Simplex

*UL, ULC**

Datasheet

# Conventional Smoke and Heat Detectors

Photo-Heat, Photo, and Heat Detectors for Two-Wire and Four-Wire Bases

## Description

Simplex ® photoelectric and photoelectric-heat detectors provide many of the proven analog sensing features for applications where detectors are connected to conventional two wire or four wire initiating device circuits (IDCs). Each detector has an onboard microprocessor that evaluates its photoelectric light scattering chamber activity. The onboard microprocessor makes an intelligent decision based on light scattering history as to whether an alarm condition is present.

Simplex photoelectric-heat detectors combine photoelectric smoke detection technology and quick response, thermistor-based heat detection technology into a sophisticated, intelligent detector. The detector analyzes each of these activities and their combination to determine whether alarm conditions are present. As a result, this microprocessor based analog detection maintains response to conditions indicative of faster acting, hot flaming fires when compared to the response of either photoelectric smoke activity or thermal activity alone, while maintaining the established high level of immunity to false alarms and nuisance alarms that is inherent with the sensor operation.

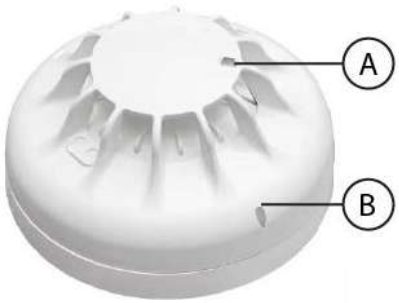
False alarm resistant detection. An onboard microprocessor provides photoelectric detection with sensitivity drift compensation, using either photoelectric or photoelectric/heat trending analysis for alarm detection. If any of these alarm conditions are experienced, an alarm is initiated.

Simplex heat detectors use a fast response, thermistor based design to provide temperature sensing that quickly, accurately, and consistently identifies when fixed temperatures are exceeded. The fixed temperature sensing thermistor tracks the local ambient temperature. This eliminates the time required to melt a lead pellet or heat a bimetallic element as occurs in mechanical heat detector designs and provides the required heat detection for most applications.

Rate-of-rise (RoR) detection is determined by the comparison of two thermistor responses. By the combination of accurate thermistors with proper physical placement, this rate-of-rise detection design achieves a superior performance that is not normally available with mechanical detection. Rate-of-rise heat detection occurs at ≥ 20° F/min (11° C/min). To minimize the possibility of false alarms, rate-of-rise detection is correlated to the ambient temperature and only activates at more than 90° F (32° C).

The detectors are packaged in a registered design housing that minimizes the visibility of the air intake louvers from the normal viewing locations and maintains a high performance smoke capture ability. Bases are available for remote alarm LED indicator connections and auxiliary relay outputs.

**Figure 1: Heat detector**




| Callout | Description |
|---|---|
| A | Status indicator, red LED |
| B | Unlock aperture with a clip on the base to secure the detector into the base. |

## Features

**Note:** * UL and ULC approvals are specific to particular photo and photo-heat detectors SKUs. For details see Table 2.

**Figure 2: 4098-5602 Photo-Heat or 4098-5601 Photo detector**




**Photoelectric detection and photoelectric with heat detection:**

- Stable and reliable photoelectric smoke detection with built-in sensitivity drift compensation.
- Correlation of smoke activity and thermal activity that provides intelligent fire detection that is more resilient than with either activity alone.

**Heat detection:**

- Includes both rate-of-rise and fixed temperature thermistor-based detection.
- Detects abnormally high rates of rising temperatures and abnormally high temperatures respectively.

**Functional chamber enclosure:**

- Concentric baffle design enhances smoke capture by the direction of flow to the chamber.
- Entrance areas are minimally visible when ceiling mounted.
- Operation is for ceiling or wall mounting

**Multi-function LED indicator:**

- Indicates normal and alarm conditions
- Provides status during a magnetic functional test

**Magnetically operated functional test:**

- Initiates an alarm and verifies performance
- Identifies general sensitivity status with detector LED pulses
- With detectors categorized as normal or needing cleaning or other service, maintenance priorities can be more easily determined

**Available options:**

- Bases for two wire or four wire operation
- Auxiliary alarm relay output
- Remote alarm LED indicator

**Designed for EMI compatibility**

**Photo and Photo-Heat detectors are listed to UL standard 268 Edition 7. Heat detectors are listed to UL standard 521 Edition 7.**

## Specifications

**Table 1: Specifications**

| Specifications | Detector data | | | |
|---|---|---|---|---|
| Detector PID | 4098-5602, 4098-5604[1] | 4098-5601, 4098-5603[1] | 4098-5611, 4098-5612[2] | 4098-5610, 4098-5613[3] |
| Type of detector | Photo-Heat | Photo | Heat | Heat RoR |
| Operating voltage, two wire | 10.5 to 33 VDC | 10.5 to 33 VDC | 10.5 to 33 VDC | 10.5 to 33 VDC |
| Rated voltage, four wire | 15 to 32 VDC | 15 to 32 VDC | 15 to 32 VDC | 15 to 32 VDC |
| Input ripple voltage | 25% max. | 25% max. | 25% max. | 25% max. |
| Max. alarm current | 64 mA at 30 V, 33 mA at 20 V, 14.5 mA at 12 V | | | |
| Surge current | <200 µA | <200 µA | <200 µA | <200 µA |
| Standby current | <70 µA | <70 µA | <70 µA | <70 µA |
| Heat element rating | 135°F (57.2°C) | n/a | 135°F (57.2°C) | 135°F (57.2°C) fixed temperature and rate-of-rise. |
| Rate-of-rise temperature alarm | n/a | n/a | n/a | >=20°F/min (11°C/min), only in effect at temperatures >90°F (32°C) |
| Humidity range, non-condensing | 10-95% RH | 10-95% RH | 10-95% RH | 10-95% RH |
| Air velocity range | 0-2000 FPM | 0-2000 FPM | n/a | n/a |
| Ambient operating temperature range [4] | 32°F to 100.4°F (0°C to 38°C) | 32°F to 100.4°F (0°C to 38°C) | 32°F to 122°F (0°C to 50°C) | 32°F to 122°F (0°C to 50°C) |
| Storage temperature | -22°F to 158°F (30°C to 70°C) | | | |

**Table 1: Specifications**

| Specifications | Detector data |
|---|---|
| Height | 42mm (1 5/8 in.) 53mm (2 1/8 in.) with base |
| Material | All plastic parts: flame retardant ABS or PC-ABS |
| Mounting position | Mount on or close to ceiling, out of direct sunlight |
| Environment | Only indoor application |

**Note:**

1. 4098-5603 and 4098-5604 detectors are ULC listed.
2. The heating element for 4098-5612 is rated at 200°F or 93.3°C .
3. The heating element for 4098-5613 is rated at 200°F or 93.3°C fixed temperature and rate-of-rise.
4. Ambient operating temperatures only refer to normal installation temperatures. During fire conditions, the detectors experience considerably higher temperatures, but they can continue to function at the higher alarm temperatures.

## Smoke detector features

**Intelligent data evaluation.** Conventional smoke detectors typically become too sensitive due to the accumulation of dust and dirt. With microprocessor based analog detection, data from the photoelectric chamber is monitored and analyzed at the detector to provide a continuously shifting reference point.

**Drift compensation.** The data evaluation and its shifting reference point provide a software filtering process that compensates for environmental factors such as dust or dirt, and component aging. This establishes an accurate reference for evaluating new activity. With this filtering, the resulting drift compensation significantly reduces the probability of false or nuisance alarms caused by shifts in sensitivity – either up or down.

**Maintained sensitivity and dirty status indications.**

With its onboard software compensation, the 4098-5601 and 4098-5602 maintain their sensitivity much longer in the presence of dust and dirt accumulation. Additionally, it determines when the dirt accumulation is near the limit of compensation, and indicates that condition through its status indicator LED. See diagnostic information.

## Magnetic test information

The detectors have self-monitoring feature that enables them to detect problems. To check the status information, perform the magnetic test and observe the detector LED pulses. The LED normally goes directly into alarm with the magnetic test. If there is an off-normal condition, the LED pulses first to indicate the condition and then goes into alarm. See Detector status LED indications and Table 8 Magnetic test LED response.

**Note:** Replace the photo detector when it is dirty. Contact your local branch office.

## Application reference

Observe heat detector location guidelines. Ambient temperature operating range is 32°F to 100°F (0°C to 38°C). Temperature fluctuations must be less than 6°F/min (3.3°C/min).

Detector locations. Determine locations only after careful consideration of the physical layout and contents of the area to be protected. Refer to NFPA 72, ***the National Fire Alarm Code***. On smooth ceilings, smoke detector spacing of 30 ft (9.1 m) may be used as a guide. For detailed installation information, refer to ***4098 Detectors, Sensors, and Bases Application Manual (574-709)***.

## Product Selection

**Table 2: Detector types**

| PID | Description | Compatibility |
|---|---|---|
| 4098-5602 | Photo-Heat detector listed to UL. | Compatible with bases: 4098-5207, 4098-5261, 4098-5680, and 4098-5682 |
| 4098-5604 | Photo-Heat detector listed to ULC. | |
| 4098-5601 | Photo detector listed to UL. | |
| 4098-5603 | Photo detector listed to ULC. | |
| 4098-5610 | Heat detector at a 135°F or 57.2°C fixed temperature and rate-of-rise. | |
| 4098-5611 | Heat detector at a 135°F or 57.2°C fixed temperature . | |
| 4098-5612 | Heat detector at a 200°F or 93.3°C fixed temperature. | |
| 4098-5613 | Heat detector at a 200°F or 93.3°C fixed temperature and rate-of-rise. | |

**Note:** The heat detectors are listed to both UL and ULC standards.

**Table 3: Maximum spacing between heat detectors**

| Model | Rating | Type | UL Maximum Spacing |
|---|---|---|---|
| 4098-5610 | 135°F or 57.2°C | Fixed with rate-of rise | 50 ft |
| 4098-5611 | | Fixed temperature | 50 ft |
| 4098-5612 | 200°F or 93.3°C | Fixed temperature | 50 ft |
| 4098-5613 | | Fixed with rate-of rise | 50 ft |

**Table 4: Compatible bases**

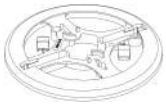
| Model | Description | Details* |
|---|---|---|
| 4098-5207 | Two wire 5 in. base for conventional/ addressable detectors with connections for remote alarm LED indicator | IDC and LED connections are screw terminals for in/out wiring, 18 to 14 AWG |
| 4098-5261 | Two wire 4 in. base for conventional/ addressable detectors with connections for remote alarm LED indicator | IDC and LED connections are screw terminals for in/out wiring, 18 to 14 AWG |
| 4098-5682 | **Four wire 5 in. base** with Auxiliary Alarm Relay Contacts and connections for Remote LED Alarm Indicator<br>**Note:** Requires external 24 VDC for operation | **Relay ratings, single form "C", for suppressed loads:**<br>Power limited, 3 A at 28 VDC. Non-power limited, 3 A at 120 VAC<br>**Wiring connections (In/Out where required):**<br>Relay contacts and IDC wiring, color coded 18 AWG leads. LED wiring, screw terminals for 18 AWG to 14 AWG |
| 4098-5680 | **Two wire 5 in. base with Auxiliary Alarm Relay** and connections for Remote LED Indicator<br>**Note:** Connect as the only device on the IDC to ensure relay operation. | **Relay ratings, dual form "C", for suppressed loads:**<br>Power limited, 1 A at 28 VDC. Non-power limited, 1/2 A at 120 VAC<br>**Wiring connections (In/Out where required):**<br>Relay contacts and IDC (-), color coded 18 AWG leads. IDC (+) and LED wiring, screw terminals for 18 to 14 AWG |

**Note:**

**Table 5: Detector accessories**

| Model | Description | | Details* | |
|---|---|---|---|---|
| 4098-9799 | 6 in. adapter plate used with a 5 in. base | | **Required** to mount to surface mounted 4 in. (102 mm) square or 4 in. octagonal boxes, and to 4 in. square flush mounted boxes | |
| | | | You can use it when to retrofit to existing bases | |
| | | | Compatible with detector base 4098-5207 | |
| 4098-9830 | Remote LED indicator | | Mounted on single gang stainless steel plate | |
| 2098-9739 | Encapsulated | 24 VDC End-of-Line Relay | Dimensions: 2-1/2 in. x 1-1/2 in x 1 in. (64 mm x 38 mm x 25.4 mm) | **Required** for four wire circuits using 4098-5682 base, one for each circuit. Select mounting type as required. Wiring is color coded 18 AWG wire leads |
| 2098-9735 | Plate Mounted | | Mounted on single gang stainless steel plate | |
| * Refer to Dimensions and reference information for dimensions and additional mounting details. 18 AWG = 0.82 $mm^2$. 14 AWG = 2.08 $mm^2$ | | | | |

**Table 6: Base/Adaptor and Backbox compatibility**

| Base / Adapter | | Single gang / Handy box Approximately 4 in. x 2 in. (102 mm x 51 mm) 83 mm fixing centers  | 3.5 in. Octagon Diameter 3.5 in. (89 mm) 70 mm fixing centers  | 4 in. Octagon Diameter 4 in. (102 mm) 90 mm fixing centers  | 4 in. Square 4 in. x 4 in. (102 mm x 102 mm) 120 mm fixing centers  |
|---|---|---|---|---|---|
|  | 4 in. Base 4098-5261<br>Outside diameter 4.3 in. (109 mm).<br>Fixing centers 50 mm to 70 mm. | No | Yes | No | No |
|  | 5 in. Base 4098-5207<br>Outside diameter 4.9 in. (125 mm).<br>Fixing centers 50 mm to 88 mm.<br>See note. | Yes | Yes | Yes<br>See note. | No |
|  | 5 in. Base 4098-5207 with new 5 in. to 6 in. adapter.<br>Outside diameter 6.3 in. (160 mm).<br>4098-9799<br>Fixing centers 50 mm to 130 mm. | Yes | Yes | Yes | Yes |
|  | 4098-5210 (Eaton) Sounder Base<br>Outside diameter 4.3 in. (109 mm).<br>Fixing centers 50 mm to 70 mm. | No | Yes | No | No |
|  | 4098-5210 with new 5 in. adapter plate 4098-5227.<br>Fixing centers 50 mm to 90 mm. | Yes | Yes | Yes | No |
|  | 4098-5210 with new 6 in. adapter plate 4098-5228.<br>Fixing centers 50 mm to 130 mm. | Yes | Yes | Yes | Yes |

**Note:** Increased to 90 mm on the latest design for 4098-5207

## Detector status LED indications

**Table 7: Detector status LED indications**

| LED indication | Status |
|---|---|
| Pulses approximately every 4 seconds | Normal |
| Steady on | Alarm |

**Table 8: Magnetic test LED response**

| Fault Type | LED | Fault Description |
|---|---|---|
| Fault A | Red LED flashes four times every two seconds then the detector goes into alarm | Detector is within 10% of drift compensation limit |
| Fault B | Red LED flashes six times every one second then the detector goes into alarm | Heat sensing element is damaged in the Optical Heat detector |
| Fault C | Red LED flashes four times every two seconds but the detector does not go into alarm. The LED continues to flash while the magnet is in place and 10 seconds afterwards. The detector then returns to normal operation. The detector becomes more sensitive and risks false alarm. | Detector has reached drift compensation limit or the optical sensor or the heat sensor is faulty. |

## Dimensions and reference information

**Figure 3: 4098-5601 and 4098-5602 dimensions mounted on base, in. (mm)**

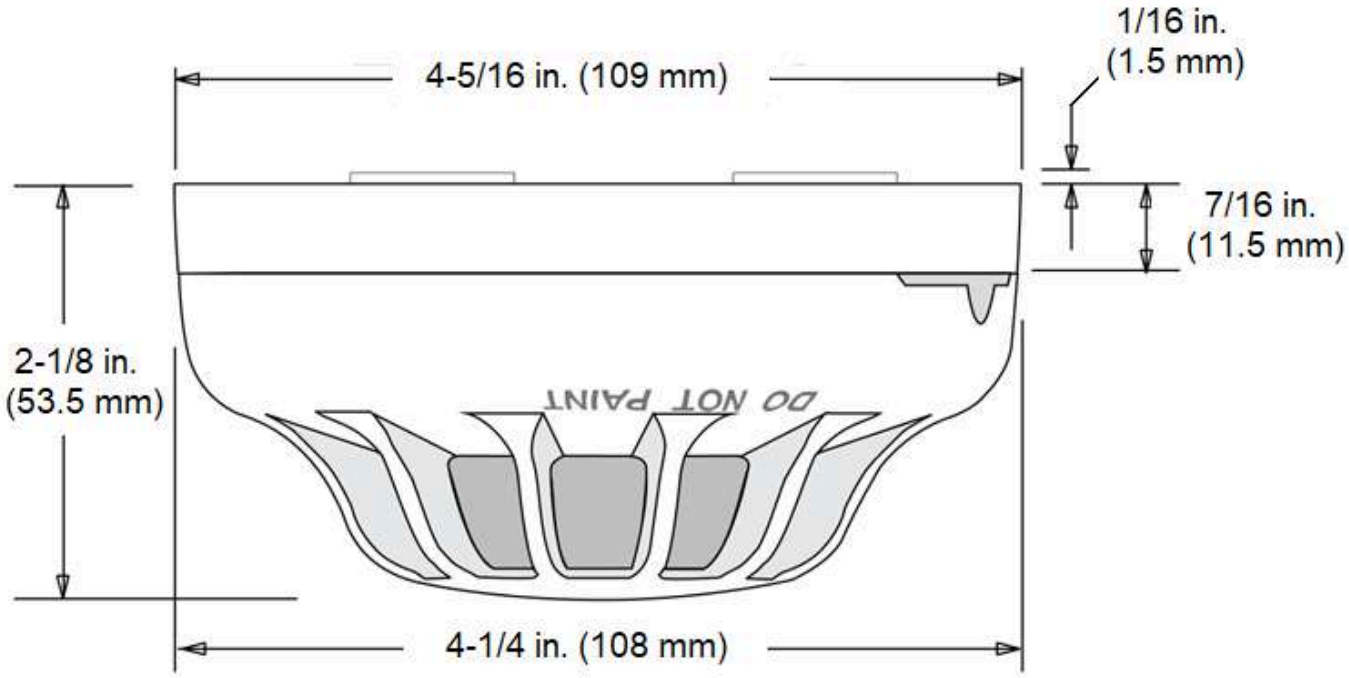


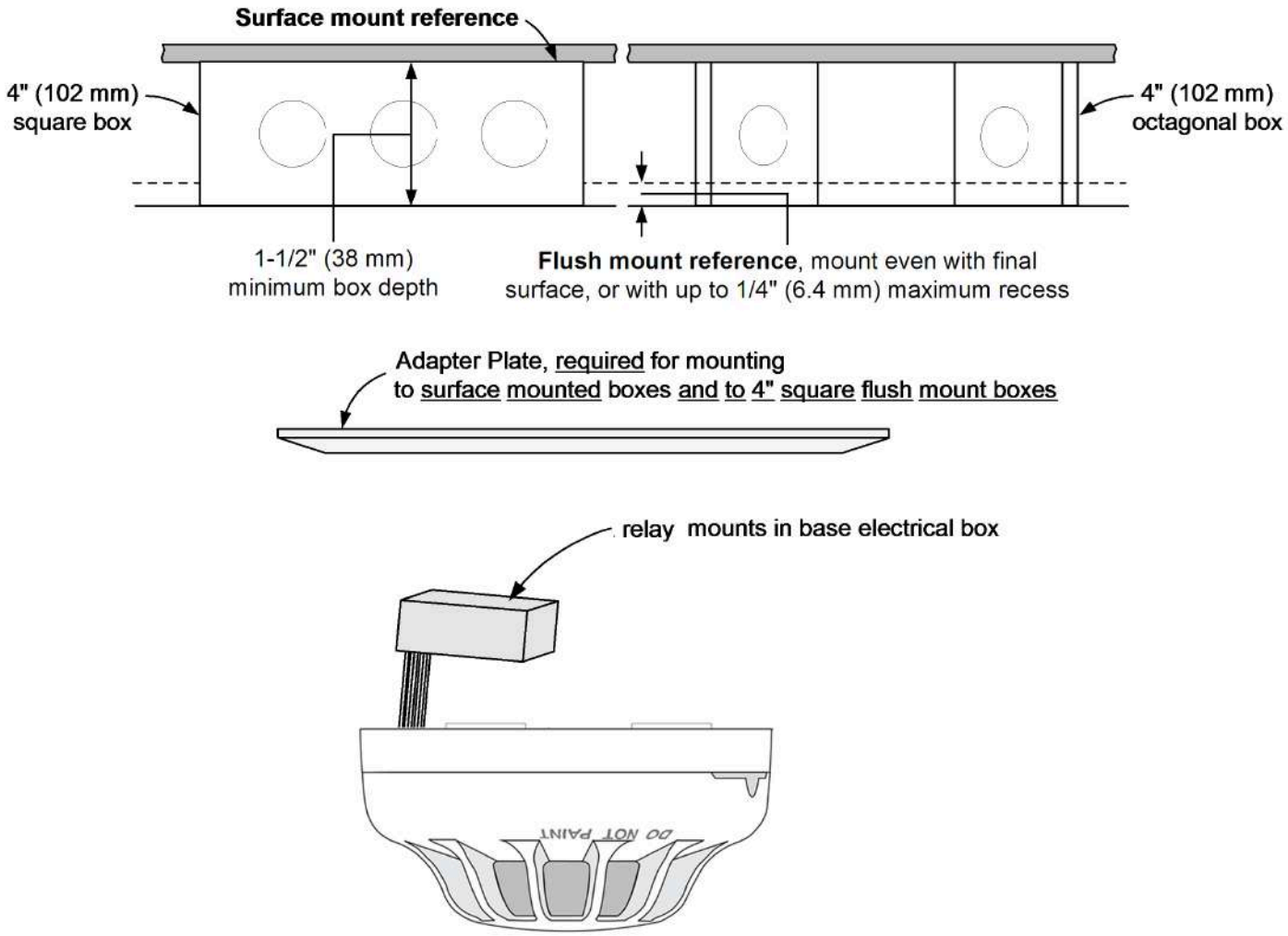

**Figure 4: 2098-9808 Remote LED Indicator (not to scale)**



## Mounting information

**Note:** Electrical boxes are supplied by others.

**Figure 5: Mounting Information**




**Note:** Figure 5 shows:

- 4098-9799 adapter plate, required for mounting to surface mounted boxes and to 4 in. square flush mount boxes.
- 4098-5682 and 4098-5680 include a relay module that mounts in base electrical box.
- Smoke and heat detector bases, 4098-5207, 4098-5261, 4098-5682, 4098-5680.

### Electrical box requirements

- Without relay (base 4098-5261): 4 in. octagonal or 4in. square, 1-1/2 in. deep Single gang, 2 in. deep
- With relay (bases 4098-5682 and 4098-5680): 4 in. octagonal, 1-1/2 in. deep, with 1-1/2 in extension ring 4 in. square, 1-1/2 in. deep, with 1-1/2 in extension ring

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