

Sierra Monitor Corporation

ATEX EU-TYPE EXAMINATION REPORT

SCOPE OF WORK

EU TYPE PRODUCT CERTIFICATION – BLIND IR GAS SENSOR

REPORT NUMBER

103729628DAL-002

ISSUE DATE

18 March 2020

PAGES

17

DOCUMENT CONTROL NUMBER



RT-R-UK-TEST-3876 (5-July-2018)

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MODEL NUMBER:	4101-28
DESCRIPTION:	Blind IR Gas Sensor
CERTIFICATE NUMBER:	ITS19ATEX105147X
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CONCLUSION:	The Sierra Monitor Corporation Blind IR Gas Sensor Model 4101-28 was considered to comply with the requirements of the European Union Directive 2014/34/EU with respect to Group II, Category 2 G apparatus together with the requirements of EN IEC 60079-0:2018 and EN 60079-1:2014 with respect to type of protection Ex "d", Group(s) IIB+H ₂ with Temperature Class T6 in an ambient temperature of -20°C ≤ Ta ≤ +60°C.

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SECTION A

ASSESSMENT NARRATIVE AND CONCLUSIONS

A1 Introduction

This report identifies the basis on which the Sierra Monitor Corporation Blind IR Gas Sensor can be assessed in accordance with the requirements of the European Union Directive 2014/34/EU with respect to Group II, Category 2 G apparatus and in accordance with the requirements of the European Standards given below in respect of type of protection Ex db for equipment Group(s) IIB+H₂ with Temperature Class T6 in an ambient temperature of -20°C ≤ Ta ≤ +60°C.

Standards Applied

STANDARD NUMBER AND EDITION	STANDARD TITLE
EN 60079-0:2018	Explosive atmospheres - Part 0: Equipment - General requirements
EN 60079-1:2014	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"

A2 Description of Equipment

Equipment is a blind IR gas sensor which is intended to measure ambient concentrations of Methane and provide an analog electrical signal output of between 4 and 20 mA. Equipment is rated to accept a nominal power input of 24Vdc; however, equipment is rated for between 10 and 30Vdc. The sensor is housed within an enclosure which has been assessed to the requirements of Ex "d". Enclosure incorporates a sintered metal disk which allows test gas to enter the enclosure to reach the sensing element. The only threaded entry into the enclosure makes up part of the cemented joint and is permanently closed.

A3. Assessment of Apparatus

A3.1 Blind IR Gas Sensor, Model 4101-28

For compliance with EN 60079-0:2018 and EN 60079-1: 2014, refer to IECEx Test Report No. US/ETL/ExTR20.0013/00.

A3.2 Documentation

The documents listed in Section A4 was provided for reference during the evaluation of the equipment and considered acceptable to the requirements of the standards evaluated for certification of the equipment.

A4 Documents

TITLE:	DRAWING NO.:	REV. LEVEL:	DATE:
ASSEMBLY 4101-28 STANDALONE IR SENSOR	A14090	B	8/6/19

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TITLE:	DRAWING NO.:	REV. LEVEL:	DATE:
ASSEMBLY PCA STANDALONE SENSOR CONTROLLER	A21951	A1	1/2/20
ASSEMBLY PCA STANDALONE IR FRONT END	A21952	A	1/8/19
ASSEMBLY REMOTE IR SENSOR	A21955	A	1/10/19
ASSEMBLY HOUSING SS BLIND SENSOR	A22145	B	8/6/19
FAB, ENCL. SEAL BLIND IR SENSOR SS	F32218	A1	1/21/19
FAB, ENCLOSURE BLIND IR SENSOR SS	F32219	B	7/29/2019
FAB, DISK SINTERED .984" X .1" 100 POROSITY	F39245	A	6/19/18
SPACER BLIND IR SENSOR	F39246	A	7/18/18
FAB, RING, BACK SPACER, IR SENSOR	F39247	A	8/1/18
ARTWORK LABEL, 4101-28 NRTL RATING	H35610	B1	3/18/2020
Sentry IT Data Sheet	T12425	A7	Dec 2019



*Note: An * is included before the title of documents that are new or revised.*

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SECTION B
COMPLIANCE CHECKLISTS

B1 EN 60079 Series

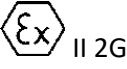
Refer to IECEx format Test Report US/ETL/ExTR20.0013/00 for standards IEC 60079-0, Ed. 7 and IEC 60079-1, Ed. 7 which are technically equivalent to their EN counterparts with the following deviations:

EN IEC 60079-0: 2018 DEVIATIONS from IEC 60079-0:2017			
CLAUSE	MODIFICATION	RESULT – REMARK	VERDICT
<i>EN common modifications indicated by . Modifications introduced by amendment A11 indicated by .</i>			

Annex ZA	Normative references to international publications	References noted.	INFO
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Annex ZY	Additional Information relating to the European ATEX Directive 2014/34/EU		
ZY.1	Equipment Groups and Categories	Equipment has been evaluated for: EPL: Gb Group: II Equipment Group: II Equipment Category: 2G Zone: 1	Pass
ZY.2	Instructions	Instructions have been supplied in English. Manufacturer accepts responsibility for providing translated versions in the respective languages for areas where the equipment is marketed and sold if the official language of the respective region is any language other than English. Equipment has not been evaluated for final installation in an assembly. Compliance to EN 60079-14 shall be evaluated during final installation, and respective assembly instructions updated to include all pertinent information required by EN 60079-14. Equipment has not been evaluated for use in underground mines. Evaluation to EN 50628 has not been performed.	N/A

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EN IEC 60079-0: 2018 DEVIATIONS from IEC 60079-0:2017			
CLAUSE	MODIFICATION	RESULT – REMARK	VERDICT
<i>EN common modifications indicated by [C]. Modifications introduced by amendment A11 indicated by [C1].</i>			
ZY.3	Marking		
ZY3.1	Additional markings required per Directive 2014/34/EU	Equipment is additionally marked: 	Pass
ZY3.2	Marking shall include Manufacturer name	Marking includes the manufacturer name.	Pass
ZY.4	Fans	No fans.	N/A
ZY.5	Significant changes between this European Standard and EN 60079-0:2018	Not a gap analysis.	N/A

Annex ZZ	Relationship between this European Standard and the Essential Requirements of 2014/34/EU	Compliance for EU Directive as determined through compliance to this standard noted in the ESHR checklist below.	Pass
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End of EN IEC 60079-0: 2018 DEVIATIONS

EN 60079-1: 2014 DEVIATIONS			
CLAUSE	MODIFICATION	RESULT – REMARK	VERDICT

Annex ZA	References to international publications noted.		
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End of EN 60079-1: 2014 DEVIATIONS

No additional deviations. The following text is contained in the forward as an endorsement notice:
“The text of the International Standard IEC 60079-1:2014 was approved by CENELEC as a European Standard without any modification.”

A checklist against the EHSR’s of the ATEX Directive 2014/34/EU is provided in Section B2.

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B2 Checklist - Directive 2014/34/EU

RELEVANT CLAUSE FROM ANNEX II OF THE ATEX DIRECTIVE	RESULT / REMARK	PASS / FAIL / N/A
<p>Preliminary observation</p> <p>A. Technological knowledge, which can change rapidly, must be taken into account as far as possible and be utilized immediately.</p> <p>B. For the devices referred to in point (b) of Article 1(1), the essential health and safety requirements shall apply only in so far as they are necessary for the safe and reliable functioning and operation of those devices with respect to the risks of explosion.</p>	<p>A. Noted</p> <p>B. Not a safety device, controlling device, or regulating device intended for use outside potentially explosive atmospheres.</p>	<p>Pass</p>
<p>1 ESSENTIAL HEALTH AND SAFETY REQUIREMENTS Common requirements</p>		
<p>1.0 General requirements</p>		
<p>1.0.1 Principles of integrated explosion safety</p> <ul style="list-style-type: none"> a. formation of explosive atmospheres by equipment and protective systems b. prevention of ignition by electrical and non-electrical sources of ignition c. limitation of explosion, flames and explosion pressures 	<p>Compliance with the standards listed on the certificate allows the equipment to be placed in a hazardous location (Zone 1) and equipment is appropriately marked.</p> <p><i>Covered partly by EN60079-0:2018 within Intertek Report 103729628DAL-001.</i></p>	<p>Pass</p>
<p>1.0.2 Analysis of possible operating faults</p>	<p>Possible operating faults are considered by application of the standards listed on certificate.</p> <p><i>Covered by EN60079-0:2018.</i></p>	<p>Pass</p>
<p>1.0.3 Special checking and maintenance conditions</p>	<p>Any special conditions are advised either on the certificate and/or the manual and /or the label as applicable.</p> <p><i>Covered by EN60079-0: 2018.</i></p>	<p>Pass</p>
<p>1.0.4 Surrounding area conditions</p>	<p>The manufacturer advises the materials of construction. The end user is to carry out a risk assessment to determine suitability.</p> <p><i>Covered by EN60079-0: 2018.</i></p>	<p>Pass</p>
<p>1.0.5 Marking</p>	<p>The markings comply with the applied standards.</p> <p><i>Covered partly by EN60079-0:2018.</i></p>	<p>Pass</p>

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RELEVANT CLAUSE FROM ANNEX II OF THE ATEX DIRECTIVE	RESULT / REMARK	PASS / FAIL / N/A
1.0.6 Instructions	<p>The manufacturer’s instructions meet the requirements of the applicable standards and are held on the project file.</p> <p><i>Covered partly by EN60079-0:2018.</i></p>	Pass
1.1 Selection of materials		
1.1.1 Materials used in the construction of equipment	<p>The materials of manufacture are suitable for the zone in to which the equipment is certified to be used.</p> <p><i>Covered by EN60079-0:2018.</i></p>	Pass
1.1.2 Reaction between the materials of construction and the constituents of a potentially explosive atmosphere	<p>It is the responsibility of the end user after consideration of the materials of manufacture to ensure that the equipment is selected correctly for the potentially explosive atmosphere in which the equipment is to be put into service.</p> <p><i>Covered by EN60079-0:2018.</i></p>	Pass
1.1.3 Material characteristics, corrosion and wear resistance, electrical conductivity, impact strength, ageing resistance and effects of temperature	<p><i>Covered by EN60079-0:2018.</i></p>	Pass
1.2 Design and construction		
1.2.1 Designed and constructed for foreseeable lifetime	<p>Designed in accordance with the latest standards for explosion protection under normal operating conditions.</p> <p><i>Covered by EN60079-0:2018.</i></p>	Pass
1.2.2 Components to be incorporated and replacements	<p>No replaceable parts internal to the equipment. Guidance provided on replacement of batteries.</p> <p><i>Covered by EN60079-0:2018.</i></p>	Pass
1.2.3 Enclosed structures and prevention of leaks	<p>The equipment is not designed to nor does it contain flammable gases or dusts. Therefore, no release of flammable substances is considered likely.</p>	Pass
1.2.4 Dust deposits	<p>Equipment is not intended for use in dust atmospheres.</p>	N/A
1.2.5 Additional means of protection	<p>Manufacturer to advise if any additional protection is needed, guidance provided in</p>	Pass

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RELEVANT CLAUSE FROM ANNEX II OF THE ATEX DIRECTIVE	RESULT / REMARK	PASS / FAIL / N/A
	<p>instructions along with certificate indicating and additional protection is required.</p> <p><i>Covered by EN60079-0:2018.</i></p>	
1.2.6 Safe opening	<p>Opening of the equipment is not intended during use.</p> <p><i>Covered by EN60079-0:2018.</i></p>	N/A
<p>1.2.7 Protection against other hazards</p> <ul style="list-style-type: none"> a. physical injury b. surface temperatures c. non-electrical dangers d. overload conditions 	<p>The manufacturer declares that the equipment does not cause injury or harm when used as specified in the accompanying instructions.</p> <p>Surface temperatures are advised on the label in the form of a temperature classification code and the ambient range is also advised. Overload conditions were assessed as part of the certification process.</p> <p><i>Covered partly by EN60079-0:2018.</i></p>	Pass
1.2.8 Overloading of equipment (Avoidance by design)	<p>Overloading is considered by the applied standards.</p> <p><i>Covered partly by EN60079-0:2018.</i></p>	Pass
1.2.9 Flameproof enclosure systems	<p>Equipment is not a Flameproof enclosure system.</p>	N/A
1.3 Potential ignition sources		
1.3.1 Hazards arising from different ignition sources	<p>So far as possible ignition sources have been addressed by EN 60079-0. Any other possible ignition sources shall be identified by the manufacturer and end user using EN 1127.</p> <p><i>Covered by EN60079-0:2018.</i></p>	Pass
1.3.2 Hazards arising from static electricity	<p>By complying with EN 60079-0 the enclosure for the equipment has met the requirements for static electricity risks.</p> <p><i>Covered by EN60079-0:2018.</i></p>	Pass
1.3.3 Hazards arising from stray electric and leakage currents	<p>Equipment is suitably grounded and bonded. All related connections have been assessed for compliance to all methods of prevention of corrosion. Additionally, the documentation provides guidance on proper installation.</p> <p><i>Covered by EN60079-0:2018.</i></p>	Pass

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RELEVANT CLAUSE FROM ANNEX II OF THE ATEX DIRECTIVE	RESULT / REMARK	PASS / FAIL / N/A
1.3.4 Hazards arising from overheating	<i>Covered by EN60079-0:2018.</i>	N/A
1.3.5 Hazards arising from pressure compensation operations	Not applicable. Not a pressure compensating device.	N/A
1.4 Hazards arising from external effects		
1.4.1 Designed and constructed for changing environmental conditions	<p>The equipment has been assessed and tested for use in potentially explosive atmospheres and ambient temperatures of between -20°C to +60°C in normal atmospheric conditions of humidity and pressure. Hazards arising from extraneous voltages were considered, so they are not likely to affect the equipment due to adequate instructions detailing installation and use. The manufacturer by design and good engineering practice shall consider vibrations which may reasonably occur in normal operating conditions and these should not affect the equipment adversely.</p> <p><i>Covered partly by EN60079-0:2018.</i></p>	Pass
1.4.2 External mechanical and thermal stresses, aggressive substances	<p>It is considered the responsibility of the end user to ensure, by carrying out a risk assessment, that the equipment is not used in areas where aggressive substances may attack the equipment.</p> <p><i>Covered partly by EN60079-0:2018.</i></p>	Pass
1.5 Requirements in respect of safety-related devices		
1.5.1 Failure of safety devices	Not Applicable. Not safety related.	N/A
1.5.2 Security of failed safety devices	Not Applicable. Not safety related.	N/A
1.5.3 Emergency stop controls	Not Applicable. Not safety related.	N/A
1.5.4 Control and display units (ergonomic principles)	Not Applicable. Not safety related.	N/A
1.5.5 Requirements for devices that rely on a measuring function for explosion protection	Not Applicable. Not safety related.	N/A
1.5.6 Measuring accuracy and serviceability	Not Applicable. Not safety related.	N/A
1.5.7 Alarm threshold safety factors for devices with a measuring function	Not Applicable. Not safety related.	N/A
1.5.8 Risks arising from software	Not Applicable. Not safety related.	N/A
1.6 Integration of safety requirements relating to the system		
1.6.1 Manual override	Not Applicable.	N/A

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RELEVANT CLAUSE FROM ANNEX II OF THE ATEX DIRECTIVE	RESULT / REMARK	PASS / FAIL / N/A
1.6.2 Emergency shutdown	Not Applicable.	N/A
1.6.3 Hazards arising from power failure	Not Applicable.	N/A
1.6.4 Hazards arising from connections	Not Applicable.	N/A
1.6.5 Placing of warning devices as parts of equipment	Not Applicable.	N/A
2 Requirements applicable to equipment in category M of equipment group I		
2.0.1 Requirements applicable to equipment in category M1 or equipment group I		
2.0.1.1 Designed and constructed to prevent sources of ignition from becoming active a. primary and secondary means of protection OR b. protection in the event of two faults occurring	Not applicable. The equipment is not for use in Category M1 or Group I.	N/A
2.0.1.2 Construction to prevent the ingress of dust	Not applicable. The equipment is not for use in Category M1 or Group I.	N/A
2.0.1.3 Surface temperature (dust in air)	Not applicable. The equipment is not for use in Category M1 or Group I.	N/A
2.0.1.4 Opening of equipment in safe areas or warnings of dangers by the use of labels	Not applicable. The equipment is not for use in Category M1 or Group I.	N/A
2.0.2 Requirements applicable to equipment in category M2 of equipment group I		
2.0.2.1 Designed and constructed to prevent sources of ignition from becoming active in normal operation	Not applicable. The equipment is not for use in Category M1 or Group I.	N/A
2.0.2.2 Opening of equipment in safe areas, interlocking systems or warning of dangers by the use of labels	Not applicable. The equipment is not for use in Category M1 or Group I.	N/A
2.0.2.3 Hazards arising from dust (2.0.1.3 applies)	Not applicable. The equipment is not for use in Category M1 or Group I.	N/A
2.1 Requirements applicable to equipment in category 1 of equipment group II		
2.1.1 Explosive atmospheres caused by gases, vapours or mists		
2.1.1.1 Designed and constructed to prevent sources of ignition from becoming active in rare incidents a. primary and secondary means of protection OR b. protection in the event of two faults occurring	Not applicable. The equipment is not for use in Category 1 of equipment group II.	N/A

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RELEVANT CLAUSE FROM ANNEX II OF THE ATEX DIRECTIVE	RESULT / REMARK	PASS / FAIL / N/A
2.1.1.2 Surface Temperature (gas in air)	Not applicable. The equipment is not for use in Category 1 of equipment group II.	N/A
2.1.1.3 Equipment parts that might be sources of ignition	Not applicable. The equipment is not for use in Category 1 of equipment group II.	N/A
2.1.2 Explosive atmospheres caused by air/dust mixtures		
2.1.2.1 Designed and constructed to prevent sources of ignition from becoming active in rare incidents <ul style="list-style-type: none"> a. primary and secondary means of protection OR b. protection in the event of two faults occurring 	Not applicable. The equipment is not for use in Category 1 of equipment group II.	N/A
2.1.2.2 Controlled entry of dust into equipment	Not applicable. The equipment is not for use in Category 1 of equipment group II.	N/A
2.1.2.3 Surface temperatures (dust and air)	Not applicable. The equipment is not for use in Category 1 of equipment group II.	N/A
2.1.2.4 Safe opening of equipment parts (see 2.1.1.3)	Not applicable. The equipment is not for use in Category 1 of equipment group II.	N/A
2.2 Requirements for category 2 of equipment group II		
2.2.1 Explosive atmospheres caused by gases, vapors or mist		
2.2.1.1 Designed and constructed to prevent sources of ignition from becoming active when frequent disturbances or faults are occurring	Equipment has been evaluated under the assumption sources of ignition will occur inside and not transmit outside of the explosion proof enclosure.	Pass
2.2.1.2 Surface temperatures (abnormal conditions)	Surface temperatures have been measured in the worst-case thermal situations including temperature of sintered metal flame arrestor while faults are causing ignitions inside the enclosure.	Pass
2.2.1.3 Opening of equipment in safe areas, interlocking systems or warning of dangers by the use of labels	Equipment is not intended to be opened. The only opening into the enclosure is permanently cemented.	N/A
2.2.2 Explosive atmospheres caused by air/dust mixtures		
2.2.2.1 Designed and constructed to prevent sources of ignition from becoming active when frequent disturbances or faults are occurring	Equipment is not intended for use in dust atmospheres.	N/A
2.2.2.2 Surface temperatures (see 2.1.2.3)	Equipment is not intended for use in dust atmospheres.	N/A
2.2.2.3 Protection against dust (see 2.2.1.3)	Equipment is not intended for use in dust atmospheres.	N/A

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RELEVANT CLAUSE FROM ANNEX II OF THE ATEX DIRECTIVE	RESULT / REMARK	PASS / FAIL / N/A
2.2.2.4 Opening of equipment (see 2.2.1.3)	Equipment is not intended for use in dust atmospheres.	N/A
2.3 Requirements applicable to equipment in category 3 of equipment group II		
2.3.1 Explosive atmospheres caused by gases, vapours or mist		
2.3.1.1 Designed and constructed to prevent foreseeable ignition sources in normal operation	Not applicable. The equipment is not for use in Category 3 of equipment group II.	N/A
2.3.1.2 Surface temperatures	Not applicable. The equipment is not for use in Category 3 of equipment group II.	N/A
2.3.2 Explosive atmospheres caused by air/dust mixtures		
2.3.2.1 Designed and constructed to prevent foreseeable ignition sources in normal operation	Not applicable. The equipment is not for use in Category 3 of equipment group II.	N/A
2.3.2.2 Surface temperatures (see 2.1.2.3)	Not applicable. The equipment is not for use in Category 3 of equipment group II.	N/A
2.3.2.3 Dust accumulations inside equipment	Not applicable. The equipment is not for use in Category 3 of equipment group II.	N/A
3 SUPPLEMENTARY REQUIREMENTS IN RESPECT OF PROTECTIVE SYSTEMS		
3.0 General requirements		
3.0.1 Dimensioning to reduce the effects of an explosion	Not applicable. Equipment is not a protection system.	N/A
3.0.2 Positioning by design to prevent dangerous chain reactions	Not applicable. Equipment is not a protection system.	N/A
3.0.3 Power failure	Not applicable. Equipment is not a protection system.	N/A
3.0.4 Failure due to outside interference	Not applicable. Equipment is not a protection system.	N/A
3.1 Planning and design		
3.1.2 Protective systems designed to contain explosions and withstand shock waves	Not applicable. Equipment is not a protection system.	N/A
3.1.3 Accessories	Not applicable. Equipment is not a protection system.	N/A
3.1.4 Reactions caused by pressure in peripheral equipment	Not applicable. Equipment is not a protection system.	N/A
3.1.5 Pressure-relief systems	Not applicable. Equipment is not a protection system.	N/A
3.1.6 Explosion suppression systems	Not applicable. Equipment is not a protection system.	N/A

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3.1.7 Explosion decoupling systems	Not applicable. Equipment is not a protection system.	N/A
3.1.8 Protective systems integrated into a circuit to enable a safe shutdown	Not applicable. Equipment is not a protection system.	N/A

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SECTION C

TESTS

C1 Test List

STANDARD	TEST CLAUSE	TEST NAME	VERDICT
IEC 60079-0	26.4.2	Resistance to impact	Pass
IEC 60079-0	26.5.1	Temperature measurement	Pass
IEC 60079-0	26.8	Thermal endurance to heat	Pass
IEC 60079-0	26.9	Thermal endurance to cold	Pass
IEC 60079-1	5	Flameproof Joint – Measurements	Pass
IEC 60079-1	6.1.2	Mechanical Strength (Cemented Joint)	Pass
IEC 60079-1	10.8	Mechanical strength – breathing device	Pass
IEC 60079-1	15.2.2	Determination of Explosion Pressure (reference pressure)	Pass
IEC 60079-1	15.2.3.2	Overpressure Test – First Method (Static)	Pass
IEC 60079-1	15.3	Test for non-transmission of an internal ignition	Pass
IEC 60079-1	15.4.2.2	Determination of Explosion Pressure (reference pressure) for enclosures with breathing and draining devices	Pass
IEC 60079-1	15.4.2.3	Overpressure test for enclosures with breathing and draining devices	Pass
IEC 60079-1	15.4.3	Thermal tests for enclosures with breathings and draining devices	Pass
IEC 60079-1	15.4.4	Non-transmission test for breathing and draining devices	Pass
IEC 60079-1	19.4	Test of erosion by flame	Pass
IEC 60079-1	B.1.2	Determination of Bubble Test Pore Size	Pass
IEC 60079-1	B1.3	Density of Sintered Metal Elements	Pass

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SECTION D

INTERTEK REPORTS WITH OWN COVERS

D1 IECEx Format Test Report(s)

TEST REPORT	NUMBER OF PAGES
US/ETL/ExTR20.0013/00	84