






IECEX TEST REPORT COVER

ExTR Reference Number	US/FMG/ExTR13.0029/00
ExTR Free Reference Number	Project ID 3048286
Compiled by + signature (ExTL)	Marlon Mitchell 
Reviewed by + signature (ExTL)....	Andrew Lozinski 
Approved by + signature (ExCB) ...	J. E. Marquedant 
Date of issue	25 April 2014
Ex Testing Laboratory (ExTL)	FM Approvals LLC
Address	1151 Boston-Providence Turnpike, Norwood, MA 02062, USA
Ex Certification Body (ExCB)	FM Approvals LLC
Address	1151 Boston-Providence Turnpike, Norwood, MA 02062, USA
Applicant's name	Sierra Instruments Inc.
Address	5 Harris Court, Building L, Monterey, CA 93940, USA
Standards associated with this ExTR package	IEC 60079-0:2011, IEC 60079-1:2007, IEC 60079-31:2008
Clauses considered	All clauses considered
Test procedure	IECEX System
Test Report Form Number	ExTR Cover_4 (released 2010-12)
Test item description	Insertion and In-line Thermal Mass Flowmeters
Model/type reference	640i and 780i
Code (e.g. Ex __ II__ T__)	Ex d IIC T3 Gb, Ex tb IIIC T200°C Db
Rating	24 Vdc; 100-240 Vac
All testing fully performed by ExTL staff at ExTL address above:	Yes

Instructions for Intended Use of ExTR Cover:

An ExTR Cover is the sole top-level document to associate together all other parts of an IECEx Test Report (ExTR) package. An ExTR package is comprised of an ExTR Cover and one or more associated ExTR documents (which may include Ex Test Reports, ExTR Addendums and ExTR of National Differences). All ExTR package documents are compiled and reviewed by the ExTL. The Issuing ExCB indicates final approval of the overall ExTR package on this ExTR Cover.

Copyright © 2010 International Electrotechnical Commission System for Certification to Standards Relating to Equipment for use in Explosive Atmospheres (IECEX System), Geneva, Switzerland. All rights reserved.

This blank publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEx System is acknowledged as copyright owner and source of the material. The IECEx system takes no responsibility for, and will not assume liability for, damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Manufacturer's name..... : Sierra Instruments Inc.
 Address : 5 Harris Court, Building L, Monterey, CA 93940, USA
 Trademark..... :



Particulars: Test item vs. Test requirements

Classification of installation and use : (~~portable~~ / stationary / ~~hand-held~~)
 Ingress protection : IP66
 Rated ambient temperature range (°C) : -20°C to +60°C

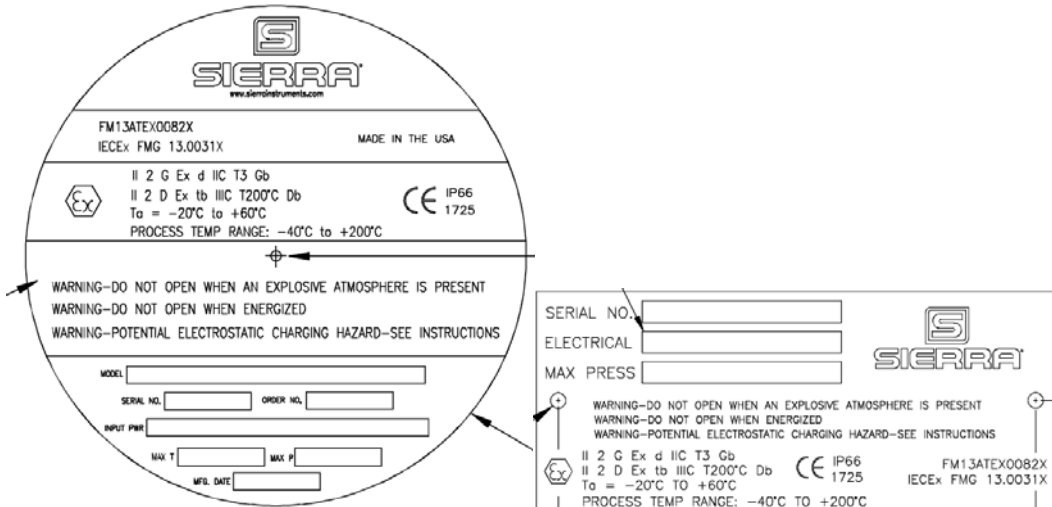
General remarks:

The test results presented in this ExTR package relate only to the item or product tested.

- "(see Attachment #)" refers to additional information appended to the ExTR package.
- "(see appended table)" refers to a table appended to the ExTR package.
- Throughout this ExTR package, a point is used as the decimal separator.
- *Where the term "N/A" appears in any part of an ExTR package, it indicates that the associated issue was considered "Not applicable" to the involved evaluation.*
- *In accordance with IECEx 02, a Receiving ExCB may request a sample of the Ex equipment and copies of the documentation referred to in an ExTR Cover.*

The technical content of this ExTR package shall not be reproduced except in full without the written approval of the Issuing ExCB and ExTL.

Copy of Marking Plate:



General product information:

The 640i and 780i Insertion and In-line Thermal Mass Flowmeters are used for gas flow measurement applications. The flowmeters integrate configuration, validation and diagnostics in a probe-mounted or remotely-mounted housing. When remotely-mounted, the electronics enclosure can be mounted up to 200 feet away from the remote probe enclosure. All variables can be monitored on an optional, viewable display. The flowmeters can also provide 4-20 mA flow and temperature output, alarm output and an optional pressure output. The 640i is suitable for insertion into pipes or ducts from three inches up to 72 inches while the 780i can go in-line to 8-inch flow bodies. For probes longer than 13 inches, a seal is required within 13 inches of the probe and enclosure.

The 640i and 780i Insertion and In-line Thermal Mass Flowmeters operate on 24 Vdc or 100-240 Vac. The flowmeters are intended for use in an ambient temperature of -20°C to +60°C and with process temperatures of -40°C to +200°C at a pressure of 300 psi (in-line) or 500 psi (insertion).

In accordance with OD 024, testing not fully performed by ExTL staff at the above ExTL address: N/A
National differences considered as part of this evaluation, if any: N/A
“Conditions of Use” for Ex Equipment or “Schedule of Limitations” for Ex Components, if any: 1. Consult the manufacturer if dimensional information on the flameproof joints is necessary. 2. A seal is required within 13 inches of the enclosure for probes longer than 13 inches.
Routine tests, if any: On 100% of production, the probes shall be subjected to an overpressure test of at least 1.5 times the maximum recorded ignition pressure 275.8 psi (1900 kPa). The test pressure of at least 414 psi (2855 kPa) shall be applied to the probe and maintained for at least 10 seconds with no impact to the flameproof Ex d protection concept. On 100% of production, the dual compartment main enclosure with window cover shall be subjected to an overpressure test of at least 1.5 times the maximum recorded ignition pressure 124.1 psi (855 kPa). The test pressure of at least 187 psi (1290 kPa) shall be applied to the enclosure and maintained for at least 10 seconds with no impact to the flameproof Ex d protection concept.

Manufacturer’s Documents: The following documents depict the equipment design and are on file at FM Approvals, blueprint folder 3048286.

Title:	Drawing No.:	Rev. Level:	Date:
CONN, RING TERMINAL, #10, 16-14 AWG	22-0576	A	
ADHESIVE, SEALANT, RTV SILICONE	36-0015	A	
SHAFT, INSERTION METERS	41-2203-XX-XX	8	
PRESSURE SENSOR FITTING	41-2205	8	
SHAFT, IN-LINE METERS	41-2222-XX	4	
BUSHING, ENCLOSURE, 640i	41-4457	1	
RETAINING RING, FLAME ARRESTOR	41-4458	2	
ENCLOSURE, 640i	41-4463-X	A	
DISK, FLAME ARRESTOR, 640i	41-4487	2	
ADAPTER, BUSHING, 640I/780I REMOTE	41-4530	4	
ENCLOSURE, REMOTE, 640i	41-4638-X	A	
WELDMENT, .5" AND .75" NPT, INLINE FLOWBODY	43-0244-XX	13	
PROBE WELDMENT AND ASSY, .75 O.D. INSERTION METERS	43-0247-XX-XX	7	
WELDMENT, SENSOR HOUSING, .75 O.D. IN-LINE METERS	43-0249-2	7	
WELDMENT, SENSOR HOUSING, .75 O.D. INSERTION METERS, 640i VTP	43-0250-XX	5	
WELDMENT, .25 IN-LINE FLOW BODY	43-0256-XX	4	
ASSEMBLY, FLAME ARRESTOR, 640i	43-0268	1	
SENSOR ASSEMBLY, 640i FR	43-0274-XX	5	
PROBE WELDMENT & ASSY. .75OD, W/FLANGE INSERTION METERS, 640i	43-0296-XX-XX	3	
LABEL, AGENCY APPROVAL, ATEX, ENCL BACK, 640i/780i	47-0501	A	
LABEL, RMT ENCL, ATEX, 640i/780i	47-0502	A	

Title:	Drawing No.:	Rev. Level:	Date:
640I Terminal PCA	52-0198	A	
640I Power PCA	52-0199	A	
640I Display RS232 PCA	52-0201	A	
640 I Main PCA	52-0202	A	
640I Remote J-Box PCA	52-0209	A	
WIRING, SENSOR HOUSING, 640I/780I	54-0372-XX	14	
640i/780i ENCLOSURE USAGE	99-1636	2	
640i/780i APPROVAL AGENCY OVER-VIEW	99-1685	B	
QuadraTherm 640i/780i Series Insertion and In-Line Mass Flow Meters Instruction Manual	IM-640i/780i	v7	
Appendix for ATEX and IECEx Certified EX Units Instruction Manual	IM-QuadraTherm-ATEX and IECEx	A	

		IECEX TEST REPORT IEC 60079-0 Explosive atmospheres – Part 0: Equipment – General requirements
ExTR Reference Number..... :	US/FMG/ExTR13.0029/00	
ExTR Free Reference Number..... :	Project ID 3048286	
Compiled by + signature (ExTL).... :	Marlon Mitchell	
Reviewed by + signature (ExTL) ... :	Andrew Lozinski	
Date of issue..... :	24 April 2014	
Ex Testing Laboratory (ExTL)	FM Approvals LLC	
Address..... :	1151 Boston-Providence Turnpike, Norwood, MA 02062, USA	
Applicant's name..... :	Sierra Instruments Inc.	
Address..... :	5 Harris Court, Building L, Monterey, CA 93940, USA	
Standard	IEC 60079-0:2011, 6 th Edition	
Test procedure..... :	IECEX System	
Test Report Form Number	ExTR60079-0_6B (released 2011-08)	
<p>Instructions for Intended Use of Ex Test Report: <i>An Ex Test Report provides a clause-by-clause documentation of the initial evaluation and testing that verified compliance of an item or product with an IEC Ex standard. This Ex Test Report is part of an ExTR package that may include other Ex Test Report, Addendum, National Differences and Partial Testing documents, along with a single ExTR Cover. An Ex Test Report is to be compiled and reviewed by the ExTL. The Issuing ExCB indicates final approval of the Ex Test Report as part of the overall ExTR package on the associated ExTR Cover.</i></p>		
<p>Copyright © 2011 International Electrotechnical Commission System for Certification to Standards Relating to Equipment for use in Explosive Atmospheres (IECEX System), Geneva, Switzerland. All rights reserved. This blank publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEX System is acknowledged as copyright owner and source of the material. The IECEX system takes no responsibility for, and will not assume liability for, damages resulting from the reader's interpretation of the reproduced material due to its placement and context.</p>		

<p>Possible test case verdicts:</p> <ul style="list-style-type: none"> - test case does not apply to the test item:N / A - test item does meet the requirement.....:Pass
<p>General remarks: The test results presented in this Ex Test Report relate only to the item or product tested.</p> <ul style="list-style-type: none"> ▪ "(see Attachment #)" refers to additional information appended to this document. ▪ "(see appended table)" refers to a table appended to this document. ▪ Throughout this document, a point "." is used as the decimal separator. <p>The technical content of this Ex Test Report shall not be reproduced except in full without the written approval of the Issuing ExCB and ExTL.</p>

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
1	Scope		
2	Normative references		
3	Terms and definitions		
4	Equipment grouping		
4.1	Group I	The equipment is intended for Group II and III.	N/A
4.2	Group II	The equipment is intended for Group II.	Pass
4.3	Group III	The equipment is intended for Group III.	Pass
4.4	Equipment for a particular explosive atmosphere	The equipment is intended for Group IIC gases using type of protection “d” and for Group IIIC dusts using type of protection “t”.	Pass
5	Temperatures		
5.1	Environmental influences		
5.1.1	Ambient temperature	The equipment is intended for use in the ambient temperature range of -20°C to +60°C.	Pass
5.1.2	External source of heating or cooling	The equipment is intended for use in process temperatures of -40°C to +200°C. The equipment is intended for local or remote installation. There are no other sources of heating or cooling.	Pass
5.2	Service temperature	For the purpose of this examination, the maximum surface temperature as determined under 26.5.1 was considered as the equipment service temperature.	Pass
5.3	Maximum surface temperature		
5.3.1	Determination of maximum surface temperature	Refer to 26.5.1.	Pass
5.3.2	Limitation of maximum surface temperature		
5.3.2.1	Group I electrical equipment	The equipment is intended for Group II and III.	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
5.3.2.2	Group II electrical equipment	The maximum surface temperature classification for the equipment is T3 Ta = -20°C to +60°C.	Pass
5.3.2.3	Group III electrical equipment		
5.3.2.3.1	Maximum surface temperature determined without a dust layer	The maximum surface temperature classification for the equipment is T200°C Ta = -20°C to +60°C.	Pass
5.3.2.3.2	Maximum surface temperature with respect to dust layers	The equipment was not evaluated for a specific given depth of layer of dust.	N/A
5.3.3	Small component temperature for Group I or Group II electrical equipment	The equipment is not considered a small component.	N/A

6	Requirements for all electrical equipment		
---	---	--	--

6.1	General	The balance of this report describes compliance with Clause 6.1 a). Compliance with 6.1 b) is the manufacturer's responsibility and is so indicated by marking the component enclosure in accordance with Clause 29 and by stating the basis of compliance in the documentation according to Clause 28.	Pass
-----	---------	---	------

6.2	Mechanical strength of equipment	The equipment described in this report meets the requirements of Clause 26.4 without the use of guards fitted.	Pass
-----	----------------------------------	--	------

6.3	Opening times	The equipment is marked with the enclosure opening marking, "WARNING – DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT", as required by item b) of 29.12.	Pass
-----	---------------	---	------

6.4	Circulating currents in enclosures (e.g. of large electrical machines)	This clause is satisfied as the equipment enclosure is of total metal construction and includes both internal and external integral connection facilities for earthing conductors which satisfy Clause 15.	Pass
-----	--	--	------

6.5	Gasket retention	The equipment gaskets meet the requirements for mechanical retention.	Pass
-----	------------------	---	------

6.6	Electromagnetic and ultrasonic energy radiating equipment	The equipment is not a source of these types of energy.	N/A
6.6.1	Radio frequency sources	Refer to 6.6.	N/A
6.6.2	Lasers or other continuous wave sources	Refer to 6.6.	N/A
6.6.3	Ultrasonic sources	Refer to 6.6.	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
7	Non-metallic enclosures and non-metallic parts of enclosures		

7.1	General		
7.1.1	Applicability	The equipment contains no non-metallic enclosure parts except for the glass and cement materials used in the construction of the window cover.	Pass
7.1.2	Specification of materials		
7.1.2.1	General	The cement and window materials are specified in the documents according to Clause 24.	Pass
7.1.2.2	Plastic materials	Refer to 7.1.1.	N/A
7.1.2.3	Elastomers	Refer to 7.1.1.	N/A

7.2	Thermal endurance		
7.2.1	Tests for thermal endurance	The cemented window cover was subjected to the thermal endurance tests according to Clauses 26.8 and 26.9.	Pass
7.2.2	Material selection	The cement material has an operating temperature of -60°C to +177°C which is 40K lower than the equipment minimum ambient temperature of -20°C and greater than 20K above the equipment maximum surface temperature of +75°C.	Pass
7.2.3	Alternative qualification of elastomeric sealing O-rings	Ingress protection is not required for flameproof type of protection, d. The o-rings used in the equipment enclosure were removed when evaluated for type of protection, t. Therefore, alternative qualification of elastomeric sealing o-rings was not used.	N/A

7.3	Resistance to light	Refer to 7.1.1.	N/A
-----	---------------------	-----------------	-----

7.4	Electrostatic charges on external non-metallic materials		
7.4.1	Applicability	This clause applies to the painted equipment enclosures.	Pass
7.4.2	Avoidance of a build-up of electrostatic charge on Group I or Group II electrical equipment	The equipment is marked 'X' according to the requirements of 29.3 and the manufacturer's instructions include guidance to the end user to avoid or minimize an electrostatic charging hazard on the surface of the enclosures. In addition, the equipment is marked with the warning according to item g) of 29.12.	Pass
7.4.3	Avoidance of a build-up of electrostatic charge on equipment for Group III	Refer to 7.4.2.	Pass

7.5	Accessible metal parts	All accessible metal parts of the equipment enclosure are connected to ground.	N/A
-----	------------------------	--	-----

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
8	Metallic enclosures and metallic parts of enclosures		
8.1	Material composition	The manufacturer's documents according to Clause 24 provide the material specifications of the equipment parts.	Pass
8.2	Group I	The equipment is intended for Group II and III.	N/A
8.3	Group II	The equipment materials of construction do not contain, by weight, more than 7.5% in total of magnesium, titanium and zirconium for EPL Gb.	Pass
8.4	Group III	The equipment materials of construction do not contain, by weight, more than 7.5% in total of magnesium, titanium and zirconium for EPL Db.	Pass
9	Fasteners		
9.1	General	Stainless steel, 10-24, 0.25-inch socket cap screws (one on the remote enclosure and two on the dual compartment, main enclosure) are used to prevent inadvertent removal of the enclosure covers. The screws require the use of a tool for removal.	Pass
9.2	Special fasteners	The equipment contains no special fasteners.	N/A
9.3	Holes for special fasteners		
9.3.1	Thread engagement	Refer to 9.2.	N/A
9.3.2	Tolerance and clearance	Refer to 9.2.	N/A
9.3.3	Hexagon socket set screws	Refer to 9.2.	N/A
10	Interlocking devices	The equipment has no interlocks fitted.	N/A
11	Bushings	The equipment contains no bushings.	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
12	Materials used for cementing	<p>The manufacturer's documentation, according to Clause 24, specifies the suitability of the cement material for use within the stated temperature limits of the equipment.</p> <p>The window cover is cemented with ADASEAL Chembon C-80308.</p> <p>The cement material has an operating temperature of -60°C to +177°C which is 40K lower than the equipment minimum ambient temperature of -20°C and greater than 20K above the equipment maximum surface temperature of +75°C.</p>	Pass
13	Ex Components		
13.1	General	The equipment is not an Ex component.	N/A
13.2	Mounting	Refer to 13.1.	N/A
13.3	Internal mounting	Refer to 13.1.	N/A
13.4	External mounting	Refer to 13.1.	N/A
13.5	Ex Component certificate	Refer to 13.1.	N/A
14	Connection facilities and terminal compartments		
14.1	General	The equipment contains internal connection facilities.	Pass
14.2	Termination compartment	The enclosure and access openings are dimensioned so that conductors can be readily connected.	Pass
14.3	Type of protection	The enclosure complies with IEC 60079-1 as Ex d and with IEC 60079-31 as Ex tb.	Pass
14.4	Creepage and clearance	There are no creepage and clearance distances specified in IEC 60079-1 or IEC 60079-31.	N/A
15	Connection facilities for earthing or bonding conductors		
15.1	Equipment requiring earthing		

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
15.1.1	Internal	The internal earthing connection consists of a stainless steel pan head 10-24 screw and 14-16 AWG #10 uncrimped, serrated ring terminal.	Pass
15.1.2	External	The external earthing connection consists of the same parts as the internal connection.	Pass
15.2	Equipment not requiring earthing	The equipment requires earthing.	N/A
15.3	Size of conductor connection	Both the internal and external earth terminals are suitable for connection of a 4 mm ² conductor.	Pass
15.4	Protection against corrosion	The earthing connection materials of construction provide suitable protection against corrosion.	Pass
15.5	Secureness of electrical connections	The arrangement of the earthing connection parts provides suitable protection against loosening and twisting.	Pass
16	Entries into enclosures		
16.1	General	The equipment enclosures are provided with ¾ inch-14NPT entries intended for use with cable or conduit.	Pass
16.2	Identification of entries	The thread form, location and number of entries appear in the manufacturer's documents according to Clause 24 as well as in the manufacturer's installation instructions.	Pass
16.3	Cable glands	The equipment does not include cable glands.	N/A
16.4	Blanking elements	The manufacturer's installation instructions specify that the end user shall close any unused entries using suitably certified blanking elements to maintain the housing type of protection.	Pass
16.5	Thread adapters	The equipment does not include thread adapters.	N/A
16.6	Temperature at branching point and entry point	The manufacturer's installation manual specifies the wire insulation temperature rating must meet or exceed 80°C.	Pass

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
16.7	Electrostatic charges of cable sheaths	This clause contains no requirements.	N/A
17	Supplementary requirements for rotating machines		
17.1	Ventilation		
17.1.1	Ventilation openings	The equipment is not a rotating machine.	N/A
17.1.2	Materials for external fans	Refer to 17.1.1.	N/A
17.1.3	Cooling fans of rotating machines		
17.1.3.1	Fans and fan hoods	Refer to 17.1.1.	N/A
17.1.3.2	Construction and mounting of the ventilating systems	Refer to 17.1.1.	N/A
17.1.3.3	Clearances for the ventilating system	Refer to 17.1.1.	N/A
17.1.4	Auxiliary motor cooling fans	Refer to 17.1.1.	N/A
17.1.5	Ventilating fans		
17.1.5.1	Applicability	Refer to 17.1.1.	N/A
17.1.5.2	General	Refer to 17.1.1.	N/A
17.1.5.3	Fan and fan hoods	Refer to 17.1.1.	N/A
17.1.5.4	Construction and mounting	Refer to 17.1.1.	N/A
17.1.5.5	Clearances for rotating parts	Refer to 17.1.1.	N/A
17.2	Bearings	Refer to 17.1.1.	N/A
18	Supplementary requirements for switchgear		
18.1	Flammable dielectric	The equipment is not switchgear.	N/A
18.2	Disconnectors	Refer to 18.1.	N/A
18.3	Group I – Provisions for locking	Refer to 18.1.	N/A
18.4	Doors and covers	Refer to 18.1.	N/A
19	Supplementary requirements for fuses	The equipment is marked with the enclosure opening marking, "WARNING – DO NOT OPEN WHEN ENERGIZED", as required by item d) of 29.12.	Pass

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
20	Supplementary requirements for plugs, sockets outlets and connectors		
20.1	General	The equipment is not a plug, socket outlet or connector.	N/A
20.2	Explosive gas atmospheres	Refer to 20.1.	N/A
20.3	Explosive dust atmospheres	Refer to 20.1.	N/A
20.4	Energized plugs	Refer to 20.1.	N/A
21	Supplementary requirements for luminaires		
21.1	General	The equipment is not a luminaire.	N/A
21.2	Covers for luminaires of EPL Mb, EPL Gb, or EPL Db	Refer to 21.1.	N/A
21.3	Covers for luminaires of EPL Gc or EPL Dc	Refer to 21.1.	N/A
21.4	Sodium lamps	Refer to 21.1.	N/A
22	Supplementary requirements for caplights and handlights		
22.1	Group I caplights	The equipment is intended for Group II and III.	N/A
22.2	Group II and Group III caplights and handlights	The equipment is not a caplight or handlight.	N/A
23	Apparatus incorporating cells and batteries		
23.1	General	The equipment does not incorporate cells or batteries.	N/A
23.2	Batteries	Refer to 23.1.	N/A
23.3	Cell types	Refer to 23.1.	N/A
23.4	Cells in a battery	Refer to 23.1.	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
23.5	Ratings of batteries	Refer to 23.1.	N/A
23.6	Interchangeability	Refer to 23.1.	N/A
23.7	Charging of primary batteries	Refer to 23.1.	N/A
23.8	Leakage	Refer to 23.1.	N/A
23.9	Connections	Refer to 23.1.	N/A
23.10	Orientation	Refer to 23.1.	N/A
23.11	Replacement of cells or batteries	Refer to 23.1.	N/A
23.12	Replaceable battery pack	Refer to 23.1.	N/A
24	Documentation	The manufacturer provides a full and correct specification of the safety aspects of the electrical equipment.	Pass
25	Compliance of prototype or sample with documents	The samples of the equipment submitted by the manufacturer complied with the definitive documents referred to in Clause 24.	Pass
26	Type tests		
26.1	General	All the required tests have been addressed. Where tests have been waived, full justification has been given.	Pass
26.2	Test configuration	Each test on the equipment test samples was conducted under the conditions considered to be the most unfavourable.	Pass
26.3	Tests in explosive test mixtures	The required tests from IEC 60079-1 have been addressed. See IEC 60079-1 assessment.	Pass
26.4	Tests of enclosures		
26.4.1	Order of tests		

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
26.4.1.1	Metallic enclosures, metallic parts of enclosures and glass parts of enclosures	Tests on the equipment were conducted in the order as per this clause.	Pass
26.4.1.2	Non-metallic enclosures or non-metallic parts of enclosures	This clause contains no requirements.	N/A
26.4.1.2.1	Group I electrical equipment	The equipment is intended for Groups II and III.	N/A
26.4.1.2.2	Group II and Group III electrical equipment	The equipment contains no non-metallic enclosure parts except for the glass and cement materials used in the construction of the window cover.	N/A
26.4.2	Resistance to impact	The metallic and glass surfaces of the equipment enclosures satisfied the 7 Joule and 4 Joule impact tests, respectively, with the hardened steel tip.	Pass
26.4.3	Drop test	The equipment is not intended to be hand held.	N/A
26.4.4	Acceptance criteria	The impact tests did not produce damage that would invalidate the equipment Type of Protection.	Pass
26.4.5	Degree of protection (IP) by enclosures		
26.4.5.1	Test procedure	The equipment enclosures were verified for an IP66 ingress rating. Refer to Appendix A of this report for the specific test details.	Pass
26.4.5.2	Acceptance criteria	The acceptance criteria were in accordance with IEC 60529.	Pass

26.5	Thermal tests		
26.5.1	Temperature measurement		
26.5.1.1	General	Temperature testing was conducted under FM Approvals Project ID 3040602. The testing revealed a 3K rise above ambient observed on the surface of the enclosure and a 10K rise above ambient on the surface of the probe. When linearly compensated for an ambient temperature of +60°C and including a 5K correction for measurement uncertainty, the maximum temperatures were +68°C and 75°C, respectively. This is satisfactory for the temperature class rating of T3 or T200°C.	Pass
26.5.1.2	Service temperature	For the purpose of this examination, the maximum surface temperature of the equipment enclosure was considered as the equipment service temperature.	Pass
26.5.1.3	Maximum surface temperature	Refer to 26.5.1.1.	Pass
26.5.2	Thermal shock test	The glass window of the equipment enclosure satisfies the thermal shock test with 1 mm water jet at +80°C. The test did not produce damage that would invalidate the equipment Type of Protection.	Pass
26.5.3	Small component ignition test (Group I and Group II)		
26.5.3.1	General	The equipment is not a small component.	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
26.5.3.2	Procedure	Refer to 26.5.3.1.	N/A
26.5.3.3	Acceptance criteria	Refer to 26.5.3.1.	N/A
26.6	Torque test for bushings		
26.6.1	Test procedure	The equipment contains no bushings used for connection facilities.	N/A
26.6.2	Acceptance criteria	Refer to 26.6.1.	N/A
26.7	Non-metallic enclosures or non-metallic parts of enclosures		
26.7.1	General	The equipment contains no non-metallic enclosure parts except for the glass and cement materials used in the construction of the window cover.	Pass
26.7.2	Test temperatures	The thermal endurance to cold and hot and cold impact tests of the equipment were performed according to the temperature requirements of this clause.	Pass
26.8	Thermal endurance to heat	The equipment was subjected to continuous storage for two weeks at 95°C and 90% RH followed by two weeks in an air oven at 100°C.	Pass
26.9	Thermal endurance to cold	Following the thermal endurance to heat, the equipment enclosure was subjected to continuous storage for 24 hours between -45°C to -50°C.	Pass
26.10	Resistance to light		
26.10.1	Test procedure	Refer to 26.7.1. The cement material is not subject to light during use.	N/A
26.10.2	Acceptance criteria	Refer to 26.7.2.	N/A
26.11	Resistance to chemical agents for Group I electrical equipment	The equipment is intended for Group II and III.	N/A
26.12	Earth continuity	Refer to 26.7.1.	N/A
26.13	Surface resistance test of parts of parts of enclosures of non-metallic materials	Refer to 7.4.2.	N/A
26.14	Measurement of capacitance		
26.14.1	General	Refer to 26.7.1.	N/A
26.14.2	Test procedure	Refer to 26.7.1.	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
26.15	Verification of ratings of ventilating fans	The equipment contains no ventilating fans.	N/A
26.16	Alternative qualification of elastomeric sealing O-rings	Refer to 7.2.3.	N/A
27	Routine tests	Routine overpressure testing is required for the equipment probes due to the welded construction and the windowed main enclosure due to high ignition pressures. Refer to Clause 16 of the IEC 60079-1 assessment.	Pass
28	Manufacturer's responsibility		
28.1	Conformity with the documentation	The manufacturer's responsibility to ensure that the electrical equipment produced complies with the documentation will be indicated by placing the relevant marking on the product.	Pass
28.2	Certificate	FM Approvals LLC is to issue an IECEx Certificate confirming the equipment is in conformity with the requirements of the applicable standards.	Pass
28.3	Responsibility for marking	The manufacturer's responsibility will be indicated by placing the relevant marking on the product. By marking the electrical equipment, the manufacturer attests that the electrical equipment has been constructed in accordance with the applicable requirements of the relevant standards and the routine verification and tests (if applicable) have been successfully completed and that the product complies with the documentation.	Pass
29	Marking		
29.1	Applicability	The manufacturer shall assure that the marking system indicated in this clause are only applied to electrical equipment which comply with IEC 60079-0, IEC 60079-1 and IEC 60079-31.	Pass
29.2	Location	The manufacturer's metallic nameplates are applied to the exterior of the equipment enclosures.	Pass

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
29.3	General	The following marking information is included on the manufacturer's label: a) The name and trademark of the manufacturer, Sierra Instruments. b) The manufacturer's type identification. c) A serial number. d) Certificate reference number, IECEx FMG 13.0031X. e) Refer to d). f) Refer to 29.4 and 29.5 for the specific Ex marking for explosive gas and dust atmospheres. g) IP66 marking.	Pass
29.4	Ex marking for explosive gas atmospheres	The following Ex marking information is included on the manufacturer's label: a) The symbol Ex. b) The symbol for the type of protection, d. c) The symbol of the Group, IIC. d) The temperature class, T3. e) The equipment protection level, Gb. f) The ambient temperature range, Ta = -20°C to +60°C. The markings a) to e) are placed in the order per this clause and each separated by a small space.	Pass
29.5	Ex marking for explosive dust atmospheres	The following Ex marking information is provided on the manufacturer's label: a) The symbol, Ex. b) The symbol for the type of protection, tb. c) The symbol of the Group, IIIC. d) The maximum surface temperature, T200°C. e) The equipment protection level, Db. f) The ambient temperature range, Ta = -20°C to +60°C. The markings a) to e) are placed in the order given, separated by small spaces.	Pass
29.6	Combined types (or levels) of protection	The equipment does not contain different parts employing different types of protection.	N/A
29.7	Multiple types of protection	The equipment does not use multiple types of protection for the same atmosphere.	N/A
29.8	Ga equipment using two independent Gb types (or levels) of protection	The equipment does not use two Gb types of protection to achieve EPL Ga.	N/A
29.9	Ex Components	The equipment is not an Ex component.	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
29.10	Small equipment and small Ex Components	The equipment is not a small Ex component or considered small equipment.	N/A
29.11	Extremely small equipment and extremely small Ex Components	The equipment is not an extremely small Ex component or considered extremely small equipment.	N/A
29.12	Warning markings	The equipment is marked with the following warnings: “WARNING - DO NOT OPEN WHILE ENERGIZED”, “WARNING – DO NOT OPEN WHILE AN EXPLOSIVE GAS ATMOSPHERE IS PRESENT” and “WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD – SEE INSTRUCTIONS”.	Pass
29.13	Alternate marking of equipment protection levels (EPLs)	For clarity, alternate marking is not used.	N/A
29.13.1	Alternate marking of type of protection for explosive gas atmospheres	Refer to 29.13.	N/A
29.13.2	Alternate marking of type of protection for explosive dust atmospheres	Refer to 29.13.	N/A
29.14	Cells and batteries	The equipment contains no cells or batteries.	N/A
29.15	Converter-fed electrical machines	The equipment is not a converter-fed electrical machine.	N/A
29.16	Examples of marking	The clause contains examples of marking.	N/A
30	Instructions		
30.1	General	The manufacturer’s instructions were reviewed and found to comply with the requirements of this clause.	Pass
30.2	Cells and batteries	The equipment contains no cells or batteries.	N/A
30.3	Electrical machines	The equipment is not an electrical machine.	N/A
30.4	Ventilating fans	The equipment contains no ventilating fans.	N/A
Annex A (Normative)	Supplementary requirements for cable glands		
A.1	General	Cable glands are not included with the equipment.	N/A
A.2	Constructional requirements		

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
A.2.1	Cable sealing	Refer to A.1.	N/A
A.2.2	Filling compounds	Refer to A.1.	N/A
A.2.3	Clamping		
A.2.3.1	General	Refer to A.1.	N/A
A.2.3.2	Group II or III cable glands	Refer to A.1.	N/A
A.2.4	Lead-in of cable		
A.2.4.1	Sharp edges	Refer to A.1.	N/A
A.2.4.2	Point of entry	Refer to A.1.	N/A
A.2.5	Released by a tool	Refer to A.1.	N/A
A.2.6	Fixing	Refer to A.1.	N/A
A.2.7	Degree of protection	Refer to A.1.	N/A
A.3	Type tests		
A.3.1	Tests of clamping of non-armoured and braided cables		
A.3.1.1	Cable glands with clamping by the sealing ring	Refer to A.1.	N/A
A.3.1.2	Cable glands with clamping by filling compound	Refer to A.1.	N/A
A.3.1.3	Cable glands with clamping by means of a clamping device	Refer to A.1.	N/A
A.3.1.4	Tensile test	Refer to A.1.	N/A
A.3.1.5	Mechanical strength	Refer to A.1.	N/A
A.3.2	Tests of clamping of armoured cables		
A.3.2.1	Tests of clamping where the armourings are clamped by a device within the gland	Refer to A.1.	N/A
A.3.2.1.1	Tensile test	Refer to A.1.	N/A
A.3.2.1.2	Mechanical strength	Refer to A.1.	N/A
A.3.2.2	Tests of clamping where the armourings are not clamped by a device within the gland	Refer to A.1.	N/A
A.3.3	Type test for resistance to impact	Refer to A.1.	N/A
A.3.4	Test for degree of protection (IP) of cable glands	Refer to A.1.	N/A
A.4	Marking		
A.4.1	Marking of cable glands	Refer to A.1.	N/A
A.4.2	Marking of cable-sealing rings	Refer to A.1.	N/A
Annex B (Normative)	Requirements for Ex Components	The equipment is not an Ex component.	N/A
Annex C (Informative)	Example of rig for resistance to impact test		

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict

Annex D (Informative)	Motors supplied by converters		
--------------------------	-------------------------------	--	--

Annex E (Informative)	Temperature rise testing of electric machines		
--------------------------	---	--	--




Annex F (Informative)	Guideline flowchart for tests of non-metallic enclosures or non-metallic parts of enclosures (26.4)		
--------------------------	---	--	--

Appendix A

Verification of Compliance to IEC 60529: 2001 – The following tests verified the equipment IP66 rating. The following tests were performed on samples of the main and remote equipment enclosures assembled to representative probes.

Dust Exclusion Test (IP6X) – Prior to testing, the samples of the main and remote enclosures had their o-rings removed and all threaded joints engaged five threads. The positive internal pressure test was waived as the sample o-rings were removed prior to testing. Each sample was then suspended in a circulating dust atmosphere of 200 mesh talc. Each sample was connected to a vacuum pump adjusted to draw a vacuum of 20 mbar on the sample. The test lasted a total of 6 hours for the remote enclosure and 8 hours for the main enclosure. At the conclusion of the tests, the samples were removed from the test chamber, excess dust was removed from the surface and opened. Results are satisfactory as the enclosures were found to have excluded the entry of dust.

Hosedown Test (IPX6) – Samples of the main and remote enclosures were subjected to a stream of water from a hose with a ½ inch (12.5 mm) nozzle delivering at least 26.4 gallons (100 liters) per minute. Conduit entries were sealed using suitable conduit plugs. The stream of water was directed at each sample from all sides from a distance of 8.2 to 9.8 feet (2.5 to 3.0 meters) for 3 minutes. At the conclusion of the tests, the enclosures were opened and inspected. Results are satisfactory as the enclosures were found to have excluded the entry of water.

	
IECEX TEST REPORT IEC 60079-1 Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d"	
ExTR Reference Number	US/FMG/ExTR13.0029/00
ExTR Free Reference Number	Project ID 3048286
Compiled by + signature (ExTL)	Marlon Mitchell 
Reviewed by + signature (ExTL) ...	Andrew Lozinski 
Date of issue	24 April 2014
Ex Testing Laboratory (ExTL).....	FM Approvals LLC
Address	1151 Boston-Providence Turnpike, Norwood, MA 02062, USA
Applicant's name	Sierra Instruments Inc.
Address	5 Harris Court, Building L, Monterey, CA 93940, USA
Standard.....	IEC 60079-1:2007, 6 th Edition
Test procedure	IECEX System
Test Report Form Number.....	ExTR60079-1_6C (released 2011-08)
<p>Instructions for Intended Use of Ex Test Report: <i>An Ex Test Report provides a clause-by-clause documentation of the initial evaluation and testing that verified compliance of an item or product with an IEC Ex standard. This Ex Test Report is part of an ExTR package that may include other Ex Test Report, Addendum, National Differences and Partial Testing documents, along with a single ExTR Cover. An Ex Test Report is to be compiled and reviewed by the ExTL. The Issuing ExCB indicates final approval of the Ex Test Report as part of the overall ExTR package on the associated ExTR Cover.</i></p>	
<p>Copyright © 2011 International Electrotechnical Commission System for Certification to Standards Relating to Equipment for use in Explosive Atmospheres (IECEX System), Geneva, Switzerland. All rights reserved. This blank publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEx System is acknowledged as copyright owner and source of the material. The IECEx system takes no responsibility for, and will not assume liability for, damages resulting from the reader's interpretation of the reproduced material due to its placement and context.</p>	

<p>Possible test case verdicts:</p> <p>- test case does not apply to the test item :N / A</p> <p>- test item does meet the requirement :Pass</p>
<p>General remarks:</p> <p>The test results presented in this Ex Test Report relate only to the item or product tested.</p> <ul style="list-style-type: none"> ▪ "(see Attachment #)" refers to additional information appended to this document. ▪ "(see appended table)" refers to a table appended to this document. ▪ Throughout this document, a point "." is used as the decimal separator. <p>The technical content of this Ex Test Report shall not be reproduced except in full without the written approval of the Issuing ExCB and ExTL.</p>

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
1	SCOPE		
2	NORMATIVE REFERENCES		
3	TERMS AND DEFINITIONS		
4	EQUIPMENT GROUPING AND TEMPERATURE CLASSIFICATION	The equipment is intended for Group IIC with a temperature classification of T3 Ta = -20°C to +60°C.	Pass
5	FLAMEPROOF JOINTS		
5.1	General requirements	The flameproof joints of the equipment comply with the requirements of Clause 5 as outlined in Clauses 5.2 and 5.3 below. The dimensions of the flameproof joints are controlled other than the relevant minimum or maximum. The product is “X” marked according to 29.2 item i) of IEC 60079-0.	Pass
5.2	Non-threaded joints		
5.2.1	Width of joints (<i>L</i>)	The equipment contains no non-threaded joints.	N/A
5.2.2	Gap (<i>i</i>)	Refer to 5.2.1.	N/A
5.2.3	Spigot joints	Refer to 5.2.1.	N/A
5.2.4	Holes in joint surfaces	Refer to 5.2.1.	N/A
5.2.4.1	Flanged joints with holes outside the enclosure (see Figures 3 and 5)	Refer to 5.2.1.	N/A
5.2.4.2	Flanged joints with holes inside the enclosure (see Figure 4)	Refer to 5.2.1.	N/A
5.2.4.3	Spigot joints where, to the edges of the holes, the joint consists of a cylindrical part and a plane part (see Figure 6)	Refer to 5.2.1.	N/A
5.2.4.4	Spigot joints where, to the edges of the holes, the joint consists only of the plane part (see Figures 7 and 8), in so far as plane joints are permitted (see 5.2.7)	Refer to 5.2.1.	N/A
5.2.5	Conical joints	Refer to 5.2.1.	N/A
5.2.6	Joints with partial cylindrical surfaces (not permitted for Group IIC)	Refer to 5.2.1.	N/A
5.2.7	Flanged joints for acetylene atmospheres	Refer to 5.2.1.	N/A
5.2.8	Serrated joints	Refer to 5.2.1.	N/A

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
5.3	Threaded joints	<p>The threaded joint between the main enclosure and cover(s), both blind and window, is M115x2 mm, 6H/6g, with a minimum design thread length of 16.5 mm for a minimum thread engagement of 8 threads which exceeds the minimum required 5 threads for a medium fit.</p> <p>The threaded joint between the remote enclosure and cover is M80x1.5 mm, 6H/6g, with a minimum design thread length of 14.3 mm for a minimum thread engagement of 9 threads which exceeds the minimum required 5 threads for a medium fit.</p> <p>Both the main and remote enclosures, when configured with an insertion probe with pressure option, require an adapter to mate the enclosure instrument opening to the probe. The threaded joint between the enclosure and the bushing is 1 inch – 14UNS-2B/2A with a minimum design thread length of 14 mm for a minimum thread engagement of 7 threads which exceeds the minimum required 5 threads for a medium fit.</p> <p>For remote configurations, the main enclosure requires an adapter to convert the instrument or probe opening to an NPT thread for conduit. The threaded joint between the enclosure and the adapter is 3/4 inch – 16UNF-2B/2A with a minimum design thread length of 16.5 mm for a minimum thread engagement of 10 threads which exceeds the minimum required 5 threads for a medium fit.</p> <p>The threaded joint between the enclosure and in-line probes is 1 inch – 14UNS-2B/2A with a minimum design thread length of 16.5 mm for a minimum thread engagement of 9 threads which exceeds the minimum required 5 threads for a medium fit.</p> <p>The threaded joint between the enclosure and insertion probes is 3/4 inch – 16UNF-2B/2A with a minimum design thread length of 16.5 mm for a minimum thread engagement of 10 threads which exceeds the minimum required 5 threads for a medium fit.</p> <p>The main and remote enclosures contain two and one threaded conduit entries, respectively. The openings are supplied as 3/4 inch – 14NPT with a minimum design thread length of 14 mm for a minimum thread engagement of 7 threads.</p>	Pass

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
5.4	Gaskets (including O-rings)	O-rings are provided between the enclosures and covers while a sealing washer is provided between the enclosures and probes. The o-rings and washers provide sealing for ingress protection and are not included in the flamepath joint construction.	Pass
5.5	Equipment using capillaries	The equipment contains no capillaries.	N/A
6	CEMENTED JOINTS		
6.1	General	<p>The glass window is cemented in the enclosure cover with ADASEAL Chembon C-80308. This joint has a minimum design length of 10 mm.</p> <p>The cemented joint was subjected to the thermal endurance to heat and cold tests as described in 26.8 and 26.9 of IEC 60079-0.</p> <p>The cement material has an operating temperature of -60°C to +177°C which is 40K lower than the equipment minimum ambient temperature of -20°C and greater than 20K above the equipment maximum surface temperature of +75°C.</p>	Pass
6.2	Mechanical strength	Following the tests for thermal endurance to heat and cold, the equipment was subjected to hot and cold impact tests followed by the overpressure test as described in 15.1.3 with compliance criteria in accordance with C.3.1.1.	Pass
6.3	Width of cemented joints	The width of the cemented joint meets the required minimum of 10 mm for an enclosure volume greater than 100 cm ³ .	Pass
7	OPERATING RODS		
7.1	Diameter of operating rod	The equipment contains no operating rods.	N/A
7.2	Diametrical clearance	Refer to 7.1.	N/A
8	SUPPLEMENTARY REQUIREMENTS FOR SHAFTS AND BEARINGS		
8.1	Joints of shafts	The equipment contains no shafts or bearings.	N/A

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
8.1.1	Cylindrical joints	Refer to 8.1.	N/A
8.1.2	Labyrinth joints	Refer to 8.1.	N/A
8.1.3	Joints with floating glands	Refer to 8.1.	N/A
8.2	Bearings		
8.2.1	Sleeve Bearings	Refer to 8.1.	N/A
8.2.2	Rolling-element bearings	Refer to 8.1.	N/A
9	LIGHT-TRANSMITTING PARTS	The window on the equipment meets the applicable requirements of IEC 60079-0.	Pass
10	BREATHING AND DRAINING DEVICES WHICH FORM PART OF A FLAMEPROOF ENCLOSURE	A sintered flame arrestor is included in the construction of the equipment probe with pressure option. It is press-fit into the flame arrestor assembly within the probe and is not accessible from the outside of the equipment.	Pass
10.1	Openings for breathing or draining	The equipment contains not flanged joints.	N/A
10.2	Composition limits	The flame arrestor's material of construction is in accordance with Annex B for sintered elements and is specified in the manufacturer's documentation according to clause 24 of IEC 60079-0.	Pass
10.3	Dimensions	The dimensions of the flame arrestor are specified in the manufacturer's documentation according to clause 24 of IEC 60079-0.	Pass
10.4	Elements with measurable paths	The element is sintered.	N/A
10.5	Elements with non-measurable paths	The element complies with the requirements of Annex B for sintered elements.	Pass
10.6	Removable devices	The element is press-fit and therefore non-removable.	N/A
10.7	Mounting arrangements of the elements	The element is press-fit into the flame arrestor assembly. The assembly satisfies the type tests outlined in clauses 14 through 16, as applicable.	Pass

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
10.8	Mechanical strength	The element is located completely within the equipment. The impact test was therefore waived as the location of the element prevents a direct impact from occurring.	N/A
10.9	Breathing devices and draining devices when used as Ex components	The element is not an Ex component nor is it intended for use as an Ex component.	N/A
10.9.1	Mounting arrangements of the elements and components	Refer to 10.9.	N/A
10.9.2	Type tests for breathing and draining devices used as Ex components	Refer to 10.9.	N/A
10.9.2.1	Test of the ability of the breathing and draining device to withstand pressure		
10.9.2.1.1	Test procedure	Refer to 10.9.	N/A
10.9.2.1.2	Acceptance criteria	Refer to 10.9.	N/A
10.9.2.2	Thermal tests	Refer to 10.9.	N/A
10.9.2.2.1	Test procedure	Refer to 10.9.	N/A
10.9.2.2.2	Acceptance criteria	Refer to 10.9.	N/A
10.9.2.3	Test for non-transmission of an internal ignition	Refer to 10.9.	N/A
10.9.2.3.1	Test procedure	Refer to 10.9.	N/A
10.9.2.3.2	Acceptance criteria	Refer to 10.9.	N/A
10.9.3	Ex component certificate	Refer to 10.9.	N/A
11	FASTENERS, ASSOCIATED HOLES AND CLOSING DEVICES		
11.1	Type of fastener	Stainless steel, 10-24, 0.25-inch socket cap screws (one on the remote enclosure and two on the dual compartment, main enclosure) are used to prevent inadvertent removal of the enclosure covers. The screws require the use of a tool for removal and comply with the applicable requirements of IEC 60079-0.	Pass
11.2	Plastic material or light alloys	There are no fasteners of plastic or light alloy materials.	N/A
11.3	Yield stress	The equipment contains no screws or nuts.	N/A
11.4	Studs	The equipment contains no studs.	N/A
11.5	Fasteners through walls	The equipment contains no fasteners that pass through the walls of the enclosures.	N/A

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
11.6	Blind holes	The equipment contains no fasteners into blind holes.	N/A
11.7	Screws into blind holes	Refer to 11.6.	N/A
11.8	Closing of through holes	The equipment contains no holes that were drilled through for ease of manufacture.	N/A
11.9	Closure of apertures and compliance of blanking elements	The manufacturer's installation instructions specify that the end user shall close any unused entries using suitably certified blanking elements to maintain the housing type of protection.	Pass
11.9.1	Closing device removable from outside	Refer to 11.9.	N/A
11.9.2	Tool used to remove closing device	Refer to 11.9.	N/A
11.9.3	Special removal technique	Refer to 11.9.	N/A
11.9.4	Blanking element used with an adapter	Refer to 11.9.	N/A
11.10	Separate fastening arrangements for threaded doors/covers	Refer to 11.1.	Pass
12	MATERIALS AND MECHANICAL STRENGTH OF ENCLOSURES – MATERIALS INSIDE THE ENCLOSURES		
12.1	Tests prescribed by Clauses 14 to 16	The equipment complies with the relevant tests in Clauses 14 through 16.	Pass
12.2	Assembly of multiple flameproof enclosures	The main and remote equipment enclosures are independent units with no partitions.	N/A
12.3	Intercommunicating enclosure compartments	The equipment enclosures were evaluated to take higher stresses into account in regards to intercommunicating compartments.	Pass
12.4	Use of cast iron	The equipment is constructed of stainless steel and aluminium.	N/A
12.5	Use of liquids	No liquids are used within the equipment.	N/A
12.6	Insulating materials for Group I apparatus	The equipment is intended for Group II and III.	N/A

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
12.7	Zinc content	The aluminium alloy (ADC12) used in the construction of the equipment contains less than 1% zinc.	Pass
13	ENTRIES FOR FLAMEPROOF ENCLOSURES	The main and remote enclosures contain two and one threaded conduit entries, respectively, which are satisfactory for the connection of cable or conduit. The manufacturer's installation instructions specify the number, type and location of the entries.	Pass
13.1	Cable glands	Cable glands are not included with the equipment.	N/A
13.2	Conduit sealing devices	Conduit sealing devices are not included with the equipment.	N/A
13.2.1	Permitted for Group II only	Refer to 13.2.	N/A
13.2.2	Requirements for sealing device	Refer to 13.2.	N/A
13.3	Plugs and sockets and cable couplers		
13.3.1	Construction & mounting	The equipment contains no plugs, sockets or cable couplers.	N/A
13.3.2	Flameproof joints of contact parts	Refer to 13.3.1.	N/A
13.3.3	Flameproof properties in the event of internal explosion	Refer to 13.3.1.	N/A
13.3.4	Exemption & warning label	Refer to 13.3.1.	N/A
13.4	Bushings	The equipment contains no bushings.	N/A
14	VERIFICATION AND TESTS	In addition to compliance with this standard, the equipment also complies with IEC 60079-0 and IEC 60079-31.	Pass
15	TYPE TESTS	The type tests were conducted in the sequence as outlined in this clause.	Pass
15.1	Tests of ability of the enclosure to withstand pressure		
15.1.1	General	The equipment was subjected to the tests according to 15.1.2 and 15.1.3.	Pass

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
15.1.2	Determination of explosion pressure (reference pressure)	<p>Main Enclosure: Two series of five ignition tests were performed on the main enclosure sample with a 12 inch section of ½ inch metal conduit installed on the instrument/probe opening. Pressure measurements were recorded in both enclosure compartments and at the end of the conduit. All o-rings and gaskets were installed and all joints were fully engaged. Based on previous testing as part of this project and Project ID 3040602, the highest ignition pressures were observed when the ignition was initiated by a spark plug installed in the conduit entry. One series of five ignitions was performed using 14% of acetylene by volume in air while the second series of five ignitions was performed using 31% of hydrogen by volume in air. All tests were conducted at room ambient temperature. The maximum ignition pressure recorded in the enclosure was 124.1 psi (855 kPa) with 14% acetylene. The maximum ignition pressure recorded in the probe was 232.3 psi (1600 kPa) with 14% acetylene.</p> <p>Remote Enclosure: Two series of five ignition tests were performed on the remote enclosure sample with a 12 inch section of ½ inch metal conduit installed on the instrument/probe opening. Pressure measurements were recorded in the enclosure and at the end of the conduit. All o-rings and gaskets were installed and all joints were fully engaged. Based on previous testing as part of this project and Project ID 3040602, the highest ignition pressures were observed when the ignition was initiated by a spark plug installed in the conduit entry. One series of five ignitions was performed using 14% of acetylene by volume in air while the second series of five ignitions was performed using 31% of hydrogen by volume in air. All tests were conducted at -40°C. The maximum ignition pressure recorded in the enclosure was 159.6 psi (1100 kPa) with 14% acetylene. The maximum ignition pressure recorded in the probe was 275.8 psi (1900 kPa) with 14% acetylene.</p>	Pass
15.1.2.1	Test procedure	Refer to 15.1.2.	Pass
15.1.2.2	Rotating electrical machines	The equipment is not a rotating electrical machine.	N/A
15.1.2.3	Pressure-piling	The tests were repeated five times for each mixture.	Pass

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
15.1.2.4	Apparatus intended for use in a single gas	The equipment is not intended for use in a single gas.	N/A
15.1.3	Overpressure test	<p>An overpressure test was satisfactorily performed on the remote enclosure at a pressure of 760 psi (5240 kPa) for a ten second duration with no signs of permanent deformation.</p> <p>Samples of the main enclosure window cover assembly were subjected to overpressure tests following the tests for thermal endurance to heat and cold and hot/cold impacts. Overpressure tests were satisfactorily performed at a pressure of 190 psi (1310 kPa) for a ten second duration with no signs of permanent deformation or leakage through the cemented joint. The test value is 1.5 times the maximum ignition pressure recorded for the enclosure, therefore the main enclosure and window assemblies are subject to routine testing.</p> <p>Overpressure testing of the main enclosure was satisfactorily performed under FM Approvals Project ID 3040602 at a pressure of 466 psi (3215 kPa) for a ten second duration with no signs of permanent deformation. The test value exceeds the required 1.5 times routine test value for the ignition pressure recorded in clause 15.1.2 above.</p> <p>Overpressure testing of the probe was satisfactorily performed under FM Approvals Project ID 3040602 at a pressure of 1970 psi (13,585 kPa) for a ten second duration with no signs of permanent deformation or leakage through the welded joints. The test value exceeds the 4 times type test value for the ignition pressures recorded in clause 15.1.2 above. Although the probe was previously type tested, due to the welded construction, they will be subject to routine testing at 1.5 times the highest ignition pressure recorded in clause 15.1.2 above.</p>	Pass
15.1.3.1	Overpressure test - First method (static)	The test procedure described in this clause was the method used. Refer to 15.1.3.	Pass
15.1.3.2	Overpressure test - second method (dynamic)	Refer to 15.1.3.1.	N/A

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
15.2	Test for non-transmission of an internal ignition	A sample of the remote enclosure, previously subjected to the overpressure test in clause 15.1.3, was subjected to the test for flame non-transmission. The cover o-ring was removed and the applicable joints were modified as described in clause 15.2.2.1 below.	Pass
15.2.1	Electrical equipment of groups I, IIA and IIB		
15.2.1.1	Test gap and test gas	The equipment is intended for Group IIC.	N/A
15.2.1.2	Increasing of gaps for test	Refer to 15.2.1.1.	N/A
15.2.1.3	Number of tests and acceptance criterion	Refer to 15.2.1.1.	N/A
15.2.2	Electrical apparatus of group IIC	This clause contains no requirements.	N/A
15.2.2.1	First method	Group IIC non-transmission of internal ignition testing was satisfactorily performed on the sample. Ten tests were conducted: five using a 27.5% hydrogen test gas mixture and five using a 7.5% acetylene gas mixture. During this testing, the length of the threaded cover joint was reduced to 4 threads according to Table 6. The non-transmission of internal ignition tests were conducted at room ambient temperature.	Pass
15.2.2.2	Second method	Refer to 15.2.2.1.	N/A
15.2.2.3	Single constructions	The equipment is not a single construction.	N/A

15.3	(Reserved for future use)		
------	---------------------------	--	--

15.4	Tests of flameproof enclosures with breathing and draining devices	The maximum bubble test pore size of the sample was determined under FM approvals Project ID 3040602 and was found to be not less than 85% of the specified maximum pore size of 20 micron.	Pass
15.4.1	Tests of ability of the enclosure to withstand pressure	This clause contains no requirements.	N/A
15.4.1.1	Replacement of breathing and draining devices	Explosion pressures were determined on a sample without the flame arrestor option.	Pass

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
15.4.1.2	Over pressure test	Due to the small size and location inside the equipment, blocking the flame arrestor was not possible. However, the test equipment compensated for the minor leakage and the following results were considered satisfactory. Overpressure testing of the flame arrestor was satisfactorily performed under FM Approvals Project ID 3040602 at a pressure of 1970 psi (13,585 kPa) for a ten second duration with no signs of permanent deformation. The test value exceeds the 4 times type test value for the ignition pressures recorded in clause 15.1.2 above.	Pass
15.4.2	Thermal tests		
15.4.2.1	Test procedure	The device was tested in accordance with 15.4.3.1 while monitoring the surface temperature using mixtures of 4.2% propane by volume in air and 7.5% acetylene by volume in air.	Pass
15.4.2.2	Acceptance criterion	No continuous burning of the sample was observed nor did any flame transmission occur. The maximum recorded external surface temperature of the enclosure was 26.7°C referenced to an ambient temperature of 21°C. The temperature rise of 5.7°C multiplied by a safety factor of 1.2 and added to the maximum rated ambient temperature of +60°C yields a maximum surface temperature of 67°C. The manufacturer's temperature class rating of T3 is considered satisfactory for the rated ambient temperature of +60°C.	Pass
15.4.3	Tests for non-transmission of an internal ignition	The tests were conducted according to 15.2 with the additions and modifications as outlined in this clause. The flame arrestor was tested as part of a probe installed in a sample of the main enclosure. The probe was cut to allow a worst case exposure of the flame arrestor directly to the environment. The cover o-rings and probe gasket were removed. During this testing, the length of the threaded cover joint was reduced to 4 threads, the probe adapter joint was reduced to 3.5 threads and the probe joint was reduced to 4 threads according to Table 6.	Pass
15.4.3.1	Test procedure	The tests were made five times for each gas mixture and for each position of the ignition source.	Pass
15.4.3.2	Non-transmission test for breathing and draining devices	The sintered element of the apparatus was tested in accordance with 15.4.3.2.2 for non-measurable devices of Group IIC.	Pass

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
15.4.3.2.1	Method A	Refer to 15.4.3.2.2.	N / A
15.4.3.2.2	Method B	<p>Tests were conducted using test mixtures of 10% acetylene, 24% oxygen, and the rest nitrogen. The tests were repeated five times for each gas mixture at room ambient temperature.</p> <p>The tests using mixtures of 40% hydrogen, 20% oxygen and the rest nitrogen were satisfactorily conducted under FM Approvals Project ID 3040602.</p>	Pass
15.4.3.3	Acceptance criterion	Results were satisfactory in that no ignition was transmitted to the test chamber.	Pass

16	ROUTINE TESTS
----	---------------

16.1	General	Routine overpressure testing of the welded probes and main enclosure is required.	Pass
16.1.1	Routine overpressure test – first method	<p>On 100% of production, the probes shall be subjected to an overpressure test of at least 1.5 times the maximum recorded ignition pressure 275.8 psi (1900 kPa). The test pressure of at least 414 psi (2855 kPa) shall be applied to the probe and maintained for at least 10 seconds.</p> <p>On 100% of production, the dual compartment main enclosure with window cover shall be subjected to an overpressure test of at least 1.5 times the maximum recorded ignition pressure 124.1 psi (855 kPa). The test pressure of at least 187 psi (1290 kPa) shall be applied to the enclosure and maintained for at least 10 seconds.</p>	Pass
16.1.2	Routine test – second method	Refer to 16.1.1.	N/A
16.1.3	Routine test – empty enclosure & parts of enclosure	The probes and enclosures are permitted to be tested empty.	Pass
16.2	Routine tests – where not required	<p>Routine overpressure testing of the probes is required due to the welded construction.</p> <p>Routine overpressure testing of the windowed main enclosures is required due to higher ignition reference pressures that would result in failure of the 4 times type test.</p> <p>Routine overpressure testing of the remote enclosure is not required as they satisfactorily passed the 4 times type test.</p>	Pass
16.3	Routine tests – acceptance criterion	There shall be no permanent deformation of joints or damage to the probes or enclosures and no leakage through the welded probe joints or the cemented window joint.	Pass

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
17	SWITCHGEAR FOR GROUP I	The equipment is intended for Group II and III and is not switchgear.	N/A
17.1	Means of isolation		
17.1.1	Fitted inside Ex d enclosure	Refer to 17.	N/A
17.1.2	Fitted inside another enclosure	Refer to 17.	N/A
17.1.3	Plug and socket or a cable coupler – Compliance with 13.3	Refer to 17.	N/A
17.2	Doors or covers		
17.2.1	Quick-acting doors or covers	Refer to 17.	N/A
17.2.1.1	Retention of properties	Refer to 17.	N/A
17.2.1.2	Closure of isolator	Refer to 17.	N/A
17.2.2	Doors or covers fixed by screws	Refer to 17.	N/A
17.2.3	Threaded doors or covers	Refer to 17.	N/A
18	LAMPHOLDERS AND LAMP CAPS	The equipment contains no lampholders or lamp caps.	N/A
18.1	Device preventing lamps working loose	Refer to 18.	N/A
18.2	Holders and caps for lamps with cylindrical caps		
18.2.1	Holders and caps for tubular fluorescent lamps	Refer to 18.	N/A
18.2.2	Other holders	Refer to 18.	N/A
18.3	Holders for lamps with threaded caps		
18.3.1	Resistant to corrosion	Refer to 18.	N/A
18.3.2	Contact separation	Refer to 18.	N/A
18.3.3	E26/E27 and E39/E40 threaded lampholders	Refer to 18.	N/A
19	NON-METALLIC ENCLOSURES AND NON-METALLIC PARTS OF ENCLOSURES	The equipment contains no non-metallic or plastic enclosure parts except for the glass and cement materials used in the construction of the window cover.	N/A
19.1	(Reserved for future use)		
19.2	Special constructional requirements		
19.2.1	Resistance to tracking and creepage distances on internal surfaces of the enclosure walls	Refer to 19.	N/A
19.3	Supplementary requirements for type tests	Refer to 19.	N/A

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
19.3.1	Tests for flameproofness		
19.3.1.1	Test procedure	Refer to 19.	N/A
19.3.1.2	Tests of ability of the enclosure to withstand pressure	Refer to 19.	N/A
19.3.1.3	Test of erosion by flame	Refer to 19.	N/A
19.3.1.4	Test for non-transmission of an internal ignition	Refer to 19.	N/A
19.3.2	Flammability	Refer to 19.	N/A

20	MARKING		
----	---------	--	--

20.1	General	The equipment is marked in accordance with IEC 60079-0.	Pass
------	---------	---	------

20.2	Caution and warning markings	The equipment is marked with the warning “WARNING – DO NOT OPEN WHEN ENERGIZED OR AN EXPLOSIVE ATMOSPHERE IS PRESENT”.	Pass
------	------------------------------	--	------

20.3	Informative markings	This clause contains examples of informative markings.	N/A
------	----------------------	--	-----

Annex A (Normative)	ADDITIONAL REQUIREMENTS FOR CRIMPED RIBBON ELEMENTS AND MULTIPLE SCREEN ELEMENTS OF BREATHING AND DRAINING DEVICES		
------------------------	--	--	--

A.1	Crimped ribbon and multiple screen elements	The equipment contains no crimped element or multiple screen elements of breathing and draining devices.	
-----	---	--	--

A.2	Path dimensions	Refer to A.1.	N/A
-----	-----------------	---------------	-----

A.3	Annex B requirements	Refer to A.1.	N/A
-----	----------------------	---------------	-----

A.4	Type tests	Refer to A.1.	N/A
-----	------------	---------------	-----

Annex B (Normative)	ADDITIONAL REQUIREMENTS FOR ELEMENTS, WITH NON-MEASURABLE PATHS, OF BREATHING AND DRAINING DEVICES		
------------------------	--	--	--

B.1	Sintered metal elements		
B.1.1	Construction	The sintered metal element is constructed of 316 stainless steel.	Pass
B.1.2	Bubble test pore size	The bubble test pore size was determined accordance with ISO 4003.	Pass
B.1.3	Density	The density is provided by the manufacturer and determined in accordance with ISO 2738.	Pass

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
B.1.4	Open porosity and/or fluid permeability	Open porosity and fluid permeability is not required in connection with the functional aspects of the equipment.	N/A
B.1.5	Identification	The manufacturer's documentation according to clause 24 of 60079-0, clearly identifies the element material, maximum pore size in micrometers, minimum density and minimum thickness.	Pass

B.2	Pressed metal wire elements		
B.2.1	Construction	The equipment contains no pressed metal wire elements.	N/A
B.2.2	Specifications	Refer to B.2.1.	N/A
B.2.3	Bubble test pore size	Refer to B.2.1.	N/A
B.2.4	Density	Refer to B.2.1.	N/A
B.2.5	Open porosity and or fluid permeability	Refer to B.2.1.	N/A
B.2.6	Identification	Refer to B.2.1.	N/A

B.3	Metal foam elements		
B.3.1	Construction	The equipment contains no metal foam elements.	N/A
B.3.2	Chromium content	Refer to B.3.1.	N/A
B.3.3	Bubble test pore size	Refer to B.3.1.	N/A
B.3.4	Density	Refer to B.3.1.	N/A
B.3.5	Open porosity and/or fluid permeability	Refer to B.3.1.	N/A
B.3.6	Identification	Refer to B.3.1.	N/A

Annex C (Normative)	ADDITIONAL REQUIREMENTS FOR FLAMEPROOF ENTRY DEVICES		
------------------------	--	--	--

C.1	General	The equipment does not include cable glands, conduit sealing devices, Ex blanking elements, Ex thread adaptors, or bushings.	N/A
-----	---------	--	-----

C.2	Constructional requirements		
C.2.1	Sealing methods		
C.2.1.1	Cable glands with elastomeric sealing rings		
C.2.1.1.1	Minimum uncompressed axial height	Refer to C.1.	N/A
C.2.1.1.2	Cable glands with only one specific elastomeric sealing ring	Refer to C.1.	N/A
C.2.1.2	Cable glands sealed with setting compound	Refer to C.1.	N/A
C.2.1.3	Conduit sealing devices with setting compound	Refer to C.1.	N/A
C.2.1.4	Bushings	Refer to C.1.	N/A

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
C.2.2	Threads	Refer to C.1.	N/A
C.2.3	Constructional requirements for Ex blanking elements		
C.2.3.1	Design requirements	Refer to C.1.	N/A
C.2.3.2	Parallel threads	Refer to C.1.	N/A
C.2.4	Constructional requirements for Ex thread adapters		
C.2.4.1	Compliance of threads	Refer to C.1.	N/A
C.2.4.2	Threads co-axial	Refer to C.1.	N/A
C.2.4.3	Length and internal volume	Refer to C.1.	N/A

C.3	Type tests		
C.3.1	Sealing test	Refer to C.1.	N/A
C.3.1.1	Cable glands and conduit sealing devices with sealing ring	Refer to C.1.	N/A
C.3.1.2	Cable glands sealed with setting compound	Refer to C.1.	N/A
C.3.1.3	Conduit sealing devices sealed with setting compound	Refer to C.1.	N/A
C.3.2	Test of mechanical strength		
C.3.2.1	Cable glands with a threaded compression element	Refer to C.1.	N/A
C.3.2.2	Cable glands with a compression element fixed by screws	Refer to C.1.	N/A
C3.2.3	Cable glands sealed with setting compound	Refer to C.1.	N/A
C3.2.4	Acceptance criteria	Refer to C.1.	N/A
C.3.3	Type tests for Ex blanking elements		
C.3.3.1	Torque test	Refer to C.1.	N/A
C.3.3.2	Over-pressure test	Refer to C.1.	N/A
C.3.4	Type tests for Ex thread adapters		
C.3.4.1	Torque test	Refer to C.1.	N/A
C.3.4.2	Impact test	Refer to C.1.	N/A
C.3.4.3	Over-pressure test	Refer to C.1.	N/A

Annex D (Normative)	EMPTY FLAMEPROOF ENCLOSURES AS EX COMPONENTS		
------------------------	--	--	--

D.1	General		
-----	---------	--	--

D.2	Introductory remarks		
-----	----------------------	--	--

D.3	Ex component enclosure requirements		
D.3.1	Compliance with IEC 60079-0 & 60079-1	The equipment is not an Ex component enclosure.	N/A
D.3.2	Geometry of enclosure	Refer to D.3.1.	N/A

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
D.3.3	Rotating machines	Refer to D.3.1.	N/A
D.3.4	Means of mounting	Refer to D.3.1.	N/A
D.3.5	Drilled holes	Refer to D.3.1.	N/A
D.3.6	Reference pressure	Refer to D.3.1.	N/A
D.3.7	Over-pressure	Refer to D.3.1.	N/A
D.3.8	Marking internally	Refer to D.3.1.	N/A
D.3.9	External marking provision	Refer to D.3.1.	N/A
D.3.10	Information in certificate	Refer to D.3.1.	N/A

D.4	Utilization of an Ex component enclosure certificate to prepare an equipment certificate		
D.4.1	Procedure	Refer to D.3.1.	N/A
D.4.2	Application of the schedule of limitations	Refer to D.3.1.	N/A

Annex E (Normative)	CELLS AND BATTERIES USED IN FLAMEPROOF “D” ENCLOSURES		
------------------------	---	--	--

E.1	Introductory remarks		
-----	----------------------	--	--

E.2	Acceptable electrochemical systems	The equipment contains no cells or batteries.	N/A
-----	------------------------------------	---	-----

E.3	General requirements for cells (or batteries) inside flameproof enclosures		
E.3.1	Restrictions	Refer to E.2.	N/A
E.3.2	Warning label	Refer to E.2.	N/A
E.3.3	Mounting	Refer to E.2.	N/A
E.3.4	Relative movement	Refer to E.2.	N/A

E.4	Arrangement of safety devices		
E.4.1	Prevention of excessive temperature and cell damage		
E.4.1.1	Short circuit condition	Refer to E.2.	N/A
E.4.1.2	Infallible components	Refer to E.2.	N/A
E.4.2	Prevention of cell polarity reversal or reverse charging by another cell in the same battery		
E.4.2.1	Additional protection	Refer to E.2.	N/A
E.4.2.2	Protection against polarity reversal or reverse charging	Refer to E.2.	N/A
E.4.3	Prevention of inadvertent charging of a battery by other voltage sources in the enclosure	Refer to E.2.	N/A

E.5	Recharging of secondary cells inside flameproof enclosures		
E.5.1	Allowable cell type	Refer to E.2.	N/A
E.5.2	Charging condition and safety devices	Refer to E.2.	N/A
E.5.3	Reverse charging	Refer to E.2.	N/A

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
E.5.4	Additional safety device(s)	Refer to E.2.	N/A
E.5.5	Recharging within enclosure	Refer to E.2.	N/A

E.6	Rating of protection diodes and reliability of protection devices	Refer to E.2.	N/A
E.6.1	Voltage rating & compliance with E.4.2	Refer to E.2.	N/A
E.6.2	Voltage rating & compliance with E.4.3	Refer to E.2.	N/A
E.6.3	Current rating	Refer to E.2.	N/A
E.6.4	Safety integrity	Refer to E.2.	N/A



Annex F (Informative)	MECHANICAL PROPERTIES FOR SCREWS AND NUTS
--------------------------	---

Annex G (Informative)	INTRODUCTION OF AN ALTERNATIVE RISK ASSESMENT METHOD ENCOMPASSING “EQUIPMENT PROTECTION LEVELS” FOR EX EQUIPMENT
--------------------------	--

Measurement Section, including Additional Narrative Remarks (as deemed applicable)



**IECEX TEST REPORT
IEC 60079
Explosive atmospheres –
Part 31 : Equipment dust ignition protection by enclosure “t”**

ExTR Reference Number	US/FMG/ExTR13.0029/00
ExTR Free Reference Number.....	Project ID 3048286
Complied by + signature (ExTL)....	Marlon Mitchell 
Reviewed by + signature (ExTL) ...	Andrew Lozinski 
Date of issue	24 April 2014
Ex Testing Laboratory (ExTL)	FM Approvals LLC
Address.....	1151 Boston-Providence Turnpike, Norwood, MA 02062, USA
Applicant's name.....	Sierra Instruments Inc.
Address.....	5 Harris Court, Building L, Monterey, CA 93940, USA
Standard	IEC 60079-31:2008, 1 st edition
Test procedure	IECEX System
Test Report Form No.	ExTR60079-31_1A
TRF Originator	
Master TRF	dated 2009-10

Instructions for Intended Use of Ex Test Report:
 This ExTR blank document is to be compiled and reviewed by the ExTL. The ExTR package in which this ExTR is incorporated (comprised of a single ExTR document or multiple ExTR documents) is to be accompanied by a single ExTR Cover Sheet, which is to be approved by the ExCB. ExTR Addendum(s) and/or ExTR Report of National Differences may also supplement this ExTR.

Copyright © 2009 International Electrotechnical Commission System for Certification to Standards relating to Equipment for use in Explosive Atmospheres (IECEX System), Geneva, Switzerland. All rights reserved.
 This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEX System is acknowledged as copyright owner and source of the material. The IECEX System takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Possible test case verdicts:
 - test case does not apply to the test object:N / A
 - test object does meet the requirement:Pass

General remarks:
 The tests results presented in this report relate only to the object tested.
 This report shall not be reproduced except in full without the written approval of the testing laboratory.
 "(see Attachment #)" refers to additional information appended to the report.
 "(see appended table)" refers to a table appended to the report.
 Throughout this report a point is used as the decimal separator.

IEC 60079-31			
Clause	Requirement – Test	Result – Remark	Verdict
1	SCOPE		
2	NORMATIVE REFERENCES		
3	TERMS AND DEFINITIONS		
4	LEVEL OF PROTECTION	The level of protection is “tb”.	Pass
4.1	General	The level of protection is “tb” which corresponds with EPL “Db”.	Pass
4.2	Additional requirements for level of protection “ta”	The level of protection is “tb”.	N/A
4.2.1	Thermal protection		
4.2.1.1	General	Refer to 4.2.	N/A
4.2.1.2	Protective devices	Refer to 4.2.	N/A
4.2.1.3	Temperature limitation	Refer to 4.2.	N/A
5	CONSTRUCTION		
5.1	Joints		
5.1.1	General	O-rings are provided on the enclosure cover joints. A sealing washer/gasket is provided on the probe joint. All parallel threaded joints meet the required constructional requirements to provide the minimum five threads of engagement. See IEC 60079-1 assessment.	Pass
5.1.2	Gaskets and seals	The gaskets and seals employed ensure the effectiveness of enclosure sealing and are of one-piece continuous construction.	Pass
5.1.3	Cemented joints	The cemented window joint is non-removable and has a width in excess of 3 mm.	Pass
5.1.4	Operating rods, spindles and shafts	The equipment enclosure contains no operating rods, spindles or shafts.	N/A
5.1.5	Windows		
5.1.5.1	Windows employing a cemented joint	The window is cemented directly into the enclosure cover and is non-removable.	Pass
5.1.5.2	Windows employing a gasket joint	Refer to 5.1.5.1.	N/A
5.2	Cable glands and threaded entries		
5.2.1	Cable glands	Cable glands are not supplied with the equipment.	N/A
5.2.2	Threaded entries	The equipment tapered NPT threaded entries meet the requirements of “tb”.	Pass
6	VERIFICATION AND TESTS		

IEC 60079-31			
Clause	Requirement – Test	Result – Remark	Verdict
6.1	Type tests		
6.1.1	Type tests for dust exclusion by enclosures	The tests for thermal endurance to heat and cold of the cemented window joint was waived as separate samples were subjected to those tests as well as impact at hot and cold temperatures followed by an overpressure test of 190 psi (1310 kPa) with no leakage. The test pressure is considered more severe than the 2 kPa positive internal prepressurization and the applied vacuum for the dust exclusion test. The equipment enclosures were submitted to impact testing (7 Joules on metal and 4 Joules on glass, where applicable) and then subjected to the required IP6X dust exclusion test for level of protection “tb”.	Pass
6.1.2	Thermal tests	Temperature testing was conducted according to the requirements of IEC 60079-0, which is satisfactory for a T200°C marking.	Pass
6.1.3	Pressure test	The pressure test was waived as the enclosures’ o-rings and gaskets were removed for testing and the cemented window joint was satisfactorily subjected to 190 psi (1310 kPa) as described in 6.1.1.	Pass
6.2	Routine tests	Routine tests are not required.	N/A

7	MARKING	The equipment is marked ‘tb’ in accordance with the requirements of IEC 60079-0.	Pass
---	---------	--	------

Additional Narrative Remarks (as deemed applicable):