Talentum® – One detector for every application

Introduction

Talentum® has since 1970 offered excellence in life safety through its range of spark and flame detectors. Originally specialising in detection of textile fires, Talentum's approach to technology development has led to a uniquely flexible flame detector that has benefitted from continuous technological improvements.

Talentum detectors use FFE BroadSpectrum™ Technology to detect flames, a unique method of operation that assures effective detection of all fuels. Through its superior design and performance, Talentum flame detectors are trusted worldwide to detect all fuels in a wide range of difficult environments.

The Talentum range uses a series of multiple IR and UV/IR sensors to achieve its flexibility in detection. Whilst standard narrowband detectors look at the signal produced by hot gases like CO_2, Talentum looks at the specific heat signature of a flame, making it highly flexible. Talentum detection not only covers standard hydrocarbon fires, but also more difficult fuel types such as hydrogen and silane. Through our extensive testing, no fuel is beyond its detection capabilities, even for challenging fuels such as magnesium and sulphur.

Here we explain how BroadSpectrum Technology gives effective detection of all known fuels, through difficult conditions and whilst offering the user reduced operational costs.

FFE BroadSpectrum™ - the first truly universal flame detection technology

Talentum flame detectors have a unique method of operation that ensures effective detection of all fuels. BroadSpectrum™ Technology works by looking at a broad range of light and then separating the signal of the fire from that of the background light. Talentum uses both the short wavelength infrared (SWIR) and, for some models the Ultraviolet (UV) areas of the spectrum. We achieve our detection by splitting up the spectrum of light in the SWIR into different regions. A real fire will always produce more signal in the infra-red region than in the visible region.

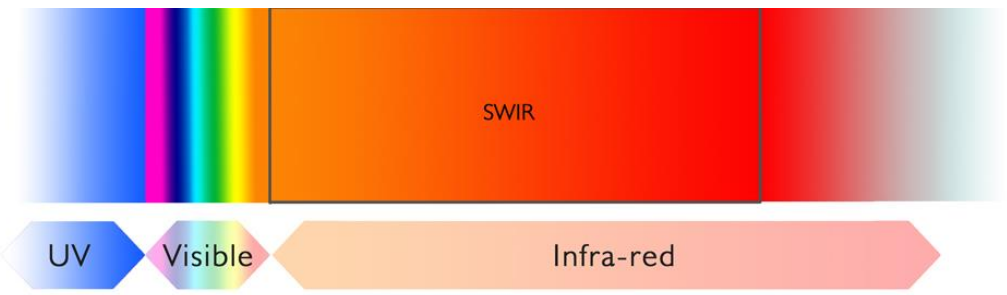

Figure 1: The flame region of the electromagnetic spectrum.

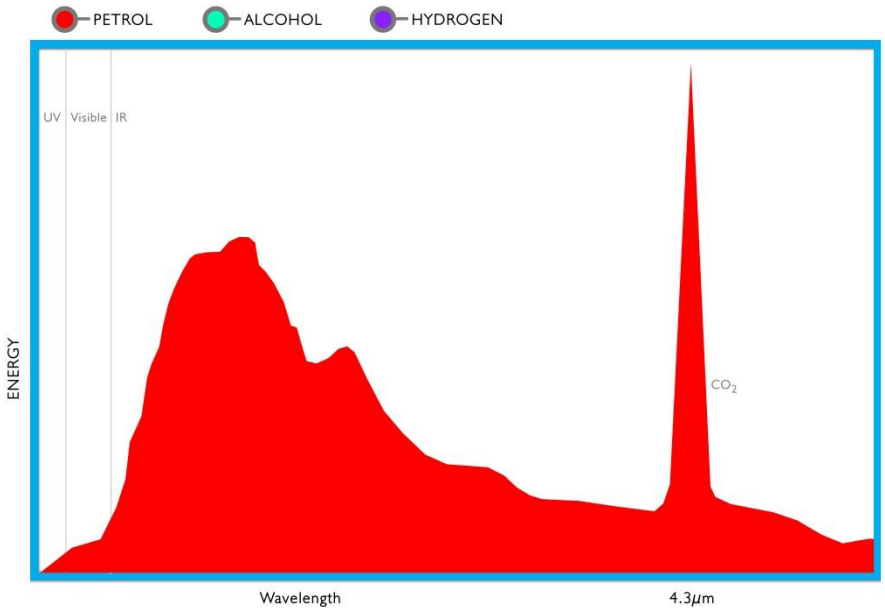

Figure 2: Spectrum of a petrol flame.
This is a standard fire from a standard fuel.

Figure 2 shows the light produced by a standard burning fuel such as petrol, plotted as energy versus wavelength. The red region is the typical light spectrum of burning petrol. A traditional narrowband detector will only look for the peak at 4.3 microns, which is the characteristic emission of burning carbon dioxide. Talentum detection is different – rather than looking for the emissions from hot gases Talentum looks at the specific heat signature of the flame.

Figure 3 shows in green the light produced by burning alcohol. The CO_2 peak at 4.3 microns is smaller than that of petrol, making narrowband detection less effective. However, Talentum detectors remain effective by looking at a wider fire spectrum, between 1.0 and 3.0 microns.

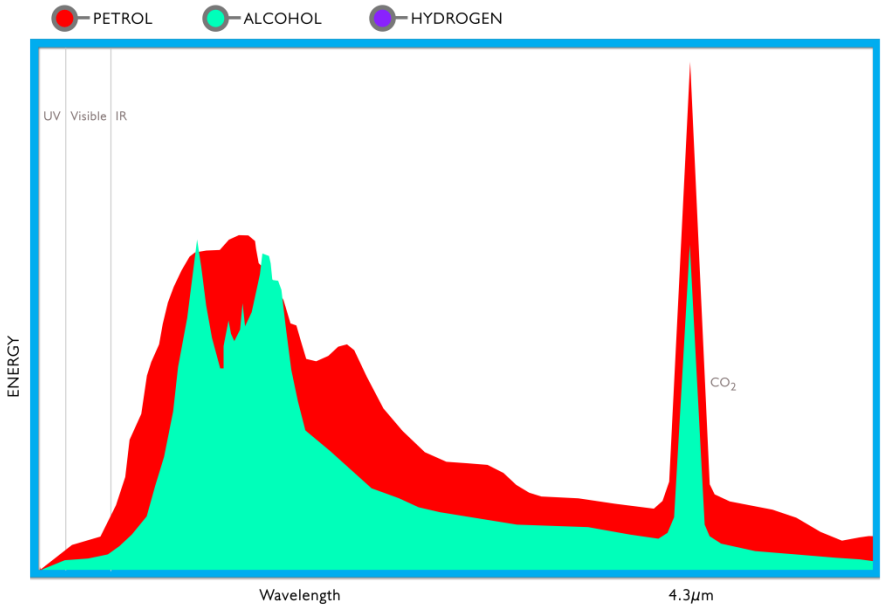

Figure 3: Alcohol flame spectrum.
This is a harder fuel to detect than most standard fires.

Figure 4 shows in purple the light produced by burning hydrogen. For hydrogen, there is no signal at 4.3 microns, and so such detectors are entirely ineffective. Talentum Flame Detectors are ideal at detecting hydrogen and all other non-hydrocarbon fires.

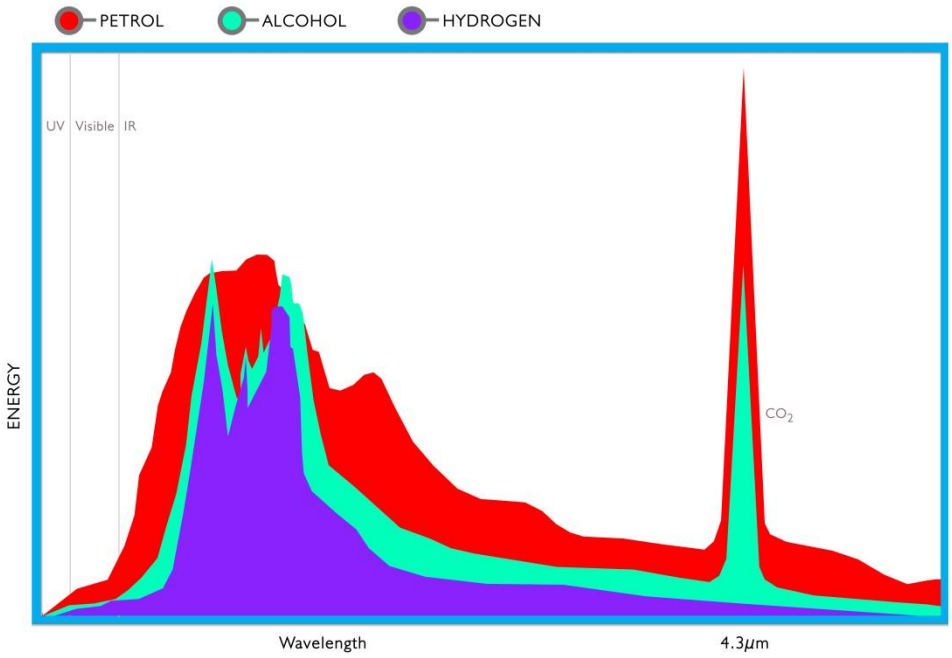

Figure 4: Hydrogen flame spectrum.
This is typically a very challenging fuel to detect.

The addition of a UV sensor makes the unit much more discriminating against false alarms, whilst providing an additional area of the spectrum to gather data in. This makes the overall fire decision much more robust.

Therefore, by acting upon the specific heat signature of a flame across the spectrum, Talentum Flame Detectors can detect fires from all fuels and reject false alarms.

Better Detection by Design

Effective detection of all fuels

The purpose of a flame detector is to protect against fire. The greater the number of fuel types the unit is sensitive to, the more flexible and reliable the detector becomes.

Standard 'narrowband' IR detectors rely on the signal produced by CO_2 at 4.3 microns to detect a fire, the light produced by burning hydrocarbons. Whilst this can be effective as a means of detecting certain types of fire, should there be insufficient 4.3 micron light produced, or if the signal is masked by a non-flame signal (such as CO_2 produced by an engine) then the unit's functionality will be compromised. Broad Spectrum™ Technology and wide band detection approaches allow the flame detector to be sensitive to all types of flames – Talentum flame detectors can sense all hydrocarbon fires and non-hydrocarbon fires.

Detecting non-hydrocarbons

Hydrocarbons, whilst a very common fuel type for fires, are not the only risk – for full fuel coverage, a better form of detector is required.

Whilst many fuels are hydrocarbons (petrol, plastics etc.), not all fires are hydrocarbon based. Compounds such as hydrogen, metals, silane and many gases do not contain carbon. A standard narrowband IR detector is blind to these fuels as they do not generate a 4.3 micron signal. Broad Spectrum technology looks at the specific heat signature of the flame to detect these additional fuels, and can even detect challenging fires such as sulphur that wide band methods cannot.

Dealing with real world fires

Fires in the real world produce a large amount of dirt, soot and smoke. An effective flame detector needs to deal with this to give users the reliability they need.

In theory, a fire produces a pure, clean flame that generates an easily detected signal. However, in the real world, the presence of smoke, soot and other particulates makes fires very challenging to detect. Standard narrowband units require a clean 4.3 micron signal- but that can be easily compromised, making its detection slower and less reliable. In comparison, Broad Spectrum Technology looks at the heat signature of the fire. The smoke created by a dirty flame does not block its heat signature, making Broad Spectrum Technology much more robust.

False alarm rejection through modulation

By combining the specific heat signature of a fire with the flicker frequency of a natural flame, we can significantly reduce false alarms.

Whilst the specific heat signature of the fire is a very effective means of analysing the fire, we can further increase our false alarm rejection by looking at the flicker that the fire produces. A natural fire will always have some turbulence, created by differences within the fuel and airflows. By looking at both these phenomena, it is possible to create a device that rejects virtually all false alarms, giving the user confidence that when the unit signals fire, it really is a fire.

Sensing cold fires

Whilst many fuels burn with a bright, energetic fire, some fires burn with a much cooler flame. Sensitivity to the flame here is vital, rather than simply relying on the output of hot gases.

Different fuels burn at different intensities. Hydrocarbons tend to burn very hot, making them easy to detect as the overall fire signal is bigger. However, fuels such as hydrogen, ethanol, methanol and other alcohols burn with a much cooler flame, making them harder to detect owing to the smaller signal. With Broad Spectrum Technology, so long as a flame is being produced, they will detect the specific heat signature of the flame, making them much more effective for cold fire detection.

Detecting partial combustion

Many fires are oxygen limited – meaning that the fuels do not fully combust and therefore do not produce CO_2. Effective flame detection means detecting fire regardless of the oxygen level.

Hydrocarbon fuels produce CO_2 when burnt, but only when there is plenty of oxygen present. When oxygen levels are low (for example in a confined space) then the fire will produce carbon monoxide (CO) rather than CO_2, leading to a reduced 4.3 micron peak and therefore significantly reduced detection. Broad Spectrum Technology does not use IR light from the 4.3 micron CO_2 peak. Looking for the general heat signature of the fire allows detection regardless of the oxygen level present, creating a more trustworthy and dependable device.

Impact of glass – installation and cost

Talentum IR detectors can operate through glass, allowing them to be installed in a wide variety of applications.

Flame detectors are used in a variety of challenging hazardous and dirty environments, where it is often advantageous to place the unit behind a glass window. This can be for several reasons, from maintaining the integrity of an ATEX zone, to reducing maintenance activities for a detector in a very dirty environment. However, 4.3 micron light is blocked by regular glass – users need to install exceptionally expensive sapphire windows for the narrow-band unit to function. Broad Spectrum Technology IR simply works through standard glass, significantly increasing the flexibility of installation for the detector and reducing the cost of ownership.

Environmental contamination

Talentum detectors cope with all manner of difficult applications, the vast majority of which do not require the addition of any accessories.

The 4.3 micron peak can be readily blocked not only by glass, but by a variety of atmospheric contaminants, including water vapour, dirt, ice and snow. It is therefore vitally important that narrowband IR devices are always heated and clean to ensure their correct functionality, increasing the cost of the unit, the running cost of the unit and the infrastructure cost. Talentum Broad Spectrum Technology is more tolerant of contaminants and so can operate in these difficult conditions without heaters and other accessories, owing to its superior selection of sensors and unique method of operation.

Power demands

Talentum's lower power consumption significantly reduces both power demands but also the cost of the supporting infrastructure, making it an excellent addition to a wider fire detection system.

Owing to the sensor technology required at this wavelength of detection, standard 4.3-micron narrowband IR units need to keep their internal sensors and optics at a constant temperature, creating a need for consistent internal temperature control. This not only increases the cost per unit, but also dramatically increases the energy consumption, raising infrastructure and running costs. Wide band IR systems (above 3 microns) normally require significant current to run their

sensors, which tend to have a high current draw. Uniquely among flame detectors, Talentum has a very low current consumption owing to the choice of sensor technology, drawing potentially as little as 4 mA. This saves the user both infrastructure and running costs, making the system significantly more attractive. It also allows the unit to be powered directly by a 4-20 mA system, increasing its flexibility – other detectors may be able to signal in 4-20 mA, but will require a separate power supply.

Universal detection

Significant research at FFE has gone into developing detection solutions for all fuel types, including Magnesium and Sulphur. With those difficulties solved, Talentum can truly claim to be a universal detector.

Sulphur is a uniquely difficult fuel fire to detect. When 'burning', sulphur is in fact undergoing a violent thermal decomposition that does not emit any IR radiation. After significant research, we have studied the spectrum of light produced by sulphur. This has led to the inclusion of a special software configuration on our UV/IR^2 devices that can detect this fire rapidly.

Additionally, magnesium is difficult to detect whilst rejecting false alarms. We have solved this problem, and can now offer a specific variant for this fuel based on our UV/IR^2 model.

Conclusion

In conclusion, Talentum's unique method of operation gives it substantial competitive advantages over every other flame detector. FFE BroadSpectrum™ Technology allows the user the best flame detection in class, with unrivalled flexibility in fuel detection. With excellent false alarm immunity and a robust design, Talentum® detectors are flexible enough for use in both the dirtiest applications as well as in a manner that keeps maintenance to a minimum.

It is fair to say that Talentum® detection technology represents revolution rather than evolution in flame detection. Broad Spectrum Technology™ makes simply a better flame detector, by design.

talentum®
Flame detection across the spectrum