Assessment Report

Title:
Report on: Prime IECEx, ATEX and UKCA certification on XP9900 mobile phone (IECEx CSA 23.0002X, CSANe 23ATEX1005X and CSAE 23UKEX1003X)
Applicant:
Sonim Technologies (Shenzhen) Ltd.
Report No.
R80105505A
ExTR Free Reference Number:
CA/CSA/2023/TR270725–80105505
Date of issue:
May 2023

CSA Issuing Body	Scheme	CSA Project No.s
CSA Group Testing & Certification Inc. 178 Rexdale Boulevard, Toronto, Ontario M9W 1R3	IECEx	80105505
CSA Group Netherlands B.V. Utrechtseweg 310, Building B42, 6812AR, Arnhem, The Netherlands	ATEX	80105506
CSA Group Testing UK Ltd, Unit 6, Hawarden Industrial Park, Hawarden, Deeside, CH5 3US, United Kingdom	UKCA	80105507

1 Report Summary

1.1 Certification Overview

This report is intended to be used as the basis for subsequent certification against the standards listed in section 1.7. The assessment applies to the certified code and ambient temperature range given below and atmospheric conditions in the range 80 to 110 kPa, with up to 21% oxygen.

1.2 Applicant's Name & Address

Applicant's Name & Address	QAR
Sonim Technologies (Shenzhen) Ltd. 14 / F, Haiwang Yinhe building No.1, Keji Middle Third Road Nanshan District, Shenzhen, Guangdong China	DE/TUR/QAR17.0010/04

1.3 Manufacturer's Name & Address

Manufacturer's Name & Address	QAR
Sonim Technologies (Shenzhen) Ltd. 14 / F, Haiwang Yinhe building No.1, Keji Middle Third Road Nanshan District, Shenzhen, Guangdong China	DE/TUR/QAR17.0010/04

Manufacturing Location:

Manufacture's Name & Address	QAR
Jiangxi Maxon Communication Co.Ltd. 1666 Tianxiang North Road Nanchang High-Tech Industrial Development Zone Nanchang City Jiangxi Province China	GB/CSAE/QAR23.0005/00

1.4 Trademark

sonim®

1.5 Product Name/Model Number

Mobile phone, Model XP9900 (P320@@)

XP9900: Fixed model name,
P320@@): Type number
P: Phone
@=0~9: Any numeric for different SW for different carrier and not related with safety/IS certificate.

1.6 Rating

Refer to section 1.9.

1.7 Assessment Standards

IECEx	ATEX	UKCA
IEC 60079-0:2017 Ed. 7.0 IEC 60079-11:2011 Ed. 6.0	EN IEC 60079-0:2018 EN 60079-11:2012	EN IEC 60079-0:2018 EN 60079-11:2012

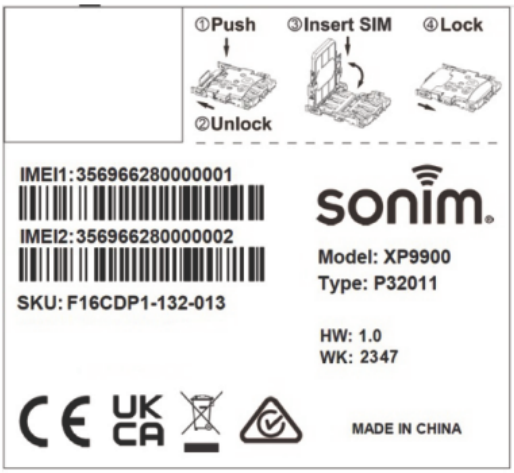
The requirements of the equivalent IECEx, ATEX, and UKCA standards are similar; therefore, any references in the following report can be regarded as referring to either format unless stated otherwise.

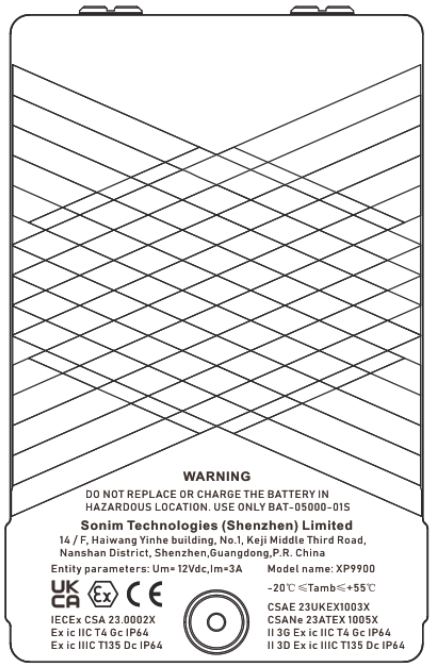
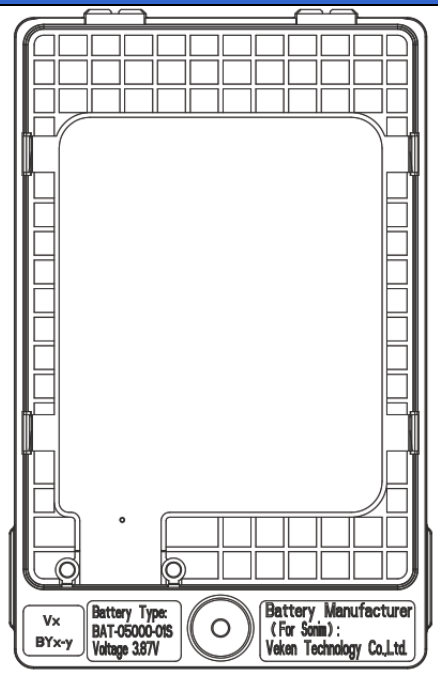
This report may be issued against standards that do not appear on the UKAS Scope of Accreditation, but have been added through CSA Group Testing UK Ltd.'s flexible scope of accreditation.

1.8 Marking

Detail	IECEx	ATEX	UKCA
Certificate number:	IECEx CSA 23.0002X	CSANe 23ATEX1005X	CSAE 23UKEX1003X
Certification code:	Ex ic IIC T4 Gc IP64 Ex ic IIIC T135 Dc IP64	Ex ic IIC T4 Gc IP64 Ex ic IIIC T135 Dc IP64	Ex ic IIC T4 Gc IP64 Ex ic IIIC T135 Dc IP64
Other marking:	None	CE Ex II 3GD	UKCA Ex II 3GD
Model number:	Refer to section 1.5.		
Manufacturer's name:	Sonim Technologies (Shenzhen) Ltd.		
Manufacturer's address:	14 / F, Haiwang Yinhe building No.1, Keji Middle Third Road Nanshan District, Shenzhen, Guangdong China		
Ambient range:	-20°C to +55°C		
Serial number:	As applicable		
Year of manufacture:	As applicable		
Warnings:	WARNING – USE ONLY BAT-05000-01S (from Veken Technology Co., Ltd.) WARNING – DO NOT REPLACE BATTERY WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT WARNING - DO NOT CHARGE THE BATTERY IN HAZARDOUS LOCATION		
Entity parameters:	USB (Safe area only), Um = 12Vdc, Im=3A.		

A copy of the nameplate is as follows:



outside of the battery cover	inside of batter cover
	

1.9 Product Description

Mobile phone XP9900 (P320@@) is to be used in zone 2 and zone 22 hazardous locations. It is powered by an internally fitted user-replaceable Li-Ion battery, whose rating is 3.87Vdc/4850mAh. The product consists of a touchscreen display, two SIM cards, WLAN, Bluetooth, GPS, 5G/GSM/UMTS/LTE communications, camera, flashlight, and other options, housed in a non-metallic enclosure.

The equipment can only be powered by manufacturer's custom designed battery packs, and the main battery pack is user-replaceable (not permitted to be swapped in hazardous areas). The equipment is only allowed to be charged outside of hazardous location, the maximum charging parameters are U_m = 12Vdc, I_m = 3.0A.

1.10 Manufacturer's Documents

Drawing	Sheets	Rev.	Date (Stamp)	Title	1	2	3
EX-9900-17-01	1 of 1	V1.0	03 Mar 23	XP9900 Exploded drawing	ü	ü	ü
EX-9900-07-01	1 to 53	V1.1	03 Mar 23	XP9900 schematic	ü	ü	ü
EX-9900-A02-01	1 of 1	V0.3	03 Mar 23	Emergency-key-FPC	ü	ü	ü
EX-9900-A03-01	1 of 1	V0.3	03 Mar 23	Power-key-FPC	ü	ü	ü
EX-9900-A04-01	1 of 1	V0.3	03 Mar 23	PPT-VOL-KEY-FPC	ü	ü	ü
EX-9900-A05-01	1 of 1	V0.1	03 Mar 23	REC-FLASH-LED-FPC	ü	ü	ü
EX-9900-A06-01	1 of 1	V0.3	03 Mar 23	X-key-FPC	ü	ü	ü
EX-9900-A07-01	1 of 1	V0.2	03 Mar 23	TYPE-C-FPC	ü	ü	ü
EX-9900-A01-01	1 of 1	V0.1	25 Apr 23	Audio-Connector-FPC	ü	ü	ü
EX-9900-10-02	1 of 12	V1.0	25 Apr 23	XP9900 BOM	ü	ü	ü
EX-9900-09-01	1 to 2	V1.0	03 Mar 23	PCB component layout	ü	ü	ü
EX-9900-08-01	1 to 10	V1.0	03 Mar 23	PCB track layout	ü	ü	ü
EX-9900-08.1-01	1 of 1	V1.0	03 Mar 23	PCB track layout description	ü	ü	ü
EX-9900-06-01	1 of 1	V1.0	03 Mar 23	Power tree block	ü	ü	ü
EX-9900-06.1-01	1 of 1	V1.0	03 Mar 23	RF Block Diagram	ü	ü	ü
EX-9900-18-01	1 to 5	V1.1	03 Mar 23	RF Design instruction for XP9900	ü	ü	ü
EX-9900-04.1-02	1 to 22	V1.2	25 Apr 23	Waterproof Solution	ü	ü	ü
EX-9900-04.3-02	1 to 2	V1.1	03 Mar 23	DC charger design	ü	ü	ü
EX-9900-04.2-02	1 to 3	V1.0	03 Mar 23	USB design	ü	ü	ü
EX-9900-13-02	1 of 1	V1.1	25 Apr 23	XP9900 IECEx/ATEX Marking	ü	ü	ü

Key: 1= IECEx, 2 = ATEX, 3= UKCA

1.11 Supporting Documents

None.

1.12 Specific Conditions Of Use

i. The product shall be charged in the non-hazardous area, using the Travel charger specifically supplied by the manufacturer for use with the unit approved as SELV or Class 2 equipment against EN/IEC 62368 or an equivalent EN/IEC standard. The maximum voltage and current from the charger Um and Im shall not exceed 12Vdc and 3A, respectively. The ambient temperature during charging shall be in the range 0°C to 45°C.

ii. Any Data downloaded via the USB connection is only permitted in non-hazardous location, using the device approved as SELV or Class 2 equipment against EN/IEC 62368 or an equivalent EN/IEC standard. The maximum voltage Um and Im from the device shall not exceed 5Vdc and 900mA, respectively.

iii. The product shall be charged in the non-hazardous area, using the DC charger specifically supplied by the manufacturer for use with the unit approved as SELV or Class 2 equipment against EN/IEC 62368 or an equivalent EN/IEC standard. The maximum voltage and current from the DC charger Um and Im shall not exceed 5.5Vdc and 2A, respectively. The ambient temperature during charging shall be in the range 0°C to 45°C.

iv. Only a passive headset could be connected to via the headset port in the non-hazardous.

v. When using, the side cover of the headset must be properly installed. The device cannot be connected with any accessories such like a headset in hazardous location.

vi. Connection and disconnection of all the external ports, opening enclosure, or replacing battery pack while live is only permitted when the potentially explosive atmosphere is shown to be absent (non-hazardous).

vii. The equipment shall be protected against excessive UV light emission and high electrostatic charge generating processes.

viii. The product shall only be used in locations where there is a low risk of mechanical impact.

1.13 Conditions Of Manufacture / Production Control

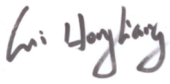
i. The adapter (for Travel charger) supplied with the mobile phone XP9900 shall be approved as SELV equipment complying with the EN/IEC 62368, or a technically equivalent standard. The maximum charging voltage shall not exceed Um = 12Vdc, and the maximum charging current shall not exceed Im = 3A.

ii. The adapter (for DC charger) supplied with the mobile phone XP9900 shall be approved as SELV equipment complying with the EN/IEC 62368, or a technically equivalent standard. The maximum charging voltage shall not exceed Um =5.5Vdc, and the maximum charging current shall not exceed Im = 2A.

1.14 Conclusion

The equipment described in this report satisfies the requirements of the listed standards, the relevant certification code being as indicated in section 1.8. The tests and assessments are limited to the standards aforementioned. In addition, the equipment meets the requirements of European Directive 2014/34/EU and UKSI 2016:1107 (as amended by UKSI 2019:696 – Schedule 3A, Part 1) for ATEX and UK Type Examination for the Category indicated in section 1.8.

1.15 Signatories

Compiled by + signature (ExTL):	**Amanda Ma** Certification Engineer	
Reviewed by + signature (ExTL):	**Hongliang Cui** Certification Engineer	
Approved by + signature (ExCB):	**Dave Magee** Senior Director Operations	

2 Tests

2.1 Samples received

Sample #	Date received	Description
KS20221121003	2022-11-21	One unit of complete sample, Temperature test
KS20221128017 KS20221128018	2022-11-28	Two units of complete sample, Thermal endurance to heat and cold
KS20221128017	2022-11-28	One unit of complete sample, Thermal shock test
KS20221128017 KS20221128018	2022-11-28	Two units of complete sample, Impact test
KS20221128017 KS20221128018	2022-11-28	Two units of complete sample, Drop test
KS20221128017 KS20221128018	2022-11-28	Two units of complete sample, IP6X ingress protection test
KS20221128017 KS20221128018	2022-11-28	Two units of complete sample, IPX4 ingress protection test
KS20221123003, KS20221123004	2022-11-23	One piece of test sheet of each non-metallic materials, Surface resistance test
Y202303370	2023-04-10	One unit of complete sample, Spark ignition test

2.2 Tests conducted

Test description	Standard ref.	Test result & evaluation	Test report #
Temperature test	IEC 60079-0:2017 Clause 26.5.1	Refer to section 2.2.1.	T-80105505-01
Thermal endurance to heat and cold	IEC 60079-0:2017 Clause 26.8 & 26.9	Refer to section 2.2.2.	T-80105505-02
Thermal shock test	IEC 60079-0:2017 Clause 26.5.2	Refer to section 2.2.3.	T-80105505-03
Impact test	IEC 60079-0:2017 Clause 26.4.2	Refer to section 2.2.4.	T-80105505-04
Drop test	IEC 60079-0:2017 Clause 26.4.3	Refer to section 2.2.5.	T-80105505-05
IPX4 ingress protection test	IEC 60079-0:2017 Clause 26.4.5	Refer to section 2.2.6.	T-80105505-06
IP6X ingress protection test	IEC 60079-0:2017 Clause 26.4.5	Refer to section 2.2.7.	T-80105505-07
Surface resistance test	IEC 60079-0:2017 Clause 26.13	Refer to section 2.2.8.	T-80105505-08

All above tests were carried out at ATF CSA Group, Kunshan, Jiangsu. 215347.

2.2.1 Temperature test

Sample tested:	KS20221121003	
Test report # & date:	T-80105505-01	2022-11-25
Standard reference:	IEC 60079-0:2017 Clause 26.5.1 (EN IEC 60079-0:2018)	
Test procedure:	Firstly, the cells in the equipment were all subjected to a series of charge and discharge cycles. A final calibrated discharge was conducted to demonstrate that the cells met the manufacturer's typical capacity. The equipment was operating in their most thermally adverse condition (MAX working power) throughout the test at the maximum ambient temperature Ta=55°C. The temperature of all the components is measured and recorded during the test.	

Test result summary:	The maximum temperature on the surface of battery was 67.95ºC at ambient 55ºC, and adding a 5K safety factor, the maximum surface temperature was 72.95ºC [67.95 + 5=72.95]. There was no electrolyte leakage during the testing. The maximum service temperature of the non-metallic material was measured to be 71.15 ºC at 55ºC ambient, which used in thermal endurance to heat and cold. The maximum surface temperature was 84.6 ºC at the maximum ambient 55 ºC, and adding a 5K safety factor, the maximum surface temperature was 89.6ºC. The equipment complies with T4 temperature class.

2.2.2 Thermal endurance to heat and Thermal endurance to cold

Sample tested:	KS20221128017, KS20221128018	
Test report # & date	T-80105505-02	2022-11-30 to 2022-12-31
Standard reference:	IEC 60079-0:2017 Clause 26.8 & 26.9 (EN IEC 60079-0:2018)	
Test procedure:	The maximum service temperature of enclosure was 71.15°C, and the condition were as follows: 672h at 80°C, 90% RH 24h at 24 °C, 50% RH 24h at -25°C.	
Test result summary:	This is conditioning test for the next impact, drop test and IP test.	

2.2.3 Thermal shock test

Sample tested:	KS20221128017	
Test report # & date:	T-80105505-03	2023-01-04
Standard reference:	IEC 60079-0:2017, clause 26.5.2 (EN IEC 60079-0:2018)	
Test procedure:	Heated sample to 72°C, and next make a jet of water of 1mm diameter at a temperature 10°C sprayed on glass part.	
Test result summary:	No visible broken on the glass.	

2.2.4 Impact test

Sample tested:	KS20221128017, KS20221128018	
Test report # & date	T-80105505-04	2023-01-06
Standard reference:	IEC 60079-0:2017, Clause 26.4.2 (EN IEC 60079-0:2018)	
Test procedure:	Client requests the low risk danger, so mark a special condition in section **Error! Reference source not found.**. To impact enclosure and flashlight from a height 0.4m under the lower temperature -25°C and the higher temperature 82°C respectively. To impact touch screen and back camera from a height 0.2m under the lower temperature -25°C and the higher temperature 82°C respectively.	
Test result summary:	After test, there was no ejection of the battery. To verify by IP test.	

2.2.5 Drop test

Sample tested:	KS20221128017, KS20221128018	
Test report # & date:	T-80105505-05	2023-01-10
Standard reference:	IEC 60079-0:2017, clause 26.4.3 (EN IEC 60079-0:2018)	

Test procedure:	Each of the samples was dropped four times from a height of at least 1m onto a horizontal concrete surface at -25°C, 1 time touch screen, 1 time rear cover and 2 times side of enclosure, vertically fell to the ground.
Test result summary:	After test, there was no ejection of the battery. To verify by IP test.

2.2.6 IPX4 ingress protection test

Sample tested:	KS20221128017, KS20221128018	
Test report # & date:	T-80105505-06	2023-01-10
Standard reference:	IEC 60079-0:2017, clause 26.4.5 (EN IEC 60079-0:2018)	
Test procedure:	The standard spray nozzle is used for tests and the enclosure should be sprayed from all practicable directions. The water pressure is adjusted to give the specified delivery rate (10 l/min ± 5 %). The pressure will be in the range of 50kPa to 150kPa. It should be kept constant during the test. Test durations is 1min/m^2 of the calculated surface area of the enclosure (excluding any mounting surface), with a minimum duration of 5min.	
Test result summary:	There was no water ingress, so the enclosure met the requirements of IPX4	

2.2.7 IP6X ingress protection test

Sample tested:	KS20221128017, KS20221128018	
Test report # & date:	T-80105505-07	2023-01-11
Standard reference:	IEC 60079-0:2017, clause 26.4.5 (EN IEC 60079-0:2018)	
Test procedure:	The same sample subjected to drop test and IPX4 was used to conduct this test. A hole was made on the enclosure. The sample under test was placed in a chamber in which talcum powder is maintained in suspension. The talcum powder used was able to pass through a square-meshed sieve, which has a nominal wire diameter of 50 micrometres and a nominal distance between wires of 75 micrometres. By means of depression (maximum 20 mbar), a volume of air 80 times the volume of the samples enclosure being tested was drawn into the enclosure without exceeding an extraction rate of 60 volumes per hour. This test continued for 2 hours.	
Test result summary:	There was no dust ingress, so the enclosure met the requirements of IP6X	

2.2.8 Surface resistance test of enclosures of non-metallic materials TPU U.80AP10 & Plastic D251

Sample tested:	KS20221123003, KS20221123004	
Test report # & date:	T-80105505-08	2022-11-24
Standard reference:	IEC 60079-0:2017, clause 26.13 (EN IEC 60079-0:2018)	
Test procedure:	All the test pieces were painted with two 100 mm long electrodes, 10 mm apart, using conductive paint and the sample pre-conditioned for 24 h at (50±5) % RH and (23±2) ºC. A voltage of 500Vdc was applied between the electrodes for 60s.	
Test result summary:	The maximum surface resistance was 28.62 MΩ for materials D251 and 227.8MΩ for materials U.80AP10 at 53% relative humidity and 23ºC.	

2.3 Tests witnessed

Test description	Standard ref.	Test result & evaluation	Test report #
Spark ignition test	IEC 60079-11:2011 Clause 10.1	Refer to section 2.3.1.	T-80105505-09

Test 2.3.1 was witness by Annie Qi /Amanda Ma at CMExC (Fushun).

2.3.1 Spark ignition test

<table>
<tr><td>Sample tested:</td><td colspan="4">Y202303370</td></tr>
<tr><td>Test report # & date:</td><td colspan="2">T-80105505-09</td><td colspan="2">2023/04/12</td></tr>
<tr><td>Standard reference:</td><td colspan="4">IEC 60079-11:2011 clause 10.1 (EN 60079-11:2012)</td></tr>
<tr><td>Test procedure:</td><td colspan="4">Test gas mixture 21% hydrogen, 200 forward revolutions and 200 reversed revolution in 5min.
Kept sample in service, connected DC charging pins and Secure audio connector in sequence to the spark test apparatus.
<table>
<tr><th colspan="2">Spark test apparatus</th><th rowspan="2">Revolution</th><th rowspan="2">Ignite(Y/N)</th></tr>
<tr><th>Positive pole</th><th>Negative pole</th></tr>
<tr><td>Signal pins of Secure audio</td><td>GND</td><td>400</td><td>N</td></tr>
<tr><td>Power pins of Secure audio</td><td>GND</td><td>400</td><td>N</td></tr>
<tr><td>Signal and Power pins of Secure audio</td><td>GND</td><td>400</td><td>N</td></tr>
<tr><td>DC charge</td><td>GND</td><td>400</td><td>N</td></tr>
</table></td></tr>
<tr><td>Test result summary:</td><td colspan="4">No ignition occurred. Pass.</td></tr>
</table>

2.4 Tests waived

None.

2.5 Tests from external sources

None.

3 Assessment against EN / IEC 60079-0

3.1 Metallic enclosures – light metal requirements

(IEC 60079-0:2017 clause 8)

Not applicable. The enclosure is made of plastic material.

3.2 Non-metallic enclosure requirements

(IEC 60079-0:2017 clause 7 & 26.7)

The product is assessed against clause 6.1.2.3 (a) of IEC 60079-11:2011, so enclosure tests of IEC 60079-0:2017 are required. Following lists are the non-metallic materials that are relied upon to maintain the type of protection.

Object	Manufacturer	Model	Technical data	Note
TPU (Used on Front and Rear Housing)	Covestro	U.80AP10	-25 to 85°C	Exposed non-metallic parts, complied by surface resistance test, refer to section 2.2.8.
Plastic (Used on Front and Rear Housing)	SABIC	ML7672	RTI: 80°C	Inside the enclosure
Plastic (Battery cover)	SABIC JAPAN LLC	D251	RTI: 80°C	Exposed non-metallic parts, complied by surface resistance test, refer to section 2.2.8.
Flash led cover	TEIJIN LIMITED RESIN AND PLASTIC	L-1250Y	RTI: 80°C	Exposed non-metallic parts, complied by limitation of surface area of non-metallic layer surface (＜2000mm^2)
Front & Rear housing O-ring	Dongguan New Orient Technology Co., Ltd	ZY-850	-30 to 200°C	Inside the enclosure
Battery cover seal	SHIN-ETSU CHEMICAL CO., LTD.	KE-2090-40A/B	-40~120°C	Inside the enclosure
USB Type-C Waterproof O-ring	Wacker Asahikasei Silicone Co., Ltd.	60094310	-50 to 250°C	Inside the enclosure
TPU (Rubber cap for USB)	Covestro	U.80AP10	-25 to 85°C	Exposed non-metallic parts, complied by limitation of surface area of non-metallic layer surface (＜2000mm^2)
Glue (Charging pins, LED cover, screw nut, and FPC seal)	Dow Corning Corporation	SE 9186L	-45 to 200°C	Inside the enclosure
Glue (Flash led and switch key Receiver seal)	Guangzhou Huitian New Material Co.,Ltd	9310	-40 to 180°C	Inside the enclosure
Glue (Fingerprint sensor seal)	Guangzhou Huitian New Material Co.,Ltd	9610H	-40 to 150°C	Inside the enclosure
Glue (Speaker seal)	CEMEDINE Co., Ltd	Super X No. 8008	-65 to 150°C	Inside the enclosure

Glue (Speaker frame seal)	Guangdong Hengda New Materials Technology Co., Ltd.	K-5933B	-60 to 260°C	Inside the enclosure
Adhesive tape (Main Window glass seal)	TESA	75640	-25 to 85°C	Inside the enclosure
Adhesive tape (Camera lens and SPK hole seal)	Sekisui Chemical Co., Ltd	5230BAZ, 5240 BAZ	-25 to 85°C	Inside the enclosure
Screw O-Ring Rubber	Shenzhen Meifu rubber Products Co., LTD	S7001	-30 to 200°C	Inside the enclosure

Refer to section 2.2.1, the maximum surface temperature was 84.6°C which was measured on the flash LED. The maximum service temperature of the non-metallic material was measured to be 71.15ºC at the adhesive tape of camera lens. The RTI or COT for all above non-metallic material have 10K greater than the maximum service temperature.

3.2.1 Thermal endurance requirements

(IEC 60079-0:2017 clauses 7.2, 26.8, 26.9 & 26.16)

The product is assessed in compliance with IEC 60079-11:2011 clause 6.1.2.3 (a), therefore, thermal endurance tests are required, refer to section 2.2.2.

3.2.2 Resistance to chemical agents

(IEC 60079-0:2017 clauses 7 & 26.11)

This test is for Group I equipment only, so it is not applicable.

3.2.3 Resistance to light test / assessment

(IEC 60079-0:2017 clauses 7.3 & 26.10)

The materials of enclosure do not meet the ultraviolet light exposure requirements (f1) in ANSI/UL 746C. Hence, a specific condition of use is added, refer to section 1.12 item iv, the product must be prevented from being exposed to the daylight or light."

3.2.4 Plastic electrostatic hazard assessment and tests

(IEC 60079-0:2017 clauses 7.4 & 26.7)

Refer to exploded drawing EX-9900-17-01, the surface materials of enclosure include SABICEXL1112, PC 2805, BJ195A, ML7672, U.80AP10, L-1250Y and D251 among which only U.80AP10 and D251 have a surface area of larger than 2000mm^2, so the surface resistance tests for materials U.80AP10 and D251 were performed (refer to section 2.2.8), which demonstrated the surface resistance was 227.8MΩ for U.80AP10 and 28.62 MΩ for D251 at 53 % relative humidity and 23ºC. This is less than the limit of 1.0 x 10^9 Ω in IEC 60079-0:2017 clause 7.4.2(a), so the materials are not considered a static hazard.

The materials that have a surface area of less than 2000mm^2 do not comprise an electrostatic risk.

3.2.5 Accessible metal parts

(IEC 60079-0:2017 clauses 7.5 & 26.14)

Not applicable, no metal material on the enclosure.

3.3 Impact test / assessment

(IEC 60079-0:2017 clauses 6.2, 26.4.2 & 26.4.4)

Impact test was conducted to comply with clause 6.1.2.3 (a) of IEC 60079-11:2011, refer to section 2.2.4.

3.4 Drop test/assessment

(IEC 60079-0:2017 clauses 6.2, 26.4.3 & 26.4.4)

The product is a personal equipment, so a drop test was performed, refer to section 2.2.5.

3.5 Ingress protection method and test

(IEC 60079-0:2017 clauses 26.4.5 & 6.5)

IEC 60079-11:2011 clause 6.1.2.3(a) requires the enclosure to meet IP54 or greater, the product was tested to comply with IP64, refer to sections 2.2.6 and 2.2.7.

3.6 Earthing continuity and circulating currents

(IEC 60079-0:2017 clause 6.4)

Excluded by IEC 60079-11:2011 Table 1.

3.7 Cable pull test for intrinsically safe equipment

(IEC 60079-11:2011 clause 10.9)

Not applicable, the product is not constructed with an integral cable.

3.8 Mechanical tests for exposed casting compound

(IEC 60079-11:2011 clause 10.6.1)

No applicable. No exposed casting compound was used in the product.

3.9 Opening times

(IEC 60079-0:2017 clause 6.3)

Excluded by IEC 60079-11:2011 Table 1.

3.10 Electromagnetic/ultrasonic energy radiating equipment

3.10.1 Radio-frequency sources

(IEC 60079-0:2017 clause 6.6.1 for Ma, Mb, Ga, Gb, Gc, Da, Db, Dc)

The wireless modules (radio frequency source) provided by manufacturer are listed below:

RF Module	Tx or Rx	Manufacturer /TYPE	Maximum Conducted power
Bluetooth	Tx or Rx	Qualcomm/WCN3998-1	13dbm
WIFI	Tx and Rx	Qualcomm/WCN3998-1	20.5dbm
GPS	Rx only	Qualcomm/WCN3998-1	/
NFC	Tx and Rx	ST/ST21NFCD	0.7W
Cellular (2G GSM/3G UMTS/4G LTE/5G-NR)	Tx and Rx	Qualcomm/QM77043	33dbm
Cellular (2G GSM/3G UMTS/4G LTE/5G-NR)	Tx and Rx	Qualcomm/QM77048	30dbm
Cellular (2G GSM/3G UMTS/4G LTE/5G-NR)	Tx and Rx	VANCHIP/VC7643-63	26dbm
Cellular (2G GSM/3G UMTS/4G LTE/5G-NR)	Tx and Rx	Qualcomm/QPM5579	26dbm

For intrinsic safety, the signal to the antenna must comply with IEC 60079-0:2017 clause 6.6.2.

Pulsed sources are considered as continuous sources as a worst case assumption, so only Table 5 of IEC 60079-0:2017 applies, which gives a 2W limitation of threshold power (equivalent to 33dBm). Therefore, any maximum output power on transmitter less than this level is considered acceptable.

According to the above table, the maximum RF power is less than 2W, so it is in accordance with the IIC limit in IEC 60079-0:2017 table 5.

The maximum conducted power of the radio frequency source shown in the manufacture's RF design documents, held in this project folder.

Note:
dBw calculation with Power: dBw=10log(P/1W)
dBw reduction calculation to dBm: 0dBw=10log1W = 10log1000Mw = 30dBm

3.10.2 Ultrasonic sources
(IEC 60079-0:2017 clause 6.6.3 for Ma, Mb, Ga, Gb, Gc, Da, Db, Dc)

Not applicable. The product does not have ultrasonic sources.

3.10.3 Lasers or other continuous wave sources
(IEC 60079-0:2017 clause 6.6.4 for Ma, Mb, Da, Db, Dc; IEC 60079-28:2015 clause 5.2 for Ga, Gb, Gc)

Not applicable. The product contains LED light source. According to IEC 60079-28: 2015 clause 1, non-array LED light source used for EPL 'Gc' are excluded from IEC 60079-28:2015. Therefore, no further assessment is required.

3.11 Fasteners
(IEC 60079-0:2017 clause 9)

Excluded by IEC 60079-11:2011 Table 1.

3.12 Interlocking devices
(IEC 60079-0:2017 clause 10)

Excluded by IEC 60079-11:2011 Table 1.

3.13 Bushings
(IEC 60079-0:2017 clause 11)

Excluded by IEC 60079-11:2011 Table 1.

3.14 Materials used for cementing
(IEC 60079-0:2017 clause 12)

Excluded by IEC 60079-11:2011.

3.15 Ex Components
(IEC 60079-0:2017 clause 13)

Not applicable. No Ex components are used in the product.

3.16 Connection facilities
(IEC 60079-0:2017 clause 14)

Excluded by IEC 60079-11:2011 Table 1.

3.17 Connection facilities for earthing or bonding conductors

(IEC 60079-0:2017 clause 15)

Excluded by IEC 60079-11:2011 Table 1.

3.18 Entries into enclosures

(IEC 60079-0:2017 clause 16)

Excluded by IEC 60079-11:2011 Table 1.

3.19 Supplementary requirements for electrical machines

(IEC 60079-0:2017 clause 17)

Excluded by IEC 60079-11:2011 Table 1.

3.20 Supplementary requirements for switchgear

(IEC 60079-0:2017 clause 18)

Excluded by IEC 60079-11:2011 Table 1.

3.21 Supplementary requirements for external plugs, socket outlets and connectors for field wiring connection

(IEC 60079-0:2017 clause 20)

Excluded by IEC 60079-11:2011 Table 1.

3.22 Supplementary requirements for luminaires

(IEC 60079-0:2017 clause 21)

Excluded by IEC 60079-11:2011 Table 1.

3.23 Supplementary requirements for caplights and handlights

(IEC 60079-0:2017 clause 22)

Not applicable, the product is neither a caplight nor a handlight.

3.24 Supplementary requirements for cells and batteries

(IEC 60079-0:2017 clause 23)

3.24.1 General

(IEC 60079-0:2017 clause 23.1)

There is only one cell used:

RF Module	Manufacturer / Type	Technical specification	Conformity standard
Battery pack	Veken Technology Co., Ltd(for Sonim), BAT-05000-01S	Rechargeable Li-ion Polymer Battery Pack, rated 3.87Vdc, 4850mAh.	UL 2054& 62368 UL file MH49774
Cell	Veken Technology Co., Ltd, 575980PV Positive electrode: (LCO) LiCoO2 Lithium Cobalt Oxide	One Li-ion cell, rated 3.87Vdc, 4880mAh. Nominal voltage: 3.87V (3.6V per IEC 60079-0: 2017 Table 14, however, manufacturer's data reflects a	UL1642 MH10118

RF Module	Manufacturer / Type	Technical specification	Conformity standard
	Negative electrode: Carbon	higher voltage, hence 3.87V used for all assessments (e.g. temperature) as most onerous consideration, except spark hazard assessment) Maximum open circuit voltage: 4.45V (4.2V per IEC 60079-0: 2017 Table 14, however, manufacturer's data reflects a higher charging voltage, hence 4.45V used for spark hazard assessment)	

There is no voltage source inside the equipment to charge the cell/battery.

The equipment shall only be charged when in non-hazardous area using an adaptor specifically supplied with the unit, approved as SELV equipment complying with the IEC 62368, or a technically equivalent standard. Conditions provided in sections 1.12.

3.24.2 Interconnection of cells to form batteries

(IEC 60079-0:2017 clause 23.2)

Excluded by EN 60079-11:2012 Table 1.

3.24.3 Cell types

(IEC 60079-0:2017 clause 23.3)

Refer to section 3.24.1.

3.24.4 Cells in a battery

(IEC 60079-0:2017 clause 23.4)

There is only one cell.

3.24.5 Ratings of batteries

(IEC 60079-0:2017 clause 23.5)

Battery SPEC sheet confirmed maximum charging voltage 4.45Vdc, and maximum charging current 3.395A. Battery BAT-05000-01S manufacturer Veken Technology Co., Ltd (for Sonim) also confirmed that the integrate U3300 (SGM41542YTQF24G/TR) limits charging voltage from 12V to 4.45V. Therefore, output rating U_m=12V, I_m=3A meets both cell and battery SPECs as well.

3.24.6 Interchangeability

(IEC 60079-0:2017 clause 23.6)

Only one secondary cell is used in the product. Interchangeability is not possible.

3.24.7 Charging of primary batteries

(IEC 60079-0:2017 clause 23.7)

There are no primary batteries.

3.24.8 Leakage

(IEC 60079-0:2017 clause 23.8)

There was no leakage during type tests.

3.24.9 Connections
(IEC 60079-0:2017 clause 23.9)

The connections are in accordance with the manufacturer's recommendations.

3.24.10 Orientation
(IEC 60079-0:2017 clause 23.10)

The cell is factory installed and the battery pack is so constructed without possibility to be installed incorrectly with the equipment.

3.24.11 Replacement of cells or batteries
(IEC 60079-0:2017 clause 23.11)

The relevant parameters of the battery are marked inside the battery enclosure and also detailed in the manufacturer's instructions.

3.24.12 Replaceable battery pack
(IEC 60079-0:2017 clause 23.12)

The replaceable battery pack is located completely inside the equipment enclosure and the battery manufacturer, battery size and nominal voltage is marked on the internal of the battery cover. A warning "Use only BAT-05000-01S" in the product is provided.

3.25 Thermal shock test
(IEC 60079-0:2017 clause 26.5.2)

Refer to section 2.2.3. No visible damage on the glass.

3.26 Marking requirements, including warning markings
(IEC 60079-0:2017 clause 29)

Refer to section 1.8.

3.27 Instructions, including live maintenance procedures
(IEC 60079-0:2017 clause 30)

An extract of controlled user manual has been checked and found to comply with IEC 60079-0:2017 clause 30. A copy of the reviewed document is retained in the electronic project file.

3.28 Thermal ignition assessment and tests
(IEC 60079-0:2017 clause 5.3; IEC 60079-11:2011 clause 5.6)

The upper service temperature is +55°C. The envisaged application does not indicate external heat sources are present, but it is the responsibility of the installer to locate the module where its service range will not be exceeded. Under the range of ambient temperature, the surface temperature of the components, wiring and tracks is evaluated as follows.

3.28.1 Enclosure external temperature assessments and tests
(IEC 60079-0:2017 clause 5.3)

Refer to section 2.2.1, the maximum measured surface temperature was 84.6 °C under the maximum ambient 55 °C, and adding a 5K safety factor, the maximum surface temperature was 89.6°C. The equipment complies with T4 temperature class.

3.28.2 Service temperature determination and assessment
(IEC 60079-0:2017 clauses 5.2 & 26.5.1.2)

Refer to section 2.2.1, the measured maximum service temperature was 71.15°C.

3.28.3 Maximum internal component temperature
(IEC 60079-0:2017 clause 5.3.3; IEC 60079-11:2011 clause 5.6)

Refer to section 2.2.1, the maximum measured surface temperature was 84.6 °C at the maximum ambient 55 °C, and adding a 5K safety factor, the maximum surface temperature was 89.6°C. The equipment complies with T4 temperature class.

3.28.4 Wiring temperature assessment and tests
(IEC 60079-11:2011 clause 5.6.3)

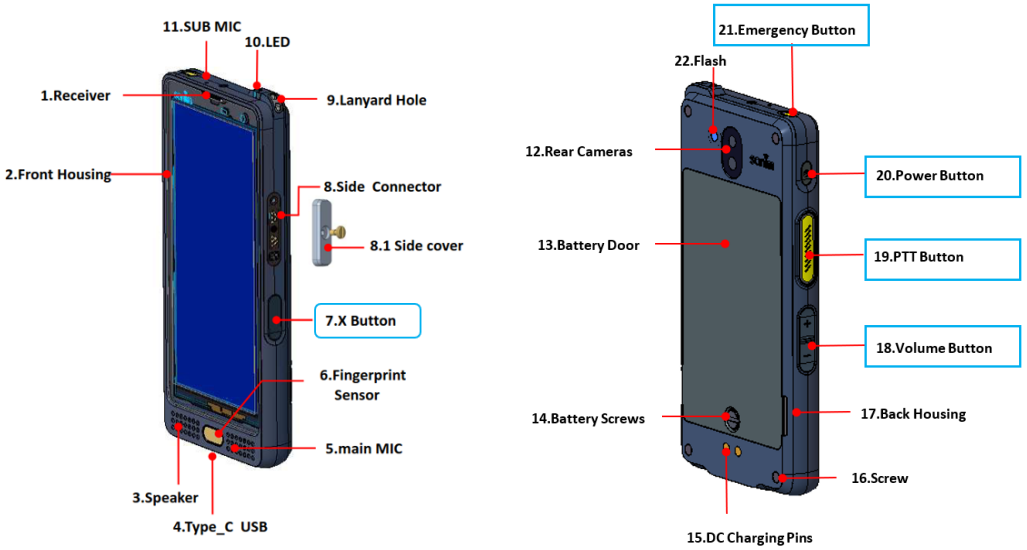
No wiring is used.

3.28.5 Printed board tracks assessment and tests
(IEC 60079-11:2011 clause 5.6.4)

Refer to section 2.2.1**Error! Reference source not found.**, the measured maximum surface temperature was 89.6°C during testing which was considered the tracks, much less than T4 requested 135°C.

4 Assessment against IEC 60079-11

The product is a mobile phone supplied by a rechargeable battery pack, intended to be used in Zone 2 EPL Gc and Zone 22 EPL Dc, protected by level of protection 'ic' per IEC 60079-11:2011. For level of protection 'ic', it is considered the unit operates in normal operation and under the conditions specified in this standard. Hence normal spark route(s) on this unit are to be identified:



- External:
  There are total 5 user accessible push buttons (No 7, 18, 19, 20, 21)

  For other user accessible ports: Type-C USB, DC charging Pins and Secure Audio connector are not allowed to be used in hazardous location by Specific Conditions of Use addressed in section 1.12

- Internal:
  None. Sonim had concurred that there are no make and break components inside the unit. Also, the unit has no fan.

Thus, only external push buttons and connectors are identified as normal sparking routes, and furtherly assessed for spark safe under normal operations in subsequent sections.

4.1 Protection against polarity reversal

(IEC 60079-11:2011 clause 6.4)

In the hazardous area, the equipment is supplied from an internal battery, the battery pack is so constructed without possibility to be installed incorrectly with the equipment, therefore there is no possibility for reverse polarity connection during normal use of this equipment.

4.2 Sources of power

4.2.1 Rechargeable cell

The main source of power in a hazardous area is from a rechargeable cell, model BAT-05000-01S, manufactured by from Veken Technology Co., Ltd. The cell has a stated nominal voltage of 3.87Vdc and charge limited voltage of 4.45V, which are greater than the values from IEC 60079-0:2017 Table 14, therefore, following parameters will be used for assessment:

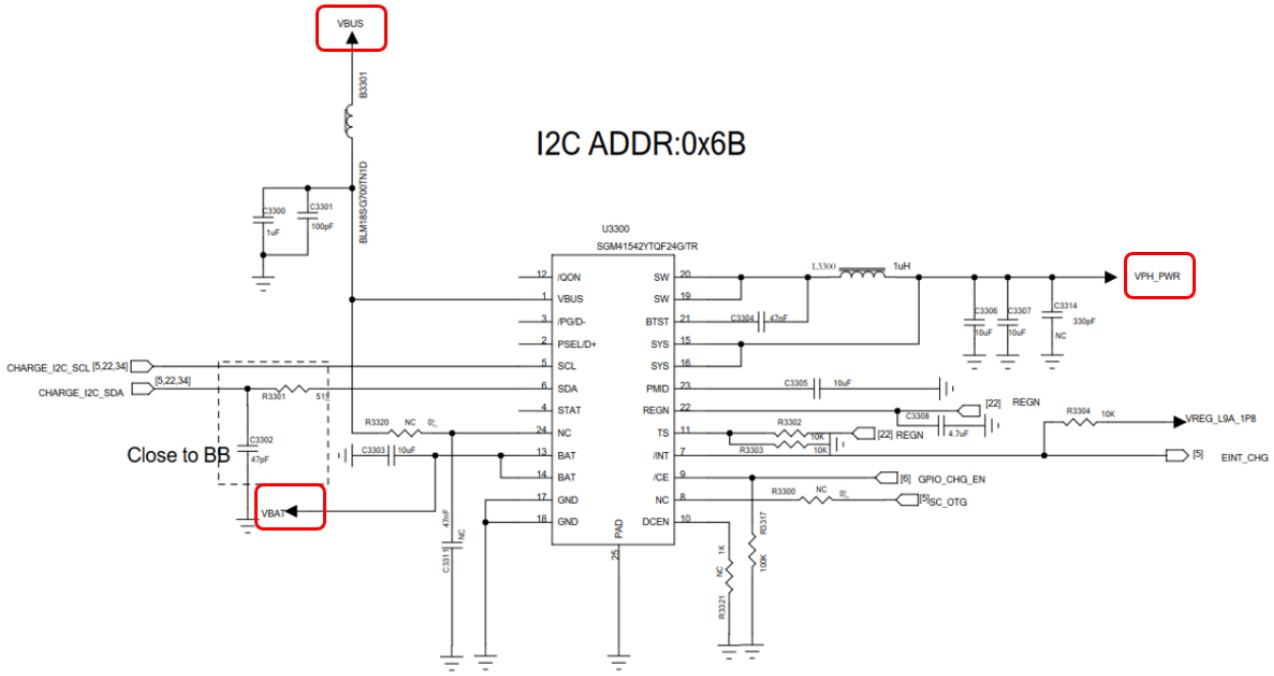
- Peak voltage for spark assessment = 4.45 V
- Nominal voltage for power assessment = 3.87 V

The operating temperature of cell/battery is stated as -20°C to +60°C, which can cover the ambient range of this certification.

4.2.2 External charger

The charger (Um:12V) is only permitted to be connected in the non-hazardous area, Charge voltage 12V is reduced by U3300 to 4.45V. Hence, U3300 is considered as a safety component.

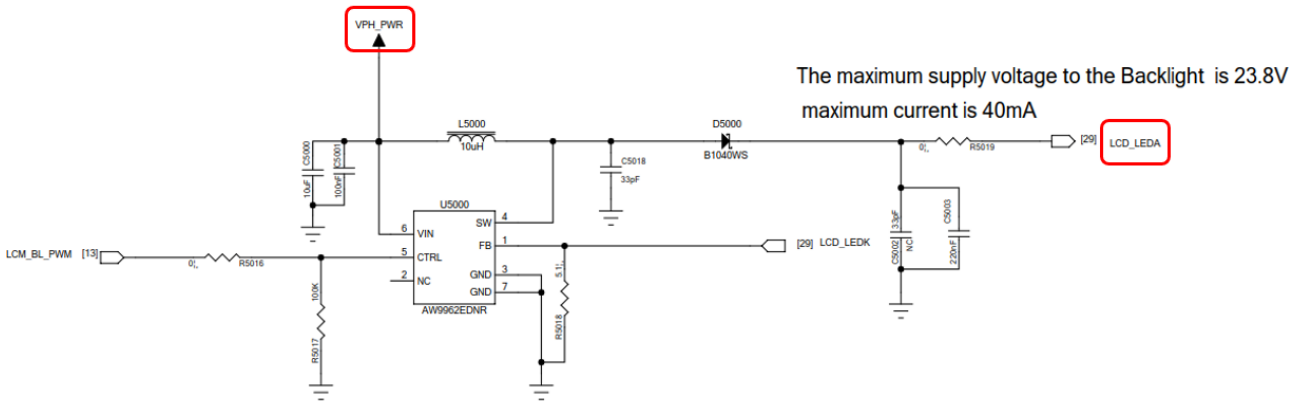
Refer to sheet 22 of EX-9900-07-01 Schematic, U3300 is a power management IC, the VBUS (pins 1) is connected to charger, and VBAT (pins 13, 14) is connected to battery. It can prevent the battery from discharging at the charger connector. When in the hazardous, the output voltage of VPH_PWR is equal to the voltage of VBAT which comes from the battery.



4.3 Source of potential voltage enhancement

4.3.1 U5000 (For LCD Backlight)

Refer to sheet 29 of EX-9900-07-01 Schematic as below. U5000 is a LED driver with integrated boost converter. The data sheet is held in the “components” folder under the project number 80105505.

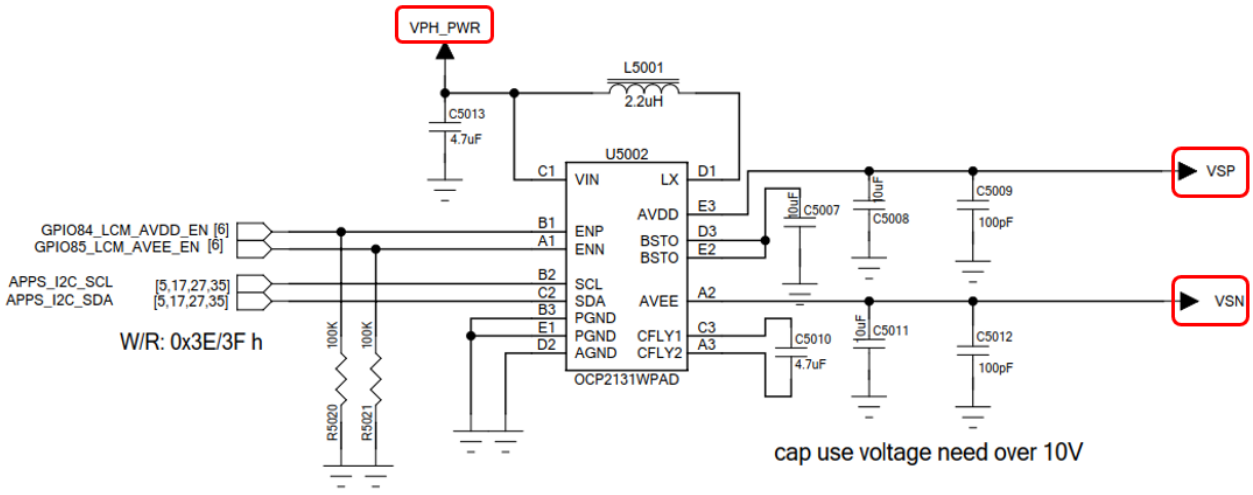


The supply VIN (pin 6) is from VPH_PWR, which is charged from the battery voltage. Refer to the figure as above, the maximum voltage of output SW (pin 4) is 23.8V during normal operation. And the datasheet of U5000 specified that the maximum voltage on SW (PIN 4) is 40V.

The maximum voltage permitted for U5000 is greater than U=4.45V (maximum open voltage of battery pack), it is considered as a safety component, refer to section 4.11. Refer to section 4.12, it demonstrates that +40V voltage cannot affect other circuit on the main board.

4.3.2 U5002 (For LCD BIAS)

Refer to sheet 29 of EX-9900-07-01 Schematic as below. U5002(OCP2131) is a programmable Dual Output LCD Bias for smartphone. The data sheet is held in the “components” folder under the project number 80105505.

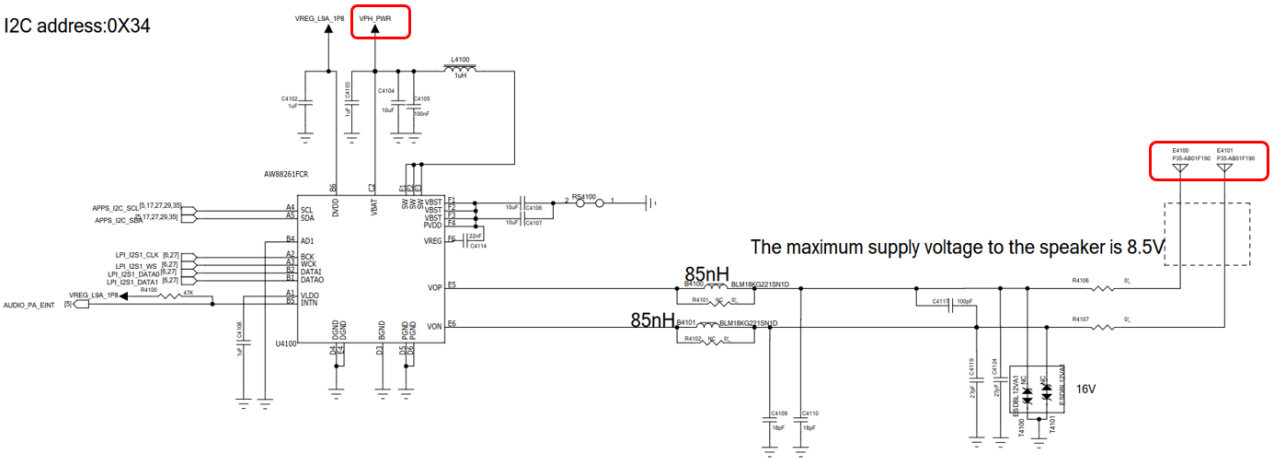


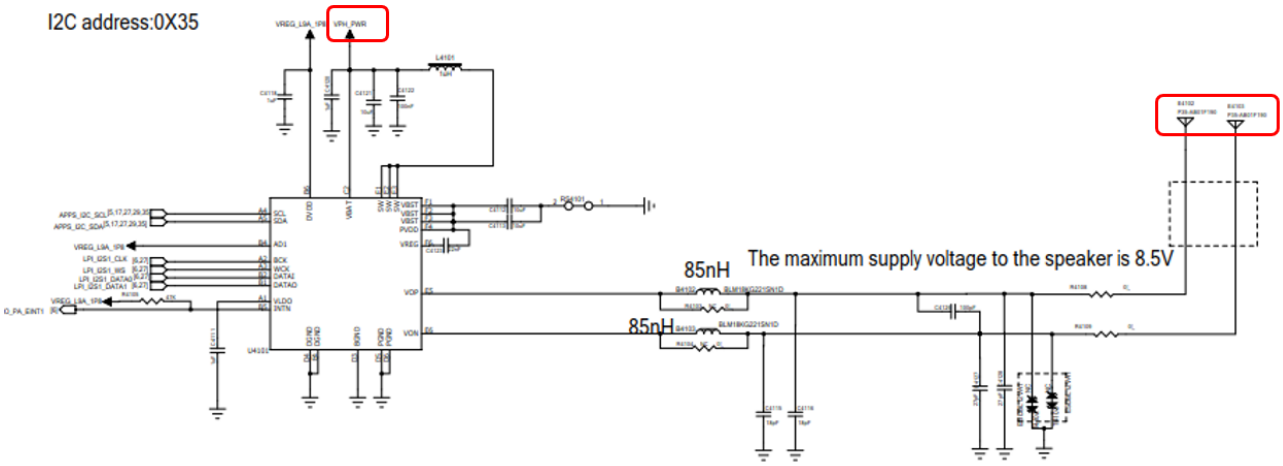
The supply VIN (pin C1) is from VPH_PWR, which is changed from the battery voltage. Refer to the figure as above, the maximum voltage of output between the pin VSP (AVDD) and VSN(AVEE) is 10V during normal operation. And the datasheet of U5000 specified that the maximum voltage between the pin VSP (AVDD) and VSN(AVEE) is 12V.

The maximum voltage permitted for U5002 is greater than U=4.45V (maximum open voltage of battery pack), it is considered as a safety component refer to section 4.11. Refer to section 4.12, it demonstrates that +40V voltage cannot affect other circuit on the main board.

4.3.3 U4100/U4101 (For Speaker)

Refer to sheet 27 of EX-9900-07-01 Schematic as below. U4100/U4101 (AW88261) is an audio amplifier with an integrated smart boost converter. The data sheet is held in the “components” folder under the project number 80105505.



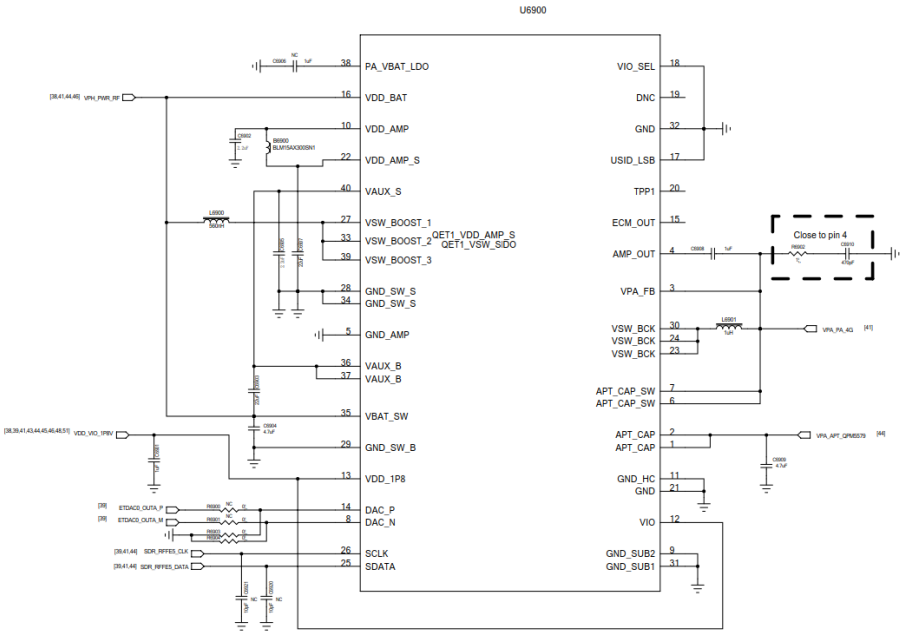


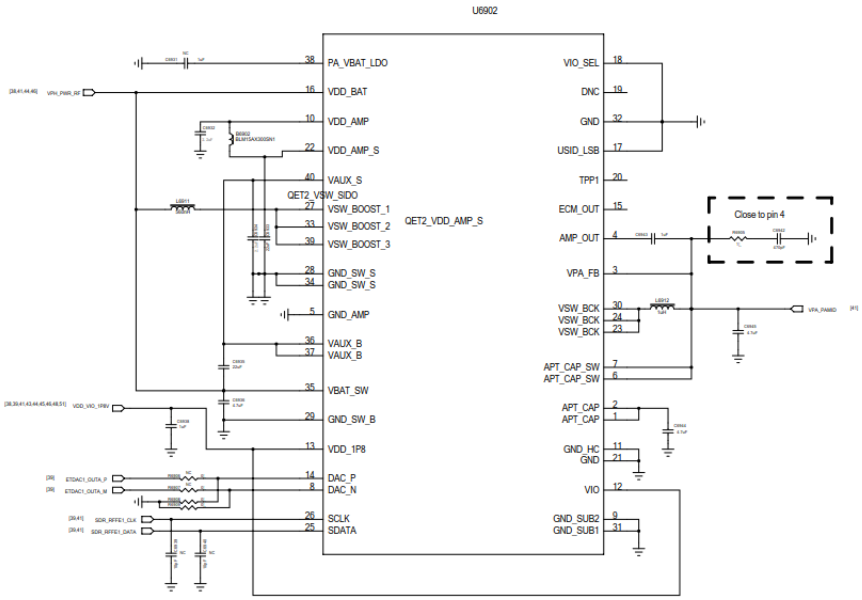
The supply VBAT (pin C2) is from VPH_PWR, which is changed from the battery voltage. The maximum voltage to speaker is 8.5V during normal operation. The specification of the U4100 shows the maximum permitted voltage of output is 13V.

The maximum voltage permitted for U4100/U4101 is greater than U=4.45V (maximum open voltage of battery pack), it is considered as a safety component, refer to section 4.11. Refer to section 4.12, it demonstrates that +40V voltage cannot affect other circuit on the main board.

4.3.4 U6900/U6902

Refer to sheet 46 of EX-9900-07-01 Schematic as below. U6900/U6902 (QET-5100) is an audio amplifier with an integrated smart boost converter. The data sheet is held in the “components” folder under the project number 80105505.





The supply VBAT (pin C2) is from VPH_PWR, which is changed from the battery voltage. Refer to the figure as above, the maximum output voltage (pin 1 &2) is 5V during normal operation, and the specification of chips U6900/U6902 shows the maximum permitted output voltage is 5.5V,

The maximum voltage permitted for U6900/U6902 is greater than U=4.45V (maximum open voltage of battery pack), it is considered as a safety component refer to section 4.11. Refer to section 4.12, it demonstrates that +40V voltage cannot affect other circuit on the main board.

4.4 Intrinsic safe assessment

The product included following external buttons which may produce spark during normal operation:

- Power Button
- Volume Button
- PTT Button
- Emergency Button
- X Button

4.4.1 Apparatus supply and input/output parameters

(IEC 60079-11:2011 clauses 5.5 & 10.1)

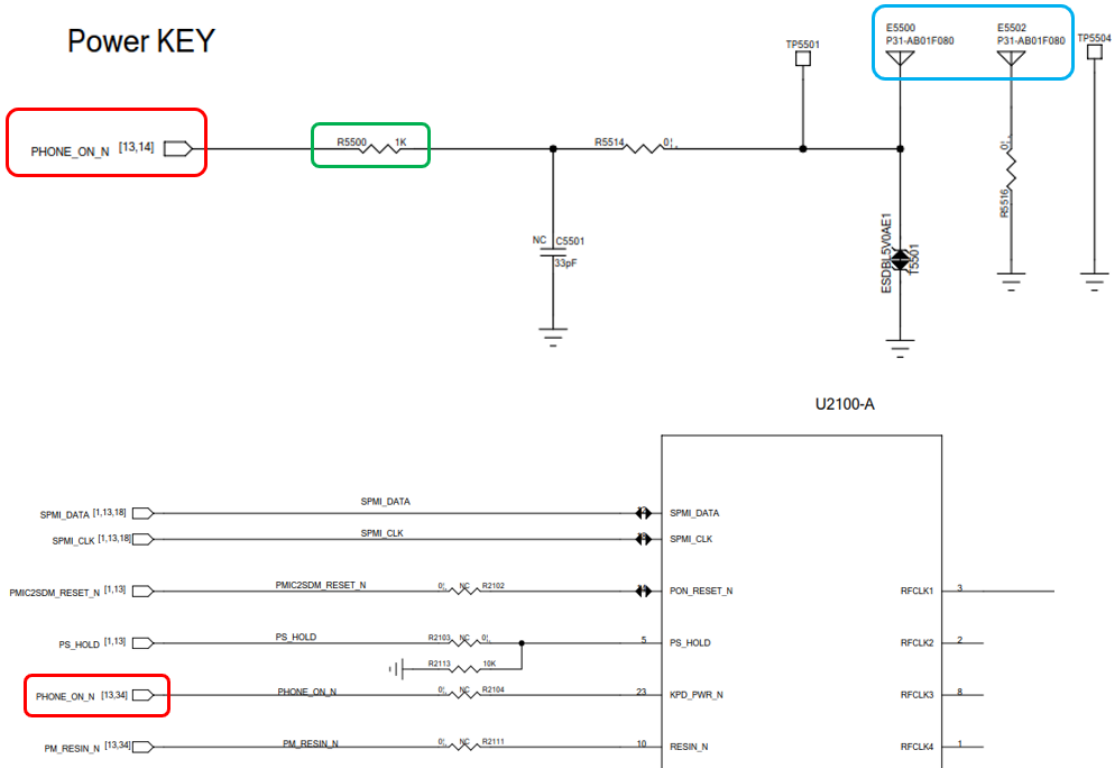
There are no inputs or outputs to be considered in this assessment.

4.4.2 Power Button (E5500 & E5502)

4.4.2.1 Resistive spark ignition assessment and tests

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A, Figure A.1 & Table A.1)

The power circuit into the Power button are described in drawing EX-9900-07-01 which are shown as below:



The Power button is supplied from pin 23 of chip U2100-A through a resistor R5500 (1KΩ, 5%) (Refer to drawing “EX-9900-07-01”, sheet 12 & 34), the maximum voltage into the power key is less than the battery voltage 4.45V, so the maximum available current to the power key under normal operation is 4.45Vdc/ [(1000*0.95)] =4.68mA. This is significantly lower than the limitation according to IEC 60079-11:2011 Table A.1 for level of protection ‘ic’ with safety factor 1.0.

Note: The supply power of U2100 is 1.8V which comes from the U2200, the U2200 is powered by battery pack single cell with peak voltage 4.45Vdc, which is directly taken as maximum voltage when assessment.

4.4.2.2 Capacitive spark ignition assessment

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A, Figures A.2 & A.3 and Table A.2)

There is no capacitor directly connected (protected by R5500), so the circuit where the button is located is considered capacitively safe.

4.4.2.3 Inductive spark ignition assessment and tests

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A)

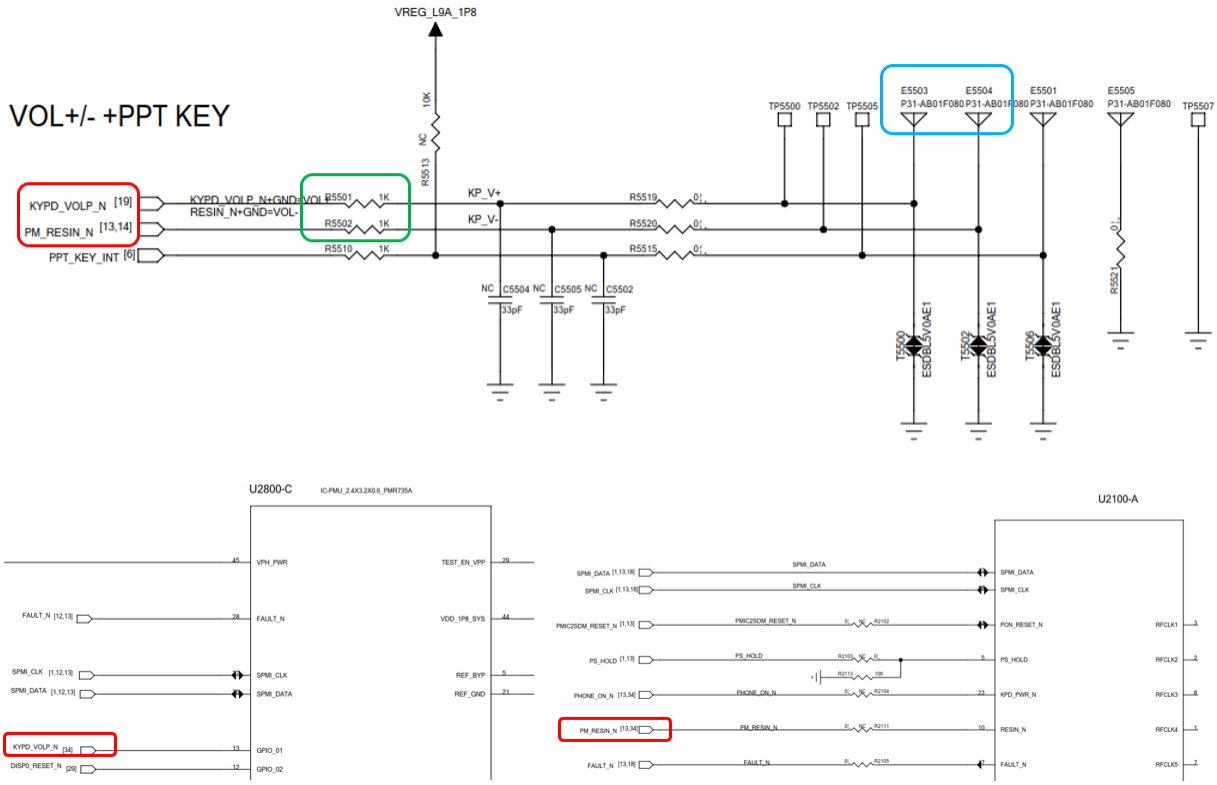
There is no inductor connected to the button, so the circuit where the button is located is considered inductively safe.

4.4.3 Volume Button (E5503 & E5504)

4.4.3.1 Resistive spark ignition assessment and tests

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A, Figure A.1 & Table A.1)

The power circuit into the Volume button are described in drawing EX-9900-07-01 which are shown as below:



The Volume up button is supplied from pin 13 of chip U2800-C through a resistor R5501 (1KΩ, 5%)(Refer to drawing “EX-9900-07-01”, sheet 18 & 34), volume down button is supplied from pin 10 of chip U2100-A through a resistor R5502 (1KΩ, 5%), (Refer to drawing “EX-9900-07-01”, sheet 12 & 34), the maximum voltage into the Volume key is less than the battery voltage 4.45V, so the maximum available current to the Volume under normal operation is 4.45Vdc/ [(1000*0.95)] =4.68mA. This is significantly lower than the limitation according to IEC 60079-11:2011 Table A.1 for level of protection ‘ic’ with safety factor 1.0.

Note: The supply power of U2100 is 1.8V which comes from the U2200, the U2200 is powered by battery pack single cell with peak voltage 4.45Vdc, which is directly taken as maximum voltage when assessment. The supply power of U2800 is VPH_PWR which is changer from the battery.

4.4.3.2 Capacitive spark ignition assessment

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A, Figures A.2 & A.3 and Table A.2)

There is no capacitor directly connected (protected by R5501 and R5502) to the buttons, so the circuit where the buttons are located is considered capacitively safe.

4.4.3.3 Inductive spark ignition assessment and tests

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A)

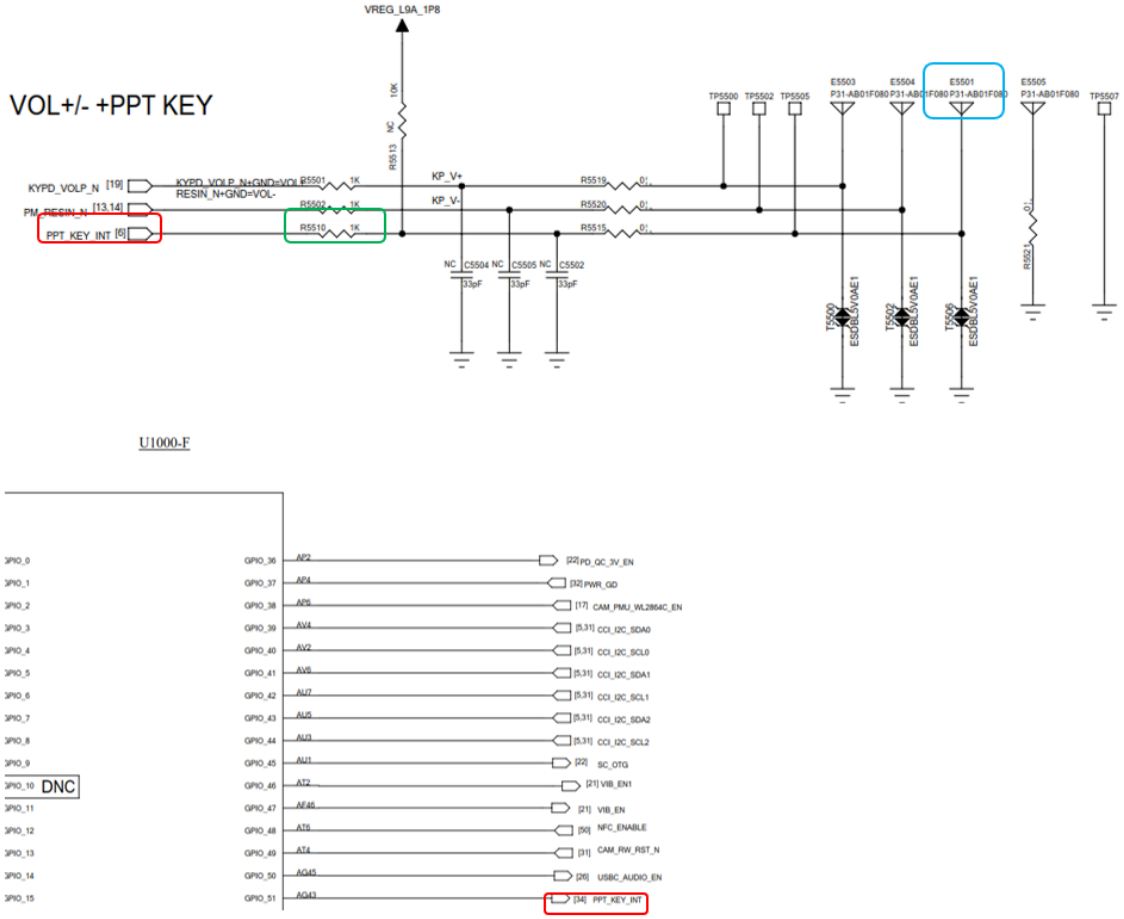
There is no inductor connected to the buttons, so the circuit where the buttons are located is considered inductively safe.

4.4.4 PPT Button (E5501)

4.4.4.1 Resistive spark ignition assessment and tests

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A, Figure A.1 & Table A.1)

The power circuit into the PPT button are described in drawing EX-9900-07-01 which are shown as below:



The PPT button is supplied from pin GPIO_51 of chip U1000-F through a resistor R5510 (1KΩ, 5%) (Refer to drawing “EX-9900-07-01”, sheet 5 & 34), the maximum voltage into the PPT key is less than the battery voltage 4.45V, so the maximum available current to the PPT key under normal operation is 4.45Vdc/ [(1000*0.95)] =4.68mA. This is significantly lower than the limitation according to IEC 60079-11:2011 Table A.1 for level of protection ‘ic’ with safety factor 1.0.

Note: U1000 is a mobile CPU and is powered by battery pack single cell with peak voltage 4.45Vdc. And is directly taken as maximum voltage when individual pin-voltage is unknown.

4.4.4.2 Capacitive spark ignition assessment

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A, Figures A.2 & A.3 and Table A.2)

There is no capacitor directly connected (protected by R5510) to the buttons, so the circuit where the buttons are located is considered capacitively safe.

4.4.4.3 Inductive spark ignition assessment and tests

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A)

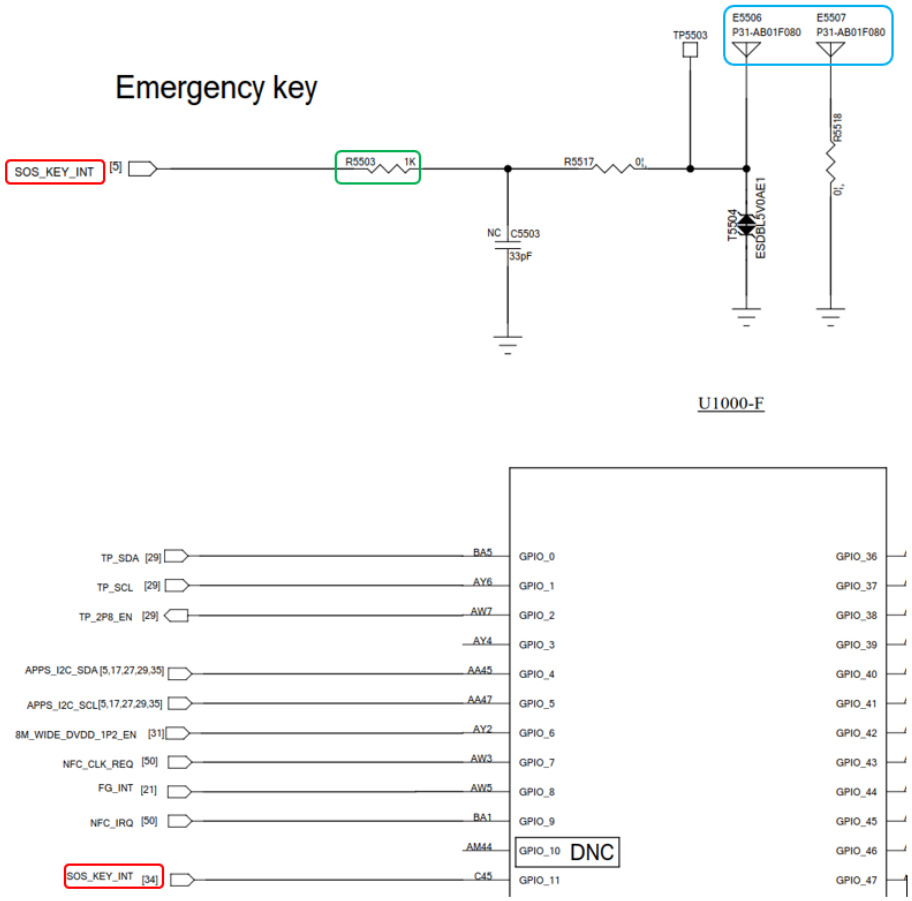
There is no inductor connected to the buttons, so the circuit where the buttons are located is considered inductively safe.

4.4.5 Emergency Button (E5506 & E5507)

4.4.5.1 Resistive spark ignition assessment and tests

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A, Figure A.1 & Table A.1)

The power circuit into the Emergency button are described in drawing EX-9900-07-01 which are shown as below:



The Emergency button is supplied from pin GPIO_11 of chip U1000-F through a resistor R5503 (1KΩ, 5%) (Refer to drawing “EX-9900-07-01”, sheet 5 & 34), the maximum voltage into the Emergency key is less than the battery voltage 4.45V, so the maximum available current to the Emergency key under normal operation is 4.45Vdc/ [(1000*0.95)] =4.65mA. This is significantly lower than the limitation according to IEC 60079-11:2011 Table A.1 for level of protection ‘ic’ with safety factor 1.0.

Note: U1000 is a mobile CPU and is powered by battery pack single cell with peak voltage 4.45Vdc. And is directly taken as maximum voltage when individual pin-voltage is unknown.

4.4.5.2 Capacitive spark ignition assessment

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A, Figures A.2 & A.3 and Table A.2)

There is no capacitor directly connected (protected by R5503) to the buttons, so the circuit where the buttons are located is considered capacitively safe.

4.4.5.3 Inductive spark ignition assessment and tests

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A)

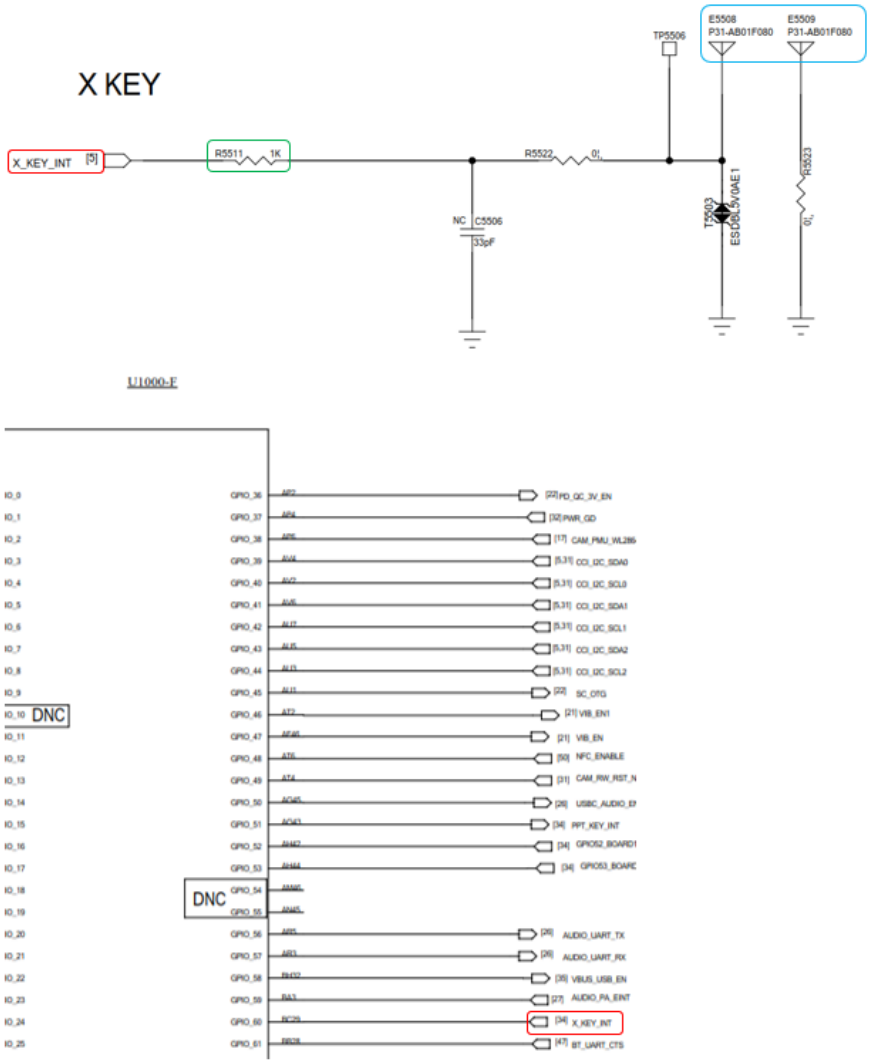
There is no inductor connected to the buttons, so the circuit where the buttons are located is considered inductively safe.

4.4.6 X Button (E5508 & E5509)

4.4.6.1 Resistive spark ignition assessment and tests

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A, Figure A.1 & Table A.1)

The power circuit into the X button are described in drawing EX-9900-07-01 which are shown as below:



The X button is supplied from pin GPIO_60 of chip U1000-F through a resistor R5511 (1KΩ, 5%) (Refer to drawing “EX-9900-07-01”, sheet 5 & 34), the maximum voltage into the X key is less than the battery voltage 4.45V, so the maximum available current to the X key under normal operation is 4.45Vdc/ [(1000*0.95)] =4.65mA. This is significantly lower than the limitation according to IEC 60079-11:2011 Table A.1 for level of protection ‘ic’ with safety factor 1.0.

Note: U1000 is a mobile CPU and is powered by battery pack single cell with peak voltage 4.45Vdc. And is directly taken as maximum voltage when individual pin-voltage is unknown.

4.4.6.2 Capacitive spark ignition assessment

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A, Figures A.2 & A.3 and Table A.2)

There is no capacitor directly connected (protected by R5511) to the buttons, so the circuit where the buttons are located is considered capacitively safe.

4.4.6.3 Inductive spark ignition assessment and tests

(IEC 60079-11:2011 clauses 5.5 & 10.1, Annex A)

There is no inductor connected to the buttons, so the circuit where the buttons are located is considered inductively safe.

4.4.7 External Terminals

There are three external connections, included a DC changing pins, a Type-C USB port and a Secure Audio connector on the enclosure.
For Type-C USB port, according to the USB design document, the Type-C port is protected by a USB Cap, and the overlapping design to ensure the cap being locked and sealed, and the USB cap is fixed by screw. During the IP test, there is no dust and water ingress to Type-C USB port. This external connection is not allowed to be used in hazardous location by Specific Conditions of Use addressed in section 1.12.

According to the drawing EX-9900-07-01, Secure Audio connector and DC charging pins are protected by the safety components listed as follows:

Item	Connector No.	Used for connection to	Electrical parameters come from which chip
Secure Audio Connector	E4000, E4004, E4009	GND	None
	E4001, E4002	Left/Right channel of Secure Audio	U4200, U1000, U3300, U3302
	E4003	MIC of Secure Audio	U4001, U1000, U4200
	E4005	Power for Secure Audio	U3300, U1000
	E4006, E4007	UART_RX/TX for Secure Audio	U1000
	E4008	HSDET	R4024, U4200
DC charging Pins	TP5302	DC charging positive pole	Q5300, Q5301, U3300
	TP5303	DC charging negative pole	None

Note 1: Electrical parameters for E4001 and E4002 come from the chips U4200 and U5601, since the chip U5601(AS3UA6480CR) is a switch IC which cannot limit the power form the product, the components U1000, U3300, J5600 and U3302 are connected to U5601. Except for the J5600 which is a connector, the other chips are considered as safety components.

In additional, spark ignition tests were conducted on DC charging Pins and Secure Audio connector, refer to section 2.3.1 for detailed information. The safety distance assessment of table 5 refer to section 4.12.

4.4.8 Cell spark ignition test

(IEC 60079-11:2011 clauses 5.5 & 10.5.3)

The apparatus contains one cell that shall not be changed in the explosive atmosphere and the single cell delivers a peak open-circuit voltage of less than 4.5V, so no spark test of the cell is required.

4.5 Circuits with both inductance and capacitance

(IEC 60079-11:2011 clauses 5.5, 10.1.5.2 & Annex A)

Based on analysis of section 4.4, no combination of inductance and capacitance is considered for all external buttons.

4.6 Let-through energy assessment and tests

(IEC 60079-11:2011 clause 10.1.5.3 & Annex E)

Not applicable. The product is not associated apparatus.

4.7 Connections when located in the non-hazardous area

(IEC 60079-11:2011 clause 6.2.5)

A Specific Condition of Use and Conditions applicable to Manufacturer (See section 1.12 and 1.13) requires the user to connect the equipment only in non-hazardous areas and using a device approved as SELV equipment complying with the IEC 62368, or a technically equivalent standard.

4.8 Any other spark ignition assessments and tests

(IEC 60079-11:2011 clauses 5.5, 6.2.3, 10.1 & Annex A)

No other spark ignition assessment and test necessary.

4.9 Encapsulation

(IEC 60079-11:2011 clauses 6.6, 10.6.1 & 10.6.2)

Encapsulation is not used.

4.10 Thermal ignition assessment and tests

(IEC 60079-0:2017 clause 5.3; IEC 60079-11:2011 clause 5.6)

Refer to section 3.28.

4.11 Safety components

(IEC 60079-11:2012 clause 8)

4.11.1 Transformers

(IEC 60079-11:2012 clause 8.2, 10.10 & 11.2)

The Equipment assembly does not contain transformers.

4.11.2 Resistors

(IEC 60079-11:2012 clause 8.5)

Refer to section 4.11.9.

4.11.3 Blocking and filter capacitors

(IEC 60079-11:2012 clause 8.6)

No blocking or filter capacitors.

4.11.4 Semiconductors

(IEC 60079-11:2012 clauses 7.5 & 8.7)

4.11.4.1 U3300

U3300 (SGM41542YTQF24G/TR) can prevent the cell from discharging at the charger connector, the input of the charger is 5.0Vdc/3.0A or 9.0Vdc/2.0A or 12.0Vdc/1.5A. Following is an extract from the datasheet of U3300, the maximum permitted input voltage and current of U3300 are 13.5 and 3.4A. The charger parameters are Um=12V, Im=3A. 13.5V>12V, 3.4A>3A, and
P_{U3300}=12x1.5=18W,
$P_{\text{permitted U3300}}$=13.5x3.4=45.9W,
Therefore, the safety factor is 2.55 (45.9/18), greater than the standard requested 1.5.

Input Voltage Range, V_{VBUS} ..... 3.9V to 13.5V
Input Current (VBUS), I_{IN} ..... 3.4A (MAX)
Output DC Current (SW), I_{SWOP} ..... 3.25A (MAX)
Battery Voltage, V_{BATOP} ..... 4.624V (MAX)
Fast Charging Current, I_{BATOP} ..... 3.78A (MAX)

4.11.4.2 U5000

U5000 provides 40mA and 23.8V to the Backlight of the product. The permitted maximum voltage and current of U5500 is 40V and 200mA, obtained from following picture which is picked up from the specification of U5000 (AW9962EDNR). 40V>23.8V, 200mA>40mA and

P_{U5000} = 23.8V*40mA = 0.952W.

$P_{permitted\ U5000}$ = 40V*200mA = 8W,

So the safety factor is 8.4 (8/0.952), greater than the standard requested 1.5.

PARAMETERS	RANGE
Supply voltage range VIN(NOTE 2)	-0.3V to 6V
Voltage on FB,CTRL (NOTE 2)	-0.3V to 6V
Voltage on SW(NOTE 2)	-0.3V to 40V
Junction-to-ambient thermal resistance θ_{JA}	120°C/W
Operating free-air temperature range	-40°C to 85°C
Operating Junction temperature T_J	-40°C to 150°C
Storage temperature T_{STG}	-65°C to 150°C
Lead Temperature (Soldering 10 Seconds)	260°C
ESD(NOTE 3)	
ALL PINS HBM (human body model) (NOTE 4)	±2kV
ALL PINS CDM (charge device model) (NOTE 5)	±1.5kV
Latch-up(NOTE 6)	
Latch-up current maximum rating per JEDEC standard	+IT：200mA -IT：-200mA

4.11.4.3 U5002

U5002 provides 50mA and 5.6V to the LCD BIAS of the product. The permitted maximum voltage and current of U5002 is 6V and 120mA, obtained from following picture which is picked up from the specification of U5002 (OCP2131WPAD-G). 6V>5.6V, 120mA>50mA and

P_{U5002} = 5.6V*50mA = 0.28W,

$P_{permitted\ U5002}$ =6V*120mA=0.72W,

So the safety factor is 2.57 (0.72/0.28), greater than the standard requested 1.5.

Parameter	Symbol	Conditions	Rating	Unit
Supply Voltage	V_{IN}	Operating	2.7 ~ 5.5	V
Positive Output Voltage	V_{AVDD}	Operating	+4.0 ~ +6.0	V
Negative Output Voltage	V_{AVEE}	Operating	-4.0 ~ -6.0	V
Positive Output Current	I_{AVDD}	Operating	0 ~ 120	mA
Negative Output Current	I_{AVEE}	Operating	0 ~ 120	mA

4.11.4.4 U4100/U4101

U4100/U4101 provides 0.74A and 8.5V to the Speaker 1 and Speaker 2 respectively. The permitted maximum voltage and current of U4100/U4101 is 13V and 0.806A, obtained from following picture which is picked up from the specification of U4100/U4101 (AW88261FCR). 13V>8.5V, 0.806A>0.74A and

$P_{U4100/U4101}$ = 8.5V/$\sqrt{2}$*0.74A = 4.4W.

$P_{permitted\ U4100/U4101}$ =6.7W (from datasheet),

So the safety factor is 1.52 (6.7/4.4), greater than the standard requested 1.5.

Parameter	Range
Battery Supply Voltage V_{VBAT}	-0.3V to 6V
Digital Supply Voltage V_{DVDD}	-0.3V to 2V
Boost output voltage V_{PVDD}	-0.3 to 13V
Boost SW pin voltage	-0.3 to V_{PVDD} (Note 2)
VOP/VON pin voltage	-0.3 to V_{PVDD} (Note 2)
Minimum load resistance R_L	5Ω

Po	Speaker Output Power	THD+N=1%, R_L=8Ω+33μH, VBAT=4.2V, PVDD=10.25V		5.2		W
		THD+N=10%, R_L=8Ω+33μH, VBAT=4.2V, PVDD=10.25V		6.5		W
		THD+N=1%, R_L=6Ω+33μH, VBAT=4.2V, PVDD=10.25V		5.4		W
		THD+N=10%, R_L=6Ω+33μH, VBAT=4.2V, PVDD=10.25V		6.7		W

4.11.4.5 U6900/U6902

U6900/U6902 provides 5V/500mA or 3.5V/750mA to the MB4G PA, QPM5579 and LMHB LPAMID. The permitted maximum voltage and current of U6900/U6902 is 5.5V and 1.2A, obtained from following picture which is picked up from the specification of U6900/U6902 (QET-5100-0-40DWLNSP-TR-04-0). 5.5V>5V, 1.2A>750mA and

$P_{U6900/U6902}$ = 3.5*750mA = 2.625W.

$P_{permitted\ U6900/U6902}$ =5.5V*1.2A=6.6W,

So the safety factor is 2.5 (6.6/2.625), greater than the standard requested 1.5.

Parameter	Comments	Min	Typ	Max	Units
Output voltage	6.8 Ω load	0.6	–	5.5	V
Output voltage GSM	GSM APT	0.6	–	VBATT	V
Output voltage resolution	Difference between any two programmed voltage settings.	29.5	30	30.5	mV
Output voltage accuracy	Mean V_{OUT} vs. programmed value				
PWM	6.8 Ω load	-5	–	5	mV
PFM	10 mA load	-20	–	20	mV
3G/4G load current	VBATT = 3.7 V; $V_{OUT} \leq$ 5.5 V	–	–	1200	mA

4.11.4.6 Q5300/Q5301

Q5300/Q5301 consumes 5.5V and 2A during normal operation. The permitted maximum voltage and current of Q5300/Q5301 is 12V and 3A at least, obtained from following picture which is picked up from the specification of Q5300/Q5301 (WPM1481-6/TR). 12V>4.45V, 3A>2A and

$P_{Q5300/Q5301}$ = 5.5*2A = 11W.

$P_{permitted\ Q5300/Q5301}$ =12V*3A=36W,

So, the safety factor is 3.2 (36/11), greater than the standard requested 1.5.

Absolute Maximum ratings

Parameter		Symbol	10 S	Steady State	Unit
Drain-Source Voltage		V_{DS}	-12		V
Gate-Source Voltage		V_{GS}	±12		
Continuous Drain Current [a d]	T_A=25°C	I_D	-5.1	-4.3	A
	T_A=70°C		-4.0	-3.4	
Maximum Power Dissipation [a d]	T_A=25°C	P_D	1.9	1.4	W
	T_A=70°C		1.2	0.9	
Continuous Drain Current [b d]	T_A=25°C	I_D	-3.7	-3.0	A
	T_A=70°C		-3.0	-2.4	

4.11.4.7 U4200

U4200 consumes 3.8V/1.1mA and 1.8V/153mA during normal operation. The permitted maximum voltage and current of 4200 is 4.6V/45mA and 1.9V/680mA, obtained from following picture which is picked up from the specification of U4200 (WCD9370). 4.6V>3.8V, 45mA>1.1mA and 1.9V>1.8V, 680mA >153mA and
P_{U4200} = 3.8*1.1mA+1.8*153mA = 280mW.
$P_{permitted\ U4200}$ =4.6*45mA+1.9*680mA =1499mW,
So, the safety factor is 5.3 (1499/280), greater than the standard requested 1.5.

Parameter	Description	Min	Typ	Max	Units
Power supply voltages					
VDD_MIC_BIAS	Power for the LDO and microphone bias circuits	3.15	3.80	4.60	V

Parameter	Conditions	Min	Typ	Max	Units
VDD_MIC_BIAS	Power for the LDO and microphone bias circuits	–	–	45	mA
VDD_TXRX [1]	Power for analog audio output/input circuits	–	–	10	mA
VDD_BUCK	Power for buck SMPS	–	–	650	mA
VDD_PX [1]	Power for digital I/O pads	–	–	20	mA

4.11.4.8 U1000

U1000 consumes 1.8V/0.25A and 0.75V/3A. The permitted maximum voltage and power of U1000 is 2.09V and 4.35W, obtained from following picture which is picked up from the specification of U1000 (SM4350).
1.9V>1.8V and 0.75V=0.75V, and
P_{U1000} = 1.8V*0.25+0.75*3=2.7W.
$P_{permitted\ U1000}$ =4.35W (from datasheet),
So the safety factor is 6.2 (4.35/2.7), greater than the standard requested 1.5.

SDM version	Octa core – 2X Gold at 2.2 GHz and 6X Silver at 1.9 GHz, Dhrystone (W) at +95°C (Tj) [1 2 3]
SM4350-AC	4.35 W

Table 3-1 Absolute maximum ratings (cont.)

Power supply	Description	Min	Max	Unit
VDD_PX3	Pad group 3	-0.3	2.09	V

4.11.4.9 U3302

U3302 consumes 3V and 5mA during normal operation, the permitted maximum voltage and current of U3302 is 7V/200mA, obtained from following picture which is picked up from the specification of U3302 (Z350). 7V>3V, 200mA>5mA and
P_{U3302} = 3V*5mA = 15mW.
$P_{permitted\ U3302}$ =7V*200mA =1400mW,
So the safety factor is 93 (1400/15), greater than the standard requested 1.5.

7. Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Supply voltage VCC pin	VCC	-0.3 ~ 7.0	V
DP, DM Input Voltage Range	V_{DP}, V_{DM}	-0.3~7.0	V
VIN, SDA, SCL and RESET Input Voltage Range	V_{INPUT}	-0.3 to VCC + 0.3	V
INTB pin Output voltage	V_{OUTPUT}	-0.3 to VCC + 0.3	V
Human Body Model (HBM)	ESD	4	KV
Charge Device Mode (CDM)	V_{CDM}	500	V
Latch-up current	I_{LU}	200	mA
Maximum junction temperature	T_{JMAX}	125	℃
Storage Temperature Range	Tstg	-60 ~ 150	℃
Thermal resistance (junction to air)	θ_{JA}		℃/W

4.11.4.10 U4001

U4001 consumes 3.6V and 0.6W during normal operation. The permitted maximum voltage and power of U4001 is 6V and 2.64W, obtained from following picture which is picked up from the specification of U4001 (AW87318FCR). 6V>3.6V and
P_{U4001} = 0.6W(from datasheet).
$P_{permitted\ U4001}$ =2.64W (from datasheet),
So the safety factor is 4.4 (2.64/0.6), greater than the standard requested 1.5.

Parameter	Range
Power Supply VDD Voltage	-0.3V to 6V

Parameter	Test Conditions	Min	Typ	Max	Unit
Mode2 Multi-Level AGC power	V_{DD}=4.2V, R_L=3Ω+15μH	2.16	2.4	2.64	W
Mode 8 output power	THD+N=1%, f=1kHz, R_L=8Ω+33μH, V_{DD}=3.6V		250		mW
Mode 9 output power	THD+N=1%, f=1kHz, R_L=8Ω+33μH, V_{DD}=3.6V		600		mW

4.11.5 Galvanically separating components

(IEC 60079-11:2011 clauses 8.9, & 10.11)

No galvanically separating components.

4.11.6 Relays

(IEC 60079-11:2011 clause 6.3.14)

No relays are used.

4.11.7 Fuses

(IEC 60079-11:2012 clauses 7.3 & 10.6.2)

No fuse is used in the product.

4.11.8 Infallible windings

(IEC 60079-11:2011 clause 8.4)

No infallible windings are used.

4.11.9 Ratings of safety components

(IEC 60079-11:2011 clause 7.1)

Where applicable, components are rated based on an ambient temperature of 55°C.

Designation	Description	Nominal rating (W1)	Max. in use (W2)	De-rating factor (W1/W2)	Comment/calculation
U3300	SGM41542YTQF 24G/TR	13.5V 3.4A 45.9W	12V 3A 18W	>1 >1 2.55	Refer to section 4.11.4
U5000	AW9962EDNR	40V 200mA 8W	23.8V 40mA 0.952W	>1 >1 8.4	Refer to section 4.11.4
U5002	OCP2131WPAD-G	6V 120mA 0.72W	5.6V 50mA 0.28W	>1 >1 2.57	Refer to section 4.11.4
U4100/U4101	AW88261FCR	13V 4A 6.7W	8.5V 0.748A 4.4W	>1 >1 1.52	Refer to section 4.11.4
U6900/U6902	QET-5100-0-40DWLNSP-TR-04-0	5.5V 1.2A 6.6W	3.5V 750mA 2.625W	>1 >1 2.5	Refer to section 4.11.4
Q5300/Q5301	WPM1481-6/TR	5.5V 2A 11W	12 3A 36W	>1 >1 3.2	Refer to section 4.11.4
U4200	WCD-9370-0-WLPSP55-TR-01-0	4.6V 680mA 1499mW	3.8V 158mA 280mW	>1 >1 5.3	Refer to section 4.11.4
U1000	SM-4350-2-PSP837-MT-01-0-AC	1.9V 2.7W	1.8V 4.35W	>1 6.2	Refer to section 4.11.4
U3302	Z350	7V 200mA 1.4W	3V 5mA 15mW	>1 >1 93	Refer to section 4.11.4

Designation	Description	Nominal rating (W1)	Max. in use (W2)	De-rating factor (W1/W2)	Comment/calculation
U4001	AW87318FCR	6V 2.64W	3.6V 0.6W	＞1 4.4	Refer to section 4.11.4
R4024	RES,100K ±5%, 1/20W, 0201	0.05W	0.21mW	238	$P=U^2R=4.45*4.45/(100000\Omega\times0.95)$ =0.21mW
R5500, R5501, R5502, R5503, R5510, R5511	RES, 1K ±5%, 1/20W, 0201	0.05W	0.021W	2.3	$P=U^2R=4.45*4.45/(1000\Omega\times0.95)$ =0.02W

IEC 60079-11:2011 clause 7.1 requires safety components to be used at no more than two-thirds of their rating, i.e. with a de-rating factor of at least 1.5. Where applicable, all the above safety components meet this criterion.

4.12 Separation distances and artwork assessment

(IEC 60079-11:2011 clause 6.3)

The product is designed to comply with Annex F. Enclosure meets conditioning, impact, drop and **Error! Reference source not found.** test requirements from IEC 60079-0 (Annex F.3.2). In the hazardous area, the equipment is only supplied from an internal battery, so the apparatus or external to the apparatus are limited to overvoltage category II as defined in IEC 60664-1. The rated voltage of the apparatus or the nominal voltage of any part of the apparatus being considered does not exceed 60V peak value, so no separation distance is required based on clause F.3.2 of IEC 60079-11:2011.

4.12.1 Printed circuit board, conformal coating

(IEC 60079-11:2011 clauses 6.3.9 & 6.3.10)

Not applicable, refer to section 4.12.

4.12.2 Infallible PCB tracks and connections

(IEC 60079-11:2011 clause 8.8)

Not applicable, refer to section 4.12.

4.13 Internal wiring

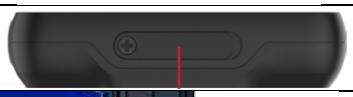
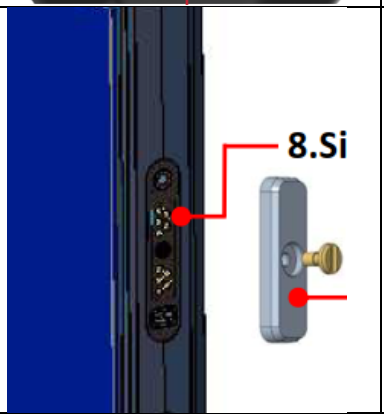
(IEC 60079-11:2011 clauses 6.3.12 and 8.8)

There is no internal wiring that is replied upon to maintain this type of protection.

4.14 Terminals

(IEC 60079-11:2011 Clause 6.2.1)

There are two external terminals on the enclosure, included a DC changing pins and a Type-C USB port on the enclosure, assessment shown as following.

Connection	Clearance(mm)	Separation distance through solid insulation (mm)	Creepage distance (mm)	verdict
Request in table 5 for Ex ic	0.8	0.2	1.3	N/A
	4.0	4.0	4.0	Pass
	0.25	0.25	0.25	Fail
	0.4	0.4	0.4	Fail

The USB connector was assessed in section 4.4.7. The DC charging Pins and Secure Audio connector were conducted spark ignition test, and no ignition occurred during the test, refer to section 2.3.1 for detailed information.

4.15 Plugs and sockets

(IEC 60079-11:2011 clause 6.2.2)

No such parts.

4.16 Connectors for internal connections, plug-in cards and components

(IEC 60079-11:2011 clause 7.2)

Refer to section 4.14.

4.17 Cells and batteries

(IEC 60079-11:2011 clause 7.4 & 10.5; IEC 60079-0:2017 clause 23)

XP9900 is applied for Ex ic, and encloses the battery in the **Error! Reference source not found.** enclosure, the battery voltage is less than 60V. Hence, no separation distance requirements additional to the general industrial standards are required.
Additionally, **Error! Reference source not found.** is considered enough to provide for the suitably protected charging circuit and there is a warning on the label, refer to item **Error! Reference source not found.** in the specific condition of use section.

4.17.1 Determination of charge capacity on discharge at normal load

(IEC 60079-11:2011 clause 10.5.1)

Tests were preceded by charge cycling for the cell, refer to section 2.2.1.

4.17.2 Electrolyte leakage during charge with one cell fully discharged or with polarity reversal

The test indicated there was no electrolyte leakage, refer to section 2.2.1.

4.17.3 Electrolyte leakage during discharge into short circuit

(IEC 60079-11:2011 clause 10.5.2)

Not applicable to Ex “ic”.

4.17.4 Determination of equivalent internal resistance

(IEC 60079-11:2011 clause 10.5.3)

The internal resistance of cell is not used.

4.17.5 Spark ignition assessment or test

(IEC 60079-11:2011 clause 10.5.3)

The cell forms part of a battery pack and is not intended for replacement in the hazardous area, in addition, the maximum open-circuit voltage of the single cell is 4.45V which is less than 4.5V, so no spark test of the cell is required.

4.17.6 Surface temperature test when short circuited

(IEC 60079-11:2011 clause 10.5.3)

The protection level is Ex ic and the maximum surface temperature of the cell was determined by testing in normal operation conditions with all protection devices in place, refer to section 2.2.1.

4.17.7 Battery container ventilation and pressure test

(IEC 60079-11:2011 clause 10.5.4)

The type of cell is sealed and faults are not considered for Ex ic. It is therefore assessed that pressurisation of the battery container is highly improbable and the test was waived.

4.18 Piezo electric devices

(IEC 60079-11:2011 clauses 7.7 & 10.7)

Not applicable. No piezo electric devices.

4.19 Dielectric strength test

(IEC 60079-11:2011 clauses 6.3.13, 10.3 & 11.2)

The product is portable and battery operated, so this test is waived.

4.20 Determination of parameters of loosely specified components

(IEC 60079-11:2011 clauses 6.3.13, 10.3 & 11.2)

None.

4.21 Electrochemical cells

(IEC 60079-11:2011 clause 7.8)

No electrochemical cells.

5 Assessment of differences between the EN and IEC standards

5.1 IEC 60079-0:2017 Edition 7.0 and EN IEC 60079-0:2018

EN IEC 60079-0:2018 – Annex ZA, ZY and ZZ			
Clause	Explanation of difference	Result / Remark	Verdict
Annex ZA	Normal references to international publications with their corresponding European publications (normative)	The appropriate European publications have been applied in this assessment.	Pass
Annex ZY	Additional Information relating to the European ATEX Directive 2014/34/EU (informative)		
ZY.1	Equipment Groups and Categories	The devices have been assessed for Group II (Gas atmospheres) and Group III (dust atmosphere) and Category 3 applications.	Pass
ZY.2	Instructions	The manufacturer shall provide instructions in the relevant community languages.	Pass
ZY.3	Marking	The following differences are included on the label  II 3GD and manufacturer's name and address	Pass
ZY.4	Fans	This product is not a fan or does not incorporate a fan.	N/A
ZY.5	Significant changes between this European Standard and EN 60079-0:2012+A11:2013	Not applicable, EN IEC 60079-0:2018 has been applied.	N/A
Annex ZZ	Relationship between this European Standard and the Essential Requirements of 2014/34/EU [2014 OJ L96] aimed to be covered (informative)	Information only. Any additional requirements have been considered in the ExTR and EHSRs as applicable.	Pass

5.2 IEC 60079-11:2011 Edition 6.0 and EN 60079-11:2012

EN 60079-11:2012 – Annex ZA, ZY and ZZ			
Clause	Explanation of difference	Result / Remark	Verdict
Annex ZA	Normative references to international publications with their corresponding European publications (normative)	The appropriate European publications have been applied in this assessment.	Pass
Annex ZY	Significant changes between this European Standard and EN 60079-11:2007	Not applicable, EN 60079-11:2012 has been applied.	N/A
Annex ZZ	Coverage of Essential Requirements of EU Directives	Information only. Any additional requirements have been considered in the ExTR and EHSRs as applicable.	Pass

6 Assessment against ATEX Directive 2014/34/EU

The table below lists all relevant Essential Health and Safety Requirements (EHSRs) in Annex II of the Directive that are not addressed by the listed standards.

Clause	Subject	Conformity	Verdict
1.2.3	Enclosed structures and prevention of leaks	The product does not release flammable gases or dusts	N/A
1.3.4	Hazards arising from overheating	No overheating caused by friction or impacts occurring.	N/A
1.3.5	Hazards from pressure compensation operations	The product has no pressure compensation operations	N/A
1.5	Requirements in respect of safety-related devices	Not a safety related device.	N/A
1.6	Integration of safety requirements relating to the system	It is the end user's responsibility to assess the system	N/A
3	Supplementary requirements for protective systems	The product is not assessed as part of a protective system	N/A

7 Assessment against UKCA Regulations

The table below lists all relevant Essential Health and Safety Requirements (EHSRs) in Schedule 1 of UKCA Regulations that are not addressed by the listed standards.

Schedule 1 of UKCA regulations		
Equipment and Protective systems Intended for Use in Potentially Explosive Atmosphere Regulations Schedule 1	Subject	Justification for compliance
9	Enclosed structures and prevention of leaks	The product does not release flammable gases or dusts.
19	Hazards arising from overheating	No overheating caused by friction or impacts occurring.
20	Hazards arising from pressure compensation operations	The product has no pressure compensation operations
22	Requirements in respect of safety-related devices	Not a safety related device.
26	Integration of safety requirements relating to the system	It is the end user's responsibility to assess the system
38, 39, 40,41,42,43	Supplementary requirements in respect of protective systems	The product is not assessed as part of a protective system

8 IECEx Checklists

8.1 IECEx TEST REPORT COVER

IECEx TEST REPORT COVER	
ExTR Reference Number.....:	Refer to page 1
ExTR Free Reference Number .....:	Refer to page 1
Compiled by + signature (ExTL)....:	Refer to Report Summary
Reviewed by + signature (ExTL) ...:	Refer to Report Summary
Endorsed by + signature (ExCB) ...:	Refer to Report Summary
Date of issue.....:	Refer to page 1
Ex Testing Laboratory (ExTL).....:	CSA Group Testing & Certification Inc.
Address .....:	178 Rexdale Boulevard, Toronto, Ontario M9W 1R3
Ex Certification Body (ExCB) .....:	CSA Group Testing & Certification Inc.
Address .....:	178 Rexdale Boulevard, Toronto, Ontario M9W 1R3
Applicant's name.....:	Refer to Report Summary
Address .....:	Refer to Report Summary
Standards associated with this ExTR package.....:	Refer to Report Summary
Clauses considered.....:	(All clauses considered / Only specific clauses considered)
Test Report Form Number .....:	ExTR Cover_10 (released 2022-10)
Related Amendments, Corrigenda or ISHs.....:	N/A
Test item description.....:	Refer to Report Summary
Model/type reference .....:	Refer to Report Summary
Code (e.g. Ex __ II__ T__) .....:	Refer to Report Summary
Rating .....:	Refer to Report Summary

ExTR Package Contents
Assembled ExTR documents and Additional reference material:
IECEx Test Report Cover
IECEx Test Report: IEC 60079-0, Edition 7.0
IECEx Test Report: IEC 60079-11, Edition 6.0

Manufacturer's name .....:	Refer to Report Summary
Address .....:	Refer to Report Summary
Trademark .....:	Refer to Report Summary
Certificate No. (optional) .....:	Refer to Report Summary
QAR Reference No. (optional) .....:	Refer to Report Summary

Particulars: Test item vs. Test requirements

Classification of installation and use ..... :	Portable (hand-held)
Ingress protection ..... :	IP64
Rated ambient temperature range (°C) ..... :	-20°C to +55°C
Rated service temperature range (°C) for Ex Components .... :	N/A

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.

Use of uncertainty of measurement for decisions on conformity (Decision rule):

No decision rule is specified by the standards associated with this ExTR package, when comparing the measurement result with the applicable limit according to the specification in these standards. The decisions on conformity are made without applying the measurement uncertainty as described in IECEx OD 012 (i.e. "simple acceptance" decision rule, previously known as "accuracy method").

General product information:

Refer to Report Summary

Details of change (applicable only when revising an existing ExTR package):

N/A

Copy of Marking Plate:

Refer to Report Summary

Details regarding 'trade agent' / 'local assembler' application in accordance with OD 203:

N/A

Testing not fully performed by ExTL staff at the above ExTL address:

Refer to Section 2

National differences considered as part of this evaluation:

N/A

"Specific Conditions of Use" / "Schedule of Limitations":

Refer to Report Summary

Routine tests:

Refer to Report Summary

Date(s) of performance for all testing:

Refer to Section 2

8.2 IECEx TR IEC 60079-0:2017

IECEx TEST REPORT
IEC 60079-0
Explosive atmospheres – Part 0: Equipment – General requirements

ExTR Reference Number ..... :	Refer to page 1
ExTR Free Reference Number ..... :	Refer to page 1
Compiled by + signature (ExTL).... :	Refer to Report Summary
Reviewed by + signature (ExTL) ... :	Refer to Report Summary
Date of issue ..... :	Refer to page 1
Ex Testing Laboratory (ExTL)..... :	CSA Group Testing & Certification Inc.
Address ..... :	178 Rexdale Boulevard, Toronto, Ontario M9W 1R3
Applicant's name..... :	CSA Group Testing & Certification Inc.
Address ..... :	178 Rexdale Boulevard, Toronto, Ontario M9W 1R3
Standard ..... :	IEC 60079-0:2017, Edition 7.0
Test procedure ..... :	IECEx System
Test Report Form Number ..... :	ExTR60079-0-7F-DS (released 2022-10)
Related Amendments, Corrigenda or ISHs.....	N/A

Possible test case verdicts:

- test case does not apply to the test item .....:N / A
- test item does meet the requirement :Pass

General remarks:

The test results presented in this Ex Test Report relate only to the item or product tested.

- § "(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.

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
1 **DS 2021/004**	Scope		
DS 2021/004	DS 2021/004	The ambient temperature range is not beyond that of some internal devices	N/A
2	Normative references		
3 **DS 2020/002**	Terms and definitions		
DS 2020/002	DS 2020/002	The product is not power supply modules, remote IO modules and input/output modules).	N/A
4	Equipment grouping		
4.1	General	Refer to section 1.	Pass
4.2	Group I	The product is evaluated as Group II and Group III.	N/A
4.3	Group II	The product is evaluated as Group II and group subdivision is IIC.	Pass
4.4	Group III	The product is evaluated as Group III and group subdivision is IIIC.	Pass
4.5	Equipment for a particular explosive gas atmosphere	The product is not intended for a particular explosive atmosphere.	N/A
5 **DS 2016/002** **DS 2015/011A**	Temperatures		
DS 2015/011A	DS 2015/011A	Thermocouples were prepared and used in accordance with IECEE document IECEE OD-5012 Edition 1.	Pass
DS 2016/002	DS 2016/002	Failure analysis is not used	N/A
5.1	Environmental influences		
5.1.1	Ambient temperature	The ambient temperature of products is -20°C to +55°C. The marking includes ambient temperature. Please refer to section 1.8 of this report.	Pass
5.1.2 **DS 2022/002**	External source of heating or cooling	No external source of heating or cooling.	N/A
DS 2022/002	DS 2022/002	No external source of heating or cooling.	N/A
5.2 **DS 2020/006**	Service temperature	See report section 3.28.	Pass
DS 2020/006	DS 2020/006	The product is EPL Dc, temperature test under dust is not required.	N/A
5.3	Maximum surface temperature		
5.3.1	Determination of maximum surface temperature	See report section 3.28.	Pass
5.3.2	Limitation of maximum surface temperature		
5.3.2.1	Group I electrical equipment	The product is not evaluated as Group I.	N/A
5.3.2.2	Group II electrical equipment	See report section 3.28.	Pass
5.3.2.3	Group III electrical equipment		
5.3.2.3.1 **DS 2020/006**	Maximum surface temperature for EPL Da	The product is EPL Dc.	N/A
DS 2020/006	DS 2020/006	The product is EPL Dc, temperature test under dust is not required.	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
5.3.2.3.2	Maximum surface temperature for EPL Db	The product is EPL Dc.	N/A
5.3.2.3.3	Maximum surface temperature determined without a layer of dust for EPL Dc	See report section 3.28.	Pass
5.3.3	Small component temperature for Group I or Group II electrical equipment	See report section 3.28.	Pass
5.3.4	Component temperature of smooth surfaces for Group I or Group II electrical equipment	The maximum surface temperature of all the components did not exceed specified T-code, see report section 3.28.	N/A
6	Requirements for all electrical equipment		
6.1	General	The product complies with this standard and IEC 60079-11:2011.	Pass
6.2	Mechanical strength of equipment	See report section 3.3.	Pass
6.3	Opening times	See report section 3.9.	N/A
6.4	Circulating currents in enclosures (e.g. of large electric machines)	See report section 3.6.	N/A
6.5	Gasket retention	See report section 3.5.	Pass
6.6	Electromagnetic and ultrasonic energy radiating equipment		
6.6.1	General	See report section 3.10.	Pass
6.6.2	Radio frequency sources	See report section 3.10.1.	Pass
6.6.3	Ultrasonic sources	See report section 3.10.2.	N/A
6.6.4 **DS 2018/004**	Lasers, luminaires, and other non-divergent continuous wave optical sources	See report section 3.10.3.	N/A
DS 2018/004	DS 2018/004	IEC 60079-28 is not considered.	N/A
7 **DS 2022/006**	Non-metallic enclosures and non-metallic parts of enclosures		
DS 2022/006	DS 2022/006	No fans.	N/A
7.1	General		
7.1.1	Applicability	See report section 3.2.	Pass
7.1.2 **DS 2011/002A**	Specification of materials		
DS 2011/002A	DS 2011/002A	See report section 3.2.	Pass
7.1.2.1	General	See report section 3.2.	Pass
7.1.2.2	Plastic materials	See report section 3.2.	Pass
7.1.2.3	Elastomers	See report section 3.2.	Pass
7.1.2.4	Materials used for cementing	See report section 3.2.	Pass
7.2	Thermal endurance		
7.2.1	Tests for thermal endurance	See report section 3.2.1.	Pass
7.2.2	Material selection	See report section 3.2.1.	Pass
7.2.3	Alternative qualification of elastomeric sealing O-rings	Not applicable.	N/A
7.3	Resistance to ultraviolet light	See report section 3.2.3.	Pass
7.4	Electrostatic charges on external non-metallic materials		

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
7.4.1	Applicability	See report section 3.2.4.	Pass
7.4.2	Avoidance of a build-up of electrostatic charge for Group I or Group II	See report section 3.2.4.	Pass
7.4.3	Avoidance of a build-up of electrostatic charge for Group III	See report section 3.2.4.	Pass
7.5	Attached external conductive parts	See report section 3.2.5.	N/A
8	Metallic enclosures and metallic parts of enclosures		
8.1	Material composition	See report section 3.1.	N/A
8.2	Group I	See report section 3.1.	N/A
8.3	Group II	See report section 3.1.	N/A
8.4	Group III	See report section 3.1.	N/A
8.5	Copper Alloys	See report section 3.1.	N/A
9	Fasteners		
9.1	General	See report section 3.11.	N/A
9.2	Special fasteners	See report section 3.11.	N/A
9.3	Holes for special fasteners		
9.3.1	Thread engagement	See report section 3.11.	N/A
9.3.2	Tolerance and clearance	See report section 3.11.	N/A
9.4	Hexagon socket set screws	See report section 3.11.	N/A
10	Interlocking devices	See report section 3.12.	N/A
11	Bushings	See report section 3.13.	N/A
12	(Reserved for future use)		
13 **DS 2014/001** **DS 2021/006**	Ex Components		
DS 2014/001	DS 2014/001	The product incorporates no certified Ex components.	N/A
DS 2021/006	DS 2021/006	Field modular approach is not used.	N/A
13.1	General	See report section 3.15.	N/A
13.2	Mounting	See report section 3.15.	N/A
13.3	Internal mounting	See report section 3.15.	N/A
13.4	External mounting	See report section 3.15.	N/A
13.5 **DS 2020/002**	Ex Component certificate	See report section 3.15.	N/A
DS 2020/002	DS 2020/002	The product is not power supply module, remote IO module or input/output module	N/A
14	Connection facilities		
14.1	General	See report section 3.16.	N/A
14.2	Type of protection	See report section 3.16.	N/A
14.3	Creepage and clearance	See report section 3.16.	N/A
15	Connection facilities for earthing or bonding conductors		
15.1	Equipment requiring earthing or bonding		
15.1.1	Internal earthing	See report section 3.17.	N/A
15.1.2	External bonding	See report section 3.17.	N/A
15.2	Equipment not requiring earthing	See report section 3.17.	N/A
15.3	Size of protective earthing conductor connection	See report section 3.17.	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
15.4	Size of equipotential bonding conductor connection	See report section 3.17.	N/A
15.5	Protection against corrosion	See report section 3.17.	N/A
15.6	Secureness of electrical connections	See report section 3.17.	N/A
15.7	Internal earth continuity plate	See report section 3.17.	N/A
16 **DS 2017/001**	Entries into enclosures		
DS 2017/001	DS 2017/001	See report section 3.18.	N/A
16.1	General	See report section 3.18.	N/A
16.2	Identification of entries	See report section 3.18.	N/A
16.3	Cable glands	See report section 3.18.	N/A
16.4	Blanking elements	See report section 3.18.	N/A
16.5	Thread adapters	See report section 3.18.	N/A
16.6 **DS 2018/002**	Temperature at branching point and entry point	See report section 3.18.	N/A
DS 2018/002	DS 2018/002	See report section 3.18.	N/A
16.7	Electrostatic charges of cable sheaths	See report section 3.18.	N/A
17	Supplementary requirements for electric machines		
17.1	General	See report section 3.19.	N/A
17.2	Ventilation		
17.2.1	Ventilation openings	See report section 3.19.	N/A
17.2.2 **DS 2022/006**	Materials for external fans	See report section 3.19.	N/A
DS 2022/006	DS 2022/006	See report section 3.19.	N/A
17.2.3	Cooling fans of rotating electric machines	See report section 3.19.	N/A
17.2.3.1	Fans and fan hoods	See report section 3.19.	N/A
17.2.3.2	Construction and mounting of the ventilating systems	See report section 3.19.	N/A
17.2.3.3	Clearances for the ventilating system	See report section 3.19.	N/A
17.2.4	Auxiliary motor cooling fans	See report section 3.19.	N/A
17.2.5	Room ventilating fans		
17.2.5.1	Applicability	See report section 3.19.	N/A
17.2.5.2	General	See report section 3.19.	N/A
17.2.5.3	Fan and fan hoods	See report section 3.19.	N/A
17.2.5.4	Construction and mounting	See report section 3.19.	N/A
17.2.5.5	Clearances for rotating parts	See report section 3.19.	N/A
17.3	Bearings	See report section 3.19.	N/A
18	Supplementary requirements for switchgear		
18.1	Flammable dielectric	See report section 3.20.	N/A
18.2	Disconnectors	See report section 3.20.	N/A
18.3	Group I – Provisions for locking	See report section 3.20.	N/A
18.4	Doors and covers	See report section 3.20.	N/A
19	Reserved for future use		
20 **DS 2020/007**	Supplementary requirements for external plugs, socket outlets and connectors for field wiring connection		
DS 2020/007	DS 2020/007	The product has no integral plug intended for field wiring.	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
20.1	General	See report section 3.21.	N/A
20.2	Explosive gas atmospheres	See report section 3.21.	N/A
20.3	Explosive dust atmospheres	See report section 3.21.	N/A
20.4	Energized plugs	See report section 3.21.	N/A
21	Supplementary requirements for luminaires		
21.1 **DS 2020/001**	General	See report section 3.22.	N/A
DS 2020/001	DS 2020/001	See report section 3.22.	N/A
21.2	Covers for luminaires of EPL Mb, EPL Gb, or EPL Db	See report section 3.22.	N/A
21.3	Covers for luminaires of EPL Gc or EPL Dc	See report section 3.22.	N/A
21.4	Sodium lamps	See report section 3.22.	N/A
22	Supplementary requirements for caplights and handlights		
22.1	Group I caplights	See report section 3.23.	N/A
22.2	Group II and Group III caplights and handlights	See report section 3.23.	N/A
23	Equipment incorporating cells and batteries		
23.1	General	See report section 3.24.	Pass
23.2	Interconnection of cells to form batteries	See report section 3.24.	N/A
23.3 **DS 2019/002**	Cell types	See report section 3.24.	Pass
DS 2019/002	DS 2019/002	The battery complies with UL1642.	Pass
23.4	Cells in a battery	See report section 3.24.	Pass
23.5	Ratings of batteries	See report section 3.24.	Pass
23.6	Interchangeability	See report section 3.24.	Pass
23.7	Charging of primary batteries	See report section 3.24.	Pass
23.8	Leakage	See report section 3.24.	Pass
23.9	Connections	See report section 3.24.	Pass
23.10	Orientation	See report section 3.24.	Pass
23.11	Replacement of cells or batteries	See report section 3.24.	Pass
23.12	Replaceable battery pack	See report section 3.24.	Pass
24	Documentation	The manufacture's documents give a full and correct specification of the explosion safety aspects of the product	Pass
25	Compliance of prototype or sample with documents	The samples comply with manufacturer's documents	Pass
26 **DS 2017/005**	Type tests		
DS 2017/005	DS 2017/005	Legacy data is not used.	N/A
26.1	General	The applicable test is conducted in accordance with this standard. Refer to section 2.2.	Pass
26.2	Test configuration	The test was considered with worst case scenarios.	Pass
26.3	Tests in explosive test mixtures	No tests in explosive test mixtures.	N/A
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	See report section 3.1.	N/A
26.4.1.2	Non-metallic enclosures or non-metallic parts of enclosures		
26.4.1.2.1	General	See report section 3.2.	Pass
26.4.1.2.2	Group I equipment	See report section 3.2.	N/A
26.4.1.2.3	Group II and Group III equipment	See report section 3.2.	Pass
26.4.2 **DS 2020/001**	Resistance to impact	See report section 2.2.4.	Pass
DS 2020/001	DS 2020/001	See report section 2.2.4.	Pass
26.4.3	Drop test	See report section 2.2.5.	Pass
26.4.4	Acceptance criteria	See report section 2.2.5.	Pass
26.4.5 **DS 2012/003**	Degree of protection (IP) by enclosures		
DS 2012/003	DS 2012/003	The equipment complies with the requirements.	Pass
26.4.5.1	Test procedure	See report section 2.2.6 and 2.2.7.	Pass
26.4.5.2	Acceptance criteria	See report section 2.2.6 and 2.2.7.	Pass
26.5	Thermal tests		
26.5.1	Temperature measurement		
26.5.1.1	General	See report section 2.2.1.	Pass
26.5.1.2	Service temperature	See report section 2.2.1.	Pass
26.5.1.3	Maximum surface temperature	See report section 2.2.1.	Pass
26.5.2	Thermal shock test	See report section 2.2.3.	Pass
26.5.3	Small component ignition test (Group I and Group II)		
26.5.3.1	General	The measured maximum surface temperature for the components did not exceed T-code	N/A
26.5.3.2	Procedure	The measured maximum surface temperature for the components did not exceed T-code	N/A
26.5.3.3	Acceptance criteria	The measured maximum surface temperature for the components did not exceed T-code	N/A
26.6	Torque test for bushings		
26.6.1	Test procedure	No bushing.	N/A
26.6.2	Acceptance criteria	No bushing.	N/A
26.7	Non-metallic enclosures or non-metallic parts of enclosures		
26.7.1	General	See report section 3.2.	Pass
26.7.2	Test temperatures	See report section 3.2.	Pass
26.8 **DS 2020/003**	Thermal endurance to heat	See report section 3.2.	Pass
DS 2020/003	DS 2020/003	Comply with the requirements.	Pass
26.9	Thermal endurance to cold	See report section 2.2.2.	Pass
26.10	Resistance to UV light		
26.10.1	General	Test was not conducted.	N/A
26.10.2	Light exposure	Test was not conducted.	N/A
26.10.3	Acceptance criteria	Test was not conducted.	N/A
26.11	Resistance to chemical agents for Group I equipment	See report section 3.2.2.	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
26.12	Earth continuity	See report section 3.6.	N/A
26.13	Surface resistance test of parts of enclosures of non-metallic materials	See report section 2.2.8.	Pass
26.14	Measurement of capacitance		
26.14.1	General	See report section 3.2.5.	N/A
26.14.2	Test procedure	See report section 3.2.5.	N/A
26.15	Verification of ratings of ventilating fans	No ventilating fans.	N/A
26.16	Alternative qualification of elastomeric sealing O-rings	Excluded by IEC60079-11:2011.	N/A
26.17	Transferred charge test		
26.17.1	Test equipment	Surface resistance test was conducted.	N/A
26.17.2	Test sample	Refer to clause 26.17.1	N/A
26.17.3	Test procedure	Refer to clause 26.17.1	N/A
27	Routine tests	See report section 1.13.	Pass
28	Manufacturer's responsibility		
28.1	Conformity with the documentation	It is the manufacture's responsibility to carry out the verifications or tests necessary to ensure that product produced complies with the documentation	Pass
28.2 **DS 2020/002** **DS 2021/005**	Certificate	The manufacturer has prepared a certificate confirming that the product is in conformity with the requirements of the used standards.	Pass
DS 2020/002	DS 2020/002	The product is not power supply module, remote IO module or input/output module	N/A
DS 2021/005	DS 2021/005	Ex auxiliary equipment and Ex components are not used in the equipment	N/A
28.3	Responsibility for marking	The manufacture has marked the product in accordance with the requirements of clause 29 and accepts the responsibility of construction, routine verification and routine tests	Pass
29 **DS 2012/005A** **DS 2017/007** **DS 2021/005** **DS 2021/006**	Marking		
DS 2012/005A	DS 2012/005A	IP rating is given as part of the marking and certificate.	Pass
DS 2017/007	DS 2017/007	The product is not combined electrical/non-electrical equipment	N/A
DS 2021/005	DS 2021/005	Ex auxiliary equipment and Ex components are not used in the product.	N/A
DS 2021/006	DS 2021/006	Field modular approach is not used	N/A
29.1	Applicability	See report section 1.8.	Pass
29.2	Location	See report section 1.8.	Pass
29.3	General	See report section 1.8.	Pass
29.4	Ex marking for explosive gas atmospheres	See report section 1.8.	Pass

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
29.5	Ex marking for explosive dust atmospheres	See report section 1.8.	Pass
29.6	Combined types (or levels) of protection	No combined types of protection.	N/A
29.7	Multiple types of protection	See report section 1.8.	Pass
29.8	Ga equipment using two independent Gb types (or levels) of protection	Not Ga equipment using two independent Gb types of protection.	N/A
29.9	Boundary wall	No boundary wall.	N/A
29.10 **DS 2004/006A** **DS 2012/006A** **DS 2012/008**	Ex Components	Not Ex components.	N/A
DS 2004/006A	DS 2004/006A	Ex component is not used	N/A
DS 2012/006A	DS 2012/006A	There is no supplier-provided Ex component	N/A
DS 2012/008	DS 2012/008	There are no IEC Ex certified components	N/A
29.11	Small Ex Equipment and small Ex Components	Not small Ex Equipment and small Ex components.	N/A
29.12	Extremely small Ex Equipment and extremely small Ex Components	Not extremely small Ex Equipment and extremely small Ex components.	N/A
29.13	Warning markings	See report section 1.8.	Pass
29.14	Cells and batteries	See report section 1.8.	Pass
29.15	Electric machines operated with a converter	No electric machines operated with a converter.	N/A
29.16	Examples of marking	No specific requirements.	Pass
30 **DS 2021/006**	Instructions		
DS 2021/006	DS 2021/006	Field modular approach is not used	N/A
30.1	General	See report section 3.27.	Pass
30.2	Cells and batteries	See report section 3.27.	Pass
30.3	Electrical machines	No electrical machines	N/A
30.4	Ventilating fans	No ventilating fans	N/A
30.5	Cable glands	Cable gland is not used.	N/A
Annex A (Normative) **DS 2017/001**	Supplementary requirements for cable glands		
DS 2017/001	DS 2017/001	Excluded by IEC 60079-11:2011.	N/A
A.1	General	Excluded by IEC 60079-11:2011.	N/A
A.2	Constructional requirements		
A.2.1	Cable sealing	Excluded by IEC 60079-11:2011.	N/A
A.2.2	Filling compounds	Excluded by IEC 60079-11:2011.	N/A
A.2.3	Clamping		
A.2.3.1	General	Excluded by IEC 60079-11:2011.	N/A
A.2.3.2	Group II or III cable glands	Excluded by IEC 60079-11:2011.	N/A
A.2.4	Lead-in of cable		
A.2.4.1	Sharp edges	Excluded by IEC 60079-11:2011.	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
A.2.4.2	Point of entry	Excluded by IEC 60079-11:2011.	N/A
A.2.5	Released by a tool	Excluded by IEC 60079-11:2011.	N/A
A.2.6	Fixing	Excluded by IEC 60079-11:2011.	N/A
A.2.7	Degree of protection	Excluded by IEC 60079-11:2011.	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	Excluded by IEC 60079-11:2011.	N/A
A.3.1.2	Cable glands with clamping by filling compound	Excluded by IEC 60079-11:2011.	N/A
A.3.1.3	Cable glands with clamping by means of a clamping device	Excluded by IEC 60079-11:2011.	N/A
A.3.1.4	Clamping test	Excluded by IEC 60079-11:2011.	N/A
A.3.1.5	Mechanical strength	Excluded by IEC 60079-11:2011.	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 integral to the gland		
A.3.2.1.1	General	Excluded by IEC 60079-11:2011.	N/A
A.3.2.1.2	Clamping test	Excluded by IEC 60079-11:2011.	N/A
A.3.2.1.3	Mechanical strength	Excluded by IEC 60079-11:2011.	N/A
A.3.2.2	Tests of clamping where the armourings are not clamped by a device integral to the gland	Excluded by IEC 60079-11:2011.	N/A
A.3.3	Type test for resistance to impact	Excluded by IEC 60079-11:2011.	N/A
A.3.4 **DS 2019/005**	Test for degree of protection (IP) of cable glands	Excluded by IEC 60079-11:2011.	N/A
DS 2019/005	DS 2019/005	Excluded by IEC 60079-11:2011.	N/A
A.4	Marking		
A.4.1	Marking of cable glands	Excluded by IEC 60079-11:2011.	N/A
A.4.2	Identification of cable-sealing rings	Excluded by IEC 60079-11:2011.	N/A
A.5	Instructions	Excluded by IEC 60079-11:2011.	N/A
Annex B (Normative)	Requirements for Ex Components		
Table B.1	Applicability of clauses to Ex Components	No Ex components	N/A
Annex C (Informative)	Example of rig for resistance to impact test		
Annex D (Informative)	Electric machines connected to converters		
Annex E (Informative)	Temperature evaluation of electric machines		
Annex F (Informative)	Guideline flowchart for tests of non-metallic enclosures or non-metallic parts of enclosures (26.4)		
Annex G (Informative)	Guidance flowchart for tests of cable glands		
Annex H (Informative)	Shaft voltages resulting in motor bearing or shaft brush sparking Discharge energy calculation		

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

N/A

8.3 IECEx TR IEC 60079-11:2011

IECEx TEST REPORT
IEC 60079-11
Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"

ExTR Reference Number.....:	Refer to page 1
ExTR Free Reference Number .....:	Refer to page 1
Compiled by + signature (ExTL) ....:	Refer to Report Summary
Reviewed by + signature (ExTL)....:	Refer to Report Summary
Date of issue.....:	Refer to page 1
Ex Testing Laboratory (ExTL) .....:	CSA Group Testing & Certification Inc.
Address .....:	178 Rexdale Boulevard, Toronto, Ontario M9W 1R3
Applicant's name .....:	Refer to Report Summary
Address .....:	Refer to Report Summary
Standard.....:	IEC 60079-11:2011, 6th Edition
Test procedure.....:	IECEx System
Test Report Form Number.....:	ExTR60079-11_6B_DS (released 2021-10)

Instructions for Intended Use of Ex Test Report:
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, ISO, ISO/IEC or IEC/IEEE Ex standard or technical specification. 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.

Possible test case verdicts:

- test case does not apply to the test item.....:N / A

- test item does meet the requirement :Pass

General remarks:

The test results presented in this Ex Test Report relate only to the item or product tested.

- § "(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.

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IEC 60079-11			
Clause	Requirement – Test	Result – Remark	Verdict
1	Scope		
2 See also **DS 2010/006A**	Normative references		
DS 2010/006A	DS 2010/006A	IEC 60079-11 has been with undated references.	Pass
3	Terms and definitions		
4	Grouping and classification of intrinsically safe apparatus and associated apparatus	See report section 1.8.	Pass
5	Levels of protection and ignition compliance requirements of electrical apparatus		
5.1	General	See report section 1.8.	Pass
5.2	Level of protection "ia"	Product complies with “ic”.	N/A
5.3	Level of protection "ib"	Product complies with “ic”.	N/A
5.4	Level of protection "ic"	See report section 1.8.	Pass
5.5	Spark ignition compliance	See report section 4.4.	Pass
5.6	Thermal ignition compliance		
5.6.1	General	See report section 3.28.	Pass
5.6.2 See also **DS 2015/016** **DS 2015/009**	Temperature for small components for Group I and Group II	See report section 3.28.	Pass
DS 2015/016	DS 2015/016	No thermocatalytic sensors.	N/A
DS 2015/009	DS 2015/009	No bulb is used.	N/A
5.6.3	Wiring within intrinsically safe apparatus for Group I and Group II	See report section 3.28.4.	Pass
5.6.4	Tracks on printed circuit boards for Group I and Group II	See report section 3.28.5.	Pass
5.6.5 **DS 2020/006**	Intrinsically safe apparatus and component temperature for Group III	See report section 3.28.	Pass
DS 2020/006	DS 2020/006	The product is EPL Dc, temperature test under dust is not required.	N/A
5.7	Simple apparatus	Not simple apparatus.	N/A
6	Apparatus construction		
6.1	Enclosures		
6.1.1	General	See report section 3.5.	Pass
6.1.2	Enclosures for Group I or Group II apparatus		
6.1.2.1	General	Refer to clause 6.1.1.	Pass
6.1.2.2	Apparatus complying with Table 5	Table 5 is not used.	N/A
6.1.2.3 **DS 2019/006**	Apparatus complying with Annex F	See report section 3.5.	Pass
DS 2019/006	DS 2019/006	6.1.2.3 a) Pollution degree 2 is achieved by enclosure with IP64.	Pass
6.1.3	Enclosures for Group III apparatus	See report section 3.5.	Pass
6.2	Facilities for connection of external circuits		
6.2.1	Terminals	No terminals.	N/A

IEC 60079-11			
Clause	Requirement – Test	Result – Remark	Verdict
6.2.2	Plugs and sockets	See report section 4.15.	N/A
6.2.3	Determination of maximum external inductance to resistance ratio (*Lo/Ro*) for resistance limited power source	Lo/Ro is not quoted.	N/A
6.2.4	Permanently connected cable	No permanently connected cable.	N/A
6.2.5	Requirements for connections and accessories for IS apparatus when located in the non-hazardous area	See report section 4.7.	Pass
6.3	Separation distances		
6.3.1	General	See report section 4.12.	N/A
6.3.2	Separation of conductive parts	See report section 4.12.	N/A
6.3.2.1	Distances according to Table 5	Table 5 is not used.	N/A
6.3.2.2	Distances according to Annex F	See report section 4.12.	N/A
6.3.3	Voltage between conductive parts	See report section 4.12.	N/A
6.3.4	Clearance	See report section 4.12.	N/A
6.3.5	Separation distances through casting compound	Casting compound is not used.	N/A
6.3.6	Separation distances through solid insulation	See report section 4.12.	N/A
6.3.7	Composite separations	Composite separations are not used.	N/A
6.3.8	Creepage distance	See report section 4.12.	N/A
6.3.9	Distance under coating	See report section 4.12.	N/A
6.3.10	Requirements for assembled printed circuit boards	See report section 4.12.	N/A
6.3.11	Separation by earthed screens	No partitions have been applied in this equipment.	N/A
6.3.12	Internal wiring	See report section 4.13.	N/A
6.3.13	Dielectric strength requirement	See report section 4.19.	N/A
6.3.14	Relays	No relays.	N/A
6.4	Protection against polarity reversal	See report section 4.1.	Pass
6.5	Earth conductors, connections and terminals	Earthing is not relied upon for intrinsic safety.	N/A
6.6	Encapsulation		
6.6.1	General	Encapsulation is not used.	N/A
6.6.2	Encapsulation used for the exclusion of explosive atmospheres	Refer to clause 6.6.1.	N/A
7	Components on which intrinsic safety depends		
7.1 **DS 2004/003** **DS 2018/005A**	Rating of components	See report section 4.11.9.	Pass
DS 2004/003	DS 2004/003	The ambient temperature range has been taken into account when establishing device rating.	Pass
DS 2018/005A	DS 2018/005A	Supercapacitors are not used in the product.	N/A

IEC 60079-11			
Clause	Requirement – Test	Result – Remark	Verdict
7.2	Connectors for internal connections, plug-in cards and components	See report section 4.16.	N/A
7.3	Fuses	See report section 4.11.7.	N/A
7.4	Primary and secondary cells and batteries		
7.4.1	General	See report section 4.17.	Pass
7.4.2 **DS2010/003**	Battery construction	See report section 4.17.	Pass
DS2010/003	DS 2010/003	See report section 4.17.	N/A
7.4.3	Electrolyte leakage and ventilation	See report section 4.17.	Pass
7.4.4	Cell voltages	See report section 4.17.	Pass
7.4.5	Internal resistance of cell or battery	Not used.	N/A
7.4.6	Batteries in equipment protected by other types of protection	No other types of protection.	N/A
7.4.7	Batteries used and replaced in explosive atmospheres	Battery is not replaced in explosive atmospheres.	N/A
7.4.8	Batteries used but not replaced in explosive atmospheres	See report section 4.17. The battery is housed in the product secured with screws.	Pass
7.4.9	External contacts for charging batteries	See report section 4.2.2.	Pass
7.5 **DS 2015/007**	Semiconductors		
DS 2015/007	DS 2015/007	No software dependent components are used as protective components.	N/A
7.5.1	Transient effects	See report section 4.11.	N/A
7.5.2	Shunt voltage limiters	See report section 4.11	Pass
7.5.3	Series current limiters	No series current limiters.	N/A
7.6 **DS 2012/009** **DS 2016/002**	Failure of components, connections and separations	Considered.	Pass
DS 2012/009	DS 2012/009	The product is Ex ic and faults are not applied.	N/A
DS 2016/002	DS 2016/002	The product is Ex ic and faults are not applied.	N/A
7.7	Piezo-electric devices	See report section 4.18.	N/A
7.8	Electrochemical cells for the detection of gases	See report section 4.21.	N/A
8	Infallible components, infallible assemblies of components and infallible connections on which intrinsic safety depends		
8.1	Level of Protection “ic”	Level of protection “ic”.	Pass
8.2	Mains transformers		
8.2.1	General	See report section 4.11.	N/A
8.2.2	Protective measures	See report section 4.11.	N/A
8.2.3	Transformer construction	See report section 4.11.	N/A
8.2.4	Transformer type tests	See report section 4.11.	N/A
8.2.5	Routine test of mains transformers	See report section 4.11.	N/A

IEC 60079-11			
Clause	Requirement – Test	Result – Remark	Verdict
8.3	Transformers other than mains transformers	See report section 4.11.	N/A
8.4	Infallible windings		
8.4.1	Damping windings	No infallible windings.	N/A
8.4.2	Inductors made by insulated conductors	No infallible windings.	N/A
8.5	Current-limiting resistors	See report section 4.11.	Pass
8.6 **DS 2003/003**	Capacitors		
DS 2003/003	DS 2003/003	Duplicated surface mounted shunt components are not used.	N/A
8.6.1	Blocking capacitors	See report section 4.11.	N/A
8.6.2	Filter capacitors	See report section 4.11.	N/A
8.7	Shunt safety assemblies		
8.7.1	General	See report section 4.11.	N/A
8.7.2	Safety shunts	No safety shunts.	N/A
8.7.3	Shunt voltage limiters	See report section 4.11.	N/A
8.8	Wiring, printed circuit board tracks, and connections	See report section 4.12.	N/A
8.9	Galvanically separating components		
8.9.1	General	No galvanically separating components.	N/A
8.9.2	Isolating components between intrinsically safe and non-intrinsically safe circuits	Refer to clause 8.9.1.	N/A
8.9.3	Isolating components between separate intrinsically safe circuits	Refer to clause 8.9.1.	N/A
9	Supplementary requirements for specific apparatus		
9.1	Diode safety barriers		
9.1.1	General	Not diode safety barriers.	N/A
9.1.2	Construction		
9.1.2.1	Mounting	Refer to clause 9.1.1.	N/A
9.1.2.2	Facilities for connection to earth	Refer to clause 9.1.1.	N/A
9.1.2.3	Protection of components	Refer to clause 9.1.1.	N/A
9.2	FISCO apparatus	Not FISCO apparatus.	N/A
9.3	Handlights and caplights	Not handlights or caplights.	N/A
10	Type verifications and type tests		
10.1 **DS 2013/002**	Spark ignition test		
DS 2013/002	DS 2013/002	Spark ignition test is not required.	N/A
10.1.1	General	Spark ignition test is not required.	N/A
10.1.2	Spark test apparatus	Refer to clause 10.1.1.	N/A
10.1.3	Test gas mixtures and spark test apparatus calibration current		
10.1.3.1	Explosive test mixtures suitable for tests with a safety factor of 1.0 and calibration current of the spark test apparatus	Refer to clause 10.1.1.	N/A
10.1.3.2	Explosive test mixtures suitable for tests with a safety factor of 1.5 and calibration current of the spark test apparatus	Refer to clause 10.1.1.	N/A

IEC 60079-11			
Clause	Requirement – Test	Result – Remark	Verdict
10.1.4	Tests with the spark test apparatus		
10.1.4.1	Circuit test	Refer to clause 10.1.1.	N/A
10.1.4.2 **DS 2018/005A**	Safety factors	Refer to clause 10.1.1.	N/A
DS 2018/005A	DS 2018/005A	Supercapacitors are not used.	N/A
10.1.5	Testing considerations		
10.1.5.1	General	Refer to clause 10.1.1.	N/A
10.1.5.2	Circuits with both inductance and capacitance	Refer to clause 10.1.1.	N/A
10.1.5.3	Circuits using shunt short-circuit (crowbar) protection	Crowbar circuits not used.	N/A
10.1.5.4	Results of spark test	Refer to clause 10.1.1.	N/A
10.2	Temperature tests	See report section 2.2.1.	Pass
10.3	Dielectric strength tests	See report section 4.19.	N/A
10.4	Determination of parameters of loosely specified components	See report section 4.20.	N/A
10.5	Tests for cells and batteries		
10.5.1	General	See report section 4.17.	Pass
10.5.2	Electrolyte leakage test for cells and batteries	See report section 2.2.1 and 4.17.2.	Pass
10.5.3	Spark ignition and surface temperature of cells and batteries	See report section 2.2.1, 4.18.5 and 4.17.6.	Pass
10.5.4	Battery container pressure tests	See report section 4.17.7.	N/A
10.6	Mechanical tests		
10.6.1	Casting compound	Casting compound is not used.	N/A
10.6.2	Determination of the acceptability of fuses requiring encapsulation	Fuses are not used.	N/A
10.6.3	Partitions	No partitions are used.	N/A
10.7	Tests for intrinsically safe apparatus containing piezoelectric devices	No piezoelectric devices are contained.	N/A
10.8	Type tests for diode safety barriers and safety shunts	Not diode safety barrier.	N/A
10.9	Cable pull test	No cable is used.	N/A
10.10	Transformer tests	No transformer.	N/A
10.11	Optical isolators tests		
10.11.1	General	No optical isolators are used.	N/A
10.11.2	Thermal conditioning, dielectric and carbonisation test	Refer to clause 10.11.1	N/A
10.11.2.1	Overload test at the receiver side	Refer to clause 10.11.1	N/A
10.11.2.2	Overload test at the transmitter side	Refer to clause 10.11.1	N/A
10.11.2.3	Thermal conditioning and dielectric strength test	Refer to clause 10.11.1	N/A
10.11.2.4	Carbonisation test		
10.11.2.4.1	Receiver side	Refer to clause 10.11.1	N/A
10.11.2.4.2	Transmitter side	Refer to clause 10.11.1	N/A

IEC 60079-11			
Clause	Requirement – Test	Result – Remark	Verdict
10.11.3	Dielectric and short-circuit test	Refer to clause 10.11.1	N/A
10.11.3.1	General	Refer to clause 10.11.1	N/A
10.11.3.2	Pre-test dielectric	Refer to clause 10.11.1	N/A
10.11.3.3	Short-circuit current test	Refer to clause 10.11.1	N/A
10.11.3.4	Current limited short-circuit current test	Refer to clause 10.11.1	N/A
10.11.3.5	Dielectric strength test	Refer to clause 10.11.1	N/A
10.12	Current carrying capacity of infallible printed circuit board connections	No infallible printed circuit board connections.	N/A
11	Routine verifications and tests		
11.1	Routine tests for diode safety barriers		
11.1.1	Completed barriers	Not a diode safety barrier.	N/A
11.1.2	Diodes for 2-diode “ia” barriers	Refer to clause 11.1.1.	N/A
11.2	Routine tests for infallible transformers	No infallible transformers.	N/A
12	Marking		
12.1	General	See report section 1.8.	Pass
12.2	Marking of connection facilities	No connection facilities.	N/A
12.3	Warning markings	See report section 1.8.	Pass
12.4	Examples of marking	No specific requirements.	Pass
13	Documentation	See report section 1.10.	Pass
Annex A (Normative)	Assessment of intrinsically safe circuits		
A.1	Basic criteria	See report section 4.4.	Pass
A.2	Assessment using reference curves and tables	See report section 4.4.	Pass
A.3	Examples of simple circuits	See report section 4.4.	Pass
A.4	Permitted reduction of effective capacitance when protected by a series resistance	See report section 4.4.	Pass
Annex B (Normative)	Spark test apparatus for intrinsically safe circuits		
B.1	Test methods for spark ignition		
B.1.1	Principle	Spark ignition test was not conducted.	N/A
B.1.2	Apparatus	Refer to clause B.1.1.	N/A
B.1.3	Calibration of spark test apparatus	Refer to clause B.1.1.	N/A
B.1.4	Preparation and cleaning of tungsten wires	Refer to clause B.1.1.	N/A
B.1.5	Conditioning a new cadmium disc	Refer to clause B.1.1.	N/A
B.1.6	Limitations of the apparatus	Refer to clause B.1.1.	N/A
B.1.7	Modifications of test apparatus for use at higher currents	Refer to clause B.1.1.	N/A
Annex C (Informative)	Measurement of creepage distances, clearances and separation distances through casting compound and through solid insulation		
Annex D (Normative)	Encapsulation		
D.1	Adherence	Encapsulation is not used.	N/A
D.2	Temperature	Encapsulation is not used.	N/A

IEC 60079-11			
Clause	Requirement – Test	Result – Remark	Verdict
Annex E (Informative)	Transient energy test		
Annex F (Normative)	Alternative separation distances for assembled printed circuit boards and separation of components		
F.1	General	Refer to section 4.12.	Pass
F.2 **DS 2019/006**	Control of pollution access	Refer to section 4.12.	N/A
DS 2019/006	DS 2019/006	Refer to section 4.12.	N/A
F.3	Distances for printed circuit boards and separation of components		
F.3.1	Level of protection “ia” and “ib”	Level of protection is “ic”.	N/A
F.3.2	Level of protection “ic”	Refer to section 4.12.	Pass
Annex G (Normative)	Fieldbus intrinsically safe concept (FISCO) – Apparatus requirements		
G.1	Overview	Not FISCO.	N/A
G.2	Apparatus requirements		
G.2.1	General	Not FISCO.	N/A
G.2.2	FISCO power supplies		
G.2.2.1	General	Not FISCO.	N/A
G.2.2.2	Additional requirements of ‘ia’ and ‘ib’ FISCO power supplies	Not FISCO.	N/A
G.2.2.3	Additional requirements of ‘ic’ FISCO power supplies	Not FISCO.	N/A
G.3	FISCO field devices		
G.3.1	General	Not FISCO.	N/A
G.3.2	Additional requirements of ‘ia’ and ‘ib’ FISCO field devices	Not FISCO.	N/A
G.3.3	Additional requirement of ‘ic’ FISCO field devices	Not FISCO.	N/A
G.3.4	Terminator	Not FISCO.	N/A
G.3.5	Simple apparatus	Not FISCO.	N/A
G.4	Marking	Not FISCO.	N/A
G.4.1	Examples of marking	Not FISCO.	N/A
Annex H (Informative)	Ignition testing of semiconductor limiting power supply circuits		