When you want to extend the duration of the output pulse, connect a capacitor to this terminal.
(When connecting an electrolytic capacitor, ensure the polarity is correct.)

*2: For C10807-01/-02 and C10423-01, open collector output (2) is not output.

Chip jumper	Pulse count
J1	1 (No background canceling)
J2	3 (normal setting)
J3	5
J4	9

Connection method



*1: The recommended rating for an open collector output transistor is 50 V / 80 mA or less with a maximum rating of 50 V / 100 mA. When connecting a relay, buzzer or similar item, be careful not to exceed this value.

*2: The factory setting for the output pulse duration is 10 ms. When you want to extend the duration of the output pulse, connect a capacitor to this terminal.
(When connecting an electrolytic capacitor, ensure the polarity is correct.)

*3: For C10807-01/-02 and C10423-01, open collector output (2) is not output.

Precautions for use

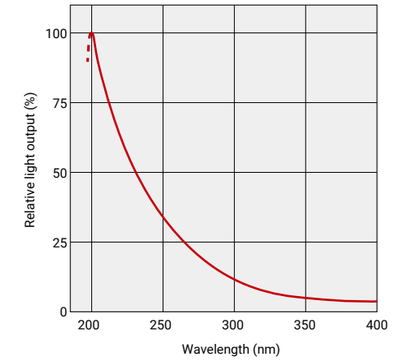
- Wire UVTRON® close to the driver circuit. Arranging them on the same printed circuit board is ideal. If the cable has a high stray capacitance, the discharge current will also be high, which may damage the electrodes.
  If UVTRON® must be installed far away from the driver circuit and the cable capacitance exceeds 100 pF, insert a current limiting resistor (4.7 kΩ) immediately before (within 25 mm) the UVTRON® anode.
- Be very careful of external noise because a C-MOS IC is used. It is recommended to place the driver circuit inside a metallic case when using it.
- Since the DC-DC converter type high-voltage power supply has an extremely high output impedance, the UVTRON® supply voltage may drop due to an electrical leak on the surface if humidity is high. A drop in the supply voltage will reduce sensitivity and result in sensor malfunction. Therefore, coat the UVTRON® connection terminal and any appropriate regions with a silicon-based moisture-proofing agent if humidity is high.

Checker lamp
L9657-03

This is a dedicated UVTRON® checker lamp.
It is compact and lightweight so can be installed on the equipment together with UVTRON®. It also has excellent lighting properties, which enables easy and accurate operation checks to be performed.

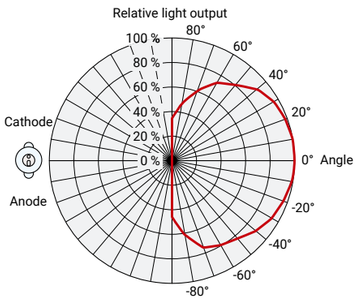
Characteristics

■ Emission spectrum distribution (Typ.)

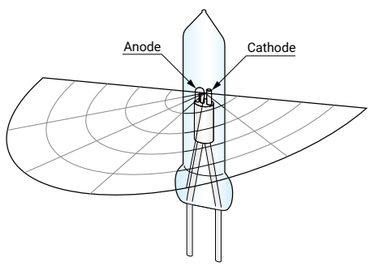


NOTE: Wavelengths of 200 nm or less are reference values.

■ Light distribution characteristics (Typ.)



● Illustration of the measurement

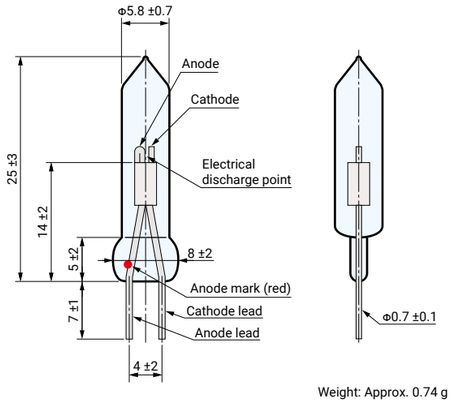


Specifications

Item			Description / Value	Unit
Window material			UV glass	–
Emission wavelength range			185 to 400	nm
Characteristics (at 25 °C)	Discharge starting voltage (DC)	Max.	260	V
	Guaranteed life *1		1000	h
Recommended operating conditions	Input voltage (DC)		300 ±25	V
	Average discharge current		150	µA
Absolute maximum rating	Input voltage (DC)		600	V
	Peak current *2		200	µA
Operating temperature range			-40 °C to +125 °C	–
Applicable standards	Environmental standard (RoHS)		EN 63000	–
Shock resistance characteristics *3			1000	m/s^2
Weight			Approx. 0.74	g
Driver circuit (sold separately) *4			C13428	–

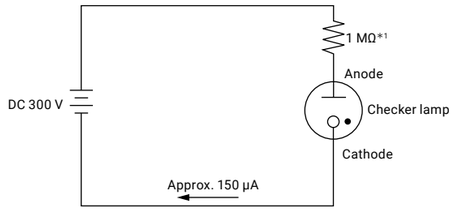
*1: The end of life is defined as the point when light output falls to 50 % of the initial value.
*2: Using the sensor at this value will considerably shorten the life.
*3: Value was measured at an action time of 11 ms using the IEC 60068-2-27 shock test method.
*4: Refer to page 25 for information about the driver circuit.

Dimensional outline (Unit: mm)



Weight: Approx. 0.74 g

Circuit configuration



*1: Insert a resistor (1 MΩ) immediately before (within 10 mm) the checker lamp anode.

Precautions for use

- Avoid using the checker lamp in the dark (when illumination is below 50 lx).
  Extreme deterioration of the lighting properties will occur because there will be less emissions of photoelectron from the cathode in the dark. When using the checker lamp in the dark, it is recommended to use our driver circuit C13428, which is equipped with a white LED for assisted lighting. When not using our driver circuit C13428, it is recommended to use a light source to assist lighting such as a white LED or similar item.
- When storing the checker lamp for a long period of time, the discharge starting voltage may rise resulting in deterioration of the lighting properties.
  Always check the operation before use.

Driver circuit for checker lamp C13428

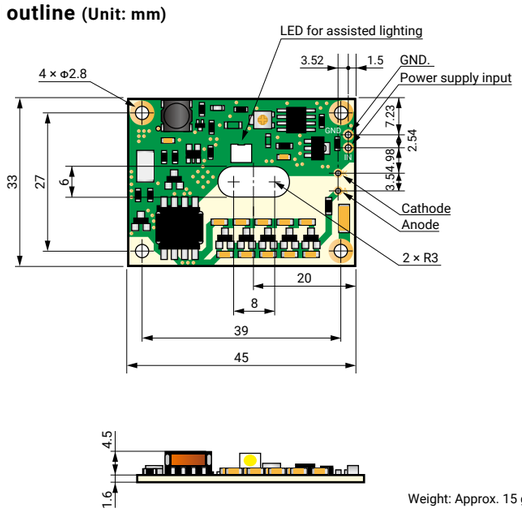
This is a dedicated driver circuit for the checker lamp.
Operation is possible simply by connecting the checker lamp and supplying voltage.
It is also equipped with an LED for assisted lighting, which illuminates momentarily when the checker lamp turns on. The LED turns off after the checker lamp has turned on.

Specifications

Item			Description / Value	Unit
Lamp current *1		Max.	150	µA
Recommended operating conditions	Input voltage (DC)		5.5 to 12	V
	Operating current	Max.	40	mA
Absolute maximum rating	Input voltage (DC)		25	V
Operating temperature range			-10 °C to +50 °C	–
Storage temperature range			-10 °C to +50 °C (no freezing)	–
Operating humidity range			20% to 80% (no condensation)	–
Applicable standards	Safety standards		IEC 61010-1/A1	–
	Environmental standard (RoHS)		EN 63000	
Shock resistance characteristics *2			1000	m/s^2
Weight			Approx. 15	g

*1: A trimmer can be used for fine adjustment.
*2: Value was measured at an action time of 11 ms using the IEC 60068-2-27 shock test method.

Dimensional outline (Unit: mm)



Weight: Approx. 15 g

Flame sensor module C16956-02

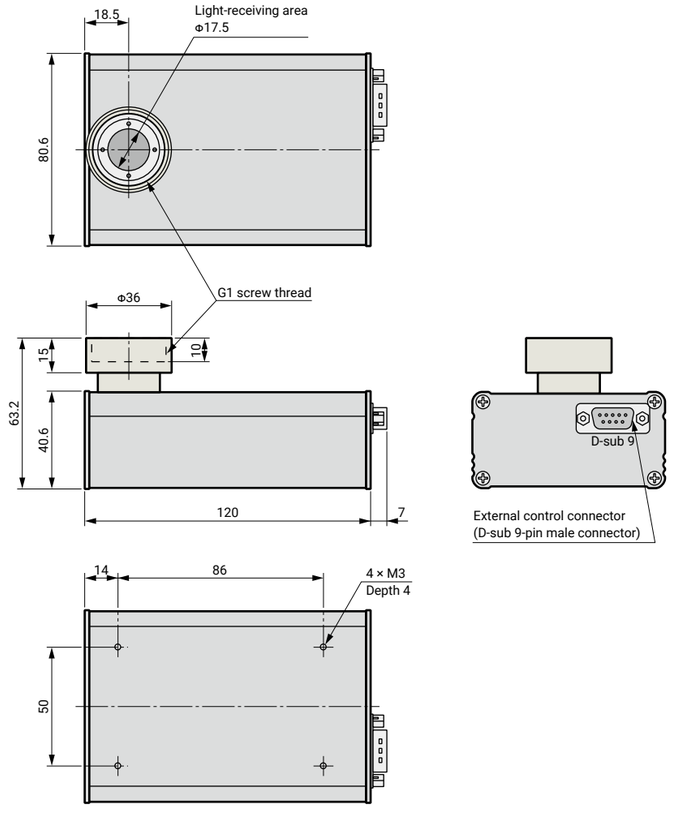
A module that integrates the UVTRON® flame and discharge sensor with a driver circuit and a signal processing circuit for background noise processing and other tasks.
It can be used to easily detect UV light simply by inputting DC voltage. The module acquires information such as sensitivity (detection count number) and a UV light detection signal via a D-sub connector, and can perform UVTRON® operation checks using the built-in UV-LED. The light-receiving unit is fitted with a G1 screw thread so that it can be easily installed on combustion devices.

Specifications

Item			Description / Value	Unit
Equipped UVTRON®			R14388	–
Spectral response range			185 to 260	nm
Characteristics (at 25 °C)	Sensitivity *1	Typ.	10000	min^{-1} *5
	Background noise *2	Max.	5	min^{-1} *5
	Expected life *3		25000	h
Recommended operating conditions	Input voltage (DC)		12 to 24	V
	Quenching time		2 to 20	ms
Power consumption		Max.	1.2	W
Cooling method			Natural air cooling	–
Operating temperature range			-10 °C to +60 °C	–
Storage temperature range			-10 °C to +80 °C (no freezing)	–
Operating humidity range			20% to 80% (no condensation)	–
Storage humidity range			80% or less (no condensation)	–
External control			Ready signal, UV light detection signal, sensitivity output, temperature alarm signal	–
Applicable standards	EMC standards		IEC 61326-1 Emission limits: CISPR 11 Group 1 Class A Immunity requirements: Table 2	–
	Safety standards		IEC 61010-1/A1	
	Environmental standard (RoHS)		EN 63000	
Shock resistance characteristics *4			1000	m/s^2
Weight			Approx. 295	g

*1: Value was measured at wavelength 200 nm and intensity of light 10 pW/cm^2.
*2: Value was measured at recommended operating conditions under indoor lighting (approx. 500 lx).
*3: Value for sustained electrical discharge at recommended operating conditions.
*4: Value was measured at an action time of 11 ms using the IEC 60068-2-27 shock test method.
*5: min^{-1} indicates counts/min.

Dimensional outline (Unit: mm)



Weight: Approx. 295 g

External control connector (D-sub 9-pin) connection

Pin No.	Signal	
1	Input voltage (12 V to 24 V)	Input
2	Sensitivity (detection count number)	Output
3	UV light detection signal	Output
4	Built-in UV-LED lighting control signal	Input
5	RS-485 (B+)	–
6	GND.	–
7	Ready signal	Output
8	Temperature alarm signal	Output
9	RS-485 (A-)	–

FAQs

■ Basic information

Q1. What features does UVTRON® have compared to other sensors ?

A1. UVTRON® is a sensor sensitive only to UV light with wavelengths of 185 nm to 260 nm *1.
It can detect UV light with high sensitivity and has a quick response when compared with infrared light systems and smoke detection systems.
*1: For nickel (Ni) electrodes

Q2. Which model of UVTRON® should I choose ?

A2. Select the best UVTRON® model based on the required sensitivity and the conditions where it will be used.
You can refer to page 5 for the product lineup and page 6 and onwards for product information where the features and specifications are listed.

Q3. Can the sensor also detect cigarettes and incense sticks ?

A3. The sensor is sensitive to UV light from flame so cannot detect flameless combustion such as cigarettes and incense sticks.

Q4. Can the sensor distinguish the size of a flame ?

A4. Due to the characteristics of UVTRON®, it is slightly linear in application. Therefore, it is recommended to use it as an ON-OFF sensor to detect the presence of UV light, not as a sensor to measure the intensity of light.

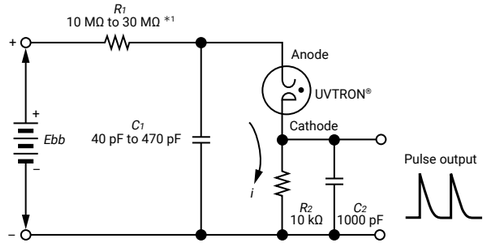
Q5. Is it possible to use multiple UVTRON® sensors at the same time ?

A5. Yes, it is possible.
However, when a UVTRON® sensor detects UV light, it discharges and emits UV light. Therefore, a neighboring UVTRON® sensor may detect the UV light emitted from the first sensor. Design the multiple sensor setup so that each UVTRON® sensor does not cause optical interference with neighboring sensors.

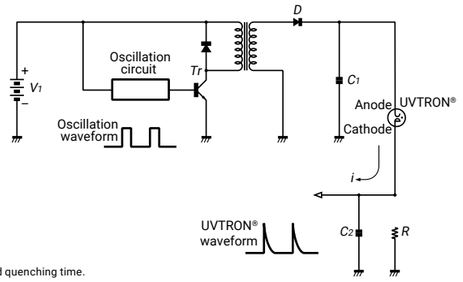
Q6. What items are needed to operate the sensor ?

A6. One of the following items are required to operate UVTRON®.
❶An external CR quenching circuit and a DC high-voltage source
❷A DC-DC converter type high-voltage power supply circuit
At Hamamatsu Photonics, we offer UVTRON® driver circuits C10807 and C10423 that use a DC-DC converter type high-voltage power supply circuit. Please contact us if you would like more information about this product.

■ Circuit configuration for an external CR quenching circuit and a DC high-voltage source



■ Circuit configuration for a DC-DC converter type high-voltage power supply circuit

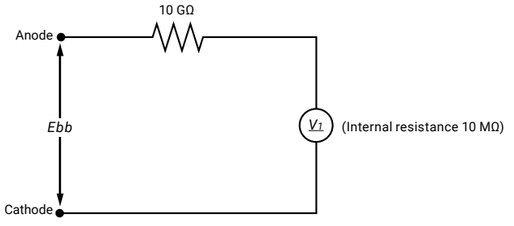


*1: Adjust the resistance value and capacitance of the capacitor according to the model to achieve the specified quenching time.

Q7. What is the best way to measure the supply voltage for UVTRON® ?

A7. Use a high impedance multimeter of approximately 10 GΩ to measure the supply voltage for UVTRON®.
If the multimeter does not have enough impedance, it may not be possible to measure the voltage accurately due to the high impedance of the UVTRON® driver circuit.

■ Circuit configuration for voltage measurement circuit with high resistance



Q8. What daily inspection should be performed ?

A8. Check whether UVTRON® detects UV light based on the ON-OFF operation of the checker lamp L9657- 03. When doing so, be careful to ensure that UV light from an external source does not enter the UVTRON® sensor.

Q9. How long can UVTRON® be stored ?
Also, what is the best way to check the operation of UVTRON® after it has been stored for a long time ?

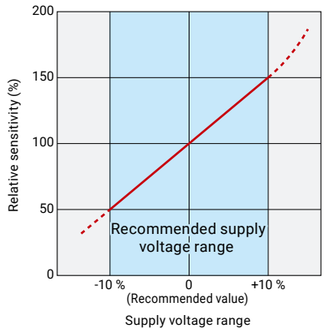
A9. The warranty period is one year from the date of delivery, and the sensor can usually be stored for approximately five years.
After storing for a long time, check if there is any deterioration of the sensor, such as rust on the lead pins, before checking operation. It depends on how the sensor was stored, but generally, if there is no deterioration such as rust, then there should be no problems with operating the sensor.

■ Features

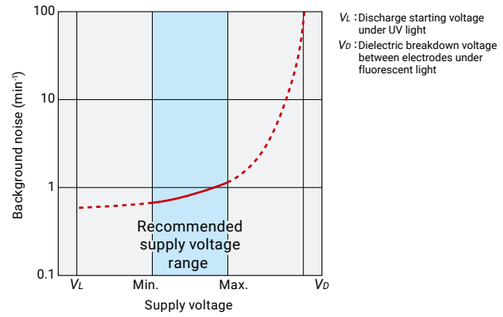
Q10. What happens if the supply voltage is changed ?

A10. If the supply voltage is increased, sensitivity will increase in proportion to the voltage increase. However, when the supply voltage exceeds the recommended operating range, background noise (BG) increases so it is recommended to use the sensor within the recommended supply voltage range.

■ Sensitivity characteristics in relation to the supply voltage (Typ.)



■ Background noise characteristics in relation to the supply voltage (Typ.)



Q11. What is defined as the end of life for the sensor?

A11. The sensor has reached the end of life when any of the following situations occur.

❶When the discharge starting voltage reaches the maximum value in the specifications

❷When sensitivity falls to 50 % of the initial value

❸When background noise reaches the maximum value in the specifications

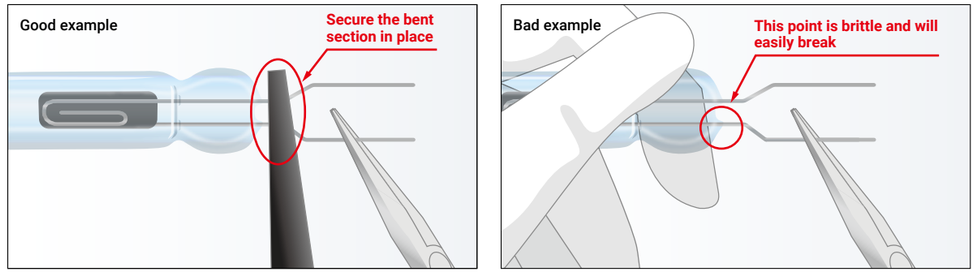
■ Processing method

Q12. What is the best way to bend the lead wires on UVTRON® ? Also, what is the best method to cut them ?

A12. The lead wires can be bent and cut on three sensor types, which are R2868, R9454 and R244. Lead wires on any of the other sensor types must not be processed (cut or bent).

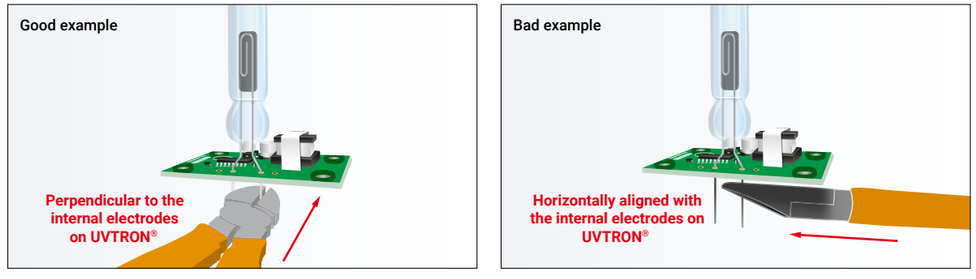
■ How to bend lead wires

Carefully bend the lead wires after firmly securing them in place to ensure the glass bulb does not break or become scratched.



■ How to cut lead wires

When processing the lead wires by cutting them, the internal electrodes may be subject to shocks. This may degrade the electrical characteristics to the same extent as if the sensor were dropped. To mitigate these shocks on the internal electrodes, cut the lead wires with the cutting edges of the nippers set perpendicular to the internal electrodes. The lead wires should be cut slowly two or three times using the nippers instead of cutting through the lead wires all at once.



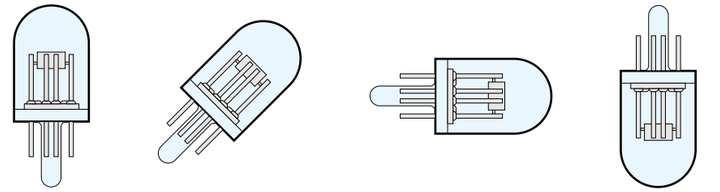
Q13. What are the precautions when soldering the sensor ? Is it OK to use a solder bath ?

A13. Applying excessive heat to the UVTRON® lead wires during soldering may cause the glass bulb to crack or the internal electrodes to deteriorate. This will lead to faulty operation, so be extra careful when soldering. For the sensors with hard pin lead wires, it is recommended to use one of the dedicated sockets that we provide. When soldering a sensor directly onto a printed circuit board, use heatsink tweezers or a similar tool to grip the root of the lead wires to prevent heat from conducting to the UVTRON® sensor, and then solder at a temperature of 350 °C or less within 5 seconds. Avoid using a solder bath. When finished soldering, be sure to completely wipe away the soldering flux with alcohol, etc.

■ Installation method

Q14. Should I be careful of the orientation and position when installing UVTRON® ?

A14. In terms of the orientation when installing the sensor, view characteristics are listed in the product information section from page 6. Refer to this information when installing the sensor to ensure that UV light can directly enter the cathode (photocathode).
There are no restrictions concerning the position when installing the sensor.



Pointing up　Angled　Sideways　Pointing down

Q15. When there are multiple anode leads and cathode leads, do all of them have to be connected ?

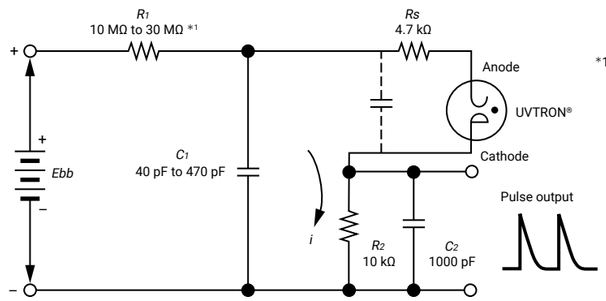
A15. As long as one of each of the anode leads and cathode leads are connected, the sensor will operate without any problems.

Q16. Is it OK to set up UVTRON® far away from the driver circuit ?

A16. If UVTRON® must be installed far away from the driver circuit and the cable capacitance exceeds 100 pF, insert a current limiting resistor (*Rs*: 4.7 kΩ) immediately before (within 25 mm) the UVTRON® anode.
If the cable has a high stray capacitance, the discharge current will also be high, which may damage the electrodes.

■ Circuit configuration for an external CR quenching circuit

・When installing UVTRON® far away



*1: Adjust the resistance value and capacitance of the capacitor according to the model to achieve the specified quenching time.

■ Background noise countermeasures

Q17. What causes background noise (BG) ?

A17. Cause of background noise (BG) include the following:

❶Radiation including cosmic rays
When radiation with higher energy than UV light is incident on the cathode (photocathode), a discharge can be caused due to the photoelectric effect. As it is difficult to completely prevent the entry of radiation such as cosmic rays, which exist in nature, it is necessary to use a signal processing circuit to distinguish it from UV light from a detection target.

❷X-rays
When X-rays with higher energy and penetrating properties than UV light is incident on the cathode (photocathode), a discharge can be caused due to the photoelectric effect.

❸Static electricity
When an object charged with static electricity comes close to or makes contact with UVTRON®, the high electric field may ionize the gas molecules in the tube and cause a discharge.

❹High electric fields, high magnetic fields, and strong electromagnetic waves
Under high supply voltage conditions, the electric field emission from the cathode (photocathode) may cause photoelectrons to jump out, and this may trigger a discharge.

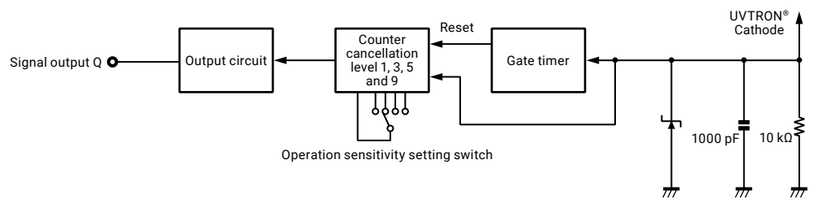
❺Intense light (such as from lasers and LEDs) with extremely high radiant intensity greater than sunlight
When intense light with extremely high radiant intensity is incident on the cathode (photocathode), background noise can increase due to thermionic emission and other factors.

❻Unintentional UV light
While this is normal for UVTRON® operation, UV light from sources other than a detection target may cause the device to malfunction. This also can be considered as a type of background noise (BG). UV light is also found abundantly in ordinary life. Especially outdoors, UVTRON® reacts to faint UV light from unexpected sources, such as sparks from arc welding or electrical sparks (sparks from a train pantograph). Take sufficient precautions for the area where UVTRON® is installed and used.

Q18. How can I prevent background noise (BG) ? Also, how do I change the cancellation level ?

A18. Be careful to ensure that unintended UV light does not enter the sensor. However, since it is not possible to avoid UVTRON® from reacting to the effects of cosmic rays, it is recommended to use a signal processing circuit that cancels background noise (BG). Our UVTRON® driver circuit C10807 and C10423 are equipped with background noise (BG) cancelling functions. Please contact us if you would like to change the cancellation level.

■ Signal processing circuit configuration



■ Checker lamp

Q19. What is the intensity of light of the checker lamp ?

A19. The lamp emits UV light that is similar in intensity to a lighter.
The lamp is considered to be harmless according to IEC62471 “Photobiological safety of lamps and lamp systems.” However, avoid directly looking into the lamp with the naked eye for long periods of time.

FAQs

■ Operating environment

Q20. Is it OK to use the sensor in high temperature, low temperature, and high humidity environments ?

A20. Be sure to keep to the specified operating temperature range of -40 °C to +125 °C and operating humidity range of 80 % or less when using UVTRON®.
The following tends to occur when using the sensor in high temperature, low temperature, and high humidity environments.

- Under high temperature, the sensor deteriorates faster.
- Under low temperature, the discharge starting voltage under UV light (V_L) drops and sensitivity increases.
- Under high humidity, operation becomes unstable due to voltage leaks and short circuiting.

If operating humidity exceeds 80 %, ensure that no moisture forms on the sensor. Also, be careful to ensure there is sufficient insulation around the lead wires, such as covering the lead wires with insulating resin.

■ Precautions for handling

Q21. Why will just dropping the sensor cause it to become defective ?

A21. Because excessive shock on UVTRON® may cause the anode and cathode to come into contact with each other, which can significantly shorten its lifespan.

Q22. Can the sensor still be used when dirty ?

A22. If the glass bulb is dirty, UV light transmittance will drop and this may cause the glass to deteriorate. After installing the sensor onto equipment, periodically wipe the glass bulb with gauze or cleaning wipes moistened with alcohol to keep it clean. When handling UVTRON®, do not touch the glass bulb with your bare hands. Wear gloves to prevent oil and grime from your hands sticking to the glass bulb.

■ Certification and regulations

Q23. Does the sensor comply with each type of certification, directive and regulation ?

A23. The UVTRON® sensor, socket, and checker lamp are not covered by CE certification. However, the UVTRON® driver circuit, checker lamp driver circuit, and module comply with CE certification.
All of these products comply with the RoHS directive.
Please contact us for information about the REACH regulation.

■ Other

Q24. I would like to trial use the sensor. Who should I contact ?

A24. We provide free demo units on loan for trial use. Please contact us for more information any time.

Notes

Notes and requests on the product
https://www.hamamatsu.com/all/en/support/disclaimer.html

UVTRON® precautions for use
https://www.hamamatsu.com/content/dam/hamamatsu-photonics/sites/documents/99_SALES_LIBRARY/etd/UVTRON_TPT1038E.pdf

- Hamamatsu Photonics makes constant efforts to improve product quality and reliability, but this does not guarantee the product integrity of UVTRON®.
  Please implement a design providing ample safety (redundant design, fire spread prevention design, malfunction prevention design, etc.) within customer's equipment manufactured using a UVTRON® in order to avoid personal injury, fire and damage to society that might possibly occur in the unlikely event of a failure of UVTRON®. In particular, when a UVTRON® is used in a piece of equipment or an environment where the malfunction or failure of the UVTRON® could result in personal injury, death or serious damage to property (hereinafter referred to as the "particular application"), the safety design must take into account the possible failures. We will not be liable for any use in such particular application unless we give our prior written consent by way of specification sheets, etc.
- Since the durability of UVTRON® varies depending on the operating environment and conditions, be sure to evaluate and confirm the operation of UVTRON® in the condition in which it is installed in the customer's equipment and in the actual operating environment. If any doubt arises about the safety of UVTRON®, please notify us as soon as possible and also be sure to implement technical measures for the above stated safety design (redundant design, fire spread prevention design, malfunction prevention design, etc.).
- When exporting UVTRON® (including cases when providing technology), please comply with export-related laws and regulations in your country, such as the Foreign Exchange and Foreign Trade Law of Japan, and be sure to obtain an export license or a service transaction license if necessary. Please contact our sales office for information on whether or not UVTRON® is subject to these export-related laws and regulations.
- The application examples described in our product literature are not intended to guarantee suitability for any particular application or the success or failure of any commercial use. No guarantee or license is granted for the enforcement of any intellectual property rights. We will not be held liable for any intellectual property rights issues that may arise with third parties as a result of using this information.
- When disposing of UVTRON®, take appropriate measures in compliance with applicable regulations regarding waste disposal, and correctly dispose of it yourself or entrust proper disposal to a licensed industrial waste disposal company. In any case, be sure to comply with the regulations in your country or state to ensure correct disposal.
- Please do not use UVTRON® in special environments such as in liquids, dust, or with high levels of corrosive gas.
- UVTRON® may malfunction due to unintentional UV light, such as sparks from arc welding or germicidal lamps. Take sufficient precautions for the area where UVTRON® is installed and used.
- When storing or transporting UVTRON®, keep it in the packing box. The product has passed the shock test method IEC 60068-2-27. However, if the packing box is dropped or bumped during storage or transportation, an excessive mechanical stress may have been applied, causing damage or degradation of characteristics. Handle with care and take adequate measures to avoid dropping and bumping. The UVTRON® sensor should be stored indoors at low humidity and stable room temperature where no corrosive gases are present and no condensation occurs.
- If UVTRON® fails due to manufacturing defects within one year after delivery, we will replace it free of charge. The scope of the warranty is limited to replacement of the product. The product will be out of warranty in the case of use in a particular application without our prior consent.

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