HAMAMATSU
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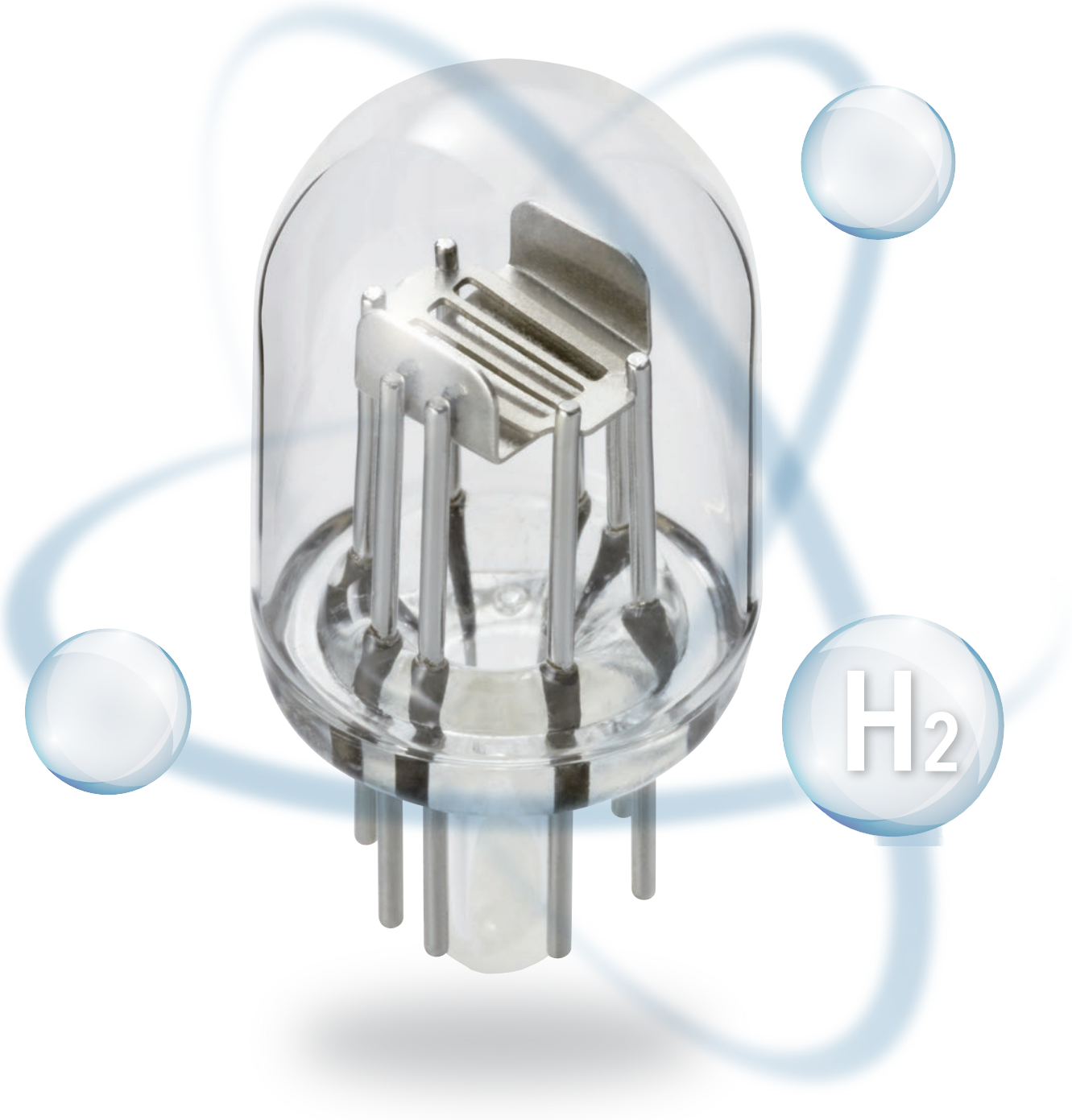
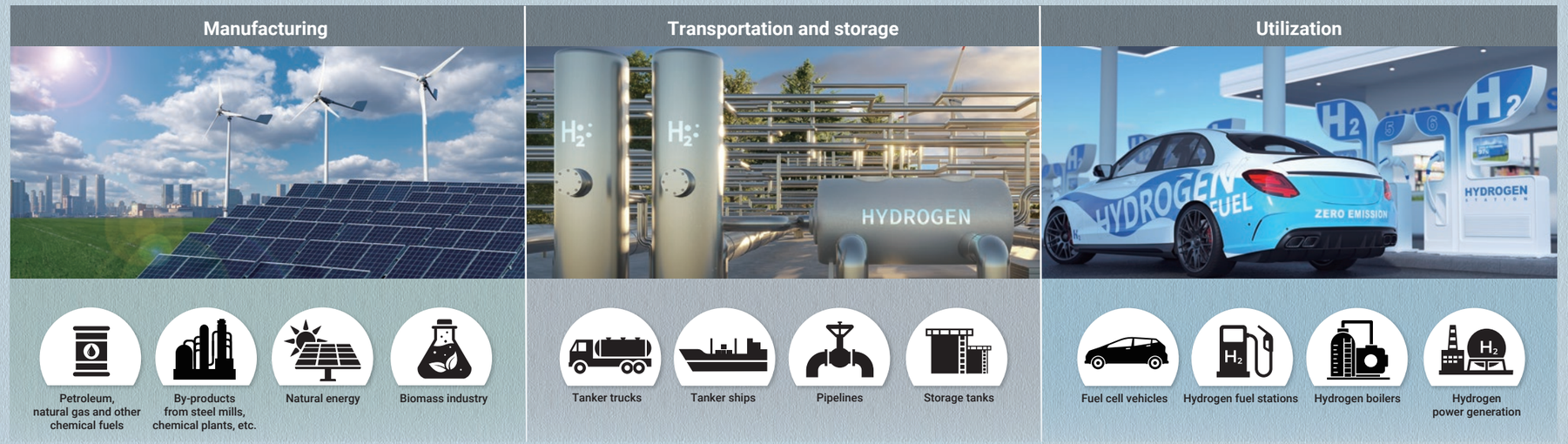
UVTRON®
UV Sensors

High sensitivity UV sensor ideal for hydrogen flame detection and monitoring



Hydrogen is attracting attention around the world as a next-generation energy source for a decarbonized society with the goals of zero emissions and carbon neutrality.

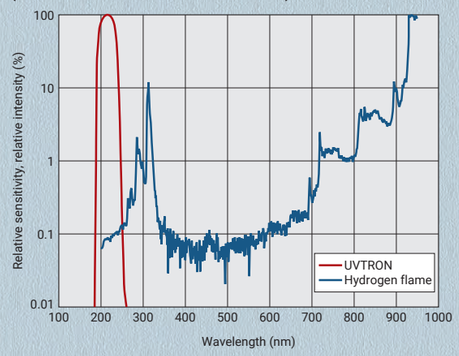
Ensuring safety when producing, transporting, storing and utilizing hydrogen requires reliable monitoring and detection of hydrogen flames. However, hydrogen flames are nearly invisible and conventional methods that rely on infrared sensors and flame rods are not sensitive enough to detect the faint hydrogen flames. This problem has led to a surge in demand for high-performance sensors specifically optimized for monitoring and detecting hydrogen flames.



Hamamatsu offers UVTRON UV sensors that are highly sensitive to the weak UV light emitted from hydrogen flames and ensure speedy and accurate flame detection.

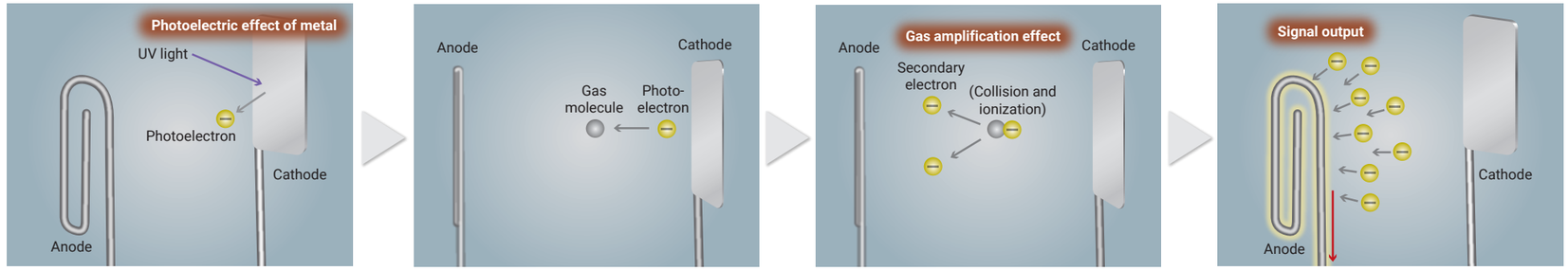
· Spectral response

Comparison with hydrogen flame spectrum (in-house measurement data)



■Operating principle

When UV light emitted from a hydrogen flame strikes the cathode of a UVTRON, photoelectrons are released from the cathode surface. Photoelectrons are drawn to the anode and collide with gas molecules in the UVTRON, ionizing them and producing secondary electrons. These electrons further collide with other gas molecules causing repeated ionization and finally reach the anode. This effect, called gas amplification effect, amplifies the current which is then output as a signal.

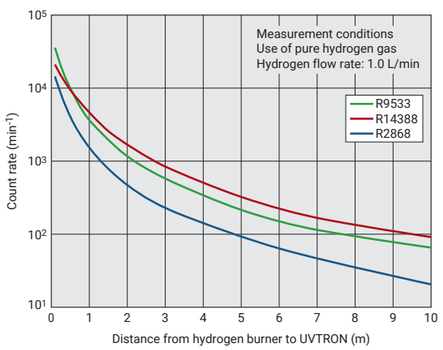


■Features

1 High sensitivity and long-distance detection

UVTRON accurately detects weak UV light emitted from hydrogen flames. It easily detects, for example, flames from hydrogen burner about 10 m away. This long-distance detection allows greater flexibility in UVTRON installation locations.

· Distance characteristics (Typ.)

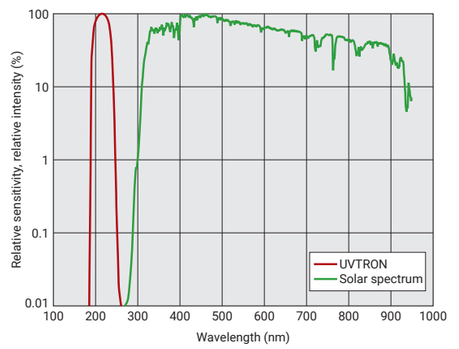


2 Solar-blind spectral response

UVTRON has no spectral response to UV through visible light from sunlight. This eliminates the need for having optical filters to cut out extraneous light. UVTRON is usable both indoors and outdoors.

· Spectral response

Comparison with solar spectrum (in-house measurement data)



3 Fast response

UVTRON quickly senses UV light and outputs a signal within a few ms so can detect a hydrogen flame as soon as it ignites. UVTRON also instantaneously detects a hydrogen flame that fizzles out, which has been nearly impossible to do until now with indirect detection and other methods utilizing thermal sensing. UVTRON in this way delivers a quick response ensuring a high level of safety management.

■Specifications

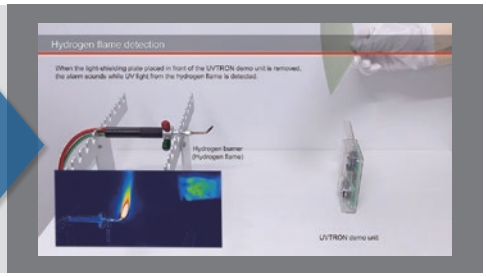
(Unit: mm)

Parameters			R9533	R14388	R2868	Unit
Spectral response range			185 to 260			nm
Recommended operating conditions	Supply voltage (DC)		350 ±25	325 ±25	325 ±25	V
	Average discharge current		0.3			mA
Characteristics (at 25 °C)	Sensitivity *1	Typ.	10000	10000	5000	min^{-1} *6
	Background *2	Max.	10	5	10	min^{-1} *6
	Estimated life *3		25000			h
Maximum rating	Supply voltage (DC)	Max.	400	420	400	V
	Average discharge current *4	Max.	1	3	1	mA
	Peak current *5	Max.	30	50	30	mA
	Operating temperature range	Max.	-40 to +125			°C

*1: These are reference values for sensitivity comparison at a wavelength of 200 nm and a light intensity of 10 pW/cm^2. Sensitivity varies depending on the wavelength of incident UV light and the drive circuit.
*2: Measured under indoor lighting (approx. 500 lux) and recommended operating conditions. Note that these values may slightly increase when used outdoors due to fluctuating ambient light.
*3: The service life is defined as the time period within which UVTRON normally operates under a constant discharge and recommended operating conditions. The service life varies depending on the operating temperature range and the drive circuit. Since high operating temperatures will shorten the service life, provide cooling air flow in situations where the operating temperature is likely to rise.
*4: The electrodes will not immediately wear out even if this maximum average discharge current is exceeded but using a wrong discharge current will drastically shorten the service life. So please use UVTRON at the recommended current.
*5: This is the allowable current value (full width at half maximum: 10 µs or less) during instantaneous current flow.
*6: min^{-1} indicates the count rate in units of counts/min.

On our website you can see how UVTRON detects hydrogen flames that are difficult to view with the naked eye. Please scan the QR code on the right or access to the URL below.

https://www.hamamatsu.com/all/en/product/optical-sensors/uv_flame-sensor/flame-sensor_uv-tron/videos.html



* UVTRON is a registered trademark of Hamamatsu Photonics K.K.

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