

Flame Detector

(Triple Infrared - Ultraviolet - Ultraviolet and Infrared combined)

1. Brief description

The flame detector (based on three infrared wavelengths, ultraviolet light, and combined use of ultraviolet and infrared light) is based on the principles for equipment for detecting flames. When a substance burns, it generates gas, which emits intense ultraviolet and infrared light. By sensing this intense light, the detector recognizes the existence of a flame. As with a gas sensor, it uses a detection system appropriate for each substance or application.

Detectable objects
[Flame] Factories, plants, etc.

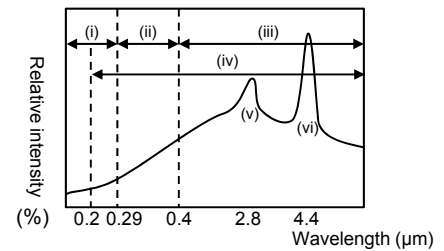
2. Principles

When a substance burns, it generates a substance-specific combination of gases. This combination includes H₂O and CO₂, each of which emits light of a wavelength specific to it. The flame emits light in the entire infrared- and visible-light regions that include the above mentioned wavelengths; in particular, it emits intense light in the ultraviolet region. Based on this light, the flame detector senses a flame.

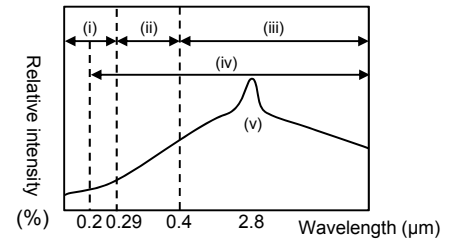
The light to be emitted varies depending on whether the flame is from hydrocarbon or not. The light from H₂O and CO₂ each has a peak if the flame is of hydrocarbon and the light from H₂O has a peak if the flame is not of hydrocarbon. The peak of the light from CO₂ is observed only for a hydrocarbon flame, which allows the detector to recognize only hydrocarbon flames. The peak of the light from H₂O is observed irrespective of whether the flame is of hydrocarbon or not, allowing the detector to sense both of hydrocarbon and non-hydrocarbon flames. In addition, the flame-emitted light seen in the ultraviolet region is observed irrespective of whether the flame is of hydrocarbon or not, allowing the detector to sense both of hydrocarbon and non-hydrocarbon flames.

[Legends] (i): UV light (ii): Visible light (iii): IR light (iv): Sunlight that reaches the earth's surface (v): H₂O peak (vi): CO₂ peak

For a hydrocarbon flame



For a non-hydrocarbon flame

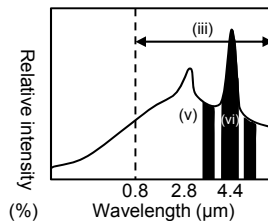


3. Features

Three infrared wavelength method

This system monitors the light of the peak wavelength range from CO₂ along with two wavelength ranges before and after the peak range. By monitoring three wavelength ranges, it minimizes incorrect detection. It is characterized by that it provides a high sensitivity and a long detection distance because it detects intense light.

[Legends] (i): UV light (ii): Visible light (iii): IR light (iv): Sunlight that reaches the earth's surface (v): H₂O peak (vi): CO₂ peak

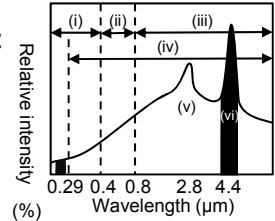


Combined use of ultraviolet and infrared light

This method monitors intense light in the infrared region along with light in the ultraviolet region.

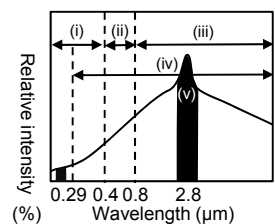
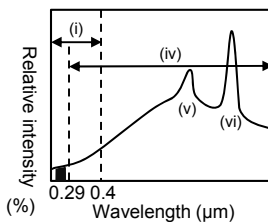
This prevents false alarms caused by sunlight or any other factor that is not a flame. As the figure on the right shows, this method includes a two-wavelength system that monitors one wavelength range each in the infrared and ultraviolet regions and three-wavelength system that two wavelength ranges in the infrared region and one wavelength range in the ultraviolet region.

The detectable flame varies depending on whether the wavelength range in the infrared region includes the peak of CO₂ (upper right figure) or not (lower right figure).



Ultraviolet method

This method monitors the ultraviolet region, which is low in radiation intensity. It monitors the wavelength range in which sunlight is normally absorbed in the atmosphere before reaching the earth's surface and therefore prevents false alarms caused by sunlight. It is characterized by that it quickly detects flames with a very high sensitivity.



4. Principles and detectable flames (examples)

Principles	Detectable flame
Three infrared wavelength method	Hydrocarbon flame
Ultraviolet method	Hydrocarbon flame, non-hydrocarbon flame (including welding and other sparks)
Combined use of ultraviolet and infrared light UV + IR (H ₂ O peak)	Hydrocarbon flame, non-hydrocarbon flame* * Hydrogen flame, silane flame, ammonia flame
Combined use of ultraviolet and infrared light UV + IR (CO ₂ peak)	Hydrocarbon flame

5. Products of this type (examples)

Stationary products

- ... Three infrared wavelength method: 40/40 I
- ... Ultraviolet method: BFL-3WW, FL-3W, FL-3B
- ... Combined use of ultraviolet and infrared light: 40/40 LB, 40/40 L4B, 40/40 UFL

40/40 series

