

APPROVAL REPORT

STRATOS HSSD2 and MICRA HIGH SENSITIVITY SMOKE DETECTION SYSTEMS

Prepared for:

**AirSense Technology Limited
71 Knowl Piece, Wilbury Way
Hitchin, Hertfordshire SG4 0TY
England**

**Project ID: 3014717
Class: 3230
Date: April 16, 2003**

**STRATOS HSSD2 and MICRA HIGH SENSITIVITY
SMOKE DETECTION SYSTEMS**

April 16, 2003

from

**AIRSENSE TECHNOLOGY LIMITED
71 KNOWL PIECE, WILBURY WAY
HITCHIN
HERTFORDSHIRE SG40TY
ENGLAND**

I INTRODUCTION

- 1.1 AirSense Technology Limited requested an Approval examination of the Stratos HSSD2 and Micra high sensitivity smoke detection systems for use with Approved fire alarm controls interfaced via the relay contacts on the detector.
- 1.2 This report may be reproduced only in its entirety and without modification.
- 1.3 **Standards:**

Title	Class Number	Date
National Fire Alarm Code	ANSI/NFPA 72	1999
Smoke Actuated Detectors for Automatic Fire Alarm Signaling	3230-3250	2/76

- 1.4 **Listings:** The listings for AirSense Technology Limited in the *Approval Guide*, a publication of FM Approvals, will be as follows:

Stratos HSSD2 aspirating type high sensitivity smoke detector. For use with compatible Approved fire alarm controls via the standard relay contacts on the terminal board of the detector. The system consists of a standard HSSD2 detector, or a network with a command module and connected standard detectors. Each detector can accommodate up to four sampling pipe inlets. The firmware version is 1.4 for the command module and 1.61 for the standard detector. The detector has a sensitivity range of 0.01%/ft (0.003 dB/m) to 4%/ft (1.2 dB/m). The Stratos HSSD2 operates from 120 V ac primary power supplied by the UPS-24 (Altronix AL300ULX) power supply. Secondary power is from two 12 V dc, 26 AH batteries for 24 hours. It is suitable for indoor use only in ambient temperatures of 14°F to 140°F (-10°C to 60°C). A balanced sampling pipe network must be installed.

Stratos Micra aspirating type high sensitivity smoke detector. For use with compatible Approved fire alarm controls via the standard relay contacts on the terminal board of the detector. Each detector is equipped with one sampling pipe inlet. The firmware version is 1.4. The detector has a sensitivity range of 0.01%/ft (0.003 dB/m) to 4%/ft (1.2 dB/m). The Stratos Micra operates from 21.6 to 26.4 V dc supplied by the UPS-24 (Altronix AL300ULX) power supply (120 V ac). Secondary power is from two 12 V dc, 26 AH batteries for 24 hours. It is suitable for indoor use

only in ambient temperatures of 32°F to 120°F (0°C to 49°C). A balanced sampling pipe network must be installed.

- 1.5 Use of this system in air handling ducts and other forced air flow occupancies was not tested, and is not included as part of this Approval. Networking capabilities using the optional addressable protocol interface card (APIC) and addressable fire alarm controls were not tested and are not included in the Approval. Connection to a pc via the RS232 port was not tested and is not included in the Approval. Although the detector's sensitivity range is 0.01%/ft (0.003 dB/m) to 7.6%/ft (2.3 dB/m), this Approval covers only the range from 0.01%/ft (0.003 dB/m) to 4%/ft (1.2 dB/m) in order to comply with Approval Standard 3230. An addendum which explains this limitation will be added to the next revision of the manual.
- 1.6 Except as described in this report, components and applications described in the manual and literature are not covered by this Approval.

II DESCRIPTION

- 2.1 The following sections contain a brief description of the equipment covered by this report. A detailed description of operation and options can be found in the Installer's Handbooks, Document Number LM80004, Issue 5 for the HSSD2 and Document Number LM 80022, Issue 3 for the Micra.
- 2.2 The HSSD2 is equipped with a detector head which is mounted in a housing along with the air sampling unit with air flow monitoring unit, visual displays which show the state of the detector, and connections for the piping network.
 - 2.2.1 One variant of the HSSD2 is referred to as a blind detector. Instead of an LCD display, there is a blank plate with three LEDs which go to standard connectors on the HSSD2 main board. A steel cabinet replaces the aluminum cabinet in the blind detector version.
- 2.3 Primary power is 120 V ac and is provided by the UPS-24 power supply. The required 24 hours of back-up power is supplied by two 12 V dc, 26 AH batteries.
- 2.4 Depressing the test button on the front of the detector displays the nominal operating sensitivity of the detector.

III EXAMINATIONS AND TESTS

- 3.1 Samples of the HSSD2 and Micra, representative of production units, were examined and tested at FM Approvals in Norwood, Massachusetts. One sample each of the HSSD2 and Micra was examined, tested, and compared to the manufacturer's drawings. All documentation applicable to this program is on file at FM Approvals.
- 3.2 **Stability Test** – The HSSD 2 and Micra samples were energized and tested to verify proper operation under normal, standby conditions. Continuous operation of these samples was monitored for 30 days in clean-air (working office type); there was no evidence of instability or false signals during that period.

FM APPROVALS
Project ID: 3014717

- 3.3 **Review of Laser Alignment Procedure** – The written laser alignment procedure for calibrating the detectors, document number AST_H2L, Issue 4 (7/16/02), was reviewed. The procedure is similar to that which was witnessed for project 0D8A8.AY, and is acceptable.
- 3.4 **Environmental Tests** – The samples were conditioned at:
- 3.4.1 Temperatures of 14°F (-10°C) and +140°F (+60°C), each for 24 hours, for the HSSD2. Temperatures of 32°F (0°C) and 120°F (49°C), each for 24 hours, for the Micra.
- 3.4.2 A temperature of 100°F (38°C) and 90% relative humidity for a period of 24 hours.
- 3.4.3 An environment which changed from 70°F (20°C) at 50% RH to 100°F (38°C) at 90% RH within a 15 minute period.
- 3.4.4 Operation of the samples was proper during and after these tests.
- 3.5 **Voltage Variation** – The input power to the UPS-24 power supply was varied from the transfer point of 58 V ac to 132 V ac. A separate test was conducted using 20.4 to 26.4 V dc. The HSSD2 detector sample operated as intended over the entire voltage range, and this is satisfactory.
- 3.6 **Battery Discharge/Recharge Test** – After a fully charged battery is subjected to a 24 hour discharge under standby conditions followed by 5 minutes in full alarm condition, the charging current shall be such that, after 48 hours, the battery is returned to a fully charged condition.
- 3.6.1 Using two 12 V 26 AH batteries connected in series and the primary power disconnected, the HSSD2 was allowed to operate until the battery voltage decreased from 27.4 V dc to 23.6 V dc. During this discharge, the battery current was 760-920 mA. The sample was then placed into alarm condition, with a current of 820 mA - 1 A, for a period of five minutes. The final battery voltage was 23.6 V dc.
- 3.6.2 The primary power was then re-connected, and the batteries were recharged for 48 hours, at which time the voltage was 27.1 V dc, and the recharge current was 120 mA which is acceptable.
- 3.7 **Transfer to Secondary Power** – The input AC voltage to the UPS-24 power supply was reduced to simulate brownout conditions. Transfer to secondary power occurred at 58 V ac. The power supply was capable of providing the minimum power required for proper operation of the HSSD2. Transfer to the secondary power supply was accomplished automatically and within 30 seconds.
- 3.8 **Electrical Safety Tests** – It was determined by examination of the electrical circuitry that power in excess of 150 watts and voltages in excess of 30 V ac or 60 V dc are present only on the circuitry of the power supply.
- 3.8.1 **Dielectric Test** – A sample of the UPS-24 power supply was subjected to the application of 1,800 V dc between the power terminals and ground for one minute. There was no arcing, dielectric breakdown, or leakage current observed during or at the end of this test.
- 3.8.2 **Protective Grounding** – Accessible conductive parts of the equipment that are likely to become energized in the event of a fault shall be properly grounded. A ground screw is provided on the power supply's enclosure to facilitate proper ground connections during installation.

- 3.8.3 **Field Wiring Terminal Spacings** - The creepage and clearance spacings between field wiring terminals and between field wiring terminal parts and the enclosure were found to be acceptable by measurement and by visual inspection.
- 3.8.4 **Electrical Shock** – Examination showed that accessibility to the 120 V ac power supply circuit was suitably restricted by a key locked enclosure.
- 3.8.5 **Battery Circuit Reverse Polarization** - The batteries were connected with polarity reversed. There was a spark, and the entire system (power supply and detector) powered down. No other adverse conditions were noted, and the result was acceptable.
- 3.9 **Vibration Test** - One sample each of the HSSD2, Micra, and UPS-24 power supply mounted in their normal position was subjected to a four-hour vibration test of 0.02 inches (0.5 mm) displacement at a frequency sweep of 10 to 30 Hz. The equipment operated properly during and after this vibration test, and there was no loosening of parts or permanent deformation as a result of this test.
- 3.10 **RFI Protection** – Although not an Approval requirement, radio frequency interference (RFI) protection in the detectors was considered. The following tests were conducted on the powered Stratos HSSD2 and Micra samples: The samples were subjected to voice modulated and unmodulated signals at frequencies of 154, 467, and 850 MHz with equivalent radiation power levels of 5.0 watts at a distance of 24 in. (0.6 m). The samples did not false alarm or give any indication of instability as a result of these exposures.
- 3.11 **Surge Transients** – Although not an Approval requirement, protection against surge line transients was considered. Test data from an international test laboratory was received and reviewed showing that representative input and output circuits were subjected to 60 pulses consisting of five different transient waveforms having peak voltage levels of 100; 500; 1,000; 1,500; and 2,400 V, as delivered into a 200 ohm load. The equipment operated as intended and remained fully operational.
- 3.11.1 It was also shown that the UPS-24 power supply was able to withstand surge line transients of 6 kV superimposed on the main power line input. The equipment operated as intended and remained fully operational.

IV MARKING

- 4.1 The following information appears on the adhesive label affixed to the outside of the enclosure and meets Standard requirements:
- Manufacturer's name
 - Model number
 - Electrical ratings
 - Part number
 - The FM Approvals Mark
- 4.2 The EPROM is provided with an adhesive paper label with the firmware revision level. This level is 1.4 for the Micra, 1.4 for the Command Module, and 1.61 for the standard HSSD2 detector.

V REMARKS

Installations shall comply with the latest edition of the manufacturer's instruction manual and the National Fire Alarm Code, ANSI/NFPA 72.

VI FACILITIES AND PROCEDURES AUDIT

The manufacturing site in Hitchin, Hertfordshire, England is currently included in the FM Approvals Facilities and Procedures Audit program. The facilities and quality control procedures in place have been found to be satisfactory to manufacture product identical to that examined and tested as described in this report.

VII MANUFACTURERS RESPONSIBILITIES

- 7.1 Documentation considered critical to this Approval is on file at FM Approvals and listed in the Documentation File, Section VIII of this report. No changes of any nature shall be implemented unless notice of the proposed change has been given and written authorization obtained from FM Approvals. The Approved Product Revision Report, Form 797, shall be forwarded to FM Approvals as notice of proposed changes.
- 7.2 A copy of the user's manual must be provided with each shipment.
- 7.3 Since the UPS-24 power supply is rated above 30 V rms, it is required that the final assembly of all UPS-24 power supply units be dielectric tested on 100% of production. The power input connections shall withstand, for one minute and with no insulation breakdown, the application of 1000 V ac (or 1400 V dc) with respect to the protective ground. Alternatively, a test potential of 1200 V ac (or 1700 V dc) may be applied for at least one second. Since the power supply is manufactured by Altronix and purchased from them, an acceptable alternative solution would be to examine documentation for each incoming shipment as part of the incoming test procedure showing and recording that this test has been satisfactorily completed by the manufacturer.

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.

VIII DOCUMENTATION

The following documents comprise the controlled documentation list and are filed under Project 3014717:

Drawing No	Drawing Title	Revision
AC10102	Command Module PCB (4 sheets)	6
AC10103	Command Module Display PCB (3 sheets)	2
AC10105	Stratos HSSD2 Display Board (2 sheets)	2
AC10107	Optical Chamber Signal Conditioning PCB	4
AC10108	Stratos HSSD2 Flow Circuit Diagram	3
AC10314	Micra Main PCB Schematic (3 pages)	07
AM10136	Stratos HSSD2 Optical Chamber Irises	01
AM10137	Stratos HSSD2 Optical Chamber Iris Tube	01

FM APPROVALS
Project ID: 3014717

ASS10102	Stratos2000 Command Module CPU PCB	2
ASS10103	Command Module Display PCB Assembly	1
ASS10104	Stratos2000 Basic CPU PCB Assembly	8
ASS10105	Stratos HSSD2 Basic Display PCB Assembly	1
ASS10107	Stratos HSSD2 Optical Chamber-Signal	3
ASS10108	Stratos HSSD2 Flow Detection-Signal Cond.	3
ASS10109	Stratos 2000 Min. Display Detector Assembly	A
ASS10110	Stratos2000 Basic Detector Assembly	2
ASS10111	Stratos2000 Basic Detector Assembly	2
ASS10112	Stratos2000 StandAlone Command Module	2
ASS10140	Stratos2000 Optical Base Assembly	1
ASS10149	Stratos2000 Optical Chamber Assembly	2
ASS10150	Stratos2000 Smoke Detector Assembly	2
ASS10152	Stratos2000 Common Chassis Assembly	2
ASS10312	Stratos Micra General Assembly	06
ASS10314	Micra PCB Assembly	06
ASS10316	Stratos Micra Transformer Assembly	1
ASS10260	Stratos HSSD2 Blind Detector Assembly	A
ASS48015	Stratos HSSD2 Flow Monitor Programmed	1
ASS48020	Stratos HSSD2 Display Programmed PIC	1
ASS48021	Stratos-2 Bus Switch Programmed PIC	1
ASS48022	Stratos2000 Basic CPU Programmed	1.61
ASS48023	StratosHSSD2 Command Module PCB	1.4
ASS48027	Stratos Micra Programmed EPROM	1.4
AST_H2L	Stratos-HSSD 2 Laser Alignment Procedure	4
AST_H2O	HSSD2/Micra Laser Power Setup Procedure	3
AST_H2S	HSSD2 Set-up Procedure	2
AST_SMB	Micra General Assembly Procedure	6
LM80004	Installer's Handbook HSSD2	5
LM80022	Installer's Handbook Micra	3
PL10102	Placements (6 sheets)	6
PL10103	Placements	3
PL10104	Placements (9 sheets)	13
PL10105	Placements (2 sheets)	2
PL10107	Placements (3 sheets)	7
PL10108	Placements (3 sheets)	2
PL10109	Placements	A
PL10110	Placements	2
PL10111	Placements	2
PL10112	Placements (4 sheets)	2
PL10140	Placements	01
PL10149	Placements	02
PL10150	Placements	02
PL10152	Placements	2
PL10155	Placements	01
PL10260	Placements	A
PL10312	Placements	06
PL10314	Placements (2 pages)	12
16001	UPS-24 Power Supply –Instructions	09/02

IX CONCLUSION

The apparatus described in Section II meets FM Approvals requirements. Approval will be effective when the Approval Agreement is signed and received by FM Approvals.

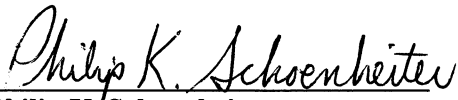
EXAMINATION AND TESTING BY: P. K. Schoenheiter

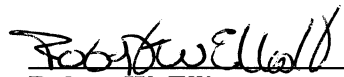
PROJECT DATA RECORD: 3014717

ATTACHMENTS: Installer's Handbooks, Document Number LM80004, Issue 5 (HSSD2) and Document Number LM 80022, Issue 3 (Micra) (Excerpts only)

REPORT BY:


REPORT REVIEWED BY:


Philip K. Schoenheiter
Senior Engineer
Systems


Robert W. Elliott
Senior Engineering Specialist
Systems


14. Stratos-HSSD-2 specification

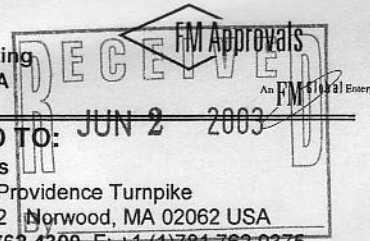
SELV rating (EN 60950)	Class III
Supply Voltage	21.6V - 26.4V DC PSU Type: conforming to EN 54-4 Electrical safety complies with IEC 61010-1
Size (mm)	427W x 372H x 95D
Weight	5.2kg (<i>Detector</i>) 5.3kg (<i>Command Module Detector</i>) 6.2kg (<i>Stand-alone Command Module</i>) 10.1kg (<i>Stand-alone Command Module + batteries</i>)
Operating temperature range	0 to +38°C (UL 268 compliance) -10 to + 60°C (CEA 4022 compliance)
Operating humidity range	0 - 90% Non Condensing IEC 61010-1 Pollution degree 1 IEC 61010-1 Installation Cat. II
Sensitivity range (%Obs/m)	Min = 25% Max = 0.03% FSD
Maximum sensitivity resolution	0.0015 %Obs/m
Detection principle	Laser light scattering mass detection
Particle sensitivity range	0.0003µm to 10µm
Current consumption	400mA (<i>Detector</i>) 450mA (<i>Stand-alone Command Module</i>) 850mA (<i>Command Module Detector</i>)
Relay contact rating	500mA @ 30V
Maximum sampling pipe length	200 metres total
Sampling pipe inlets	4
Sampling pipe internal diameter	15-25mm
Alarm levels	4 (Fire 2, Fire 1, PreAlarm and Aux)
Bargraph sensitivity range	0.0015 - 25% obs/m
Bargraph segments	26
Chamber service intervals	Greater than 8 years (depending on environment)
Dust separator replacement intervals	Greater than 5 years (depending on environment)
Laser lifetime (MTTF)	Greater than 1000 years
Programming	Front panel or PC via RS232/RS485
Data bus cable	RS485 data cable
Data bus length	1.2 km IN, 1.2km OUT
IP rating	IP50
Supported languages on internal programmer	Czech English Finnish German Italian Spanish Dutch Estonian French Hungarian Norwegian Swedish

NB  This equipment is only to be used in accordance with this specification. Failure to operate the equipment as specified may cause damage to the unit.

13. Stratos-Micra specification

SELV rating (EN 60950)	Class III
Supply Voltage	21.6V - 26.4V DC PSU Type: conforming to EN 54-4 Electrical safety complies with BS EN 610190-1
Size (mm)	140W x 215H x 85D
Weight	1.7kg with docking station
Operating temperature range	0 to +38°C (UL268) -10 to +60°C (CEA4022)
Operating humidity range	0 - 90% Non Condensing BS EN 61010-1 Pollution degree 1 BS EN 61010-1 Installation Cat. II
Sensitivity range (%Obs/m)	Min = 25% Max = 0.03% FSD
Maximum sensitivity resolution	0.0015 % obs/m
Detection principle	Laser light scattering mass detection
Particle sensitivity range	0.0003µm to 10µm
Current consumption	250mA
Relay contact rating	500mA @ 30V
Maximum sampling pipe length on	50 metres total (see design limitations section 5)
Sampling pipe inlets	1
Sampling pipe internal diameter	15-25mm
Alarm levels	4 (Fire 2, Fire 1, Pre-Alarm and Aux) 1 relay as standard, others available
Chamber service intervals	Greater than 8 years (depending on environment)
Dust separator replacement intervals	Greater than 5 years (depending on environment)
Laser lifetime (MTTF)	Greater than 1000 years
Programming	PC via RS232/RS485
Data bus cable	RS485 data cable
Data bus length	1.2 km
IP rating	IP50

NB  This equipment is only to be used in accordance with this specification. Failure to operate the equipment as specified may cause damage to the unit.



SENDER: Forward with updated drawings or other appropriate changes to the attention of **FM Approvals**. Original forms will be returned showing course of action taken.

Additional forms may be obtained by sending a written request to the attention of the **FM Approvals** stock room.

FORWARD TO:
FM Approvals
1151 Boston-Providence Turnpike
P.O. Box 9102 Norwood, MA 02062 USA
T: +1 (1)781 762 4300 F: +1 (1)781 762 9375
www.fmglobal.com/approvals

Please provide the following information below: Attention of, Company Name, Address, State & Zip Code. **FM Approvals Representative: P.K. Schoenheiter**

Attention of: **Phil Schoenheiter**
From: **AirSense Technology Ltd**
71 Knowl Piece
Wilbury Way
Hitchin, Herts
SG4 0TY
U.K.

Phone: +44 (0)1462 440666

Fax: +44 (0)1462 440666

PRODUCT(S) **Stratos HSSD 2, Micra**

DATE 21 st May 2003
SENDER Alastair J. Archibald
TITLE Quality Manager
SIGNATURE
MODEL(S) AFFECTED Stratos HSSD 2, Stratos-Micra 25
INDICATE ORIGINAL FM APPROVALS PROJECT IDENTIFICATION: 3014717

DOES THIS REVISION RESULT IN MODEL/TYPE NUMBER CHANGE TO THE CURRENT APPROVAL GUIDE LISTING? IF YES, EXPLAIN BELOW OR USE SEPARATE SHEET IF REQUIRED: YES NO

HAS THE MANUFACTURING LOCATION, LISTING ADDRESS, TELEPHONE NUMBER OR MAIN CONTACT PERSON CHANGED? IF YES, EXPLAIN BELOW: YES NO

REASON FOR CHANGE(S)/COMMENTS:

"Blind detector" drawings issued unchanged at iss 1 (were at iss A)
HSSD 2 detector & Command Module GA drawings and parts lists changed to show pipe bungs used for rear pipe ports (previously fitted but not shown on drawings) – no change. **NB, ASS 10110 doc title should be shown as "Stratos-HSSD 2 Detector + Command Module" or "Stratos-HSSD 2 Det + CM"**
Software changes given in text on separate page – do not change smoke detection function or ClassiFire

REVISION DETAILS	AFFECTED DRAWING NUMBER	REVISION	NEW DRAWING	REVISION
5 off pipe bungs shown fitted to rear pipe entries	ASS10110	02	ASS10110	03
5 off pipe bungs shown fitted to rear pipe entries	ASS10111	02	ASS10111	03
5 off pipe bungs included in parts list	PL10110	02	PL10110	03
5 off pipe bungs included in parts list	PL10111	02	PL10111	03
Minimum display (Blind) Detector drawings issued	ASS10260	A	ASS10260	01
	PL10260	A	PL10260	01
	ASS10109	A	ASS10109	01
	PL10109	A	PL10109	01
Software updates (see overleaf)	SW48022	1.61	SW48022	1.8
	SW48027	1.4	SW48027	1.7
Procedure updates. See overleaf for details	AST_H2L	4	AST_H2L	5
	AST_H2O	3	AST_H2O	4
	AST_H2S	2	AST_H2S	3
	AST_SMB	6	AST_SMB	8

FOR FM APPROVALS USE ONLY

COMMENTS: <i>No testing required. Critical document list updated.</i>	Master Agreement Implementation Date:		
	REVISION REPORT J. I. <i>—</i>	ACCESS IDENTIFICATION <i>03472-283</i>	CLASS NUMBER <i>3230</i>
	REVISION ACCEPTED <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Third Signature Required		
	EXAMINED BY <i>PK Schoenheiter</i>	DATE <i>6/4/03</i>	
	REVIEWED BY <i>Ronald E. Major</i>	DATE <i>5-JUN-03</i>	
	APPROVED BY (Third signature required for listing changes only)	DATE	