



1 **EC TYPE-EXAMINATION CERTIFICATE**

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

3 Certificate Number: **Sira 04ATEX1357U** Issue: **6**

4 Component: **Type MSH \*\*\* Gas Sensors**

**This Safety Related Device has been assessed with reference to the requirements of EN 50271:2010. It can be considered for use in the design of safety function up to and including SIL 1 and is not implicit of the achieved Safety Integrity Level (SIL) of the safety related system.**

5 Applicant: **Dynament Limited**

6 Address: **Premier House, The Village, South Normanton, Derbyshire DE55 2DS, UK**

7 This component and any acceptable variation thereto are 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 component has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of a component 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 60079-0:2009
- EN 60079-1:2007
- EN 50271:2010
- EN 60079-11:2007 (For guidance on the small component tests)
- EN 60079-26:2007 (For details on the use of two independent levels of protection)

10 The sign 'U' is placed after the certificate number to indicate that the product assessed is a component and may be subject to further assessment when incorporated into equipment. Any special conditions for safe use are listed in the schedule to this certificate.

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

12 The marking of the component shall include the following:

**Type MSH \*\*\* and Type MSH-P \*\*\* Gas Sensors**



I M2  
Ex d I Mb

and



II 2 G  
Ex d IIC Gb

**Type MSHia \*\*\* and Type MSHia-P \*\*\***



I M1  
Ex d+ia I Ma

and



II 2 G  
Ex d IIC Gb

Project Number 70004928

C Ellaby  
Deputy Certification Manager

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#### 13 DESCRIPTION OF COMPONENT

The Type MSH \*\*\* Gas Sensors are a range of 'plug-in' sensors which may be rated at up to 30 V with a maximum power dissipation of up to 0.8 W. The sensors comprise a small cylindrical enclosure manufactured in stainless steel with integral electrical connection pins at the rear and a stainless steel sinter at the front to facilitate the ingress of the sample gas.

The interior of the enclosure comprises a small chamber which may contain a range of electro-catalytic, infrared or pyroelectric gas detectors, all with energy storage capability no greater than 0.04 mJ.

**Design option:** The sinter may be replaced by a two-layer mesh; this variant is known as the Type MSH-P \*\*\* Gas Sensor.

#### Variation 1

This variation introduced the following changes:

- i. The applicant's name and address was changed:  
**From:** Status Scientific Controls Ltd  
Hermitage Lane Industrial Estate, Mansfield, Nottinghamshire NG18 5ER, UK  
**To:** Dynament Limited  
Premier House, The Village, South Normanton, Derbyshire DE55 2DS, UK
- ii. The documents listed in Section 9 were changed to recognise that the sensor complies with the requirements of EN 60079-0:2006 and EN 60079-1:2004.
- iii. The use of alternative materials for the closing disc through which the connection pins pass was introduced, the disc may be manufactured from non-metallic materials having a tracking index greater than CTI 175 or may be manufactured from metal; a special condition for safe use applies.
- iv. All previously certified drawings were replaced by new drawings.

#### Variation 2

This variation introduced the following changes:

- i. The introduction of the Gas Sensors Type MSHia \*\*\* and Type MSHia-P \*\*\*, this involved changing the coding for Group I gases and by specifying that the devices shall be supplied by an intrinsically safe supply coded EEx ia (or Ex ia) having a maximum output voltage of 6.0 V d.c. and a maximum output power of 0.8 W.

**Variation 3** - This variation introduced the following changes:

- i. Following appropriate re-assessment to demonstrate compliance with the requirements of the latest EN 60079 series of standards, the documents originally listed in section 9, EN 60079-0:2006, EN 60079-1:2004, EN 60079-11:2007 and IEC 60079-26:2006, were replaced by those currently listed.

**Variation 4** - This variation introduced the following changes:

- i. It was recognised that the Type MSHia-P \*\*\* Gas Sensors can be used as a SIL 1 safety related device as defined in EN 50271:2010; note that the EHSRs section 1.5 (safety related devices) has been addressed, however, performance test to EN 60079-29-1 has not been conducted as part of this certification. This change necessitated the introduction of conditions of manufacture and additional special conditions for safe use.

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Table 1: Summary of Failure Data of Platinum Gas Detector (Single and Dual Channels)

<b>Safety Function:</b>			
To measure the concentration of gas by means of analogue and /or digital outputs so that:			
<i>Analogue output: Output voltage &lt; 0.2V or &gt;2.5V reserved for revealed failures</i>			
<i>Analogue output: Output voltage ≥0.2V and ≤2.5V normal operating conditions</i>			
<i>Digital output: &lt; -200% and/or &gt; 200% of gas concentration reserved for revealed failures</i>			
<i>Digital output: &gt;-200% and &lt; 200% of gas concentration for normal operating conditions</i>			
<b>Notes: For bridge type sensors configuration powered by 5V to 3V, the output Voltage Vo is configurable as defined in this equation:</b>			
Output Voltage (Vo) = (Zero * Supply Voltage) + (Sensitivity * (Gas Level / FSD))			
Where, zero (0.4 to 0.6), Supply Volt (3V to 5V), Sensitivity (±0.1V to ±0.2V), Gas Level (any value between -200% to +200%), FSD ( 5% v/v)			
<b>(Sensitivity 100mV)</b>			
a) 5V supply voltage:	Vo < 2.3V or >2.7V reserved for revealed failures and	Vo ≥2.3V and ≤2.7V normal operating conditions	
b) 3V supply voltage:	Vo < 1.3V or >1.7V reserved for revealed failures and	Vo ≥1.3V and ≤1.7V normal operating conditions	
<b>(Sensitivity: 200mV)</b>			
a) 5V supply voltage:	Vo < 2.1V or >2.9V reserved for revealed failures and	Vo ≥2.1V and ≤2.9V normal operating conditions	
b) 3V supply voltage:	Vo < 1.1V or >1.9V reserved for revealed failures	Vo ≥1.1V and ≤1.9V normal operating conditions	
Digital outputs (SF) conditions unchanged, their outputs as described above.			
<b>Summary of Clauses</b>	<b>Single Channel</b>	<b>Dual Channel</b>	<b>Verdict</b>
<b>7.4.2 and 7.4.4 of IE 61508-2</b>			
Architectural constraints	HFT=0	HFT=0	Type B
Safe Failure Fraction (SFF)	66%	67%	SIL 1
Random hardware failures: [h <sup>-1</sup> ] (dangerous)	λ <sub>DD</sub> λ <sub>DU</sub>	1.70E-07 9.20E-08	1.56E-07 8.81E-08
Random hardware failures: [h <sup>-1</sup> ] (safe)	λ <sub>SD</sub> λ <sub>SU</sub>	3.61E-09 7.59E-09	2.05E-09 2.19E-08
Diagnostic Coverage (DC)	64%	64%	
Probability of failure on demand @ proof test interval = 8760 Hrs Mean time to restoration = 8 Hrs	4.05E-04	3.88E-04	SIL 3
Frequency of a Dangerous failure (High Demand - PFH) [h <sup>-1</sup> ]	9.20E-08	8.81E-08	
Hardware safety integrity compliance	Route 1 <sub>H</sub>		
Systematic safety integrity compliance (HW)	Route 1 <sub>S</sub>		
Systematic safety integrity compliance (SW)	EN 50271		
Systematic Capability (SC1, SC2, SC3, SC4)	SC1		
Overall SIL-capability achieved	SIL 1 due to Architectural constraints (SFF).		

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14 DESCRIPTIVE DOCUMENTS

14.1 Drawings

Refer to Certificate Annexe.

14.2 Associated Sira Reports and Certificate History

Issue	Date	Report no.	Comment
0	16 November 2004	R51A11650A	The release of prime certificate.
1	18 May 2005	R51V13273A	The re-issue of the prime certificate to recognise the changes described in report number R51V13273A.
2	23 April 2007	R51A16373A	This Issue covers the following changes: <ul style="list-style-type: none"><li>All previously issued certification was rationalised into a single certificate Issue 2, Issues 0 and 1 referenced above are only intended to reflect the history of the previous certification and have not been issued as documents in this format.</li><li>The introduction of Variation 1.</li></ul>
3	8 August 2008	R52L18475B	The introduction of Variation 2.
4	19 December 2008	R52A19455A	This Issue covers the following changes: <ul style="list-style-type: none"><li>Drawings were updated to include the marking 'II 2G'.</li><li>The correction of typographical errors.</li></ul>
5	13 April 2010	R21767A/00	The introduction of Variation 3.
6	26 June 2014	R70004928A	The introduction of Variation 4.

15 SPECIAL CONDITIONS FOR SAFE USE

- 15.1 The sensors have been assessed as suitable for use within an ambient temperature range of -20°C to +60°C, whilst producing a maximum external surface rise of 45K in normal operation.
- 15.2 The devices shall be effectively protected from impact.
- 15.3 These devices are intended for use at atmospheric pressure and should not be used in pressures exceeding 1.1 bar.
- 15.4 The sensor may be supplied with a metallic closing disc around the connection pins, this shall be considered in respect of creepage and clearance distance when the device is incorporated into equipment.
- 15.5 Unless subsequently protected by concepts that render the following conditions unnecessary:
- The connection pins shall be protected from dust and moisture by an enclosure with an Ingress Protection rating of at least IP 54.
  - The devices should not be installed/removed when an explosive gas atmosphere is present.
- 15.6 The Type MSHia \*\*\* and Type MSHia-P \*\*\* shall be supplied by an intrinsically safe supply coded EEx ia (or Ex ia) with a maximum output voltage of 6.0 Vd.c. and a maximum output power of 0.8 W.

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The following conditions apply when the Types MSH-P\*\*\* and MSHia-P \*\*\* Gas Sensors are used as a SIL 1 safety related device as defined in EN 50271:2010

- 15.7 The user shall comply with the requirements given in the manufacturer's user documentation in regard 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.
- 15.8 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.
- 15.9 The safety related device must be functioning and powered independently of any control devices required for operation.
- 15.10 The recommended proof test interval for the safety functions is 1 year.
- 15.11 All information associated with any field failures of this product should be collected under a dependability management process (e.g., IEC 60300-3-2) and reported to the manufacturer.
- 15.12 The IR Platinum Series are only approved for software version (V7.17.00u B18).
- 15.13 The certified products series shall only be configured using Dynamet "Status Scientifics' PC application v3.4.0 or later".
- 15.14 The serial communication bus shall only be used with the protocol developed by Dynamet Ltd to exercise the safety function.

### 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 scope of the assessment is based on achieving a SIL1 as a result of an FMEA and supporting IEC 61508 assessment and EN 50271. It does not cover any Ex assessment and further assessment shall be required when the safety device is combined with specific enclosures for use in hazardous areas.
- 17.4 The manufacturer shall include the safety instructions in the relevant product manual.
- 17.5 The validity of this ATEX certificate is only for 5 years, subject to the auditing results of the IEC 61508 assessment reports R56A18622A\_rev1, R56A18622B\_rev1 and R56A18622C\_rev1.
- 17.6 The software version (V7.17.00u.B18) shall not be changed or modified without the acknowledgement of the approval body. Any modification to the software, it shall be assessed to EN 50271 and any additional relevant clauses from IEC 61508 part 3.

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# Certificate Annexe

Certificate Number: Sira 04ATEX1357U  
Component: Type MSH \*\*\* Gas Sensors  
Applicant: Dynament Limited



## Issue 0

The drawings introduced in Issue 0 were replaced by the drawings introduced in Issue 1.

## Issue 1

The drawings introduced in Issue 1 were replaced by the drawings introduced in Issue 2.

## Issue 2

Number	Sheet	Rev.	Date	Description
DYN/015*	1 of 1	1	15 Mar 07	GA sensor housing
DYN/016*	1 of 1	1	15 Mar 07	GA of mini sensor housing
DYN/365	1 of 1	1	15 Mar 07	MSH-P Optic Spacer

\* These drawings were replaced by corrective drawings introduced by Issue 3, the replacement drawings bear the Sira date stamp 29 July 2008.

## Issue 3

Number	Sheet	Rev.	Date (Sira Stamp)	Description
DYN/016	1 of 1	1	29 Jul 08	General arrangement of Type MSH ***
DYN/015	1 of 1	1	29 Jul 08	General arrangement of Type MSH-P ***
DYN/022	1 of 1	1	10 Jul 08	General arrangement of Type MSHia ***
DYN/021	1 of 1	1	10 Jul 08	General arrangement of Type MSHia-P ***

## Issue 4

Number	Sheet	Rev.	Date (Sira Stamp)	Description
DYN/016	1 of 1	2	18 Dec 08	General arrangement of Type MSH ***
DYN/015	1 of 1	2	18 Dec 08	General arrangement of Type MSH-P ***
DYN/022	1 of 1	2	18 Dec 08	General arrangement of Type MSHia ***
DYN/021	1 of 1	2	18 Dec 08	General arrangement of Type MSHia-P ***

Issue 5 No new drawings were introduced.

## Issue 6

Number	Sheet	Rev.	Date (Sira Stamp)	Description
FS101	-	1a	01/05/2013	Single channel parts list
FS102	-	1b	01/05/2013	Dual channel parts list
DYN 118	-	3	01/05/2013	Circuit diagram for single channel processor board
DYN 116	-	3	01/05/2013	Circuit diagram for dual channel analogue board
DYN 115	-	2	01/05/2013	Circuit diagram for dual channel processor board
DYN 114	-	3	01/05/2013	Circuit diagram for single channel analogue board

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