Report on the Radio Testing of:

RFID PROXIMITY SWITCH – safeIDS

Model(s):

- 1. SE1-ST1A20 (Sensor)
- 2. SE1-SS1A20 (Sensor)
- 3. SE1-AM02 (Actuator)

In accordance with 47 CFR FCC Part 2.1091

Prepared for: SICK AG Erwin-Sick-Str. 1 79183 Waldkirch Germany

COMMERCIAL-IN-CONFIDENCE

Document Number: 7191331641-EEC24/03 | Issue: 01 FCC ID: 2AHDRSE1

RESPONSIBLE FOR	NAME	DATE	SIGNATURE			
Approved By	Foo Kai Maun	24 Apr 2024				
Prepared By	Quek Keng Huat	24 Apr 2024				
Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD PSB document convolute.						
EXECUTIVE SUMMARY A sample of this product was tested and found to be compliant with the mentioned standard(s).						



Laboratory: TÜV SÜD PSB Pte. Ltd. 15 International Business Park TÜV SÜD @ IBP Singapore 609937 Phone : +65-6778 7777 E-mail: info.sg@tuvsud.com https://www.tuvsud.com/sg Co. Reg : 199002667R Regional Head Office: TÜV SÜD Asia Pacific Pte. Ltd. 15 International Business Park TÜV SÜD @ IBP Singapore 609937 TÜV [®]

Page 1 of 18



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Contents

1	Report Summary	3
1.1	Report Modification Record	3
1.2	Introduction	4
1.3	Brief Summary of Results	5
1.4	Product Information	8
1.5	Deviations from the Standard	9
1.6	EUT Modification Record	9
1.7	Test Location(s)	10
1.8	Test Facilities Registrations	10
1.9	Supporting Equipment	11
2	Test Details	12
2.1	Maximum Permissible Exposure (MPE)	12
3	Test Equipment	14
4	Measurement Uncertainty	15
5	Annex A – FCC Label and PositionS	16
End o	of the Test Report	



1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	24 Apr 2024





1.2 Introduction

Applicant / Manfacturer	:	SICK AG Erwin-Sick-Str. 1 79183 Waldkirch Germany
Factory	:	SICK Sdn. Bhd. No. 16, Jalan Indah Gemilang 5 Taman Perindustrian Gemilang 81800, Ulu Tiram, Johor, Malaysia
Model Number(s)	:	Sensors 1. SE1-ST1A20 2. SE1-SS1A20 Actuators 1. SE1-AM02
Serial Number(s)	:	Sensors 1. 23320012 (Part Number 1132196) 2. 23330027 (Part Number 1132197) Actuators 1. 23340004 (Part Number 1132272)
Number of Complex Tested	¢	
Number of Samples rested		200
Test Sample(s) Condition	:	Good
Quotation Reference	:	5824642 & 5993428
Test Specification/Issue/Date	:	FCC 47 CFR Part 2.1091
Test Sample(s) Received Date	:	07 Sep 2023
Start of Test	:	07 Sep 2023
Finish of Test	:	03 Oct 2023



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with specifications as shown below.

Specification Clause	Test Description	Result	Comments/Base Standard
47 CFR FCC Part 2			
2.1091	Radiofrequency Radiation Exposure: Mobile Devices	Pass	KDB 447498 D01 General RF Exposure Guidance v06

Notes

- 1. The EUT is a Class B device when in non-transmitting state and meets the 47 CFR FCC Part15B Class B requirements.
- 2. The EUT was operated in continuous transmission, ie 100% duty cycle.
- 3. The software library stacks firmware used in the product during testing is R01.06.00. Sick Product Center Asia Pte. Ltd. has since updated their firmware to R01.06.00 → R01.07.00. Sick Product Center Asia Pte. Ltd. declares that the firmware update will not impact the RF performance and Sick Product Center Asia Pte. Ltd. had performed detailed analysis of the impact of this firmware update to the testing results. Please refer to Sick Product Center Asia Pte. Ltd. for more information.
- 4. The difference between variant SE1-SS1A20 and SE1-ST1A20 is the number of inductor coils (antenna) and capacitors used for impedance matching due to different sensing direction. Please refer to the following illustrations for more details.
- 5. Sick Product Center Asia Pte. Ltd. declares that safeIDS System comprises of a Device (Sensor) & Actuator.

Device (Ser	sor)	Actuato	r	
a. SE1-ST1A2	0 (Tested)	a. SE1-AM	01 (Declared)	
h SE1-SS1A2	E1-SS1A20 (Tested)			
b. 5E1-551A20 (Tested)		c. SE1-AN	103 to SE1-AM16 Declar	red)
	1 5			
125kHz				_
Actuator (RE)	Sens	or	Cable	Safe IO-Link Master



Notes (Continued)

SICK SISTRAID IP-0204-PD20-801					SE1 Variant E372141 Rev	1 and 2 compari /. 01 (2023-11-2	sons 29)
Variant No	safeIDS Description	Product iden. Number P/N	TYPE of Device	Sensing Direction	Antenna placement at PCB	Hardware (RFID chipset, MCU, power supply, digital circuits)	Firmware
1	Front/TOP sensing via IO- Link Safety refer to Figure 1 (a) to (c)	1132196	SE1- ST1A20	TOP (Figure 1b)	Two ferrite inductor coils	IDENTICAL	IDENTICAL
2	SIDE sensing via IO-Link Safety – refer to Figure 1 (d) to (f)	1132197	SE1- SS1A20	SIDE (Figure 1e)	One ferrite inductor coil		





Notes (Continued)

6. Sick Product Center Asia Pte. Ltd. declares that the actuators have identical electrical characteristics, material and physical dimensions.

		SE1 Actuator	
no.	Type of Device	Identification Number (1 mio#)	ShortID (Variants)
1	SE1-AM01	1132271	01
2	SE1-AM02	1132272	02
3	SE1-AM03	1132273	03
4	SE1-AM04	1132274	04
5	SE1-AM05	1132275	05
6	SE1-AM06	1132276	06
7	SE1-AM07	1132277	07
8	SE1-AM08	1132278	08
9	SE1-AM09	1132279	09
10	SE1-AM10	1132280	10
11	SE1-AM11	1132281	11
12	SE1-AM12	1132282	12
13	SE1-AM13	1132283	13
14	SE1-AM14	1132284	14
15	SE1-AM15	1132285	15
16	SE1-AM16	1132286	16
the second se	the second se	A REAL PROPERTY AND A REAL	

The only difference between each actuator is the digital data programmed in ShortID. Sick Product Center Asia Pte. Ltd. declares that the difference in ShortID value will not cause any interference to RF/electromagnetic or EMC. SE1-AM02 was selected as a representative model for the family.

- 7. This report 7191331641-EEC24/03 | Issue: 01 was reproduced from TÜV SÜD PSB issued test report 7191315763-EEC23/02 | Issue: 01 dated 17 Oct 2023 to amend
 - Applicant to SICK AG.
 - Issue report 47 CFR FCC Part 2.1091.



1.4 **Product Information**

1.4.1 Technical Description

Description		The Equipment Under Test(s) (EUT(s)) is a RFID PROXIMITY SWITCH.					
Microprocessor	:	TMicroelectronics STM32F303VEH6					
Operating Frequency	:	125KHz (RFID)					
Clock / Oscillator Frequency	:	16MHz (crystal for MCU)					
	2						
Modulation	dulation : Amplitude Modulation (AM)						
Antenna Gain	:	Not Applicable					
Port / Connectors	1	M12 A-coded 4-pin Male connector					
Rated Power	:	DC Supply Voltage					
		Nominal 24Vdc					
		Minimum 18/da					
	6						
Accessories							
Accessones							



1.4.2 Test Configuration and Modes of Operation

Mode(s)	Description
Maximum RF power transmission	The EUT was transmitting and receiving continuously at 125kHz.

1.4.3 Test Setup Drawings



1.5 Deviations from the Standard

Nil.

1.6 EUT Modification Record

No modifications were made.



1.7 Test Location(s)

TÜV SÜD PSB Pte Ltd Electrical & Electronics Centre (EEC), Product Services, 15 International Business Park TÜV SÜD @ IBP Singapore 609937

1.8 Test Facilities Registrations

Requirements	Registration Numbers
FCC	994109 (Test Firm Registration Number)
ISED	SGAP01 (CAB Identifier)
	2932N-1 (10m Semi-Anechoic Chamber)
VCCI	R-13324 (10m ANC), G-10203 (10mANC)
	R-20151 (3m RF Chamber - Lab 7), G-20149 (3m RF Chamber - Lab 7)
9	C-14933 (C.E @ CEIBP)
11	T-12403 (Telecom Ports @ CEIBP)
BSMI	SL2-IS-E-6001R [CNS-13803 (ISM Equipment)]
	SL2-IN-E-6001R [CNS-13438, CNS-15936 (IT Equipment)]
	SL2-R1/R2-E-6001R [CNS-13439, CNS-15936 (Broadcast Receivers)]
	SL2-A1-E-6001R [CNS-13783-1 (Household Appliances)]
	SL2-L1-E-6001R [CNS-14115 (Lighting Equipment)]
SABS	SABS/A-LAB/0030/2018
ASCA	TL-86



1.9 Supporting Equipment

Equipment Description (Including Brand Name)	Model, Serial & FCC ID Number	Cable Description (List Length, Type & Purpose)
Dell Latitude 7280 Laptop	M/N: P28S001	
	S/N: JQPRBH2	
	FCC ID: DoC	
Dell AC Adapter	M/N: LA130PM121	1.80m unshielded power cable
	S/N: CN-0VJCH5-72438-4AS- 2F47-A01	
	FCC ID: DoC	
PowerPax AC Adapter	M/N: SW4309B	1.50m unshielded power cable
	S/N: AM-77717	
	FCC ID: DoC	
PowerPax AC Adapter	M/N: SW4309B	1.50m unshielded power cable
	S/N: AM-77718	
	FCC ID: DoC	
TEConcept GmbH	M/N: IO-Link Master 03	
	S/N: EMVT006A	
	FCC ID: DoC	
TEConcept GmbH	M/N: IO-Link Master 03	
	S/N: EMVT006B	
	FCC ID: DoC	
LINDY Electronics Limited Serial	M/N: Nil	1.50m unshielded signal cable
USB to Serial Converter	S/N: Nil	
	FCC ID: DoC	



2 Test Details

2.1 Maximum Permissible Exposure (MPE)

2.1.1 Test Limits

The EUT shows compliance to the requirements of this section, which states the MPE limits for general population / uncontrolled exposure are as shown below:

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (min)
0.3 - 1.34	614	1.63	100 Note 2	30
1.34 - 30	824 / f	2.19/f	180 / f ^{2 Note 2}	30
30 - 300	27.5	0.073	0.2	30
300 - 1500	- 2	-	f / 1500	30
1500 - 100000 1.0 30				30
Notes				
1. f = frequency in MHz				
2. Plane wave equivalent power density				

2.1.2 Test Setup

- 2.1.2.1 The EUT and supporting equipment were set up as shown on the setup photo.
- 2.1.2.2 The relevant field probe was positioned at least 20cm away from the EUT and supporting equipment boundary.

2.1.3 Test Method

- 2.1.3.1 The EUT was switched on and allowed to warm up to its normal operating condition.
- 2.1.3.2 The test was first carried out at one of the positions / sides of the EUT.
- 2.1.3.3 Power density measurement (mW/cm²) was made using the field meter set to the required averaging time.
- 2.1.3.4 Measurements were repeated for the next position and its associate EUT operating mode, until all possible positions and modes were measured.

Sample Calculation Example

At 2400 MHz, limit = 1.0 mW/cm²

Power density reading obtained directly from field meter = 0.3 mW/cm^2 averaged over the required 30 minutes.

Therefore, margin = $0.3 - 1.0 = -0.7 \text{ mW/cm}^2$

i.e. 0.7 mW/cm² below limit



2.1.4 **Test Results**

Test Input Power	120V 60Hz	Temperature	24°C
Test Distance	20cm	Relative Humidity 60%	
Model	SE1-SS1A20	Atmospheric Pressure	1030mbar
		Tested By	Derrick Ng
		Test Date	03 Oct 2023

Freq (MHz)	Measured Magnetic Field Strength (A/m)	Magnetic Field Strength Limit (A/m)	Margin (dB)	Average Time (min)
0.125	0.21	1.63	1.42	30

	1.13k		
Test Input Power	120V 60Hz	Temperature	24°C
Test Distance	20cm	Relative Humidity 60%	
Model	SE1-ST1A20	Atmospheric Pressure 1030mbar	
		Tested By	Derrick Ng
		Test Date	03 Oct 2023

Freq (MHz)	Measured Magnetic Field Strength (A/m)	Magnetic Field Strength Limit (A/m)	Margin (dB)	Average Time (min)
0.125	0.19	1.63	1.44	30

SÜD

Notes Notes

1.	All possible modes of operation were investigated. Only the worst case highest radiation levels were measured. Measurements were taken at the required averaging time. All other radiation levels were relatively insignificant.
2.	Accordingly, for § 2.1091-Mobile devices, the MPE limits between 100 kHz to 300 kHz are to be considered the same as those at 300 kHz in Table 1 of § 1.1310, that is, 614 V/m and 1.63 A/m, for the electric field and magnetic field, respectively.
3.	A "positive margin" indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a "negative margin" indicates a FAIL.



3 Test Equipment

Instrument	Model	S/No	Cal Due Date
Maximum Permissible Exposure (MPE)			
Wavecontrol EM Field Meter	SMP2	21SN1744	03 Nov 2023
Wavecontrol Probe	WP400	21WP100901	03 Nov 2023





4 Measurement Uncertainty

All measured results are traceable to the SI units. The uncertainty of the measurement is at a confidence level of approximately 95%, with a coverage factor of 2.

Test Name	Measurement Uncertainty	
Conducted Emissions at Mains Terminals	1.1dB (9kHz to 30MHz)	
Radiated Emissions	10m Anechoic Chamber (Lab 4)	
	2.2dB (9kHz to 30MHz @ 10m)	
	3.1dB (30MHz to 1GHz @ 10m)	
	3.7dB (30MHz to 1GHz @ 3m)	
	4.7dB (>1GHz to 40GHz @ 3m)	
	<u>3m RF Chamber (Lab7)</u>	
	3.6dB (30MHz to 1GHz @ 3m)	
2	4.7dB (>1GHz to 40GHz @ 3m)	
Maximum Permissible Exposure	2.53% (0.01kHz to 400kHz) – H-field	
	1.3dB (0.3MHz to 18GHz) - E-field	
	2.3dB (1MHz to 40GHz) - E-field	





5 Annex A – FCC Label and PositionS

Labelling requirements per Section 2.925 & 15.19

The label shown will be permanently affixed at a conspicuous location on the device and be readily visible to the user at the time of purchase.





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Effective 26 January 2021



