APPLICATION

The U7698E is a completely unitized single frequency infrared (IR) flame detection device that incorporates all detection, electronic, and switching components in a single explosion-proof/flame-proof enclosure. The microprocessor based circuitry offers field adjustable sensitivity, time delay, signal processing methods and either automatic or manual optical integrity (Oi) testing. These features allow the flame detector to be adjusted to meet the needs of a wide variety of applications. The U7698E provides reliable fire protection for hydrocarbon fires in areas that can present problems for other types of optical detectors. The U7698E is ideally suited for harsh salt water environments, for areas where arc welding, x-rays, lightning, high concentrations of ultraviolet attenuating vapors occur, and areas where oil film or dust particles can accumulate on the viewing window. Typical applications for the U7698E include:

- offshore platforms
- refineries
- transport loading racks
- turbine enclosures
- paint spray booths.
- high pressure gas locations

FEATURES

- Long detection range to hydrocarbon fires.
- Field selectable automatic or manual Oi.
- Fire and fault relays standard.
- Optional 4 to 20 ma output with separate Oi fault indication.
- Easily visible LEDs indicate normal operation, fire and fault conditions.
- Adjustable sensitivity and time delay for fire output.
- High-speed capability.
- CENELEC approved for internal installation of addressable modules.

*Oi is Detector Electronics' Trademark for its patented Optical Integrity Systems, U.S. Patent 3,952,196, United Kingdom Patent 1,534,969, Canada Patent 1,059,598.

SPECIFICATION DATA

Unitized Single Frequency Infrared Flame Detector/Controller
U7698E

- Selectable latching or non-latching for fire and fault outputs.
- Selectable Time Domain Signal Analysis (TDAS) or Standard signal processing method.
- Modular design with microprocessor based circuitry.
- Ignores false alarm sources such as arc welding, lightning, chopped sunlight and x-rays.
- Optional swivel mounting bracket for ease of installation and positioning.
- Operates under adverse weather conditions and in dirty environments.
- Space provided for installation of addressable interface devices.
- Explosion-proof/flame-proof detector housing designed to meet BASEEFA/CENELEC, FM and CSA requirements.
DESCRIPTION

Precision optical filters in the U7698E limit the response of the solid state sensor to radiation in the 4.45 micron range. The signal processing method of the resulting signal is field selectable to customize the U7698E to the application. Because flicker is a characteristic of fire, standard signal processing uses a flicker filter to test the signal, rejecting any signal that does not meet the flicker frequency requirements, such as steady state IR emissions. TDSA signal processing technique analyzes the input signal in real time, allowing it to effectively ignore regularly chopped IR signals that exist in an application that would cause an alarm using the Standard signal processing method. TDSA requires the IR signal to flicker randomly in order to recognize it as a fire condition.

The U7698E has a selectable Massive Channel feature which, when turned on, allows time delay requirements to be over-ridden in the event of an intense signal. When the Massive Channel is activated, the detector is capable of responding to an intense fire signal (fire at close range) in less than 50 milliseconds (0.050 seconds).

The U7698E is equipped with the automatic or manual oi feature. The patented oi system assures proper operation of the detector by checking the cleanliness of the optical surfaces, sensitivity of the IR sensor, and proper functioning of the electronic circuitry.

The U7698E provides a normally de-energized Form C relay output for fire conditions. A normally energized (closed) relay contact is provided for normal operation (no fault conditions) and will de-energize (open) to indicate a fault condition. An optional 4 to 20 ma current output is also available for indicating normal operation, fire, oi fault and fault conditions.

The U7698E provides LEDs in the sensor window for indicating normal operation, fire and fault conditions. During normal operation, the LEDs will blink once every 5 seconds with automatic oi selected and once every 10 seconds with manual oi selected. If a fire condition exists, the LEDs will turn on and remain on until the fire is no longer detected, or until the unit has been reset if latching operation has been selected. A fault condition is indicated by the LEDs no longer blinking.

The U7698E housing is designed to provide ample space for field wiring and for easy access to wiring terminals. The housing has two conduit/cable entries to facilitate incoming and outgoing wiring when connecting multiple detectors in a loop. An optional Q9001 swivel mounting bracket allows easy sighting of the detector in the field.

SPECIFICATIONS

OPERATING VOLTAGE—
24 vdc nominal (18 vdc minimum, 32 vdc maximum).

POWER CONSUMPTION—
2.0 watt typical, 4.0 watts maximum during oi test, 7.0 watts maximum when end of line components are installed.

OUTPUT RELAYS—
The timed Fire Alarm is Form C (N.O. and N.C. contacts available). The Fire Alarm relay is normally de-energized and is field programmable for either latching or non-latching operation. The Fault relay is normally energized. The Fault relay contacts are normally closed when power is applied and no faults are present. The relay contacts are rated for 5 amperes at 30 vdc.

TEMPERATURE RANGE—
Operating: –40°F to +167°F (–40°C to +75°C)
Storage: –40°F to +185°F (–40°C to +85°C)

CURRENT OUTPUT—
An optional 4 to 20 ma output is available that can be wired for current sinking or current sourcing, isolated or non-isolated operation. The output requires a minimum of 6.5 vdc across its terminals to operate properly. The output is capable of driving an 875 ohm load when at 24 vdc. The current output is field programmable for latching or non-latching operation.

0 milliampere = fault
2 milliampere = oi fault
4 milliampere = normal condition
16 milliampere = instant alarm (standard mode only)
20 milliampere = fire condition

HUMIDITY RANGE—
0 to 95% relative humidity, can withstand 100% condensing humidity for short periods of time.

SPECTRAL SENSITIVITY—
4.45 microns.

CONE OF VISION—
The detector has a 80 degree cone of vision with the highest sensitivity lying along its central axis.

FLAME SENSITIVITY—
The detector has 4 field adjustable sensitivity settings. When the standard setting is selected, the detector will respond to a 1 square foot gasoline fire at 85 feet.

RESPONSE TIME—
The detector is field selectable for a 0 to 7.5 second time delay (in 0.5 second intervals) when the
Standard signal processing mode is selected. When the TDSA signal processing mode is selected, the detector response time typically 1 to 5 seconds, depending on the field programmable switch settings. The detector is capable of responding to fire within 50 millisecond when Massive Channel is selected. Response time is a function of fuel, fire size, distance, detector adjustments and orientation of the fire source. Typical time delay setting is 3 seconds.

POWER ON DELAY—
8 seconds

ENCLOSURE MATERIAL—
Copper-free aluminum or 316 stainless steel. Optional stainless steel mounting bracket used with both housings.

DETECTOR ENCLOSURE RATINGS—

VIBRATION—
The U7698E is designed to meet MIL-STD-810C vibration requirements.

DIMENSIONS—
See Figures 1 and 2.

WIRING—
14 AWG (1.5 mm²) to 22 AWG (0.3 mm²) shielded cable is recommended.
CONDUIT ENTRIES—
Two conduit/cable entries per detector. Two sizes available: 3/4 inch NPT, 25 mm.

TERMINAL CONFIGURATION—
See Figure 3.

SHIPPING WEIGHT (Approximate)—
Aluminum: 4.75 pounds (2.14 kilograms). Stainless Steel: 10 pounds (4.54 kilograms).

ENGINEERING SPECIFICATION
The IR flame detection system shall be a unitized device that contains all sensing, signal processing, visual indicators, and relay outputs in a stainless steel enclosure. The detector shall operate on 24 vdc. The signal processing circuitry shall require the IR radiation to exceed minimum threshold levels and time delay before signaling an alarm condition. The detector shall have field adjustable sensitivity and be capable of responding to a 1 foot by 1 foot gasoline fire at a distance of 85 feet. The detector shall be capable of a 50 millisecond or faster response time to an intense fire signal. The device must be capable of responding to a fire when arc welding, X-rays or hot surfaces are present. The detector shall not respond to regularly chopped blackbody sources. The detector shall have a uniform 80° cone of vision.

The detector shall have a normally de-energized Form C relay for the fire output. A normally energized relay (closed contacts) shall be provided for the fault output. Relays shall be rated for 5 amperes at 30 vdc. The detector shall be field selectable for latching or non-latching operation through the use of an internal switch. The detector shall have a 4 to 20 ma output that signals normal, fire, and fault conditions. An optical test fault shall be indicated separately from a general fault on the 4 to 20 ma output.

Two red LEDs shall be visible through the sensor window to allow visual annunciation of detector status from a wide viewing angle. The LED indicators shall provide visual annunciation of normal operation, fire, and fault conditions.

The IR flame detector shall have a modular design that will allow the electronics module and the IR sensor module to be easily field replaced without disturbing field wiring. All optical surfaces shall be easy to access for cleaning, no metal rods shall be allowed in front of the sensor window. The IR flame detector shall have optical testing capabilities that can be field selectable for automatic or manual operation. Ice films that blind the IR sensor shall cause the fault relay to de-energize. The LEDs shall stop blinking to annunciate the fault.

Field wiring terminals shall be suitable to accept 1.5 mm² wire. The device shall be suitable for Style D (Class A) wiring.

The IR flame detector shall be rated for an operating temperature range of –40°F to +167°F (–40°C to +75°C) and a storage temperature range of –40°F to +185°F (–40°C to +85°C). The detector shall operate over a humidity range of 0 to 95% RH. All printed circuit boards shall be coated to provide protection from the environmental conditions. The IR flame detector shall be designed to meet MIL-STD-810C for vibration.

The IR flame detector shall be flame-proof and rated for IIC T6 and IIC T4 environments. The device shall be IP66 (dust-tight,watertight). The IR flame detector shall be the Det-Tronics model U7698E, no equal.

ACCESSORIES
—Q9001 Swivel Mount Assembly (shown in Figure 1) is recommended for mounting the detector.
—Q1113 Air Shield Assembly is intended for use in locations with high levels of airborne contaminants.
—W867 Explosion-proof Test Lamp for remote testing of the detector.
—W8067 Test Lamp for remote testing of the detector in non-explosive environments.
—Q1201 (holder) and TP2 (laser) cone of vision tester.