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# APPROVAL REPORT

**DETERMINATOR MODEL 850 INFRARED  
COMBUSTIBLE GAS DETECTOR AND OPTIONAL  
SPECIAL LOCAL ALARM MODULE  
FOR HAZARDOUS (CLASSIFIED) LOCATIONS**

**Prepared for:**

**Delphian Corporation  
220 Pegasus Avenue  
Northvale, NJ 07647-1977**

**Project ID: 3012928  
Class: 6320, 3615  
Date: July 23, 2002**

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**FM APPROVALS**  
**Project ID:3012928**

**Determinator Model 850 Infrared Combustible Gas Detector  
and Optional Special Local Alarm Module  
For Hazardous (Classified) Locations**

**July 23, 2002**

**from**

**Delphian Corporation  
220 Pegasus Avenue  
Northvale, NJ 07647-1977**

**I INTRODUCTION**

- 1.1 Delphian Corporation requested FM Approval of their Determinator Model 850 Infrared Combustible Gas Detector and optional Special Local Alarm Module (SLAM) assembly as an explosionproof combustible gas detector for use in Class I, Division 1, Groups C and D; hazardous (classified) indoor locations. CSA International performed the examination and testing of the Combustible Gas Detector Model 850 Determinator with the optional SLAM assembly for possible Approval based on the inter-laboratory agreement between FM Approvals and CSA International.
- 1.2 This report may be reproduced only in its entirety and without modification.
- 1.3 **Standards:**

<b>Title</b>	<b>Class Number</b>	<b>Date</b>
Electrical Equipment for Use in Hazardous (Classified) Locations, General Requirements	3600	November 1998
Explosionproof Electrical Equipment General Requirements	3615	March 1989
Electrical and Electronic Test, Measuring and Process Control Equipment	3810 (Including Supplement #1)	March 1989 (July 1995)
Combustible Gas Detectors	6310, 6320	2001

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- 1.4 **Listings:** The product will appear in Section 10 of the Fire Protection Approval Guide as follows:

**COMBUSTIBLE GAS DETECTORS, Fixed**

Stationary Single Channel 4-20mA/1-5mA Combustible Gas Detector. Stand Alone Sensor/Transmitter Determinator Model 850 Infrared Combustible Gas Detector and Special Local Alarm Module (SLAM) option are explosionproof for installation in Class I, Division 1, Groups C and D, T5 Ta = +70°C hazardous (classified) indoor locations. Model 850 Sensor/Transmitter monitors 0-100% LFL methane gas-in-air atmospheres. The instrument provides a five-digit measurement display with magnetically coupled control functions and a 4-20mA or 1-5mA measurement signal. Optional SLAM alarm function provides 4 SPDT relay contacts; Fail, Lo, Hi and HiHi. The transmitter assembly is constructed of aluminum and includes IR processor module P/N 370-850-XXX and Interface module P/N 367-850-01. The sensor assembly consists of P/N 365-850-01 (aluminum) or P/N 365-850-02 (stainless steel) and mounts integrally to the transmitter housing. The sensor's sinter is protected with flame arrester shield P/N 364-389-01. Optional SLAM assembly is constructed of aluminum and consists of SLAM relay module P/N 364-160-01, extension kit P/N 364-382-01 and wire harness P/N 364-330-01. The operating temperature range of the apparatus is -30°C to +70°C and operating voltage is 24 Vdc (nominal), 4W maximum power, SLAM relay contact ratings are 2A at 24Vdc. In addition, the apparatus complies with ANSI/ISA-12.13.01-2000 Performance Requirements for Combustible Gas Detectors. The following accessories are Approved for use with Model 850 Sensor/Transmitter: Type A calibration kit P/N 360-954-02, calibration zero gas cylinder P/N 361-774-01, methane calibration gas cylinder P/N 360-671-01, gas test gas adaptor P/N 364-332-01 and configuration tool P/N 361-853-02. This Approval covers use of the instruments when calibration is performed using the gas to be monitored and the alarm set points are preset within 10% of the calibration gas concentration.

- 1.5 As described in this report, the construction of the Determinator Model 850 Infrared Combustible Gas Detector and optional Special Local Alarm Module (SLAM) assembly provides the degree of protection against electrical shock, fire and injury required for hazardous (classified) locations.

## **II DESCRIPTION**

- 2.1 This report is FM Approvals' addition to CSA International Test Report No. 172375-1237468/1309886 for Delphian Corporation Determinator Model 850 Infrared Combustible Gas Detector and optional SLAM Assembly. Determinator Model 850 Infrared Combustible Gas Detector is an indoor stationary single channel Stand Alone combustible gas sensor/transmitter with a five digit measurement display and magnetically coupled control functions and a 4-20mA or 1-5mA measurement output signal. The gas detector measures methane-in-air atmospheres ranging from 0 to 100% LFL (Lower Flammable Limit) using infrared radiation technology. Model 850 transmitter is housed within an explosionproof enclosure which is constructed of Aluminum Alloy. Model 850 sensor is housed in an explosionproof assembly that mounts integrally with the transmitter housing. The sensor enclosure assembly body is constructed of either cast aluminum or stainless steel. The sensor assembly also contains a flame arrester assembly with a required flame arrester shield. The SLAM assembly is an option to Determinator Model 850 Infrared Combustible Gas Detector. The SLAM assembly option provides 3 levels of alarm contact closure (LO, HI, HI-HI) and one fail alarm. The SLAM assembly is enclosed in an explosionproof enclosure and is connected to the Model 850 transmitter assembly through conduit with a conduit seal.

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2.2 **Specifications** - The manufacturer's specifications are as follow;

Range:	0-100% LFL
Storage Temperature:	-40°C to +75°C
Operating Temperature:	-30°C to +70°C
Accuracy:	±3% LFL from 0 to 50% LFL, ±5% LFL from 51% to 100% LFL
Relative Humidity:	5 to 95% RH
Supply Voltage:	20-32 Vdc, 24 Vdc (Nominal), 4W maximum
Step Response:	Rise to 50% of FS within 8 Sec Rise to 60% of FS within 11Sec Rise to 90% of FS within 21Sec
Measurement Signal:	4-20mA or 1-5mA

2.3 For additional descriptive information, reference the attached CSA report No.172375-1237468/1309886.

### III EXAMINATIONS AND TESTS

3.1 **General** - Representative samples of the product listed in Section 1.4 of this report were examined and tested by CSA International, under Project No. 172375-1237468/1309886 to determine acceptability as combustible gas detection apparatus for use in the specified hazardous (classified) locations. Examination and testing by CSA International was conducted under the guidelines set forth within the FM Approvals/CSA International Contracts Testing and Reports Agreement. Test results compiled by CSA International have been satisfactorily reviewed by FM Approvals and are attached to this report. The following is a summary of tests and evaluations conducted:

- Explosionproof examination and testing for Class I, Division 1, Groups C and D hazardous (classified) locations for a +70°C maximum ambient temperature rating with a T5 temperature code marking.
- Flamability, chemical compatibility, high temperature aging examination and testing of the encapsulation materials; Stycast 2651-40 with Catalyst 9 and Innovative Resin Systems Inc. EP 272 Part A resin and EP 272 Part B hardener.
- Combustible gas detection performance tests.
- Examination and testing to verify protection against fire, injury and shock.

3.2 **Instruction Manual** - The instruction manual provided with each unit contains the following information:

- a. Instrument specifications and operational limits.
- b. Maintenance and calibration instructions.
- c. Explanation of indicators, adjustments and initial start-up instructions.
- d. A trouble shooting procedure and recommended replacement parts list.

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**IV MARKING**

The following information appears on the apparatus identified in Section 1.4 and meets Standard requirements:

- Manufacturer's name and manufacturing location.
- Model number, name and serial number
- The FM Approval logo
- Hazardous (classified) locations information
- Maximum operating ambient temperature range
- The following CAUTIONS:
  - AREA MUST BE FREE OF FLAMMABLE CONCENTRATIONS PRIOR TO OPENING
  - READ AND UNDERSTAND MANUAL BEFORE OPERATING OR SERVICING
  - RE-ENSTALL FLAME ARRESTOR SHIELD & SECURE SET SCREW AFTER CALIBRATION
  - INSTALL CONDUIT SEALS WITHIN 18 INCHES OF THIS ENCLOSURE
  - KEEP ASSEMBLY TIGHTLY CLOSED WHEN CIRCUITS ARE ALIVE

The information is silkscreened with black epoxy ink on aluminum plates, 0.02 inches thick, permanently attached to the enclosures by means of rivets in bottomed holes having remaining material thickness of 1/8 inches (3.2mm). Killark enclosure nameplate must be removed.

**V REMARKS**

- 5.1 **Approval Application** - This examination verified that the subject gas detection equipment operates as specified and provides an electronic signal indicative of sampled gas concentrations. This Approval does not include or imply Approval of apparatus to which the subject instrumentation may be connected and which processes the electronic signal for eventual end use. In order to maintain a FM Approved system, the control instrument, to which the subject instrument is connected, must also be FM Approved gas detection apparatus.
- 5.2 **Installation Instructions** - Manufacturer's instructions supplied with the detectors and the National Electrical Code (ANSI/NFPA 70) shall be followed when installing this equipment.
- 5.3 **Component Replacement** - Tampering or replacement with nonfactory components may adversely affect the safe use of the system.

**VI FACILITIES AND PROCEDURES AUDIT**

The design and manufacturing of the Determinator Model 850 Infrared Combustible Gas Detector and optional SLAM assembly are controlled and performed by Delphian Corporation at their Northvale, New Jersey facility. This facility and quality control procedures in place has been found to be satisfactory to manufacture the product identical to that tested and Approved. This facility is subject to follow-up audit inspections by FM Approvals.

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**VII MANUFACTURERS RESPONSIBILITIES**

- 7.1 **Documentation** - The documentation listed in Section VIII is applicable to this Approval and is on file at FM Approvals. 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 Approved Product - Revision Report, FM Approvals Form 797 shall be forwarded to FM Approvals as notice of proposed changes.
- 7.2 **Installation and Operation Manual** - The manufacturer shall provide the end user with a copy of the instruction manual. The manufacturer shall make additional copies available upon request.
- 7.3 **Dielectric Strength Tests** - On 100% of production, the manufacturer shall conduct routine dielectric tests on the equipment listed in Section 1.4. The apparatus shall withstand the application of 350 Vrms or 500 Vdc test voltage applied within 2 seconds and maintained for at least 2 seconds, with no insulation breakdown, between instrument's field connections connected together with respect to the Switch metal case
- 7.4 **Protective Grounding System** - On 100% of production, the manufacturer shall conduct a routine inspection of the protective grounding system of the Determinator Model 850 Infrared Combustible Gas Detector and SLAM assemblies.

**VIII DOCUMENTATION**

The following drawings describe the gas detection apparatus in Section 1.4 and are filed under Project I.D. 3012928.

<b>Drawing No.</b>	<b>Issue</b>	<b>Description</b>
363099	D	Schematic SLAM Module
364160_B	B	Layout SLAM Module
364-309	B	Layout Interface
364314	B	IR Sensor Body
364-318	2/3/97	Flame Arrestor Cup
364319	B	IR Sensor Flame Arrestor Assembly
364374	B	Label, Model 810 IR
364382	A	SLAM Extension Kit
364386	B	Label, SLAM Assembly
364388	A	Flame Arrestor Shield
900-105	C	Operations Manual
995309_C	C	850 Wiring Diagram
995314	1/22/99	Model 850 IR Layout
995-315	8/25/01	Potting IR Sensor
364-3111	B	Layout Processor
364-308-01	B	Schematic Interface Module
364-311-01	7/12/99	Schematic, Processor
364-311-02	8/26/98	Schematic Display

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**IX CONCLUSION**

The apparatus listed in Section 1.4 meets FM Approvals requirements. Approval is effective when the Approval Agreement is signed and received by FM Approvals.

**EXAMINATION AND TESTING BY:**

- CSA International - Jack S. Chin

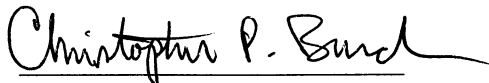
**EXAMINATION BY:**

- FM Approvals - Christopher Burch
- FM Approvals - Robert Menot

**ATTACHMENTS:**

- CSA Test Report, Number 172375-1237468/1309886, dated July 10, 2002
- Determinator Operations Manual, Number 900-105 Revision C
- Product Label Drawings, 364374 Revision B and 364386 Revision B.

**REPORT BY:**




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**REPORT REVIEWED BY:**



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