Analox 9000 F1 Flammable Sensor

User Manual

Analox Sensor Technology Ltd.
15 Ellerbeck Court, Stokesley Business Park
North Yorkshire, TS9 5PT, UK

T: +44 (0)1642 711400 **F:** +44 (0)1642 713900
W: www.analox.net **E:** info@analox.net

List of Contents

1 Introduction

The ANALOX 9000 F1 Range of sensors are designed to detect Flammable gas, mainly methane (CH4) in ambient air monitoring applications. The model is listed below:

Model 9000 F1 which is of the Explosion proof type

The Model 9000 F1 consists of a 316 stainless steel sensor unit certified EExd IIC T6 II2GD, mounted in a glass reinforced polyester fire retardant junction box, which is certified EExe T6 II2GD.

The Model 9000 F1 unit junction box includes 1 x 20mm threaded cable gland entry.
A Certified blanking plug is supplied with the unit.

The Pellistor inserts used in the 9000 sensors are of the poison resistant variety. The sensor can be supplied with either CAT300, CAT170 and CAT335 type Pellistor inserts; Operating currents are 300 mA (2.0 volts), 170 mA (2.0 volts) and 335mA (2.5 volts) respectively. The CAT300 have a larger active element and is slightly more resistant to poisoning than the CAT 170 but if the area to be monitored is unlikely to contain poisoning substances then other considerations may determine which Pellistors are chosen.

2 Principle of Operation

2.1 The elements used in these sensors are of the Catalytic Pellistor type and are sensitive to most common combustible gases and vapours.

2.2 A single sensor assembly may therefore be used to detect a wide range of these gases. The devices are made from two coils of very fine platinum wire which are embedded in separate beads of alumina. One device is the detector and the other is a temperature compensating element. The detecting element is treated with a catalyst which promotes oxidation of the gas and the compensating element is treated with an oxidation inhibiting agent.

2.3 The two elements are connected to the Instrument in a Half Bridge configuration and the excitation current passing through them raises their temperature to about 550 Deg C. At this temperature, the gas oxidises on the detector element and raises the temperature of the bead even further. This alters the resistance of the detector bead and this change in resistance is measured by the monitor instrument and converted to produce a reading of the gas concentration on the Instrument display.

2.4 The output of the device is essentially linear for most gases up to high concentrations, typically 100% LEL and the response time to 25% LEL is about 2 or 3 seconds. Any pre-filtering of the gas before it reaches the sensor may lengthen the response time. If the sensors are required to operate in high gas concentrations for short periods, it has been found that for periods up to about 2 minutes, 10 second bursts of 8%, 10% and 80% methane in air, produce no ill effects. Prolonged exposure can result in zero drift which may be reversed by operating for a short period in clean air. Exposure to 40% concentration for longer periods will begin to destroy the detector surface, altering the Zero point and reducing the sensitivity. Whenever a sensor is exposed to high concentrations of combustible gas, the calibration should be rechecked as soon as possible.

2.5 The performance of the sensors may be temporarily impaired by operation in the presence of certain volatile substances containing halogens or sulphur. The sensors may recover after a short period of operation in clean air. Whenever the substance produces a permanent effect on the catalyst, resulting in a large reduction in sensitivity, the sensor is said to be Poisoned. Typical substances which can cause poisoning are silicon oils and grease, anti-knock petrol additives and phosphate esters. Activated carbon filters will provide adequate protection from poisoning in most cases. Notwithstanding the above comments, the combustible gas sensors have an inherently long life. Although the sensors respond to most combustible gases, the signals produced vary in magnitude depending on the actual gas to which the sensor is exposed. The sensors should normally be calibrated using 50% LEL methane, i.e. 2.5% methane in air.

NOTE: When the sensors are used to detect a different gas than that used for calibration, then a correction factor should be applied to the readings obtained. A table showing conversion factors for various gases is shown in Appendix A of this manual. (See also ‘Instrument Calibration’ section)

WARNING: When a pellistor type sensor is exposed to concentrations of flammable gas greater than 100% LEL (5% methane in air) there eventually comes a point at

which the signal output from the sensor DECREASES as a result of an INCREASING concentration of the gas.

This is caused by the flammable gas displacing oxygen in the sample and gradually inhibiting the normal oxidation process at the detecting element. Most monitoring instruments provide an OVER-RANGE indication to inform the user of this condition. (See also 'L.E.L. and U.E.L.' section)

3 L.E.L. and U.E.L.

3.1 The above principle of operation is only valid where the gas mixture to be sensed contains oxygen. It is therefore suitable for detection of leakages of gases in atmospheric surroundings, where it is important to know the level of concentration, well before a hazardous situation arises. Flammable gas mixtures are only ignitable between certain fairly clear, but experimentally defined limits. These levels are known as the 'Lower Explosive Limit' (L.E.L.) and the 'Upper Explosive Limit' (U.E.L.). Typical L.E.L. figures for some common explosive gases are as follows:

Methane (Natural Gas) 5% + 95% Air
Hydrogen 4% + 96% Air
Ammonia 16% + 84% Air
Ethylene 3% + 97% Air
Butane 1.9%+ 98.1% Air
Propane 2.1%+ 97.9% Air

3.2 If the gas concentration is below the L.E.L. then combustion cannot take place due to insufficient gas, and if above U.E.L. level, there will be insufficient Oxygen present to sustain combustion.

4 Sensor Signal Cables

4.1 All the Analox flammable gas sensors require a three core cable between the sensor and the measuring instrument. Because of the relatively heavy current demands of the pellistor type of sensors the connecting cables must be chosen with care. For example, Pellistors of the CAT300 type require an operating potential (at the Sensor) of 2.00 volts DC at a current of 300 milliamps. When a current of this magnitude is passed along signal cables, any significant resistance in the cables will result in a drop in voltage along the cables. As an example: Assume a cable run of 100 metres is required between the monitoring instrument and the sensor and the cross sectional area of the cable chosen is 1.00mm2. Most manufacturers quote the resistance of this cable to be 19.1 Ohms per kilometre; therefore in this case, a 100 metre length will have a resistance of 19.1 / 10 = 1.91 Ohms. Bearing in mind that as far as the loop current is concerned, the actual conductor length is 200 metres; (100m to the sensor and 100m back again) the total cable resistance in this case is 3.82 Ohms. Using Ohm's law to calculate the voltage drop across the entire cable:

Voltage Drop = Current x Resistance
Where Voltage is in Volts: Current is in Amps & Resistance is in Ohms
Voltage Drop = 0.3 x 3.82 = 1.15 Volts

4.2 This means that if the monitoring instrument supplies a drive voltage of 2.00 volts then the sensor will only have 0.85 Volts applied to it. (2.00v-1.15v=0.85v). The pellistor sensor will NOT operate correctly in this condition.

4.3 **NOTE**: Although the ANALOX 9000 F1 sensors use a 3 wire connecting cable, only two of the wires carry the sensor excitation current. The third wire is connected to the centre tap of the 'Half Bridge' configuration. It only carries a signal voltage at very low current and may therefore be ignored as far as resistance effects are concerned. Most monitoring instruments designed to operate with flammable gas detectors of the pellistor type have the facility for compensating, within limits, for this voltage drop. The ANALOX range of monitors (GDS-404) allow the drive voltage to be adjusted up to about 3.8 volts. So, in the case of the above installation, the 1.15 volt drop across the cable could be compensated by adjusting the monitoring instrument drive voltage to 3.15 volts. It is not necessary to carry out all of these calculations every time an installation is done - correct operation of the sensor can be achieved by measuring the voltage AT THE SENSOR JUNCTION BOX TERMINALS. A further point, which is often overlooked, is that the resistance of copper cable has a temperature co-efficient. The effect of this variation in resistance due to temperature changes can be significant on very long cable runs, particularly if the cable has a small cross sectional area and is subject to large variations in temperature. The measuring instrument is unable to distinguish between a change in cable resistance and a genuine gas signal. Copper cable resistance is normally quoted at 20°C and will vary by approximately 0.4% per degree C, as the temperature changes above and below this value. Using the above cable installation as an example, the total loop resistance was calculated to be 3.82 Ohms at 20°C. If the temperature of the cable drops to 0°C then the resistance will change to 3.80 Ohms. At first sight, this may not seem significant but could result in drift of the ZERO reading on the monitoring instrument.

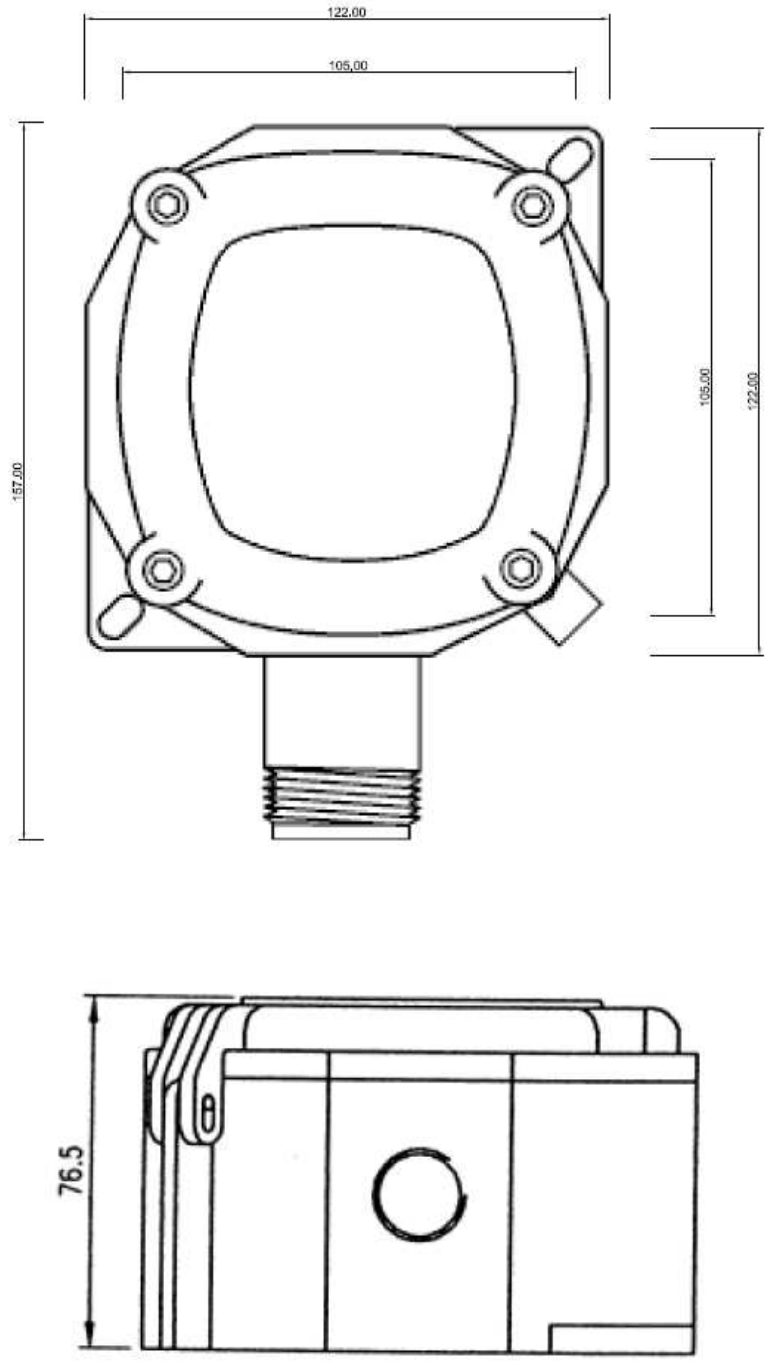
5 Instrument Calibration

5.1 There is some confusion over what is meant by the sensitivity of instruments used to measure the concentrations of combustible gas. Ideally, all units employing catalytic combustion as the measuring principle should be calibrated in terms of percentage of potential combustibility, where 100% scale reading represents an ignitable mixture, for a particular Gas/Air mixture.

5.2 It is unfortunate that the sensing elements are not equally responsive to all combustible gas/air mixtures and although the sensitivity to a wide range of gases is similar to within a few percent of L.E.L., and for all practical purposes, the inaccuracies may be ignored, it may be desirable in certain cases to make allowances for these variations.

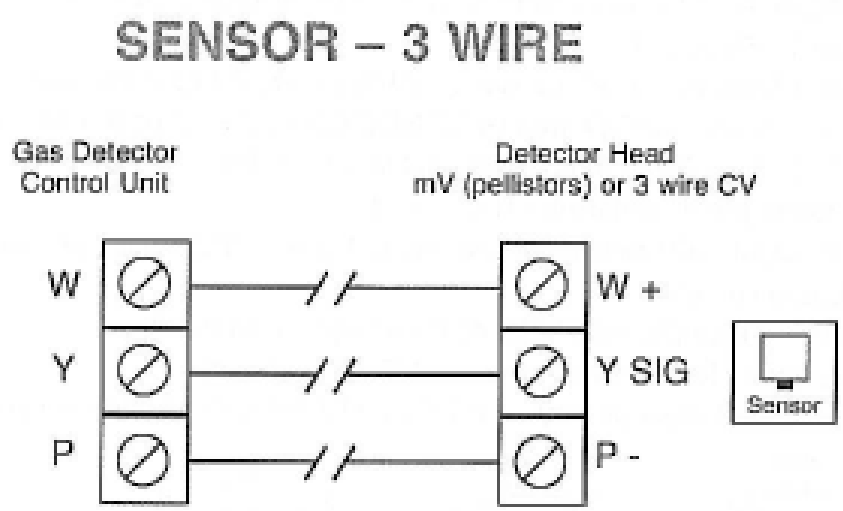
5.3 It is therefore common practice to calibrate units of this type over the range 0 - 100% L.E.L. where 100% scale is equal to the actual percent concentration of the calibration gas, at the Lower Explosive Limit. For example, an instrument calibrated 0-100% L.E.L. methane would indicate 100% scale at 5.0% gas concentration and one calibrated for Butane would indicate 100% scale at 1.9% gas concentration.

6 Sensor Physical Details



Analox 9000 F1 Series Flammable Gas Sensor

7 Electrical Connections



Analox 9000 F1 Series Flammable Sensor

8 Sensor Installation

8.1 Care should be exercised during installation not to damage the sintered element on the front surface of the device. IT IS PARTICULARLY IMPORTANT THAT THEY ARE NOT EXPOSED TO SILICON BASED SUBSTANCES OR HALOGENS, either during installation or in their normal operating condition. This could lead to the sensors being poisoned, as described above in section 2 of this manual.

8.2 The type of gas to be detected determines, in general, the physical location of the sensor. Whereas a gas that is heavier than air will require a low sensor mounting position, a lighter than air gas will necessitate an elevated mounting point.

8.3 Consideration should be given to those areas where it is anticipated that leakage may occur. For example, in the vicinity of valves, pipe flanges, compressors, etc, and also to the possibility of pockets of gas collecting in the event of a leak. In this respect, heavier than air gases, for example propane or butane, may tend to accumulate in floor ducts, pits etc. and ventilation should be provided for these areas as a normal precaution. Lighter than air gases e.g. methane or hydrogen will tend to accumulate between ceiling joists, in roof spaces etc and similar consideration should be given to adequate ventilation.

8.4 Additionally, the effects of any ventilation must be considered in the siting of gas sensors and it may be prudent to mount sensors in air extraction ducts. However, excessive velocities can affect the sensors and it may be necessary to provide a degree of draught protection. TABLE 1 below shows examples of molecular weights of some common flammable gases and groups them in categories according to their weight, relative to air.

Lighter than Air				Heavier than Air			
Hydrogen	2.0	Methane	16.0	Ethane	30.1	Hydrogen Sulphide	34.0
Ammonia	17.0	Carbon Monoxide	28.0	Butane	58.1	Propane	44.1
Ethylene	28.0	Acetylene	26.0	Pentane	72.2	Toluene	92.1
				Hexane	86.2	Heptane	100.2

TABLE 1. Relative Molecular weight of common gases NOTE: AIR = 29

The flammable sensors should be mounted with the sinter facing downward, whether it is mounted high or low.

9 Hazardous Area Installation

GDS Technologies Ltd
Fusion Point, Ash Lane,
Garforth, Leeds LS25 2GA
Tel +44 (0)113 286 0166
Fax +44 (0)113 287 8178
www.gds-technologies.co.uk

ISO 9001

ATEX NOTIFIED

F1

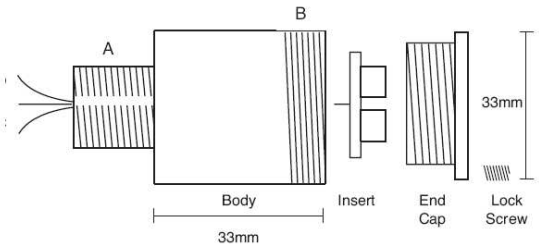
F1 GAS DETECTOR - HAZARDOUS AREA Product Information

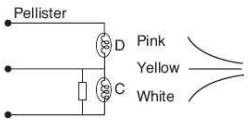
CONDITIONS FOR SAFE USE:

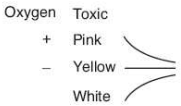
1. To maintain the certification, only manufacturers supplied replacement parts should be used.
2. Caution - the installation of this product must be carried out by suitably trained and qualified personnel only. If in doubt please contact GDS Technologies Ltd. www.gds-technologies.co.uk
3. This apparatus has been produced for use in a potentially explosive atmospheres. Before it is installed you must be aware of the requirements of IEC60079-0 2004, IEC60079-1 2003, IEC61241-0 2004, IEC61241-1 2004.

Special conditions of use -

1. The unit will not be used as a safety related device. When installed, the F1 Gas Sensor shall be electrically bonded to earth. Mechanical and explosion protection shall be provided for the flying leads of the F1 Gas Sensor.
2. Before removing the end cap disconnect the power to the sensor and wait 3 minutes - allowing for the sensor elements to cool.
3. The sensor end cap must be fully screwed into the body and the lock screw firmly tightened.
4. Maintenance - Inspection of the sinter disc is to be carried out at 6 monthly intervals to ensure it is clear and dust free.
5. The apparatus shall be electrically bonded to earth, the sensor body mounting thread must be fully engaged into an appropriate junction box.
6. A suitably certified junction box must be used wirh the F1 sensor.
7. Insert replacement may be achieved by use of long nosed pliers.







001-031	CAT335C	2.5v/335mA	
001-061	THE300A	2v/300mA	
001-801	SS10	2v/175mA	
001-231	CAT335A	2.5v/335mA	
001-271	CAT335B	2.5v/335mA	
001-411	CAT100A	2v/100mA	
001-011	SEMIV5	5v/170mA	
001-301	CAT300A	2v/300mA	
001-171	CAT170A	2v/175mA	

Type: F1 Gas Sensor
Insert: Replaceable
Certification: ATEX Cert No. 03ATEX1176X
EExd IIC T6 T85°C Tamb -20 to 35°C II2GD
Ex T6 IIIC T85°C Db IP63
IECEx Cert No. SIR 06.0016x
Exd IIC T6 Gb
Protection: IP63 + water shield IP65
Threads: A - 20mm -1.5 pitch - options available
B - 33.3mm -1.25 pitch
Weight: 165gms
Material: Stainless Steel 316 S16
Lock Screw: 3mm 1.5mm Allen key
Order Code: End Cap replacement 001-003

C765A
045D23C

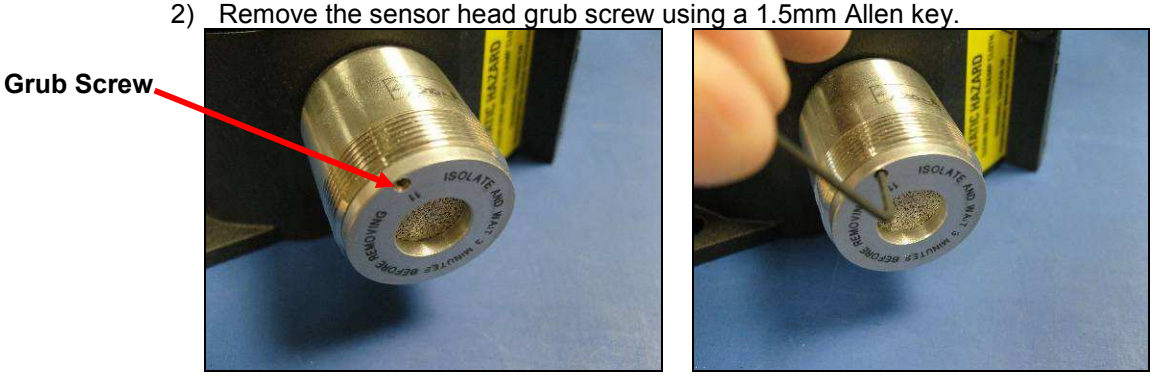
10 Replacing the Sensor Insert

The expected operating life of most sensors varies. However, if the sensor is constantly exposed to high doses of its specific gas, or gases to which it is cross sensitive then its life span will be reduced in proportion to the concentration/exposure time. It is a matter for the user to decide whether the sensor is replaced automatically at a pre-determined interval, or if it is left until a time when it is no longer possible to calibrate. This will depend on the nature of the application.

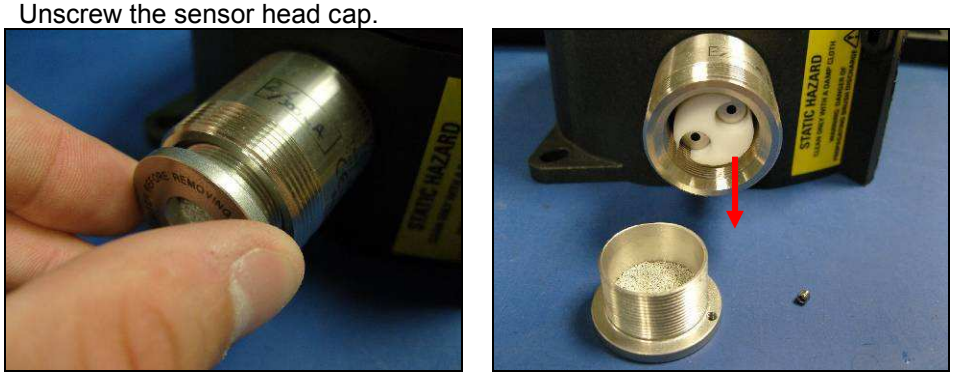
10.1 Sensor Insert Replacement Procedure

1) Isolate the sensor from its power supply and wait 3 minutes before proceeding to allow any power stored in the sensor to dissipate.

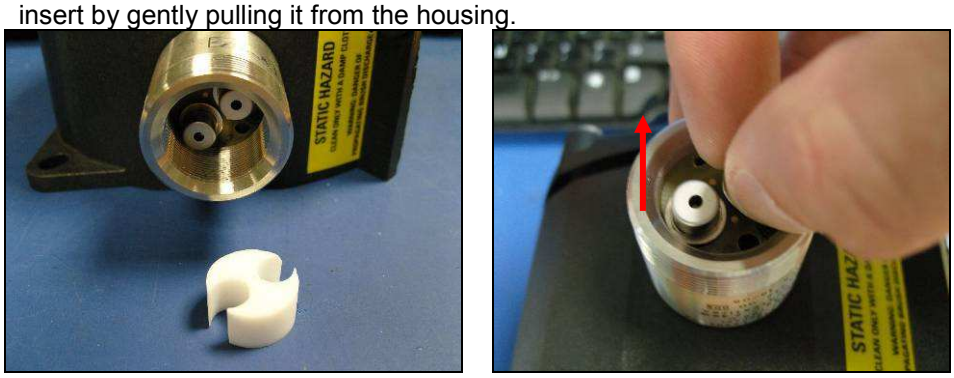
2) Remove the sensor head grub screw using a 1.5mm Allen key.



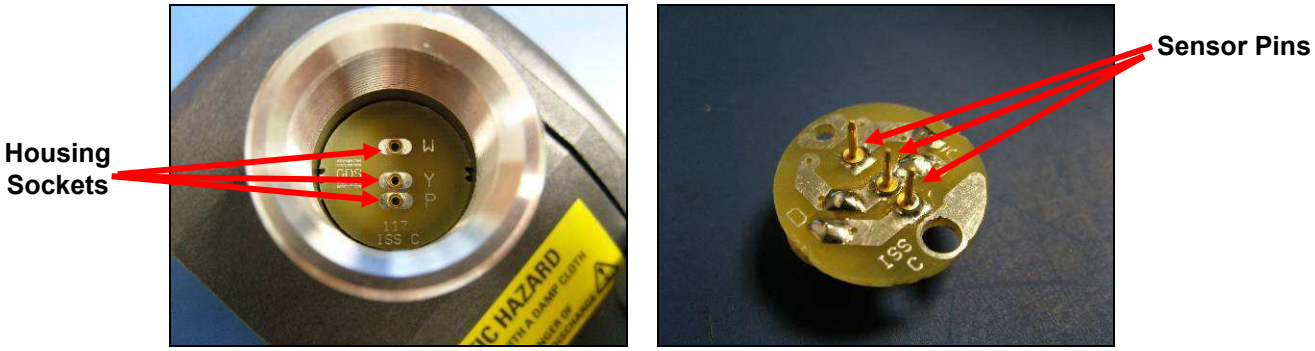
3) Unscrew the sensor head cap.



4) Remove the white sensor mount from the sensor insert and then remove the sensor insert by gently pulling it from the housing.



5) Fit the new sensor insert into the housing. Note the orientation of the sensor connector pins and housing connector sockets, the cell can only be fitted in the correct orientation.



6) Refit the white sensor mount.

7) Refit the sensor head cap.

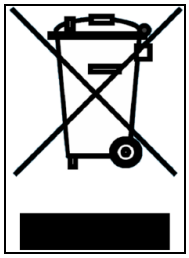
8) Refit the sensor head grub screw.

9) Re-apply power to the sensor. Allow approximately one hour for the new sensor to settle and then carry out the calibration procedure.

10.2 Disposal of Discarded Sensor

When the life of the sensor has expired or otherwise damaged it must be disposed of safely in accordance with local regulations.

According to WEEE regulation this electronic product can not be placed in household waste bins. Please check local regulations for information on the disposal of electronic products in your area.



11 Specifications

Classification	Certified flameproof ATEX / IECEx – Exd IIC T6 Gb CSA/US Class 1 Groups A, B, C, D. High temperature versions
ATEX SCS Cert No.	03ATEX1176X
IECEx SCS Cert No.	IECEx SIRO6.0016X
UK Design patent	No. 2025396
Housing Material	Stainless Steel 316 S16
Dimensions	Body length 32mm dia 33mm
Weight	165gms
Cable Exit Mounting Thread	20mm 1.5 pitch – options available 25mm, 3/4 NPT
Accessory Mounting Thread	33mm 1.25 pitch
Lock Screw	3mm-1mm key
Housing Components	Body ref. 001-002 End cap ref. 001-003
Ingress Protection	IP63 + water shield IP65
Approved sensor junction boxes	Type 9000 – EExe II T6 Material – GRP - IP66

12 Spares

The following Replacement Sensor Inserts /Accessories are available for the Analox 9000 F1 series of sensors:

Replacement Sensor Inserts

Part Number	Description
9100-1300	F1 CAT 300A Sensor Insert – 300mA
9100-1170	F1 CAT 170A Sensor Insert – 170mA
9100-1410	F1 CAT 335A Sensor Insert – 335mA

Accessories

Part Number	Description
6000-0048	F1 Sensor Flow Adaptor

13 Certification

sira CERTIFICATION

1 **EC TYPE-EXAMINATION CERTIFICATE**

2 Equipment intended for use in Potentially Explosive Atmospheres Directive 94/9/EC

3 Certificate Number: **Sira 03ATEX1176X** Issue: **4**

4 Equipment: **F1 Gas Sensor**

5 Applicant: **GDS Technologies Limited**

6 Address: Fusion Point
Ash Lane
Garforth
Leeds
LS25 2GA
UK

7 This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 Sira Certification Service, notified body number 0518 in accordance with Article 9 of Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential reports listed in Section 14.2.

9 Compliance with the Essential Health and Safety Requirements, with the exception of those listed in the schedule to this certificate, has been assured by compliance with the following documents:

EN 60079-0:2006 EN 60079-1:2007 EN 61241-1:2004

10 If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

11 This EC type-examination certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment.

12 The marking of the equipment shall include the following:

II 2 G D
Ex d IIC T6 Gb -20°C≤Ta≤+35°C
Ex tb IIIC T85°C Db IP6X
Ex d IIC T5 Gb -20°C≤Ta≤+50°C
Ex tb IIIC T100°C Db IP6X
Ex d IIC T4 Gb -20°C≤Ta≤+85°C
Ex tb IIIC T135°C Db IP6X
Ex d IIC T3 Gb -20°C≤Ta≤+120°C
Ex tb IIIC T200°C Db IP6X

Project Number 20978
C. Index 14

D R Stubbings BA MIET
Certification Manager

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Form 9400 Issue 1

Sira Certification Service
Rake Lane, Eccleston, Chester, CH4 9JN, England
Tel: +44 (0) 1244 670900
Fax: +44 (0) 1244 681330
Email: info@siracertification.com
Web: www.siracertification.com

sira CERTIFICATION

SCHEDULE

EC TYPE-EXAMINATION CERTIFICATE **Sira 03ATEX1176X**
Issue 4

13 **DESCRIPTION OF EQUIPMENT**

The F1 Gas Sensor is designed to monitor flammable gases in air. It is cylindrical in shape and has a two-part construction comprising a main body and an end cap, both of which are manufactured from stainless steel. The end cap screws into the main body and has a 250 µm sinter fused into its walls. This sinter allows the surrounding atmosphere to enter the sensor so that the presence of the flammable gas can be detected by various sensing elements contained within the main body. The sensor has a maximum power dissipation of 2.48 W. The rear end of the main body is filled with a setting compound through which the equipment wiring passes, it also has a male M20 x 1.5 thread-form that allows the F1 Gas Sensor to be fitted to an associated enclosure.

Variation 1 - This variation introduced the following change:

i. The introduction of minor dimensional changes relating to the gas sensor extended body.

Variation 2 - This variation introduced the following change:

i. The change of the Applicant's address from Swillington Lane, Swillington, Leeds, LS26 6BZ to Fusion Point, Ash Lane, Garforth, Leeds, LS25 2GA.

Variation 3 - This variation introduced the following change:

i. Following appropriate re-assessment to demonstrate compliance with the requirements of the EN 60079 series of standards, the documents originally listed in section 9, EN 50014:1997 (amendments 1 and 2), EN 50018:2000 and EN 50281-1-1:1998, were replaced by those currently listed, the markings in section 12 were updated accordingly.

Variation 4 - This variation introduced the following change:

i. The recognition of previously assessed updated drawings.

14 **DESCRIPTIVE DOCUMENTS**

14.1 **Drawings**

Refer to Certificate Annexe.

14.2 **Associated Sira Reports and Certificate History**

Issue	Date	Report No.	Comment
0	24 October 2003	R51A8269A	The release of the prime certificate.
1	19 January 2006	R51A14236A	The introduction of Variation 1.
2	9 December 2008	R51L19300A	This Issue covers the following changes: • All previously issued certification was rationalised into a single certificate, Issue 2, Issues 0 to 1 referenced above are only intended to reflect the history of the previous certification and have not been issued as documents in this format. • The introduction of Variation 2.
3	30 December 2008	R51L19028A	The introduction of Variation 3.
4	18 September 2009	R20978A	The introduction of Variation 4.

Sira Certification Service
Rake Lane, Eccleston, Chester, CH4 9JN, England
Tel: +44 (0) 1244 670900
Fax: +44 (0) 1244 681330
Email: info@siracertification.com
Web: www.siracertification.com

Form 9400 Issue1

sira
CERTIFICATION

SCHEDULE

EC TYPE-EXAMINATION CERTIFICATE **Sira 03ATEX1176X**
Issue 4

15 **SPECIAL CONDITIONS FOR SAFE USE** (denoted by X after the certificate number)

15.1 The F1 Gas Sensor shall not be used as Safety Related Devices in accordance with Directive 94/9/EC.

15.2 When installed, the F1 Gas Sensor shall be electrically bonded to earth.

15.3 Mechanical and explosion protection shall be provided for the flying leads of the F1 Gas Sensor.

16 **ESSENTIAL HEALTH AND SAFETY REQUIREMENTS OF ANNEX II** (EHSRs)

The relevant EHSRs that are not addressed by the standards listed in this certificate have been identified and individually assessed in the reports listed in Section 14.2.

17 **CONDITIONS OF CERTIFICATION**

17.1 The use of this certificate is subject to the Regulations Applicable to Holders of Sira Certificates.

17.2 Holders of EC type-examination certificates are required to comply with the production control requirements defined in Article 8 of directive 94/9/EC.

17.3 The manufacturer shall substitute, on the approved label affixed to the apparatus, the new name and address for the old name and address.

Form 9400 Issue1

Sira Certification Service
Rake Lane, Eccleston, Chester, CH4 9JN, England
Tel: +44 (0) 1244 670900
Fax: +44 (0) 1244 681330
Email: info@siracertification.com
Web: www.siracertification.com

IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres
for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.:	IECEx SIR 06.0016X issue No.:1	Certificate history: Issue No. 1 (2008-12-10) Issue No. 0 (2007-1-26)
Status:	Current	
Date of Issue:	2008-12-10 Page 1 of 4	
Applicant:	**GDS Technologies Limited** Fusion Point Ash Lane Garforth Leeds LS25 2GA **United Kingdom**	
Electrical Apparatus: *Optional accessory:*	**F1 Gas Sensor**	
Type of Protection:	**Flameproof and Dust**	
Marking:	**Ex d IIC T6** **Ex tD A21 IP6X T85°C** **(-20°C to +35°C)**	
Approved for issue on behalf of the IECEx Certification Body:	D R Stubbings BA MIET	
Position:	Certification Manager	
Signature: (for printed version)		
Date:	2008-12-10	

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the Official IECEx Website.

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Eccleston
Chester
CH4 9JN
United Kingdom

sira CERTIFICATION

IECEx Certificate of Conformity

Certificate No.: IECEx SIR 06.0015X

Date of Issue: 2008-12-10 Issue No.: 1

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Manufacturer: **GDS Technologies Limited**
Fusion Point
Ash Lane
Garforth
Leeds
LS25 2GA
United Kingdom

Manufacturing location(s):

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

STANDARDS:
The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2004 Edition: 4.0	Electrical apparatus for explosive gas atmospheres - Part 0: General requirements
IEC 60079-1 : 2003 Edition: 5	Electrical apparatus for explosive gas atmospheres - Part 1: Flameproof enclosure 'd'
IEC 61241-0 : 2004 Edition: 1	Electrical apparatus for use in the presence of combustible dust - Part 0: General requirements
IEC 61241-1 : 2004 Edition: 1	Electrical apparatus for use in the presence of combustible dust - Part 1: Protection by enclosures "tD"

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

TEST & ASSESSMENT REPORTS:
A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in:

Test Report:

GB/SIR/ExTR06.0088/00
GB/SIR/ExTR08.0184/00

Quality Assessment Report:
GB/SIR/QAR06.0040/00

IECEx Certificate of Conformity

Certificate No.: IECEx SIR 06.0016X

Date of Issue: 2008-12-10 Issue No.: 1

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Schedule

EQUIPMENT:
Equipment and systems covered by this certificate are as follows:

The F1 Gas Sensor is designed to monitor flammable gases in air. It is cylindrical in shape and has a two-part construction comprising a main body and an end cap, both of which are manufactured from stainless steel. The end cap screws into the main body and has a 250 µm sinter fused into its walls. This sinter allows the surrounding atmosphere to enter the sensor so that the presence of the flammable gas can be detected by various sensing elements contained within the main body. The sensor has a maximum power dissipation of 2.48 W. The rear end of the main body is filled with a setting compound through which the equipment wiring passes. It also has a male M20 x 1.5 thread-form that allows the F1 Gas Sensor to be fitted to an associated enclosure.

CONDITIONS OF CERTIFICATION: YES as shown below:

When installed, the F1 Gas Sensor shall be electrically bonded to earth.
Mechanical and explosion protection shall be provided for the flying leads of the F1 Gas Sensor.

IECEx Certificate of Conformity

Certificate No.: IECEx SIR 06.0016X

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DETAILS OF CERTIFICATE CHANGES (for issues 1 and above):

Issue 1 – this issue introduced the following change:		
1	To recognise the new company address change	
	From	To
	GDS Technologies Limited Swillington Lane Swillington Leeds LS26 6BZ UK	GDS Technologies Limited Fusion Point Ash Lane Garforth Leeds LS25 2GA UK

sira CERTIFICATION

1 **EC TYPE-EXAMINATION CERTIFICATE**

2 Equipment intended for use in Potentially Explosive Atmospheres Directive 94/9/EC

3 Certificate Number: **Sira 03ATEX1168X** Issue: **2**

4 Equipment: **Range 9000 Enclosure**

5 Applicant: **GDS Technologies Limited**

6 Address: Fusion Point
Ash Lane
Garforth
Leeds
LS25 2GA
UK

7 This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 Sira Certification Service, notified body number 0518 in accordance with Article 9 of Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential reports listed in Section 14.2.

9 Compliance with the Essential Health and Safety Requirements, with the exception of those listed in the schedule to this certificate, has been assured by compliance with the following documents:

EN 60079-0:2006 EN 60079-1:2007 EN 60079-7:2003 EN 61241-0:2006 EN 61241-1:2004

10 If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

11 This EC type-examination certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment.

12 The marking of the equipment shall include the following:

II 2 G D

Ex d e IIC T6	Ex d e IIC T5	Ex d e IIC T4	Ex d e IIC T3
Ex tD A21 T85°C IP6X	Ex tD A21 T100°C IP6X	Ex tD A21 T135°C IP6X	Ex tD A21 T200°C IP6X
(-20°C ≤ Ta ≤ 35°C)	(-20°C ≤ Ta ≤ 50°C)	(-20°C ≤ Ta ≤ 85°C)	(-20°C ≤ Ta ≤ 120°C)

Project Number 22124
C. Index 14

C Ellaby
Certification Officer

Page 1 of 3

Form 9400 Issue 1

Sira Certification Service
Rake Lane, Eccleston, Chester, CH4 9JN, England
Tel: +44 (0) 1244 670900
Fax: +44 (0) 1244 681330
Email: info@siracertification.com
Web: www.siracertification.com

sira CERTIFICATION

SCHEDULE

EC TYPE-EXAMINATION CERTIFICATE **Sira 03ATEX1168X**
Issue 2

13 **DESCRIPTION OF EQUIPMENT**

The Range 9000 Enclosure comprises an F1 Gas Sensor mounted via a cable entry point to a Range 9000 increased safety junction box manufactured by Flameproof Electrical Enclosures Ltd. The Range 9000 junction box comprises a glass reinforced polyester enclosure with a hinged lid secured by four M5 x 22 socket head cap screws. They are fitted with either an M6 internal/external earth assembly manufactured from brass or an internal earth continuity plate.

Variation 1 - This variation introduced the following change:

i. The change of the Applicant's address from Swillington Lane, Swillington, Leeds, LS26 6BZ to Fusion Point, Ash Lane, Garforth, Leeds, LS25 2GA.

Variation 2 - This variation introduced the following change:

i. Following appropriate re-assessment to demonstrate compliance with the requirements of the later standards, the documents originally listed in section 9, EN 50014:1997 (Amendments A1 & A2), EN 50018:2000 (Amendment A1), EN 50019:2000 and EN 50281-1-1:1998, were replaced by those currently listed, the markings in section 12 were updated accordingly.
ii. A condition of certification relevant to marking was removed.

14 **DESCRIPTIVE DOCUMENTS**

14.1 **Drawings**

Refer to Certificate Annexe.

14.2 **Associated Sira Reports and Certificate History**

Issue	Date	Report no.	Comment
0	24 October 2003	R51A8269A	The release of the prime certificate.
1	9 December 2008	R51L19300A	This Issue covers the following changes: • All previously issued certification was rationalised into a single certificate, Issue 1, Issue 0 referenced above is only intended to reflect the history of the previous certification and has not been issued as a document in this format. • The introduction of Variation 1.
2	15 September 2010	R22124A/00	The introduction of Variation 2

15 **SPECIAL CONDITIONS FOR SAFE USE** (denoted by X after the certificate number)

15.1 The Range 9000 Enclosure shall not be used as a Safety Related Device in accordance with Directive 94/9/EC.

16 **ESSENTIAL HEALTH AND SAFETY REQUIREMENTS OF ANNEX II** (EHSRs)

The relevant EHSRs that are not addressed by the standards listed in this certificate have been identified and individually assessed in the reports listed in Section 14.2.

Sira Certification Service
Rake Lane, Eccleston, Chester, CH4 9JN, England
Tel: +44 (0) 1244 670900
Fax: +44 (0) 1244 681330
Email: info@siracertification.com
Web: www.siracertification.com

SCHEDULE

EC TYPE-EXAMINATION CERTIFICATE

Sira 03ATEX1168X
Issue 2

17 **CONDITIONS OF CERTIFICATION**

17.1 The use of this certificate is subject to the Regulations Applicable to Holders of Sira Certificates.

17.2 Holders of EC type-examination certificates are required to comply with the production control requirements defined in Article 8 of directive 94/9/EC.

17.3 The Range 9000 Enclosure covered by this certificate incorporate previously certified devices, it is therefore the responsibility of the manufacturer to continually monitor the status of the certification associated with these devices, and the manufacturer shall inform Sira of any modifications of the devices that may impinge upon the explosion safety design of the Range 9000 Enclosure.

Form 9400 Issue1

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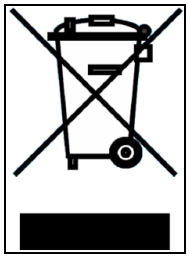
Web: www.siracertification.com

14 Disposal

According to WEEE regulation this electronic product can not be placed in household waste bins. Please check local regulations for information on the disposal of electronic products in your area.



15 Appendix

A feature of the pellistor combustible gas detectors is the almost universal response to LEL of hydrocarbons. Almost all detectable gases produce a similar output at LEL. This table lists the theoretical factors by which the signal with a Calibration gas should be multiplied to give the equivalent signal for other gases.

Gas/Vapour	LEL (CENELEC Standards)	Relative Response (with respect to Methane)	Gain Adjustment
Acetic Acid	5.40%	0.2	5
Acetone	2.60%	0.35	2.86
Ammonia	15%	0.65	1.54
Butyl Acetate	1.40%	0.3	3.33
Cyclo-hexane	1.30%	0.45	2.22
Cyclo-pentane	1.40%	0.5	2
Decane	0.75%	0.2	5
Dioxane	2.00%	0.5	2
Ethane	3.00%	0.85	1.18
Ethanol	3.30%	0.45	2.22
Ethyl Acetate	2.20%	0.35	2.86
Ethylene	2.70%	0.65	1.54
Hydrogen	4.00%	0.95	1.05
Iso-Butane	1.80%	0.55	1.82
Iso-butyl Alcohol	1.70%	0.3	3.33
Iso-Octane	0.95%	0.35	2.86
Iso-Pentane	1.40%	0.45	2.22
Iso-Propyl Alcahol (IPA)	2.20%	0.35	2.86
Methane	5%	1	1
Methanol	6.70%	0.7	1.43
Methyl Ethyl Ketone (MEK)	1.90%	0.35	2.86
n-Butane	1.80%	0.55	1.82
n-Heptane	1.05%	0.4	2.5
n-Hexane	1.02%	0.45	2.22
Nonane	0.85%	0.25	4
n-Pentane	1.40%	0.5	2
n-propanol	2.20%	0.4	2.5
n-Propyl Alcahol	2.20%	0.4	2.5
Propane	2.10%	0.6	1.67
Propylene	2.40%	0.7	1.43
Styrene Monomer	1.1	0.3	3.33
Toluene	1.20%	0.4	2.5
Benzene	1.30%	0.35	2.86
Iso-Butyl Methyl Ketone	1.20%	0.25	4