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# APPROVAL REPORT

**Project No:** 0003059936  
**Supplements Project No.:**  
**Class:** 3260  
**Product Name:** FM Approval of D371SS, D381AL, D383AL, and D390PP Model Flame Detectors to FM3260 and Canadian S386  
**Product Type:** Flame Detectors  
**Name of Listing Company:** Detectors Inc.  
**Address of Listing Company:** 1800 East Miraloma Ave  
Placentia CA 92870  
United States  
**Customer ID:** 243200-1  
**Customer website** [www.detectorsinc.com](http://www.detectorsinc.com)

**Prepared by**

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**6 November 2017**

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**Date of Approval**

## 1 INTRODUCTION

1.1 Detectors Inc. requested Approval of the apparatus listed in Section 1.4 for compliance with the standards listed in Section 1.3 as suitable for the listing categories described in Section 1.4.

1.2 This report may be freely reproduced only in its entirety and without modification.

### 1.3 Standards

#### 1.3.1 United States Standards

Title	Number	Issue Date
Approval Standard for Radiant Energy-Sensing Fire Detectors for Automatic Fire Alarm Signaling	3260	2000
National Fire Alarm Code	NFPA72	2002

#### 1.3.2 Canadian Standards

Title	Number	Issue Date
Flame Detectors	ULC/ORD-C386-15	2015

### 1.4 Listing

The product will be updated in the Approval Guide, an on-line resource of FM Approvals, as follows with all changes highlighted, deletions shown with strikethroughs and additions in red text:

#### 1.4.1 US Listings

☒Electrical Signaling ☒Alarm Signal Initiating Devices ☒Fire Detection, Flame-Actuated

<b>Models</b>	D371, D381/D383 with UV/IR/IR/IR, D390 with IR/IR/IR flame detectors
<b>Firmware</b>	rev. 10.8
<b>Operating Voltage</b>	24 VDC nominal (18-34), Regulated
<b>Power Consumption</b>	Standby: 60 mA at 24 VDC
<b>Alarm</b>	90 mA at 24 VDC
<b>Heater</b>	180 mA additional [D371]. Heater turns on at 40°F (4°C) [D371]
<b>Temperature Range</b>	-40 to +185°F (-40 to +85°C), -55 to + 70°C [D381/.D383]
<b>Humidity Range</b>	5 to 95% relative humidity, non-condensing
<b>Visual Indications</b>	Green LED – Normal Operation, Red LED – Alarm, Amber LED - Fault
<b>Outputs</b>	Two fire alarm relays, 4-20 mA analog [not FM examined], RS485 ModBus RTU communication.
<b>Relays Outputs</b>	Alarm & Auxiliary Relays: SPDT—contacts rated 2A at 24 VDC. De-Energized with N.O. contacts (power applied) Auxiliary relay settings: 0.3 [D383], 3, 10, 20 [D371, D381] seconds. Factory Default for Aux. relay: 3 seconds [D371, D381] Fault relay: SPST – contact rated 2A at 24 VDC [Energized with N.C. contact, (power applied)]
<b>Analog Output</b>	0-20 mA

**Flame Detection:**

<b>D371 Fireranger sensitivity -</b>	<b>high [ft]</b>	<b>medium [ft]</b>	<b>min. [ft]</b>
Heptane	135	75	50
JP4 [w/D371 @ 8ft height]	100	60	50
Isopropyl	100	75	50
<b>D381/D383 Fireranger sensitivity</b>	<b>max. [ft]</b>	<b>medium [ft]</b>	<b>min. [ft]</b>
Heptane	80	---	40
JP4 [w/D381 @ 8ft height]	80	---	20
Isopropyl	80	---	40
Hydrogen	60	40	---

<b>D390 Firescout sensitivity</b>	<b>ft.</b>
Heptane	30
JP4 [w/D390 @ 8ft height]	30
Isopropyl	30

<b>Flame sensing</b>	Ultraviolet radiation in UV spectrum, Infrared radiation in 3 discrete bands of IR in the range of 2-5 microns.
<b>Sensitivity</b>	Min., Med., High, D390 has one sensitivity. Spectral Sensitivity: UV - 180-260 nanometers, IR - 2-5 microns (3 discrete bands)
<b>Field-of-View</b>	90° Horizontal & Vertical
<b>Features</b>	Interface with an FM Approved fire alarm control panels, stand-alone device, or PLC. The detectors includes an Automatic Self-Test and monitoring of optical path.

Model D390 IR/IR/IR flame detector, intended for semiconductor clean rooms and wet bench use is constructed with a polypropylene enclosure.

The D390 detector requires an external FM Approved 24 VDC power source and connection of the Alarm / Auxiliary / Fault relays, 4-20 mA analog and RS485 ModBus outputs. The detector is supplied with an integral 20-foot multi-conductor cable for wiring to external FM Approved devices. The detector can store 200 events and 6 FireGraphs with time and date stamped in its FRAM memory.

Enclosure Type: NEMA 4, IP67 [D371, D381, D383]

Models D371, D381, D383, are watertight NEMA 4 (IP67) and explosion-proof aluminum enclosure designed for Class I, Division 2 (Zone 2) installations or Explosion-proof Stainless Steel designed for Class 1, Division 1 (Zone 1) installations.

Detector false stimuli immunity is detailed in the detector instructions.

**1.4.2 Canadian Listings**

☒Electrical Signaling ☒Alarm Signal Initiating Devices ☒Fire Detection, Flame-Actuated

<b>Models</b>	D371, D381/D383 with UV/IR/IR/IR, D390 with IR/IR/IR flame detectors
<b>Firmware</b>	rev. 10.8
<b>Operating Voltage</b>	24 VDC nominal (18-34), Regulated
<b>Power Consumption</b>	Standby: 60 mA at 24 VDC

<b>Alarm</b>	90 mA @ 24 VDC
<b>Heater</b>	180 mA additional [D371]. Heater turns on at 40°F (4°C) [D371]
<b>Temperature Range</b>	-40 to +185°F (-40 to +85°C), -55 to + 70°C [D381/.D383]
<b>Humidity Range</b>	5 to 95% relative humidity, non-condensing
<b>Visual Indications</b>	Green LED – Normal Operation, Red LED – Alarm, Amber LED - Fault
<b>Outputs</b>	Two fire alarm relays, 4-20 mA analog [not FM examined], RS485 ModBus RTU communication.
<b>Relays Outputs</b>	Alarm & Auxiliary Relays: SPDT—contacts rated 2A at 24 VDC. De-Energized with N.O. contacts (power applied) Auxiliary relay settings: 0.3 [D383], 3, 10, 20 [D371, D381] seconds. Factory Default for Aux. relay: 3 seconds [D371, D381] Fault relay: SPST – contact rated 2A at 24 VDC [Energized with N.C. contact, (power applied)]
<b>Analog Output</b>	0-20 mA

**Flame Detection:**

<b>D371 Fireranger sensitivity -</b>	<b>high [ft]</b>	<b>medium [ft]</b>	<b>min. [ft]</b>
Heptane	135	75	50
JP4 [w/D371 @ 8ft height]	100	60	50
Isopropyl	100	75	50
<b>D381/D383 Fireranger sensitivity</b>	<b>max. [ft]</b>	<b>medium [ft]</b>	<b>min. [ft]</b>
Heptane	80	---	40
JP4 [w/D381 @ 8ft height]	80	---	20
Isopropyl	80	---	40
Hydrogen	60	---	---

<b>Flame sensing</b>	Ultraviolet radiation in UV spectrum, Infrared radiation in 3 discrete bands of IR in the range of 2-5 microns.
<b>Sensitivity</b>	Min., Med., High, D390 has one sensitivity. Spectral Sensitivity: UV - 180-260 nanometers, IR - 2-5 microns (3 discrete bands)
<b>Field-of-View</b>	90° Horizontal & Vertical
<b>Features</b>	Interface with an FM Approved fire alarm control panels, stand-alone device, or PLC. The detectors includes an Automatic Self-Test and monitoring of optical path.

Enclosure Type: NEMA 4, IP67 [D371, D381, D383]

Models D371, D381, D383, are watertight NEMA 4 (IP67) and explosion-proof aluminum enclosure designed for Class I, Division 2 (Zone 2) installations or Explosion-proof Stainless Steel designed for Class 1, Division 1 (Zone 1) installations.

Detector false stimuli immunity is detailed in the detector instructions.

## 2 DESCRIPTION

Model D371, D381, D383 UV/IR/IR flame detectors with firmware, Rev 10.8 sense the Ultraviolet radiation in UV spectrum and Infrared radiation in 3 discrete bands of IR in the range of 2-5 microns.

The detectors have multiple outputs including two fire alarm relays, 4-20 mA analog and RS485 ModBus RTU.

The detectors can be used as a stand-alone device or can be interfaced with an FM Approved fire alarm control system, or PLC. The detector includes an Automatic Self-Test and monitoring of the optical path.

The Model D390 IR/IR/IR flame detector for semiconductor clean rooms and wet benches is constructed with a polypropylene enclosure. The detector's flame response and false source rejection is accomplished by utilizing the Convolution Method and Advanced DSP (Digital Signal Processing) in conjunction with hard coded Algorithms identifying specific wavelengths of Energy.

The D390 detector requires external FM Approved 24 VDC power source and connection of the Alarm / Auxiliary / Fault relays, 4-20 mA analog and RS485 ModBus outputs. The detector is supplied with an integral 20-foot multi-conductor cable for wiring to external FM Approved devices. The detector can store 200 events and 6 FireGraphs with time and date stamped in its FRAM memory.

Models D371, D381, D383, are NEMA 4 (IP67) and explosion-proof aluminum enclosure for Class I, Division 2 (Zone 2) installations or Explosion-proof Stainless Steel designed for Class 1, Division 1 (Zone 1) installations.

## 3 EXAMINATIONS AND TESTS

### 3.1 US & Canadian Examination

Samples were submitted for examination and testing. The samples were considered to be representative of the product line and were examined, tested, and compared to the manufacturer's drawings. All data is on file at FM Approvals along with other documents and correspondence applicable to this program.

All testing and analysis considered appropriate was conducted and verified to be in compliance with the Standards defined in Section 1.3.

FM3260 & ULC/ORD-C386 Test Program:

- Baseline Sensitivity Test
- Flame Response Sensitivity Test
- False Stimuli Response Tests
- Field of View Test
- Switching Test
- Stability Test
- Voltage Range Tests (includes Baseline Sensitivity)
- Vibration Test (includes Baseline Sensitivity)
- Durability (includes Baseline Sensitivity)
- Humidity Test (includes Baseline Sensitivity)
- Temperature Extremes Test (includes Baseline Sensitivity)

Extraneous Transient Test  
Signal Line Transient Test  
Dielectric Voltage-Withstand Test  
Bonding Test  
Review of Documents  
Secure Mounting  
Normal Handling  
Alarm Indication  
Enclosure (Environmental) Suitability  
Secure Wiring  
Response Time  
Grounding  
Duplicate Terminals/Leads  
Markings  
Mfg's Installation and Operation Instructions  
Calibration  
Specifications  
Software Requirements  
MTBF calculations

#### **4 MARKING**

- 4.1** Product intended for use in Canada shall be provided with caution and warning labels in both English and French.

See attached CDL report for marking drawing(s).

#### **5 REMARKS**

- 5.1** Extreme care should be taken with the installation of this equipment. The latest edition of the manufacturer's instruction manual must be followed completely, and any problems should be resolved by consultation with the factory or the authorized representative.
- 5.2** All installation wiring shall be in accordance with the appropriate national electrical code.
- 5.3** An Approval examination of equipment such as this can only evaluate typical configurations. Although those components identified in this report have been tested, it is beyond the scope of such an examination to test all possible configurations. It is therefore necessary, that those responsible for the setup and acceptance of specific installations take special care to verify that the equipment, including programmable functions, is configured to operate properly for the required performance of that installation.
- 5.4** Tampering and replacement with non-factory components may adversely affect the safe use of the system.
- 5.5** The products(s) discussed in this report were certified by FM Approvals under a Type 5 Certification System as identified in ISO/IEC 17067.

#### **6 SURVEILLANCE AUDIT**

The design and manufacturing facilities at the following location(s) shall be visited on a routine basis. The facility processes and quality control procedures in place have been determined to be satisfactory to manufacture product identical to that tested and Approved. An FM Approved Products/Specification-Tested Revision Request Form shall be submitted to FM Approvals for

requesting to manufacture product at any additional or alternate manufacturing facilities which are not listed below.

**Design**

Detectors Inc  
1800 East Miraloma Ave  
Placentia CA 92870  
United States

**Manufacturing**

Detectors Inc  
1800 East Miraloma Ave  
Placentia CA 92870  
United States

**7 MANUFACTURER'S RESPONSIBILITIES**

- 7.1 Documentation that is applicable to this approval is on file at FM Approvals and listed in the Documentation File, Section 8, of this report. No changes of any nature shall be made unless notice of the proposed change has been given and written authorization obtained from FM Approvals. The FM Approved Products/Specification-Tested Revision Request Form shall be forwarded to FM Approvals as notice of proposed changes.
- 7.2 The Manufacturer is responsible for control of the product marking and installation / operation / maintenance instructions for the System.
- 7.3 The manufacturer shall provide installation / operation / maintenance instructions with each system.
- 7.4 The system with circuits  $\geq 30\text{Vac}$  shall be dielectric tested on 100% of production. The insulation between accessible conductive parts and the power supply input connections shall withstand for one minute, with no insulation breakdown, the application of 1000 Vac [1400 V dc] with respect to the protective ground. Alternatively, a test potential of 1200 Vac [1700 V dc] may be applied for at least one second. **WARNING:** The dielectric test required may present a hazard of injury to personnel and/or property and should only be performed under controlled conditions, and by persons knowledgeable of the potential hazards of such testing to minimize the likelihood of shock and/or fire.
- 7.5 In accordance with the Master Agreement, the manufacturer shall make full and immediate disclosure to FM Approvals of all information concerning any defect in, or potential hazard of, the product or service manufactured or provided by the Customer which is Approved by, or being examined by, FM Approvals. The manufacturer shall make all necessary arrangements for the investigation of complaints / anomalies applicable to this approval and shall keep records of all complaints / anomalies including actions taken.

**8 DOCUMENTATION**

See attached blueprint report.

**9 CONCLUSION**

The apparatus described in section 1.4 meets FM Approvals requirements. Since a duly signed Master Agreement is on file for this manufacturer, US and Canadian Approval is effective the date of this report.

**PROJECT DATA RECORD:** 0003059936

**Attachment: Blue Print**

# Blueprint Report

**Detectors Inc. (243200)**

**Class No 3260**

**Original Project I.D. 3059936**

<u>Drawing No.</u>	<u>Revision Level</u>	<u>Drawing Title</u>	<u>Last Report</u>	<u>Electronic Drawing</u>
BOM-0601	F1	Sensor Board	3059936	Yes (excel12book)
BOM-0701	F	High Voltage Board	3059936	Yes (excel12book)
BOM-0801	F	Relay Board	3059936	Yes (excel12book)
BOM-1001	C	Inter Chamber	3059936	Yes (excel12book)
D371	0	instruction manual	3059944	Yes (pdf)
D381	0	instruction manual	3059944	Yes (pdf)
D383	0	instruction manual	3059944	Yes (pdf)
D390	0	instruction manual	3059944	Yes (pdf)
DWG-01IC-0401	C	Lock Ring	3059936	Yes (pdf)
DWG-01ID-1101	D	D371 Core	3059936	Yes (pdf)
DWG-01ID-1201	D	D381 Back Cap	3059936	Yes (pdf)
DWG-04IC-0201	C	D371 Lens Holder	3059936	Yes (pdf)
DWG-04ID-0101	D	D381 Base	3059936	Yes (pdf)
DWG-04ID-0201	D	D381 Lens Holder	3059936	Yes (pdf)
DWG-05IA-0101	A	D390 Lid modified	3059936	Yes (pdf)
DWG-05IA-0102	A	D390 Base	3059936	Yes (pdf)
FIN-01IA-0101	A	D371 Final Assembly	3059936	Yes (excel12book)
FIN-04ID-0101	D	D381 Final Assembly	3059936	Yes (excel12book)
FRM0601F108	10.8	Firmware Control Document	3059936	Yes (excel)
GAS-05IA-0101	A	D390 Complete Assembly	3059936	Yes (excel12book)
LAB-RANG-0001	C	UVIR Faceplate Label	3059936	Yes (pdf)
LAB-RANG-0002	C	IR Faceplate Label	3059936	Yes (pdf)
LAB-RANG-0006	4	Laser Engraving drawing	3059936	Yes (pdf)
LAB-SCOU-0001	A	Fire Scout Internal Label	3059936	Yes (pdf)
LAB-SENT-0001	A	D381 Label	3059936	Yes (pdf)
SCH-0601_A	A	Sensor Schematic	3059938	Yes (pdf)
SCH-0701_A	A	High Voltage Schematic	3059939	Yes (pdf)
SCH-0801_A	A	Relay Schematic	3059940	Yes (pdf)
SCH-1001_B	B	Interconnect Schematic	3059941	Yes (pdf)
SUB-01IA-0101	A	D371 Electronis Assembly	3059942	Yes (excel12book)
SUB-01IA-0102	A	D371 Housing Assembly	3059943	Yes (excel12book)
SUB-04ID-0101	D	Sentinal Housing Assembly	3059944	Yes (excel12book)