

TEST REPORT

Report Number: 103927645MIN-004

Project Number: G103927645

Equipment Designation:
SulfiLogger™ A1-BCDE-F

to
47 CFR, Part 15:2019, §15.107 and §15.109, Class A

For
UNISENSE A/S

Test Performed by:
Intertek Testing Services NA, Inc.
40 51st Way NE, Suite 100
Fridley, MN 55421 USA

Test Authorized by:
UNISENSE A/S
Tueager 1
DK-8200 Aarhus N Denmark

Prepared by: SKhezen
Simon Khazon

Reviewed by: U. Spector
Uri Spector

Date of issue: October 30, 2019

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

TABLE OF CONTENTS

1.0	DESCRIPTION OF THE SAMPLE (EUT)	3
2.0	TEST SUMMARY	4
2.1	Statement of the Measurement Uncertainty	4
3.0	EQUIPMENT UNDER TEST	5
3.1	Power Configuration	5
3.2	EUT Configuration	5
3.3	Environmental conditions	6
4.0	TEST CONDITIONS AND RESULTS	7
4.1	Line Conducted Emissions	7
4.2	Radiated Emissions	11
5.0	TEST EQUIPMENT	15
6.0	REVISION HISTORY	16

1.0 DESCRIPTION OF THE SAMPLE (EUT)

Model:	SulfiLogger™ S1-1020-5mgL
Version:	V02
Type of EUT:	Gas Sensing Device
Company:	UNISENSE A/S
Customer:	Søren Porsgaard, PhD
Address:	Tueager 1 DK-8200 Aarhus N Denmark
Phone:	+ 45 42 41 42 14
e-mail:	spo@unisense.com
Test Standards:	<input checked="" type="checkbox"/> 47 CFR, Part 15:2019, §15.107 and §15.109, Class A, test method: ANSI C63.4-2014 <input type="checkbox"/> Other
Date Sample Submitted:	May 8, 2019
Test Work Started:	May 9, 2019
Test Work Completed:	May 14, 2019
Test Sample Conditions:	<input type="checkbox"/> Damaged <input type="checkbox"/> Poor (Usable) <input checked="" type="checkbox"/> Good <input type="checkbox"/> Prototype <input checked="" type="checkbox"/> Production <input type="checkbox"/> Used

2.0 TEST SUMMARY

Referring to the performance criteria and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards.

TEST STANDARD	TEST	RESULT
Subpart B – 15.107	Conducted Emissions	Pass
Subpart B – 15.109	Radiated Emissions	Pass

2.1 Statement of the Measurement Uncertainty

Note: The Emissions measured result in this report is within the specification limits by more than the measurement uncertainty; the measured result indicates that the product tested complies with the specification limit.

The expanded uncertainty ($k = 2$) for radiated emissions from 30 to 1000 MHz has been determined to be: ± 4 dB at 10m and ± 4.8 dB at 3m

The expanded uncertainty ($k = 2$) for radiated emissions above 1GHz has been determined to be: ± 5.9 dB at 3m

The expanded uncertainty ($k = 2$) for conducted emissions from 150 kHz to 30 MHz has been determined to be: ± 2.6 dB

3.0 EQUIPMENT UNDER TEST

3.1 Power Configuration

Rated voltage:	<input checked="" type="checkbox"/> 4-20mA Current Loop <input type="checkbox"/> Other:
Rated current:	Amp.
Rated frequency:	<input type="checkbox"/> 50Hz <input type="checkbox"/> 60Hz
Number of phases:	<input type="checkbox"/> 1 Phase <input type="checkbox"/> 3 Phases

3.2 EUT Configuration

The equipment under test was operated during the measurement under the following conditions:

- ☐ - Standby
- ☒ - Continuous Normal Operation (see details below)
- ☐ - Test program
- ☐ -

Operating modes of the EUT:

No.	Description
1	Normal mode: continuous temperature measurements with 1 sec data rate interval

Cables:

No.	Type	Length	Designation	Note
1	Shielded, 5-pin metal round connector	9 m	4-20mA Current Loop	
2	Shielded, 5-pin metal round connector	9 m	RS-232	

Support equipment/Services:

No.	Item	Description
1	AC/DC Power Adapter	DC Power Source
2	Lenovo Laptop, model ThinkPad	Local PC

General notes: According to the Client Statement the tested model SulfiLogger™ S1-1020-5mg/L is electrically identical to the product family SulfiLogger™ A1-BCDE-F, where

- A is X for devices for Ex applications; S for non-Ex applications
- B is the analyte, 1: H₂S; 2: O₂; 3: H₂; 4: NO; 5: N₂O
- C is the mechanical design of the sensor:
 - 0: Flush front;
 - 1: Threaded front (G1") – type A;
 - 2: Threaded front (G1") – type B;
 - 3: Flush front and conduit through sensor;
 - 4: Threaded front (G1") and conduit through sensor
- D is a number 0-9 defining the sensor/software configuration
- E is 0
- F is the maximum concentration including unit.

3.3 Environmental conditions

During the measurement the environmental conditions were within the required ranges and shown in the test data sections

4.0 TEST CONDITIONS AND RESULTS

4.1 Line Conducted Emissions

Test result:	Pass
Frequency range:	0.15MHz-30MHz
Max. Emissions margin:	10.3 dB below the limits

Notes: As the EUT is powered via 4-20mA Current Loop circuitry, the Conducted Emissions testing according to FCC Part 15.107 was performed at AC Port of the Support equipment (the AC/DC Power Adapter / DC Power Source).

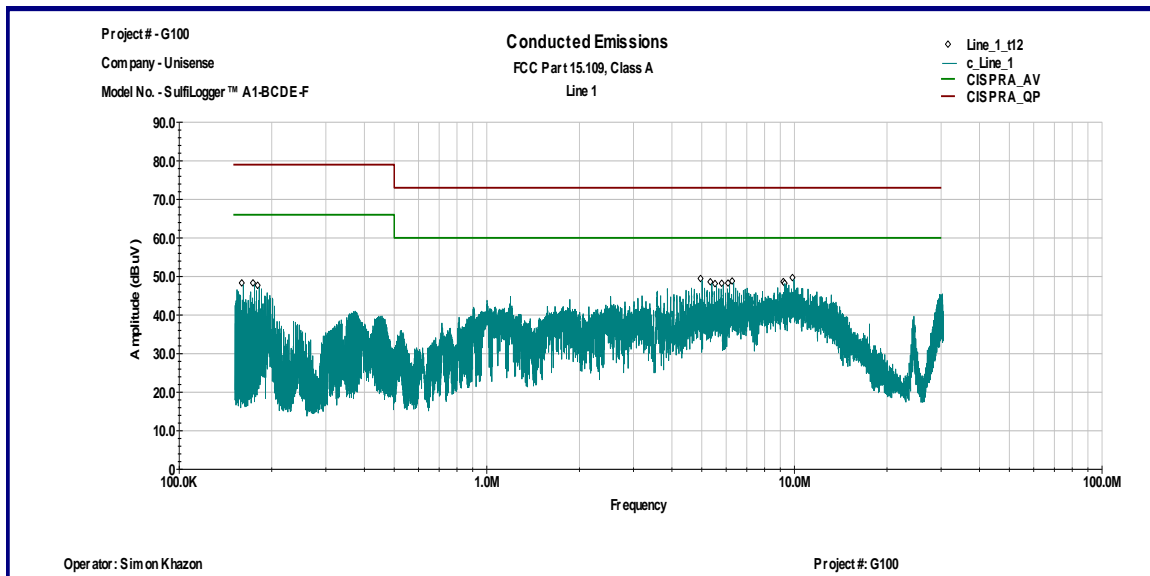


Test Setup Photos

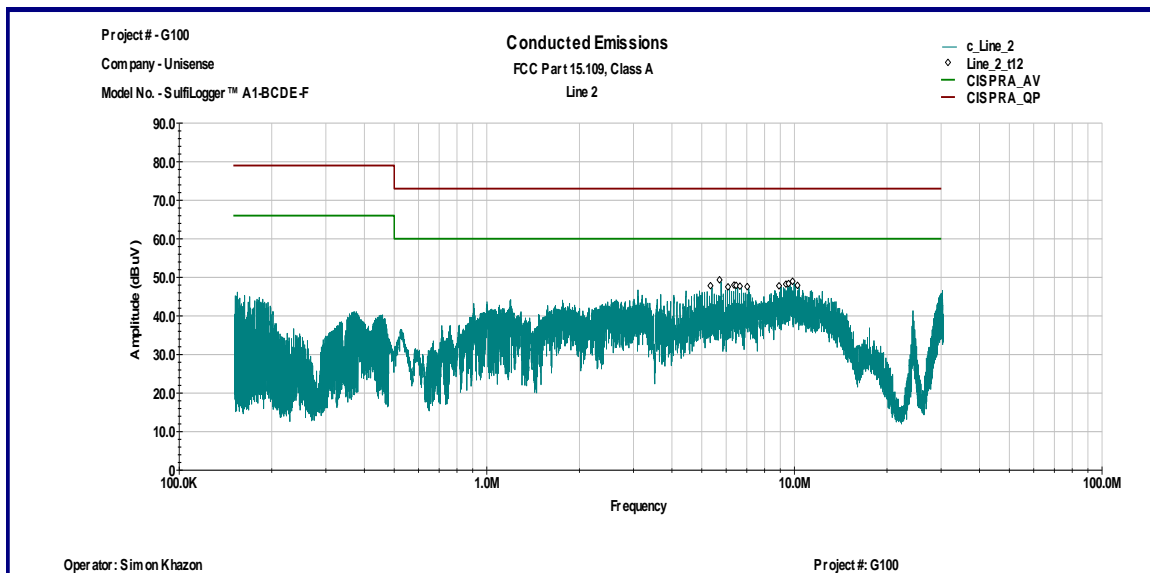
Date:	October 30, 2019	Result: Pass
Tested by:	Simon Khazon	
Standard:	FCC Part 15.107, Class A	
Test Point:	Line 1 and Line 2	
Operation mode:	See page 5	
Environmental Conditions:	23°C; 35%(RH); 98.7kPa	
Equipment Verification:	<input checked="" type="checkbox"/>	
Note:	None	

Table 1

Line 1					
Frequency MHz	Peak dBμV	QP Limit dBμV	AVG Limit dBμV	QP Margin dB	AVG Margin dB
159.79 KHz	48.3	79.0	66.0	-30.7	-17.7
173.77 KHz	48.3	79.0	66.0	-30.7	-17.7
179.91 KHz	47.7	79.0	66.0	-31.3	-18.3
4.9498 MHz	49.5	73.0	60.0	-23.5	-10.5
5.328 MHz	48.6	73.0	60.0	-24.4	-11.4
5.5172 MHz	48.1	73.0	60.0	-24.9	-11.9
5.8021 MHz	48.2	73.0	60.0	-24.8	-11.8
6.0829 MHz	48.3	73.0	60.0	-24.7	-11.7
6.2685 MHz	48.8	73.0	60.0	-24.2	-11.2
9.1996 MHz	48.7	73.0	60.0	-24.3	-11.3
9.2931 MHz	48.2	73.0	60.0	-24.8	-11.8
9.8515 MHz	49.7	73.0	60.0	-23.3	-10.3
Line 2					
Frequency MHz	Peak dBμV	QP Limit dBmV	AVG Limit dBmV	QP Margin dB	AVG Margin dB
5.3305 MHz	47.8	73.0	60.0	-25.2	-12.2
5.7039 MHz	49.4	73.0	60.0	-23.6	-10.6
6.0829 MHz	47.5	73.0	60.0	-25.5	-12.5
6.3613 MHz	48.0	73.0	60.0	-25.0	-12.0
6.4602 MHz	47.9	73.0	60.0	-25.1	-12.1
6.6458 MHz	47.7	73.0	60.0	-25.3	-12.3
7.0261 MHz	47.6	73.0	60.0	-25.4	-12.4
8.9115 MHz	47.8	73.0	60.0	-25.2	-12.2
9.3826 MHz	48.2	73.0	60.0	-24.8	-11.8
9.5673 MHz	48.4	73.0	60.0	-24.6	-11.6
9.8564 MHz	49.0	73.0	60.0	-24.0	-11.0
10.229 MHz	47.9	73.0	60.0	-25.1	-12.1



Graph 1



Graph 2

4.2 Radiated Emissions

Test location: ☐ OATS ☒ Anechoic Chamber

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Frequency range: 30MHz-1000MHz

Max. Emissions margin: 8.2 dB below the limits

Notes: The Radiated Emissions scan was performed in the Anechoic chamber at 3m measurement distance
(see Table 2 and Graphs 3 - 4)

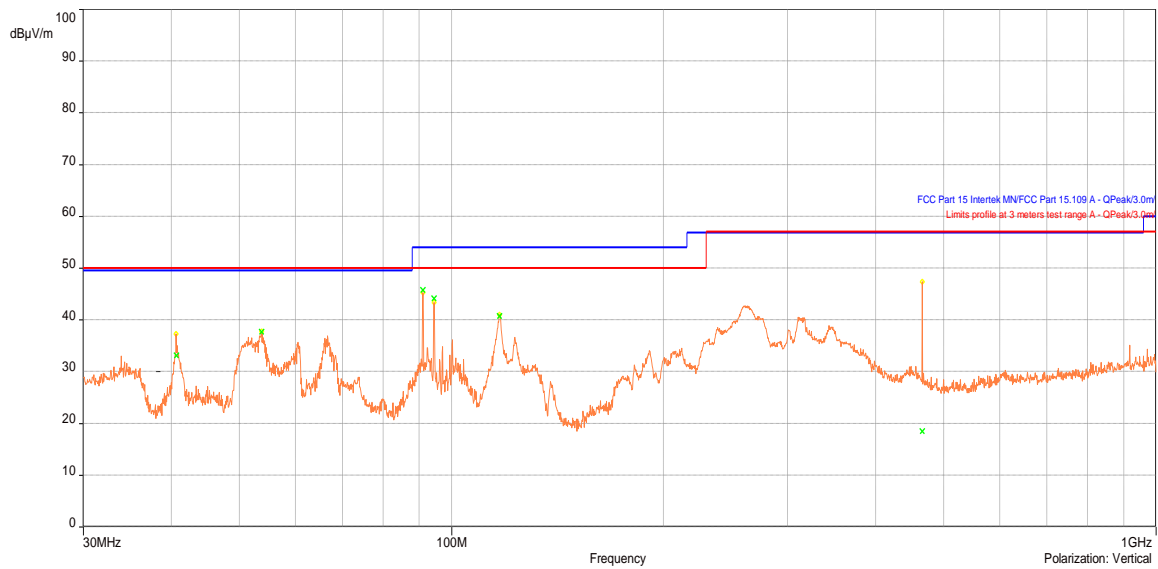


Test Setup Photos

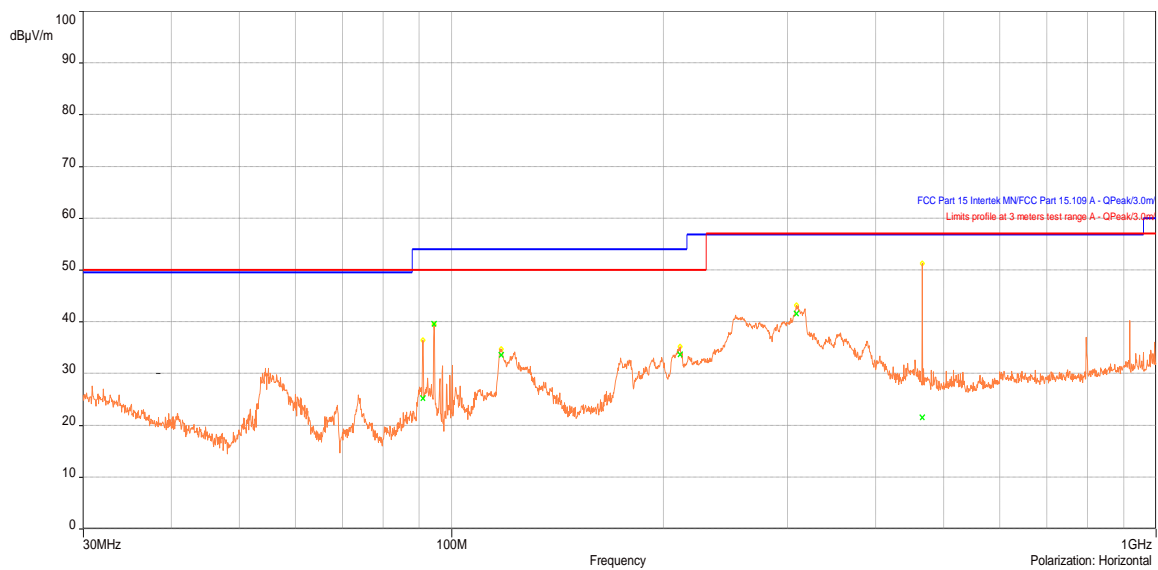
Date:	May 9-10, 2019	Result: Pass
Tested by:	Simon Khazon	
Standard:	FCC Part 15.109, Class A	
Test Point:	Enclosure	
Operation mode:	See page 5	
Environmental Conditions:	22°C; 32%(RH); 98.3kPa	
Equipment Verification:	<input checked="" type="checkbox"/>	
Note:	None	

Table 2

Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	QP Reading	Total @ 3m	Limit	Margin
MHz	Polarity	Hts(m)	dB1/m	dB	Gain (dB)	dBμV	dBμV/m	dBμV/m	dB
40.71	V	1.01	18.0	0.4	0.0	14.6	33.1	49.5	-16.4
53.77	V	1.28	11.7	0.5	0.0	25.5	37.7	49.5	-11.9
91.10	V	1.20	13.7	0.7	0.0	31.3	45.8	54.0	-8.2
94.50	V	1.24	14.4	0.7	0.0	28.9	44.1	54.0	-9.9
117.06	V	1.00	16.9	0.8	0.0	23.0	40.7	54.0	-13.3
465.99	V	2.31	21.5	1.8	0.0	-4.8	18.5	56.9	-38.4
91.10	H	3.05	13.7	0.7	0.0	10.7	25.2	54.0	-28.8
94.49	H	2.50	14.4	0.7	0.0	24.4	39.5	54.0	-14.5
117.72	H	3.70	16.9	0.8	0.0	15.8	33.6	54.0	-20.4
211.04	H	2.61	14.8	1.1	0.0	17.7	33.7	54.0	-20.3
308.81	H	2.07	18.1	1.4	0.0	22.0	41.6	56.9	-15.3
465.95	H	2.37	21.5	1.8	0.0	-1.8	21.5	56.9	-35.4



Graph 3



Graph 4

5.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	LAST CAL DATE	CAL DUE	USED
Spectrum Analyzer	R & S	ESU	100398	25283	07/09/2018	07/09/2019	<input checked="" type="checkbox"/>
Bicono-Log Antenna	Schaffner-Teseq	CBL6112B	2468	9734	06/26/2018	06/26/2019	<input checked="" type="checkbox"/>
LISN	COM-Power	Li-215A	191970	172315	07/17/2018	07/17/2019	<input checked="" type="checkbox"/>
LISN	COM-Power	Li-215A	191971	172316	04/04/2019	04/04/2020	<input checked="" type="checkbox"/>
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBU	VBU	<input checked="" type="checkbox"/>
System	Nexio Inc.	BAT-EMC	Ver. 3.17.0.21	172Nexio	VBU	VBU	<input checked="" type="checkbox"/>

6.0 REVISION HISTORY

REVISION LEVEL	DATE	REPORT NUMBER	PREPARED	REVIEWED	NOTES
0	10-30-2019	103927645MIN-004	SK	US	Original Issue