

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
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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 control rule.

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with the mentioned standard(s).



LA-2007-0380-A LA-2007-0386-C
LA-2007-0381-F LA-2010-0464-D
LA-2007-0382-B LA-2018-0702-B
LA-2007-0383-G LA-2018-0703-G
LA-2007-0384-G LA-2020-0747-L
LA-2007-0385-E

The results reported herein have been performed in accordance with the terms of accreditation under the Singapore Accreditation Council. Inspections/Calibrations/Tests marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our inspection body/laboratory.

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®

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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 / Manufacturer	:	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 Samples Tested	:	2
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

- The EUT is a Class B device when in non-transmitting state and meets the 47 CFR FCC Part15B Class B requirements.
- The EUT was operated in continuous transmission, ie 100% duty cycle.
- 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.
- 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.
- Sick Product Center Asia Pte. Ltd. declares that safeIDS System comprises of a Device (Sensor) & Actuator.

Device (Sensor)
a. SE1-ST1A20 (Tested)
b. SE1-SS1A20 (Tested)

Actuator
a. SE1-AM01 (Declared)
b. SE1-AM02 (Tested)
c. SE1-AM03 to SE1-AM16 Declared)



Notes (Continued)





SISTRAID
IP-0204-PD20-801


SE1 Variant 1 and 2 comparisons
E372141 Rev. 01 (2023-11-29)

Variant No	safelDS 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 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

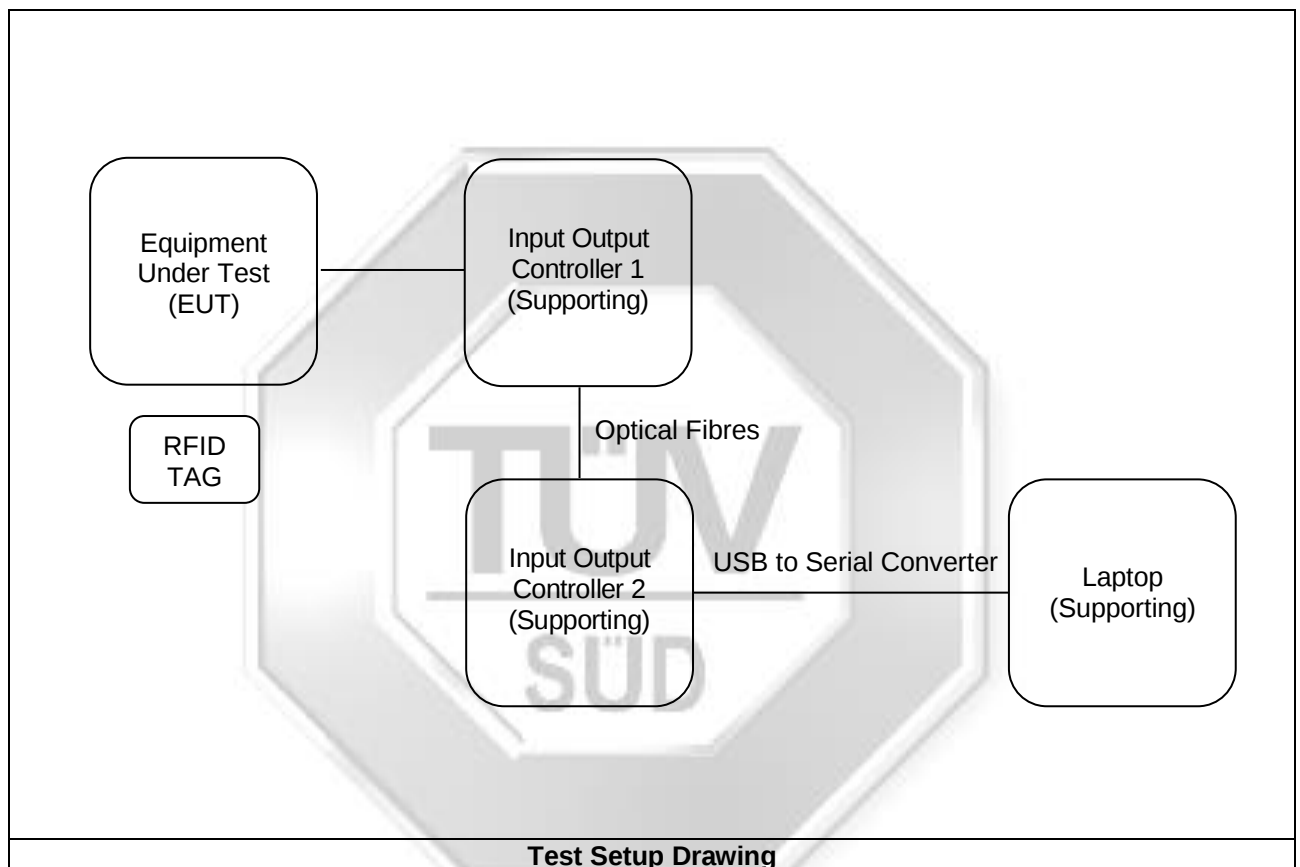
1.4.1 Technical Description

Description	:	The Equipment Under Test(s) (EUT(s)) is a RFID PROXIMITY SWITCH.
Microprocessor	:	STMicroelectronics STM32F303VEH6
Operating Frequency	:	125KHz (RFID)
Clock / Oscillator Frequency	:	16MHz (crystal for MCU)
Modulation	:	Amplitude Modulation (AM)
Antenna Gain	:	Not Applicable
Port / Connectors	:	M12 A-coded 4-pin Male connector
Rated Power	:	DC Supply Voltage Nominal 24Vdc Maximum 30Vdc Minimum 18Vdc
Accessories	:	Nil

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) SG0002 (Designation 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) C-14933 (C.E @ CEIBP) 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 S/N: CN-0VJCH5-72438-4AS-2F47-A01 FCC ID: DoC	1.80m unshielded power cable
PowerPax AC Adapter	M/N: SW4309B S/N: AM-77717 FCC ID: DoC	1.50m unshielded power cable
PowerPax AC Adapter	M/N: SW4309B S/N: AM-77718 FCC ID: DoC	1.50m unshielded power cable
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 USB to Serial Converter	M/N: Nil S/N: Nil FCC ID: DoC	1.50m unshielded signal cable

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	-	-	f / 1500	30
1500 - 100000	-	-	1.0	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/cm² averaged over the required 30 minutes.

Therefore, margin = 0.3 – 1.0 = -0.7 mW/cm²

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

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

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

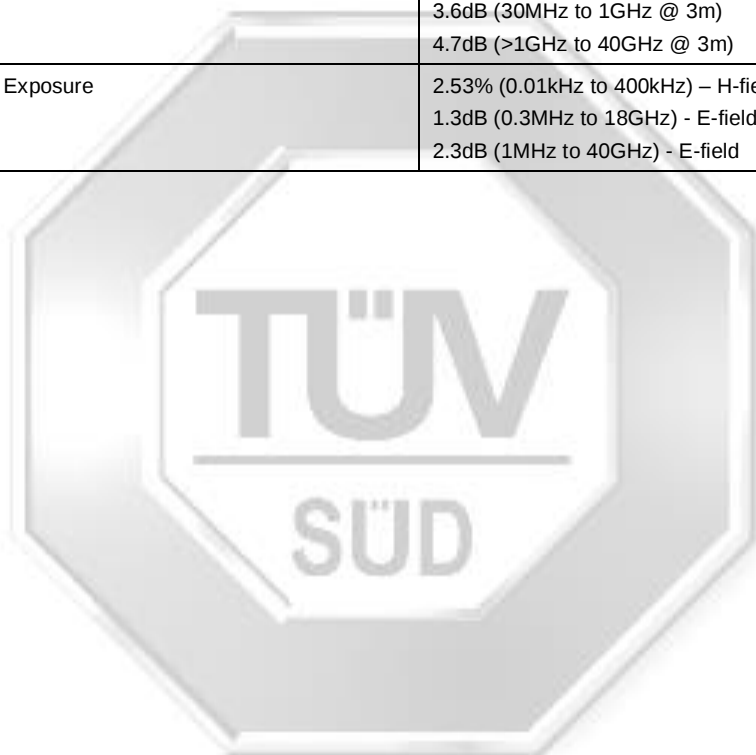
Instrument	Model	S/No	Cal Due Date
<i>Maximum Permissible Exposure (MPE)</i>			
Wavecontrol EM Field Meter	SMP2	21SN1744	03 Nov 2023
Wavecontrol Probe	WP400	21WP100901	03 Nov 2023



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	<u>10m Anechoic Chamber (Lab 4)</u> 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) 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.

• Sensor

SICK

SE1

Safety Switch
SE1-ST1A20

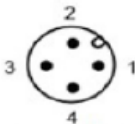
Product ID
 pid.sick.com /
 P/N 1132196/
 S/N 24050001



Safe Switch On (Front)	: 15
Safe Switch On (Top/Bottom)	: 6
Safe Switch Off	: 30

FCC ID : 2AHDRSE1, IC : 21147SE1
 Type 1, Class 2
 Safety Parameters : Cat. 4, PL e (EN ISO 13849)
 SIL 3 (IEC 61508)

Enclosure Rating	: IP67, IP69K
Operating Temperature	: -10 °C to +70 °C
Power Supply	: DC 24 V / 35 mA
Operating Instruction	: 8028531



1 +24 V DC
2 N.C.
3 0V
4 C / Q

handle it with care
Fragile

SICK AG, 79183 Waldkirch, Germany

Made in Malaysia (WX)

Sample Label Print on Packaging Bag



Please note that this Report is issued under the following terms :

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Effective 26 January 2021

