

## REDEFINING SAFETY WITH THE LATEST IN OPTICAL FLAME DETECTION

Compared to only 10 years ago, recent advances in optical multi-spectrum infrared flame sensing technologies are now enhancing their features and capabilities. The result is improved accuracy, range, reliability, and efficiency that can help protect people, processes, and plants from flames and fires, as well as avoiding accidental false alarms (Figure 1).



### Optical Flame Monitoring Basics

The most common optical flame detectors are combination ultraviolet/infrared (UV/IR) and multi-spectrum infrared (MSIR) types. These detectors measure radiant energy in multiple spectral energy wavelengths and utilize signal processing algorithms to analyze radiant energy levels, ratio-metric relationships of the signal levels, and modulation or flicker rate of the IR energy. These algorithms are designed to enable fast and reliable flame detection while rejecting non-fire energy sources (false fire alarms) at the same time.

All optical flame detectors have a limited field of view as a function of fire size or radiant heat output and rely on a line-of-sight transmission of radiant energy from the source to the detector. It is important to always select the proper detector to match the radiant emissions expected from the flames to be detected. Since flammable fuels often emit unique spectral signatures, not all detectors are capable of detecting all fuels.

### The Detection Challenges

As effective as conventional (MSIR, UV, IR, UV/IR) flame detectors have been, they have had limitations when it comes to range, accuracy, installation, maintenance and false alarm immunity. This has been especially true in terms of false alarm immunity in facilities full of stainless-steel objects and other sources of reflective light, such as those typically found in petrochemical refineries, storage facilities, and distribution depots. Users also have reported problems with optical sensors in cold climates, heavy rain, and humid environments.

Verifiable fuel compatibility (third party tested) has been another limitation for some users, as well as the effective range or distance of reliable optical sensor flame detection. In large oil/gas production fields and chemical plant refineries, for example, range is an important issue because extended range accuracy requires fewer optical flame detectors to do the same job at a more economical cost. Monitoring the same area with fewer detectors also simplifies installation and start-up commissioning and day-to-day alarm monitoring. Maintenance is easier too, which reduces technician field time and the long-term cost of ownership.

### The Future Optical Solution Is Here Now

Flame and fire detection are important process and plant safety objectives that help save lives. For this reason, the MSA optical flame detector product engineering team has focused its latest efforts on the continuous improvement of enhanced detector



Figure 1: Petrochemical Plant FL5000 MSIR Detector Photo Montage

accuracy and false alarm immunity to help prevent industrial fires.

The result is the new MSA General Monitors® FL5000 Multi-Spectrum Flame Detector, which is a rugged, intelligent multi-spectrum infrared (MSIR) flame detector. It employs infrared (IR) detectors and an advanced flame detection algorithm leveraging the intelligence of three sophisticated artificial neural networks (ANN) for signal processing that detects real flame and fire hazards.

### Accuracy & False Alarm Immunity

The first thing users will appreciate about the new FL5000 Detector is its enhanced accuracy and false alarm immunity. With its intelligence, the FL5000 can distinguish between real flames and sources of false alarms common in petrochemical and other industrial plants, such as those caused by lightning, sunlight reflection, arc-welding, hot objects and other sources of radiation.

Next, the FL5000 Flame Detector's distance range has been extended now up to 310 feet (95 meters) for n-Heptane fuel sources, while maintaining accuracy and reliability in seeing

actual flames before they become full fire events. This instrument offers a wide field of view (FOV) too: 30° at 310 feet (95 m), 60° at 210 feet (64 m) or 90° at 110 feet (34 m) (Figure 2).

Plus, the performance of the FL5000 Detector has been Factory Mutual (FM) verified for 22 of the most common, popular fuel types in use by the petrochemical and other process industries, including: n-Heptane, gasoline, methanol, methane, butane, propane, ethane, ethanol, crude oil, ethylene glycol, isopropanol, diesel, JP4, JP5, JP8, jet fuel A, marina fuel, kerosene, xylene, MEK, wood, and cardboard.

### Bluetooth® Technology

The FL5000 Detector is the industry's first optical flame detector with Bluetooth technology for use in initial configuration set-up and diagnostics activity via a mobile device. This proven technology has been pioneered by MSA Safety in the roll out of its ULTIMA® X5000 & General Monitors® S5000 Gas Detector Series, which will help eliminate much of the learning curve in plants

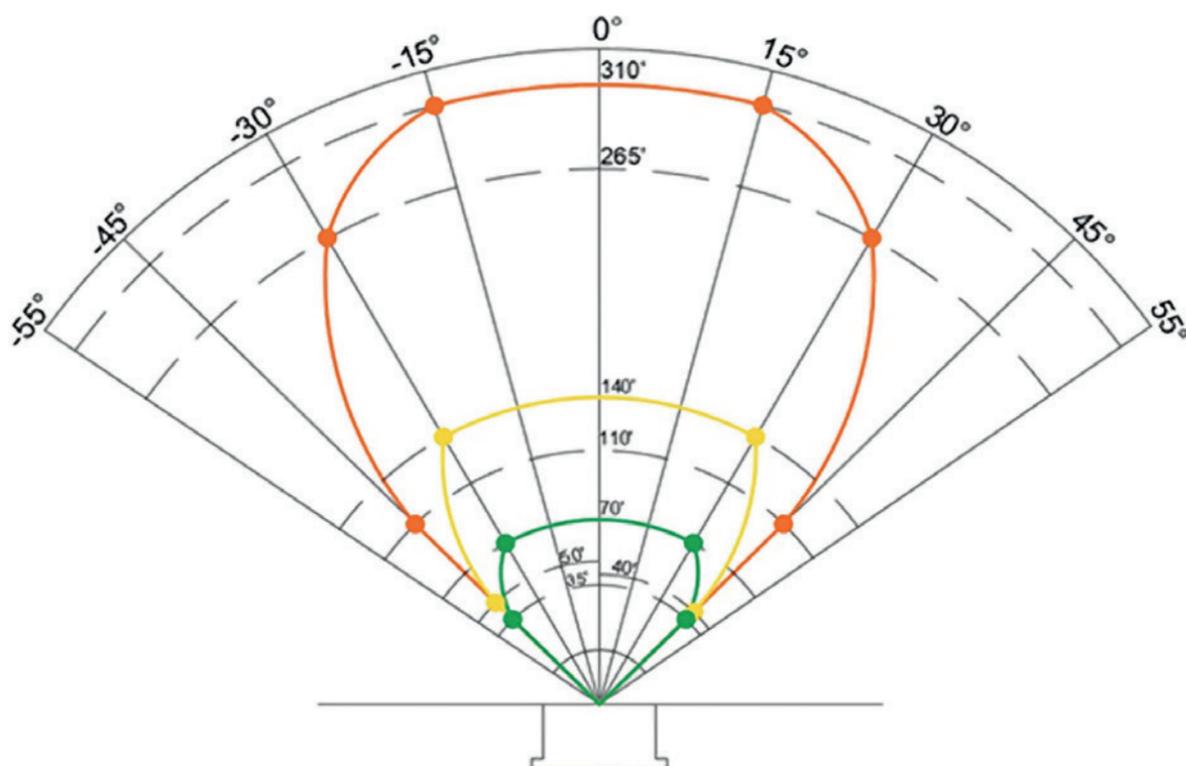


Figure 2: FL5000 Detector Extended Range & FOV Graphic

already protected by these toxic and combustible gas monitoring devices as they install the FL5000 Detectors.

MSA's Flame Connect App (Figure 3) for the FL5000 Flame Detector is now available on both the Google Play and Apple App stores. New FL5000 Detector users will appreciate the way this app enables their quick setup and checking of detector status, as well as the ability to monitor detector performance in near real time, turn the optics heater off/on, and download event logs. In addition to its unique Bluetooth app, the FL5000 Detector features Modbus RS-485 and HART 7 bus communications for integration with automated plant process and comprehensive safety systems.

### Rugged Design With Approvals

The SIL 2/3 rated FL5000 Detector comes with comprehensive hazardous area safety classifications and approvals including FM, CSA, IECEx, ATEX, UKCA, CE Marking as well as performance approvals for FM, ULC, and EN 54-10. MSA's rugged flame detector design features a red powder coated 316 stainless steel body, which is resistant to harsh outdoor climate conditions around the globe from the freezing temperatures of northernmost Europe to the heat of the Middle East/African continent and the humidity of the tropics.

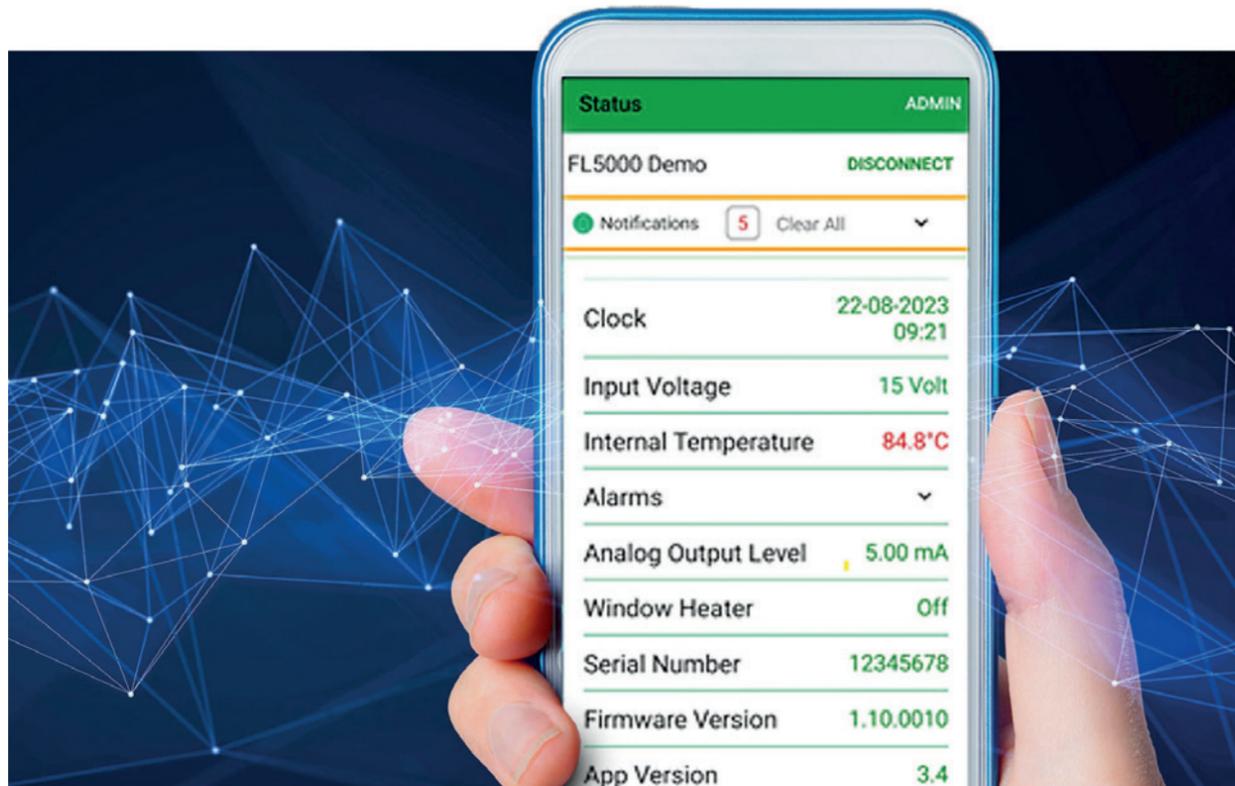


Figure 3: Sample Bluetooth App Screen(s)

### Built-In Reliability

The highly intelligent FL5000 MSIR Flame Detector features a built-in self-check known as Continuous Optical Path Monitoring (COPM). Every two minutes, the instrument's electronics perform an optical and electrical check to ensure the path is clear and the electronic circuitry is operational. In addition, it includes a built-in heater that keeps frost and condensation away to help ensure the optical integrity of the infrared sensor array.

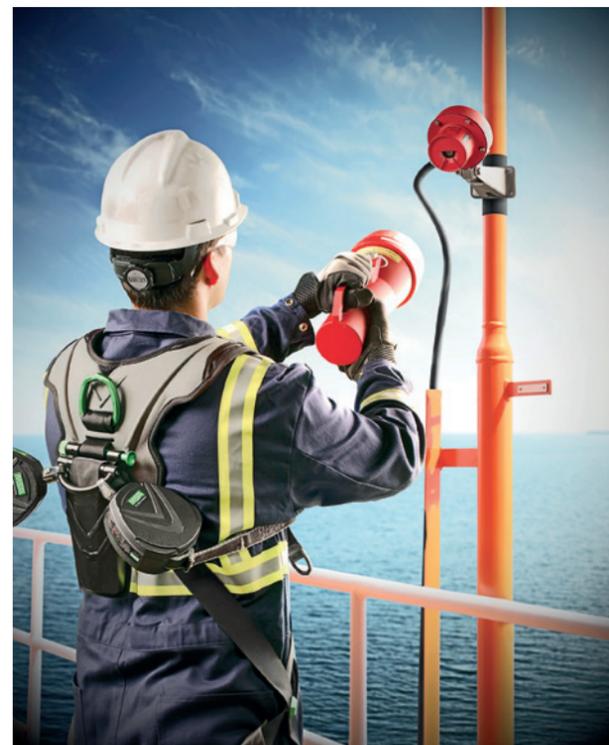


Figure 4: Flame detector being tested with TL105 test lamp

### Ease of Maintenance

Field technicians will appreciate that the FL5000 Detector can be manually tested from the ground with MSA's explosion-proof TL105 Test Lamp (Fig 4), which simulates the flickering of a fire. This allows the detector to be in-situ tested under real fire conditions without the associated risk of an open flame.

### Upgrading To Next Gen Technology

The new FL5000 MSIR Flame Detector has been designed with existing users of General Monitors FL4000H MSIR Flame Detectors in mind. For starters, these devices have the same footprint in common and much more.

To upgrade to the FL5000 Detector, all the user needs to do is remove the FL4000H front housing, remove the wiring, remove the optical and relay electronics, insert the FL5000 optical and relay electronics, hook the wiring back up, and put the FL5000 front housing on. This easy-upgrade design means the user need not remove any of their wiring conduits or remove seals that would require significant additional work and inspections.

### Conclusions

Representing the future, but available today, MSA Safety's new FL5000 MSIR Flame Detector offers process, plant, and safety engineers a step forward in technology to help protect people, equipment, and the planet from flame incidents and catastrophic fires. Not only does it offer improved range-ability with a wide field of view covering more fuel types, but its industry-first Bluetooth application software allows those responsible for plant fire protection to access these detectors with mobile devices for true safety peace-of-mind.

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