



1 **EU-TYPE EXAMINATION CERTIFICATE**

2 Equipment intended for use in Potentially Explosive Atmospheres Directive 2014/34/EU

3 Certificate No.: **Sira 17ATEX1048X** Issue: **3**

4 Equipment: **S5000 Gas Monitor fixed gas detection system (Transmitter and Junction Boxes) and Digital Sensor (With FRIT)**

5 Applicant: **General Monitors Inc.** **General Monitors (Ireland) Limited**

6 Address: **26776 Simpatica Circle Ballybrit Business Park**
Lake Forest, CA 92630 Galway
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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 Articles 17 and 21 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, 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 60079-0:2012/A11:2013 EN 60079-1:2014 EN 60079-31:2014 *EN 60079-29-1:2007 EN 50271:2010

* Applies only to the S5000 Gas Monitor fixed Combustible Gas Detection System.

* EN 60079-31 compliance does not imply that the equipment will detect gas during and after exposure to dust and fibers in suspension in air conditions)

The above list of documents may detail standards that do not appear on the UKAS Scope of Accreditation, but have been added through Sira's flexible scope of accreditation, which is available on request.

10 If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to Specific Conditions of Use identified in the schedule to this certificate.

11 This EU-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:

**S5000 Transmitter:
Cemented Joint-versions:**



II 2GD
Ex db IIC T5 Gb
Ex tb IIIC T85°C Db
-55°C ≤ Ta ≤ +75°C
EN 60079-29-1

IP66

**S5000 Junction Boxes:
Cemented Joint versions:**



II 2GD
Ex db IIC T6 Gb
Ex tb IIIC T85°C Db
-55°C ≤ Ta ≤ +75°C

IP66

**Digital Sensor:
With FRIT**



II 2GD
Ex db IIC T5 Gb
Ex tb IIIC T85°C Db
-55°C ≤ Ta ≤ +60°C

IP65

C Ellaby
Deputy Certification Manager

Project Number 70172583

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**S5000 Transmitter:
Flanged Joint versions:**



II 2GD
Ex db IIB+H2 T5 Gb
Ex tb IIIC T85°C Db
-55°C ≤ Ta ≤ +75°C
EN 60079-29-1

IP66

**S5000 Junction Boxes:
Flanged Joint versions:**



II 2GD
Ex db IIB+H2 T6 Gb
Ex tb IIIC T85°C Db
-55°C ≤ Ta ≤ +75°C

IP66

13 DESCRIPTION OF EQUIPMENT

The S5000 Gas Monitor fixed gas detection system is designed to measure specified percentage volumes of methane and propane gases or a variety of toxic gases or oxygen. The system comprises an S5000 transmitter base unit and an optional S5000 Junction Box fitted with an arrangement of up to a pair of two factory-configured combustible, toxic or oxygen gas sensors. The transmitter enclosure is fitted with associated circuitry, connection facilities and an LED display visible through the viewing window of the enclosure.

The S5000 transmitter is the control unit of the S5000 Gas Monitor fixed gas detection system and the enclosure of the transmitter is designed for Flameproof (Ex db) and Dust protection by enclosure (Ex tb). The enclosure is provided with 3/4" NPT threaded entries and a certified adapter is supplied for M25 entries which can be fitted with the sensors described below or suitably certified cable entry devices or blanking plugs. The equipment enclosure has been separately tested against the requirements of IEC 60529 and meets IP66.

The S5000 Junction Boxes are the remote mounting unit of S5000 Gas Monitor fixed gas detection system and the Junction Box enclosure is designed for Flameproof (Ex db) and Dust protection by enclosure (Ex tb). The enclosure is provided with 3/4" NPT threaded entries and a certified adapter is supplied for M25 entries which can be fitted with the sensors described below or suitably certified cable entry devices or blanking plugs. The equipment enclosure has been separately tested against the requirements of IEC 60529 and meets IP66.

The Digital Sensor (With FRIT) assembly utilizes either a catalytic sensing element (Combustible) construction type for the S5000 Gas Monitor fixed combustible gas detection configurations or an electrochemical sensing element (Toxic and Oxygen) construction type for toxic or oxygen detection. The FRIT (sinter element) is located in the lower sensor element housing assembly, which has a fine thread pattern machined to mate to the thread pattern of the upper sensor body assembly. The Digital Sensor (With FRIT) is designed for Flameproof (Ex db) and Dust protection by enclosure (Ex tb). The equipment enclosure has been separately tested against the requirements of IEC 60529 and meets IP65.

The S5000 system makes use of three sensor types including a Digital Sensor for combustible, toxic or oxygen gas detection, Universal Gas (passive sintered) Sensors for combustible or toxic gas detection and an IR (infrared) sensor for combustible gas detection, all mounted via conduit entries. The permitted sensor configurations follow:

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- Two -Digital Sensors (combustible, toxic or oxygen) installed either integral to the S5000 transmitter, one integral and one remote via a S5000 Junction Box or two remote via two separate S5000 Junction Boxes.
- One IR400 sensor (combustible) and one Digital Sensor (combustible, toxic or oxygen) installed either integral to the S5000 transmitter or remotely via the S5000 Junction Box
- One Universal Gas (passive sintered) Sensor (combustible or toxic) installed either integral to the S5000 transmitter or one remote via the S5000 Junction Box

The product model code options of the S5000 gas detection systems (Combustible, toxic or oxygen) featuring the S5000 transmitter, S5000 Junction Box, IR400 sensor, Universal Gas (passive sintered) Sensors and the Digital Sensor component are shown in the Model Code Options section below. The applicable configuration limitations resulting from the hazardous area classifications can be derived in the model codes. The equipment enclosures have been separately tested against the requirements of IEC 60529 for Ingress Protection levels.

Model Code Options:

The S5000 Gas Monitor fixed gas detection system:

The S5000 Transmitter:

Model coding appearing on the transmitter enclosure are shown below:

S5000 transmitter (equipment)		
Model reference	Description	Coding/System Limitations
S5000- <i>abcdeeffggg</i>	<p>Transmitter control unit of the Fixed Gas Detection System for use in explosive gas atmospheres: where up to two sensor may be connected either coupled to the transmitter enclosure or one coupled to the transmitter and the other coupled to the Junction Box enclosure – only one sensor per Junction Box permitted; two Digital Sensors or/ one IR400 sensor and one Digital Sensor or/ one Universal Gas H2S sensor (Toxic – Passive Sintered) or/ one Universal Gas HC sensor (Combustible – Passive Sintered) –</p> <p><i>a</i> is for Enclosure Material: 0 = Aluminum – IIB+H2 (flanged/non-cemented) 1 = Aluminum – IIC (cemented) 2 = Stainless Steel – IIB+H2 (flanged/non-cemented) 3 = Stainless Steel – IIC (cemented)</p> <p><i>b</i> is for Output Communications 0 = Bluetooth/ Modbus/ HART 1.25 mA 1 = Bluetooth/ Modbus/ HART 3.5 mA 2 = Bluetooth/ Modbus/ HART 1.25 mA/ RELAYS 3 = Bluetooth/ Modbus/ HART 3.5 mA/ RELAYS 4 = No Bluetooth/ Modbus/ HART 1.25 mA 5 = No Bluetooth/ Modbus/ HART 3.5 mA 6 = No Bluetooth/ Modbus/ HART 1.25 mA/ RELAYS 7 = No Bluetooth/ Modbus/ HART 3.5 mA/ RELAYS</p> <p><i>c</i> is for Relay State: 0 = No Relays 1 = Latch Alarm / Non-Latch Warn De-Energized 2 = Latch Alarm / Non-Latch Warn Energized</p>	<p><i>transmitter only, without sensors</i></p> <p>- cemented joint window assembly</p> <p>Ex db IIC T5 Gb Ex tb IIIC T85°C Db Tamb: -55°C ≤ Ta ≤ +75°C</p> <p>- flanged joint window assembly</p> <p>Ex db IIB+H2 T5 Gb Ex tb IIIC T85°C Db Tamb: -55°C ≤ Ta ≤ +75°C</p> <p><i>Zone 1 Combustible Gas Detection Systems: main transmitter + two Digital Sensors (With FRIT) units (one sensor maybe connected to one Junction Box)</i></p>

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S5000 transmitter (equipment)		
Model reference	Description	Coding/System Limitations
	3 = Latch Alarm / Latch Warn De-Energized 4 = Latch Alarm / Latch Warn Energized 5 = Non-Latch Alarm / Non-Latch Warn De-Energized 6 = Non-Latch Alarm / Non-Latch Warn Energized 7 = Non-Latch Alarm / Latch Warn De-Energized 8 = Non-Latch Alarm / Latch Warn Energized d is 1 for ATEX/IECEx ee is for an Additional Feature selection: 00 = None (standard) 01 = Stainless Steel Tag fff is for Sensor 1 selection: ggg is for Sensor 2 selection: Sensors: for Sensor Selection fff or ggg : (Independently certified Ex Equipment Sensors or Ex Component Sensors forming the Combustible Gas Detection System, per 60079-29-1, are denoted by [^]) - Digital Sensor selections include, D00 = No Sensor or Sensor Body (transmitter only) D01 = No Sensor (sensor body (With FRIT) w/blank element) D10 = Carbon Monoxide, 0-100 ppm D11 = Carbon Monoxide, 0-500 ppm D12 = Carbon Monoxide, 0-1000 ppm D14 = Carbon Monoxide, Hydrogen Resistant 0-100 ppm D16 = Oxygen, 0-25% D17 = Oxygen, 0-25% Solvent Tolerant D20 = Hydrogen Sulfide, 0-10 ppm D21 = Hydrogen Sulfide, 0-50 ppm D22 = Hydrogen Sulfide, 0-100 ppm D23 = Hydrogen Sulfide, 0-500 ppm D60 = Combustible, 0-100% LEL – 5% Methane [^] D61 = Combustible, 0-100% LEL – 2.1%Propane [^] D65 = Combustible, 0-100% LEL – 4.4 % Methane [^] D66 = Combustible, 0-100% LEL – 1.7% Propane [^] D72 = Nitrogen oxide, 0-100 ppm D75 = Hydrogen Cyanide, 0-50 ppm -IR400 gas detector/ sensor selections include, R00 = No Sensor R13 = Methane, AL [^] R14 = Propane, AL [^] R43 = Methane, SS [^] R44 = Propane, SS [^] R16 = Pentane, AL R17 = Butane, AL R20 = Ethylene, AL R47 = Butane, SS R48 = Ethane , SS R50 = Ethylene, SS	(cemented) Ex db IIC T5 Gb Ex tb IIIC T85°C Db Tamb: -55°C ≤ Ta ≤ +60°C (flanged) Ex db IIB+H2 T5 Gb Ex tb IIIC T85°C Db Tamb: -55°C ≤ Ta ≤ +60°C <i>Zone 1 Combustible Gas Detection System: main transmitter + one IR400 + one Digital Sensor (With FRIT) (one sensor maybe connected to one Junction Box)</i> (cemented and flanged) Ex db IIB+H2 T5 Gb Ex tb IIIC 100°C Db Tamb: -55°C ≤ Ta ≤ +75°C <i>Zone 1 Combustible Gas Detection Systems: main transmitter + one Universal Gas HC (Combustible – Passive Sintered) sensor head or one Universal Gas H2S (Toxic – Passive Sintered) sensor head (one sensor maybe connected to one Junction Box)</i> (cemented) Ex db IIC T4 Gb Tamb: -40°C ≤ Ta ≤ +70°C (flanged) Ex db IIB+H2 T4 Gb Tamb: -40°C ≤ Ta ≤ +70°C The coding of any attached sensor limits the coding of the transmitter/ system.

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S5000 transmitter (equipment)		
Model reference	Description	Coding/System Limitations
	<p>-Universal Gas HC head sensor selections include, C00 = No Sensor C07 = 11159-1L, Stainless Steel [^] C08 = 11159-2L, Stainless Steel, High Temp. [^] C11 = 11159-1, Stainless Steel [^] C12 = 11159-2, Stainless Steel, High Temp. [^] C09 = 11159-8L, Stainless Steel C10 = 11159-8, Stainless Steel</p> <p>-Universal Gas H2S head sensor selections include, M00 = No Sensor M11 = 51457-1L, Stainless Steel, 0-100 ppm M12 = 51457-5L, Stainless Steel, 0-50 ppm M13 = 51457-9L, Stainless Steel, 0-20 ppm M14 = 51457-1, Stainless Steel, 0-100 ppm M15 = 51457-5, Stainless Steel, 0-50 ppm M16 = 51457-9, Stainless Steel, 0-20 ppm</p> <p>000 = No Sensor selection if Sensor 1 is not equal to C00 (Universal Gas HC head sensor or Universal Gas H2S head sensor), D## = Digital Sensor selection only if Sensor 1 = R## or D## (IR400 or Digital Sensor)</p>	

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The S5000 Junction Boxes:

Model coding appearing on the junction box enclosures are shown below:

S5000 Junction Boxes (equipment)		
Model reference	Description	Coding/System Limitations
324240-1	S5000 Junction Box; Stainless Steel, IIB + H2 (flanged/non-cemented)	<i>Junction Box only, without a sensor</i>
324240-2	S5000 Junction Box; Aluminium, IIB+H2 (flanged/non-cemented)	Ex db IIB+H2 T6 Gb Ex tb IIIC T85°C Db Tamb: -55°C ≤ Ta ≤ +75°C <i>Zone 1 configurations:</i> <i>With one Digital Sensor (With FRIT) model connected</i> Ex db IIB+H2 T5 Gb Ex tb IIIC T85°C Db Tamb: -55°C ≤ Ta ≤ +60°C <i>With one IR400 connected</i> Ex db IIB+H2 T5 Gb Ex tb IIIC 100°C Db Tamb: -55°C ≤ Ta ≤ +75°C <i>With one Universal Gas HC (Combustible – Passive Sintered) <u>or</u> one Universal Gas H2S (Toxic – Passive Sintered) connected</i> Ex db IIB+H2 T4 Gb Tamb: -40°C ≤ Ta ≤ +70°C The coding of any attached sensor limits the coding of the junction boxes.

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S5000 Junction Boxes (equipment)		
Model reference	Description	Coding/System Limitations
324240-3	S5000 Junction Box; Stainless Steel, IIC (cemented)	<i>Junction Box only, without a sensor</i>
324240-4	S5000 Junction Box; Aluminium, IIC (cemented)	Ex db IIC T6 Gb Ex tb IIIC T85°C Db Tamb: -55°C ≤ Ta ≤ +75°C <i>Zone 1 configurations:</i> <i>With one Digital Sensor (With FRIT) model connected</i> Ex db IIC T5 Gb Ex tb IIIC T85°C Db Tamb: -55°C ≤ Ta ≤ +60°C <i>With one IR400 connected</i> Ex db IIB+H2 T5 Gb Ex tb IIIC 100°C Db Tamb: -55°C ≤ Ta ≤ +75°C <i>With one Universal Gas HC (Combustible – Passive Sintered) or one Universal Gas H2S (Toxic – Passive Sintered) connected</i> Ex db IIC T4 Gb Tamb: -40°C ≤ Ta ≤ +70°C The coding of any attached sensor limits the coding of the junction box.

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The Digital Sensor:

Model coding appearing on the sensor enclosure are shown below:

Digital Sensor, gas sensor (equipment)		
Model reference	Description	Coding
A-5K-SENS- <i>aa-b-c-d-e</i>	Digital Sensor (With FRIT) model (combustible); where the following applies <i>aa</i> is for Gas Type: 01 = No Sensor (sensor body (With FRIT) w/blank element) 60 = Combustible, 0-100% LEL – 5% Methane 61 = Combustible, 0-100% LEL – 2.1% Propane 65 = Combustible, 0-100% LEL – 4.4% Methane 66 = Combustible, 0-100% LEL – 1.7 % Propane <i>b</i> is for Material type 0 = Stainless Steel 1 = Aluminum <i>c</i> is for the listed Approval: A = ATEX/IECEX <i>d</i> is for Sensor Body: 0 = No Sensor Body 1 = ¾" NPT 2 = M25 <i>e</i> is 0 = Not relevant to certification	Ex db IIC T5 Gb Ex tb IIIC T85°C Db Tamb: -55°C ≤ Ta ≤ +60°C
	Digital Sensor (With FRIT) model (toxic); where the following applies <i>aa</i> is for Gas Type: 01 = No Sensor (sensor body (With FRIT) w/blank element) 10 = Carbon Monoxide, 0-100 ppm 11 = Carbon Monoxide, 0-500 ppm 12 = Carbon Monoxide, 0-1000 ppm 14 = Carbon Monoxide, Hydrogen Resistant 0-100 ppm 16 = Oxygen, 0-25% 17 = Oxygen, 0-25% Solvent Tolerant 20 = Hydrogen Sulfide, 0-10 ppm 21 = Hydrogen Sulfide, 0-50 ppm 22 = Hydrogen Sulfide, 0-100 ppm 23 = Hydrogen Sulfide, 0-500 ppm 72 = Nitrogen oxide, 0-100 ppm 75 = Hydrogen Cyanide, 0-50 ppm <i>b</i> is for Material type 0 = Stainless Steel 1 = Aluminum <i>c</i> is for the listed Approval: A = ATEX/IECEX <i>d</i> is for Sensor Body: 0 = No Sensor Body 1 = ¾" NPT 2 = M25 <i>e</i> is 0 = Not relevant to certification	

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The IR400 Sensor:

Model coding appearing on the sensor enclosure are shown below:

IR400 Sensor, gas sensor (equipment)		
Model reference	Description	Coding
IR400	Detector/ Sensor (combustible); provides a 4-20mA output with Modbus or optional Hart output.	Ex db IIB+H ₂ T5 Gb Ex tb IIIC T100°C Db Tamb: -60°C ≤ Ta ≤ +75°C

The Universal Gas (passive sintered) Sensors HC & H2S Sensor Heads, models no. 11159 (HC) and 51457 (H2S):

Model coding appearing on the sensor enclosure are shown below:

Universal Gas (passive sintered) Sensor, two types (equipment)		
Model reference	Description	Coding
11159-1 11159-2 11159-8* 11159-1L 11159-2L 11159-8L*	HC sensor head; Passive Sintered (combustible)	Ex db IIC T4 Gb Tamb: -40°C ≤ Ta ≤ +70°C
*Excluded from the combustible gas detection performance approval (60079-29-1)		
51457-1 51457-5 51457-9 51457-1L 51457-5L 51457-9L	H2S sensor head; Passive Sintered (Toxic)	

Description relating to EN 50271:2010 Application:

The S5000 main transmitter supports either one or two sensors, depending on sensor selection and is assembled with one of three sensor interface specific boards; Digital interface sensors, MOS sensors or Passive Catalytic bead combustible sensors.

IR400 Sensor – The IR400 sensor is an infrared sensor designed to measure many combustible gases. It communicates with the main transmitter via a 4-20 mA loop.

Passive Catalytic Sensor – The passive catalytic sensor is a catalytic bead with no additional electronics. All signal amplification and processing is handled by a special version of the main board in the S5000 main transmitter.

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Passive MOS Sensor – The passive MOS (metal oxide semiconductor) sensor is a high performance / high concentration H2S sensor which includes a small heating element. All signal amplification and processing is handled by a special version of the main board in the S5000 main transmitter.

Digital Sensors – The Digital Sensor modules include either an MSA XCell electrochemical sensor or an MSA XCell catalytic bead combustible sensor, a pre-amp board and a board that digitizes the gas measurement for communication with the main transmitter. The CO and H2S sensor modules also includes MSA's patented Life and Health algorithm that automatically compensates for sensor drift and sensitivity loss.

Table 1: FMEDA Analysis Results of the S5000 Gas Detector (single mode)

Parameter name	Symbol	Equation/source	Result
Proof Test Interval	T1	IEC 61508-4 clause 3.8.5	2190 hrs
Mean Time To Repair	MTTR	IEC 61508-4 clause 3.6.21	4 hrs
Mean Repair Time (once revealed)	MRT	IEC 61508-4 clause 3.6.22	4 hrs
Type A/B	Type	IEC 61508-2 clause 7.4.4.1.2 & 7.4.4.1.3	Type B
Total failures:	λ	IEC 61508-4 clause 3.6.4	See Table 3 & Table 4.
Safe diagnosed failures:	λ_{SD}	IEC 61508-4 clause 3.6.8	
Safe undiagnosed failures:	λ_{SU}		
Dangerous diagnosed failures:	λ_{DD}	IEC 61508-4 clause 3.6.7	
Dangerous undiagnosed failures:	λ_{DU}		
Diagnostic coverage:	DC	$DC = \frac{\lambda_{DD}}{\lambda_{DU} + \lambda_{DD}}$	
Safe Failure Fraction:	SFF	$SFF = \frac{\lambda_{SD} + \lambda_{SU} + \lambda_{DD}}{\lambda}$	
Channel equivalent down time	t_{CE}	$t_{CE} = \frac{\lambda_{DU}}{\lambda_D} \left(\frac{T}{2} + MRT \right) + \frac{\lambda_{DD}}{\lambda_D} MTTR$	
PFD _{AVG} (using simplified equation)	PFD _{AVG}	$PFD_{AVG} = \lambda_{DU} \left(\frac{T}{2} + MTTR \right) + \lambda_{DD} MTTR$	

Element Safety Function

The element safety functions of the S5000 Gas Detector is defined as follows:

'To provide the host system with a predefined 4-20mA alarm signal output and de-energise a relay (if included) in the event of a dangerous or explosive atmosphere depending on the sensor type configuration.'

See Table 2 below for 4-20 mA alarm signal details in different operation modes.



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Table 2: Analog Output Default Values

Output Setting	Custom 1 (mA)	Custom 2 (mA)	3.5 mA with HART (mA)	1.25 mA with HART (mA)	HART Disabled (mA)
Fault	1.25	1.25	3.5	1.25	0
Calibration (excl. O ₂)	1.5	1.5	3.5	1.5	1.5
Calibration – O ₂ only	1.5	21.7 ³	3.5	1.5	1.5
Ready/Zero Reading	4.04	4.04	4.04	4.04	4.04
Maintenance/Startup	3.5	3.5	3.5	3.5	3.5
WARN Signal	5.6	5.6	5.6	5.6	5.6
ALARM Signal	8.8	8.8	8.8	8.8	8.8
Over Range	21.7	21.7	21.7	21.7	21.7

Table 3: FMEA Summary for the S5000 Gas Detector in Single Mode (1oo1) without Relay (Low Demand of Operation)

Safety Function: To provide the host system with a predefined 4-20 mA alarm signal output and de-energise a relay (if included) in the event of a dangerous or explosive atmosphere depending on the sensor type configuration. See Table 2 for 4-20 mA alarm signal details in different operation modes.										
Sensor 1	Sensor 2	Relay	λ _{SD}	λ _{SU}	λ _{DD}	λ _{DU}	SFF	DC	t _{CE}	PFD
Xcell Toxic	No Sensor	No	8.00E-08	1.21E-06	1.38E-06	2.66E-08	99%	98%	2.47E+01	3.48E-05
Xcell Toxic	Xcell Toxic	No	8.06E-08	1.53E-06	1.87E-06	5.32E-08	98%	97%	3.44E+01	6.59E-05
Xcell Toxic	Xcell Oxygen	No	8.07E-08	1.61E-06	1.85E-06	2.83E-08	99%	98%	2.04E+01	3.85E-05
Xcell Toxic	IR 400	No	8.00E-08	3.31E-06	3.63E-06	5.30E-08	99%	98%	1.98E+01	7.28E-05
Xcell Oxygen	No Sensor	No	8.01E-08	1.28E-06	1.37E-06	1.71E-09	99%	99%	5.36E+00	7.36E-06
Xcell Oxygen	Xcell Oxygen	No	8.08E-08	1.69E-06	1.84E-06	3.34E-09	99%	99%	5.98E+00	1.10E-05
Xcell Oxygen	IR 400	No	8.01E-08	3.38E-06	3.62E-06	2.81E-08	99%	99%	1.24E+01	4.54E-05
IR 400	No Sensor	No	7.93E-08	2.98E-06	3.15E-06	2.65E-08	99%	99%	1.31E+01	4.17E-05
Digital Cat Bead	No Sensor	No	7.94E-08	9.89E-07	1.55E-05	1.60E-06	91%	90%	1.07E+02	1.82E-03
Digital Cat Bead	Digital Cat Bead	No	7.96E-08	1.10E-06	3.01E-05	3.20E-06	90%	90%	1.09E+02	3.64E-03
Digital Cat Bead	Xcell Oxygen	No	8.02E-08	1.39E-06	1.60E-05	1.60E-06	91%	90%	1.04E+02	1.83E-03
Digital Cat Bead	Xcell Toxic	No	8.01E-08	1.32E-06	1.60E-05	1.63E-06	91%	90%	1.05E+02	1.85E-03
Digital Cat Bead	IR 400	No	7.94E-08	3.09E-06	1.77E-05	1.63E-06	92%	91%	9.61E+01	1.86E-03
Passive Cat Bead	No Sensor	No	4.14E-08	6.35E-07	1.52E-05	1.60E-06	90%	90%	1.09E+02	1.82E-03
Passive MOS	No Sensor	No	5.09E-08	6.57E-07	1.67E-05	1.34E-08	99%	99%	4.87E+00	8.16E-05

The above results are based on the following:

Proof Test Interval (PTI) = 2190 hours (3 months), Mean Time to Restoration (MTTR) = 4 hours, Mean Repair Time (MRT) = 4 hours

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Table 4: FMEA Summary for the S5000 Gas Detector in Single Mode (1oo1) with Relay (Low Demand of Operation)

Safety Function: To provide the host system with a predefined 4-20 mA alarm signal output and de-energise a relay (if included) in the event of a dangerous or explosive atmosphere depending on the sensor type configuration. See Table 2 for 4-20 mA alarm signal details in different operation modes.										
Sensor 1	Sensor 2	Relay	λ_{SD}	λ_{SU}	λ_{DD}	λ_{DU}	SFF	DC	t_{CE}	PFD
Xcell Toxic	No Sensor	Yes	1.03E-07	1.24E-06	1.40E-06	2.92E-08	98%	97%	2.63E+01	3.77E-05
Xcell Toxic	Xcell Toxic	Yes	1.04E-07	1.56E-06	1.89E-06	5.57E-08	98%	97%	3.54E+01	6.88E-05
Xcell Toxic	Xcell Oxygen	Yes	1.04E-07	1.64E-06	1.87E-06	3.08E-08	99%	98%	2.17E+01	4.13E-05
Xcell Toxic	IR 400	Yes	1.03E-07	3.34E-06	3.65E-06	5.56E-08	99%	98%	2.04E+01	7.57E-05
Xcell Oxygen	No Sensor	Yes	1.03E-07	1.31E-06	1.39E-06	4.23E-09	99%	99%	7.32E+00	1.02E-05
Xcell Oxygen	Xcell Oxygen	Yes	1.04E-07	1.72E-06	1.86E-06	5.86E-09	99%	99%	7.44E+00	1.39E-05
Xcell Oxygen	IR 400	Yes	1.03E-07	3.41E-06	3.64E-06	3.06E-08	99%	99%	1.31E+01	4.82E-05
IR 400	No Sensor	Yes	1.03E-07	3.01E-06	3.17E-06	2.90E-08	99%	99%	1.39E+01	4.45E-05
Digital Cat Bead	No Sensor	Yes	1.03E-07	1.02E-06	1.55E-05	1.60E-06	91%	90%	1.07E+02	1.82E-03
Digital Cat Bead	Digital Cat Bead	Yes	1.03E-07	1.13E-06	3.01E-05	3.21E-06	90%	90%	1.09E+02	3.64E-03
Digital Cat Bead	Xcell Oxygen	Yes	1.03E-07	1.42E-06	1.60E-05	1.61E-06	91%	90%	1.04E+02	1.83E-03
Digital Cat Bead	Xcell Toxic	Yes	1.03E-07	1.35E-06	1.60E-05	1.63E-06	91%	90%	1.05E+02	1.86E-03
Digital Cat Bead	IR 400	Yes	1.03E-07	3.12E-06	1.77E-05	1.63E-06	92%	91%	9.61E+01	1.86E-03
Passive Cat Bead	No Sensor	Yes	6.47E-08	6.68E-07	1.52E-05	1.60E-06	90%	90%	1.09E+02	1.82E-03
Passive MOS	No Sensor	Yes	7.42E-08	6.89E-07	1.67E-05	1.59E-08	99%	99%	5.04E+00	8.44E-05

The above results are based on the following:

Proof Test Interval (PTI) = 2190 hours (3 months), Mean Time to Restoration (MTTR) = 4 hours, Mean Repair Time (MRT) = 4 hours

Variation 1 – This variation introduced the following changes:

- i. Digital Sensor Specific Condition of Use referencing “maximum reference pressure” was revised, for a higher pressure value.
- ii. S5000 transmitter and S5000 Junction Box enclosure with an integral mounted Digital Sensor Condition of Manufacture referencing “hydrostatic pressure testing” was removed.

Variation 2 – This variation introduced the following changes:

- i. Following appropriate assessment to demonstrate compliance, EN 50271:2010 was added to the list of standards and the description was amended to recognise the application of the product in a safety related loop. Specific Conditions of Use and Conditions of Manufacture were introduced as a result of this change.

Variation 3 – This variation introduced the following changes:

- i. The introduction of the pre-existing Zone 1 Ex db (and Ex tb) Digital Sensor assembly having the FRIT (stainless steel sintered element) and utilizes either a catalytic sensing element (Combustible) construction type for the S5000 Gas Monitor fixed combustible gas detection configurations or an electrochemical sensing element (Toxic and Oxygen) construction type for toxic or oxygen detection; now being referenced as “Digital Sensor (With FRIT)”.

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- ii. The Marking, the Product Description and the Model Code Tables were amended to present reference of Digital Sensor to Digital Sensor (With FRIT) model where appropriate.
- iii. Specific Conditions of Use was amended to revise the present reference of "Digital Sensor" to "Digital Sensor (With FRIT)".
- iv. Specific Condition of Use referencing "EN 50271 (clause 4.8, safety integrity assessment excluded from the assessment)" was removed; due to the introduction of EN 50271:2010 to the list of Standards of Certificate Sira 17ATEX1048X issue 1.
- v. Conditions of Manufacture was amended to revise the present reference of "Digital Sensor" to "Digital Sensor (With FRIT)".
- vi. Inclusion of the IP rating for each equipment enclosure as part of both the marking.
- vii. Added the General Monitors (Ireland) Limited factory/ subcontractor to the Manufacturer's Name and Address section.

14 DESCRIPTIVE DOCUMENTS

14.1 Drawings

Refer to Certificate Annexe.

14.2 Associated Sira Reports and Certificate History

Issue	Date	Report no.	Comment
0	08 January 2018	R70141952A, R70141952B	The release of the prime certificate.
1	16 February 2018	R70168186A	The introduction of Variation 1
2	03 May 2018	R70164637E	The introduction of Variation 2.
3	20 September 2018	R70172583A	The introduction of Variation 3.

15 SPECIFIC CONDITIONS OF USE (denoted by X after the certificate number)

15.1 S5000 Transmitter:

- 15.1.1 Under certain extreme circumstances, the non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore, the equipment shall only be cleaned with a damp cloth.
- 15.1.2 This fixed equipment is exclusively designed for field mounting in the vertical orientation with restrictions placed around the conduit entry locations permitted for connection of the Digital Sensor, IR400 infrared (IR) sensors and Universal Gas Sensors. The equipment is subject to the installation and orientation requirements defined in the product manual.
- 15.1.3 The flameproof joints shall not be repaired.

15.2 S5000 Junction Boxes:

- 15.2.1 Under certain extreme circumstances, the non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore, the equipment shall only be cleaned with a damp cloth.
- 15.2.2 The flameproof joints shall not be repaired.

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15.3 Digital Sensor (With FRIT) model:

- 15.3.1 Under certain extreme circumstances, the non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore, the equipment shall only be cleaned with a damp cloth.
- 15.3.2 The flameproof joints shall not be repaired.
- 15.3.3 If the sensor is uninstalled, the equipment manufacturer shall be contacted prior to reinstalling.
- 15.3.4 The Digital Sensor is provided with a 3/4" NPT thread and shall only be connected to a suitably certified junction box or instrument for the hazardous area of installation and thereby provide Ex protection for the flying lead connections. The installation to the certified enclosure shall be with five fully engaged threads, tightened wrench-tight.
- 15.3.5 The Digital Sensor shall only be fitted to enclosures having a maximum reference pressure of 34.4 bars or lower.
- 15.3.6 For combustible gas detection performance applications, the appropriate Digital Sensor model number shall only be used to construct the S5000 Gas Monitor fixed gas detection system; mounted onto either the S5000 transmitter or S5000 Junction Box enclosures and receive power and control from the transmitter.
- 15.3.7 The Ingress Protection rating is exclusively based upon the installation instruction for orientation specified in the operating manual.

15.4 Conditions relating to EN 50271:2010

- 15.4.1 The user shall comply with the requirements given in the manufacturer's user documentation in regards to all relevant functional safety aspects such as application of use, installation out of hazardous areas, operation, maintenance, proof tests, maximum ratings, environmental conditions, and repair.
- 15.4.2 Selection of this equipment for use in safety functions, configuration, overall validation, maintenance and repair shall only be carried out by competent personnel, observing all the manufacturer's conditions and recommendations in the user documentation.
- 15.4.3 The safety related device must be functioning and powered independently of any control devices required for operation.
- 15.4.4 The proof test interval for the S5000 safety function is 3 months.
- 15.4.5 Further assessment shall be required when the safety device is combined with specific Equipment under Control and before the safety device is used to control risks of explosion.

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.

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17 CONDITIONS OF MANUFACTURE

- 17.1 The use of this certificate is subject to the Regulations Applicable to Holders of Sira Certificates.
- 17.2 Holders of EU-Type Examination Certificates are required to comply with the conformity to type requirements defined in Article 13 of Directive 2014/34/EU.
- 17.3 **Conditions relating to EN 50271:2010**
 - 17.3.1 The manufacturer shall include the safety instructions in the relevant product manual.
 - 17.3.2 Modification to the hardware or software shall be in accordance with IEC 61508-2, clause 7.8 and EN 50271. The certification body shall be notified of any changes.

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Certificate Annexe



Certificate Number: Sira 17ATEX1048X
 Equipment: S5000 Gas Monitor fixed gas detection system
 (Transmitter and Junction Boxes) and Digital
 Sensor (With FRIT)
 Applicant: General Monitors Inc

Issue 0:

Drawing	Sheets	Rev.	Date(Sira stamp)	Description
324140	1 of 1	0	23 Nov 17	S5000 Relay Board, Schematic
324141	1 of 1	0	23 Nov 17	S5000 Relay Board, Circuit Card Assembly
324141-1	1 of 1	1	23 Nov 17	S5000 Relay Board, BOM
324130	1 to 9	2	23 Nov 17	S5000 Control Board, Schematic
324131	1 of 1	1	23 Nov 17	S5000 Control Board, Circuit Card Assembly
324131-1	1 to 2	0	23 Nov 17	S5000 Control Board, BOM
324120	1 of 1	2	23 Nov 17	S5000 User Interface Board, Schematic
324121	1 of 1	0	23 Nov 17	S5000 User Interface Board, Circuit Card Assembly
324121-1	1 of 1	3	23 Nov 17	S5000 User Interface Board BOM
324101	1 to 3	1	12 Dec 17	S5000 Explosion-Proof Enclosure Design
324200	1 of 1	1	23 Nov 17	S5000 Junction Box Board, Schematic
324201	1 of 1	1	23 Nov 17	S5000 Junction Box Board, Circuit Card Assembly
324201-1	1 of 1	1	23 Nov 17	S5000 Junction Box Board, BOM
324240	1 of 1	0	23 Nov 17	Junction Box Assembly
324114	1 of 1	0	23 Nov 17	S5000 Transmitter and Junction Box electronics assembly
MANS5000	1 to 63	01	23 Nov 17	Operating Manual General Monitors S5000 Gas Monitor
7-7208-1	1 of 1	0	23 Nov 17	Digital Sensor (cap) assembly S5000
324180	1 of 1	0	23 Nov 17	Schematic diagram, Digital Sensor
324181	1 of 1	0	23 Nov 17	Digital Sensor Board, Circuit Card Assembly
324181-1	1 of 1	1	23 Nov 17	Digital Sensor Board, BOM
324230	1 of 1	2	23 Nov 17	Digital Sensor Life and Health Board, Schematic
324231	1 of 1	2	23 Nov 17	Digital Sensor Life and Health Board, Circuit Card Assembly
324231-1	1 of 1	3	23 Nov 17	Digital Sensor Life and Health Board, BOM
324170	1 of 1	0	23 Nov 17	Schematic Diagram, GM Catalytic Cell Pre-amp
324171	1 of 1	0	23 Nov 17	Circuit Card Assembly, Catalytic Cell Pre-amp
324174	1 of 8	0	23 Nov 17	Artwork Catalytic Cell Pre-Amp
324110-1	1 of 1	1	23 Nov 17	Label Artwork S5000 Transmitter IIB+H2
324110-3	1 of 1	1	23 Nov 17	Label Artwork S5000 Transmitter IIC
324247-1	1 of 1	1	23 Nov 17	Label Artwork S5000 Junction Box IIB+H2
324247-2	1 of 1	1	23 Nov 17	Label Artwork S5000 Junction Box IIC
10179426	1 of 1	2	23 Nov 17	Label Artwork Digital Sensor
486482	1 of 1	3	28 Nov 17	Cup, porous, 60 microns (sintered element)

Issue 1: - No new drawings were introduced.

Issue 2: - The following new drawings were introduced to support the EN 50271 certification.

Drawing	Sheets	Rev.	Date (Sira stamp)	Title
SK3073-1122	1 of 1	4	29 Nov 17	Toxic & Oxygen ASIC Schematic

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Certificate Annexe



Certificate Number: Sira 17ATEX1048X
Equipment: S5000 Gas Monitor fixed gas detection system
(Transmitter and Junction Boxes) and Digital
Sensor (With FRIT)
Applicant: General Monitors Inc

Issue 3:

Drawing	Sheets	Rev.	Date (Sira stamp)	Title
324131	1 of 1	2	16 Aug 18	S5000 Control Board, Circuit Card Assembly
MANS5000	1 to 66	02	16 Aug 18	Operating Manual General Monitors S5000 Gas Monitor
SK3098-1444	1 of 6	0	16 Aug 18	Nameplate Approval Drawing, S5000 equipment

Note: Drawing SK309-1444 replaces Drawings: 324110-1, 324110-3, 324247-1, 324247-2, and 10179426.

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