

Report on the FCC Testing of the
Kronegger
RFID Reader Module
Model: Kronegger PuP small RS232
In accordance with KDB447498

Prepared for: Kronegger GmbH
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8074 Grambach
Austria



Product Service

Add value.
Inspire trust.

COMMERCIAL-IN-CONFIDENCE

FCC ID: ZKCPP9912-2009-5

Date: 2023-12-14

Document Number: TR-713313045-02 | Revision 0

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Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

Engineering Statement:

This measurement shown in this report were made in accordance with the procedures described on test pages.

All reported testing was carried out on a sample equipment to demonstrate limited compliance with with 47 CFR, Part 1 and KDB 447498 D01

The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Martin Steindl	2023-12-15	 SIGN-ID 865138

Laboratory Accreditation
DAkkS Reg. No. D-PL-11321-11-02
DAkkS Reg. No. D-PL-11321-11-03

Laboratory recognition
Registration No. BNetzA-CAB-16/21-15

Industry Canada test site registration
3050A-2

Executive Statement:

A sample of this product was tested and found to be compliant with 47 CFR, Part 1 : 2022 KDB 447498 D01 v06

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Trade Register Munich
HRB 85742
VAT ID No. DE129484267
Information pursuant to Section 2(1)
DL-InfoV (Germany) at
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1 Report Summary

1.1 Modification Report

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

Revision	Description of changes	Date of Issue
0	First Issue	2023-12-15

Table 1: Report of Modifications

1.2 Introduction

Applicant	Kronegger GmbH Parkring 1 8074 Grambach Austria
Manufacturer	Kronegger GmbH
Model Number(s)	Kronegger PuP small RS232
Serial Number(s)	072301991
Version(s)	prod-05.2-01.0 Vers. 4.1
Number of Samples Tested	1
Test Specification(s) / Issue / Date	FCC 47 CFR Part 1: 2022 and
Test Plan/Issue/Date	N/A
Order Number	2023102402
Date	
Date of Receipt of EUT	2023-12-05
Start of Test	2023-12-15
Finish of Test	2023-12-15
Name of Engineer(s)	M. Steindl
Related Document(s)	KDB 447498 D01 v06



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 1 is shown below.

<i>Section</i>	<i>Specification Clause</i>	<i>Test Description</i>	<i>Result</i>
Fehler! V erweis- quelle konnte nicht ge- funden werden.	1.1310	Radiofrequency radiation exposure limits	Pass

Table 2: Results according to FCC 47 CFR Part 1



1.4 Product Information

1.4.1 Technical Description

The EUT is a RFID reader module

Frequency Band 13.110 – 14.010 MHz

Number of frequency channels: 1

Supply Voltage: 5 V

Supply Frequency: DC (0 Hz)

*Highest clock frequency
(non-radio part):* 48 MHz

1.4.2 List of Antennas

<i>Manufacturer</i>	<i>Model</i>	<i>Antenna im- pedance</i>	<i>Antenna Type</i>	<i>Antenna gain</i>
Kronegger	N/A	N/A	Integrated loop antenna	N/A

Table 3: List of antennas

1.4.3 EUT Ports / Cables identification

Port	Max Cable Length speci- fied	Usage	Screened
RS-232 with 5 V DC supply	N/A	Signal-Control port	yes

Table 4

1.5 Test Configuration

The EUT was configured as RS-232 interface device of a laptop PC.

1.6 Modes of Operation

Continuous polling mode



1.7 EUT Modifications Record

The table below details modifications made to the EUT during the test programme.
The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer	Not Applicable	Not Applicable

Table 5

1.8 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing test laboratory:

Test Name	Name of Engineer(s)
Radiofrequency radiation exposure limits	M. Steindl

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany



2 Test Details

2.1 Radiofrequency radiation exposure limits

2.1.1 Specification Reference

FCC 47 CFR Part 1, Clause 1.1310

2.1.2 Equipment under Test and Modification State

Kronegger PuP small RS232; S/N 072301991; Modification State 0

2.1.3 Date of Test

2023-12-15

2.1.4 Environmental Conditions

Ambient Temperature	23 °C
Relative Humidity	34 %



2.1.5 Specification Limits

<i>Limits for Occupational / Controlled Expo</i>				
<i>Frequency Range (MHz)</i>	<i>Electric field strength (V/m)</i>	<i>Magnetic field strength (A/m)</i>	<i>Power density (mW/cm²)</i>	<i>Averaging time (min)</i>
0.3 – 3.0	614	1.63	100	≤ 6
3.0 – 30	1842 / f	4.89 / f	900 / f^2	< 6
30 – 300	61.4	0.163	1.0	< 6
300 – 1500			$f / 300$	< 6
1500 - 100000			5	< 6
Note 1: f in MHz				

Table 6 Limits for Occupational / Controlled Exposure

<i>Limits for Occupational / Controlled Expo</i>				
<i>Frequency Range (MHz)</i>	<i>Electric field strength (V/m)</i>	<i>Magnetic field strength (A/m)</i>	<i>Power density (mW/cm²)</i>	<i>Averaging time (min)</i>
0.3 – 3.0	614	1.63	100	< 30
3.0 – 30	824 / f	2.19 / f	180 / f^2	< 30
30 – 300	27.5	0.073	0.2	< 30
300 – 1500			$f / 1500$	< 30
1500 - 100000			1.0	< 30
Note 1: f in MHz				

Table 7 Limits for General Population / Uncontrolled Exposure



2.1.6 Test Results

Test was performed with a test distance of 20 cm

<i>Frequency</i>	<i>Electric Field Strength</i>	<i>Limit</i>	<i>Margin</i>
13.56 MHz	0.46 V/m	60.77 V/m	60.31 V/m

Table 8 Electric Field Strength

<i>Frequency</i>	<i>Magnetic Field Strength</i>	<i>Limit</i>	<i>Margin</i>
13.56 MHz	0.0213 A/m	0.1615 A/m	0.1402 A/m

Table 9: Magnetic Field Strength

2.1.7 Test Location and Test Equipment

The test was carried out in radio test laboratory

Instrument	Manufacturer	Type No	TE No	Calibra- tion Pe- riod (months)	Calibration Due
Electromagnetic radiation meter	Narda	EMR-200	19590	36	2025-12-31
Electric field probe	Narda	Type 8.3	19591	36	2025-12-31
Magnetic field probe	Narda	Type 12.1	19592	36	2025-12-31

Table 10

3 Photos taken during tests





4 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

<i>Radio Interference Emission Testing</i>		
<i>Test Name</i>	<i>kp</i>	<i>Expanded Uncertainty</i>
Conducted Voltage Emission		
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB
100 kHz to 200 MHz (50Ω/5μH AMN)	2	± 3.6 dB
Discontinuous Conducted Emission		
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB
Conducted Current Emission		
9 kHz to 200 MHz	2	± 3.5 dB
Magnetic Fieldstrength		
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB
Radiated Emission		
30 MHz to 300 MHz	2	± 4.9 dB
300 MHz to 1 GHz	2	± 5.0 dB
1 GHz to 6 GHz	2	± 4.6 dB
Test distance 10 m		
30 MHz to 300 MHz	2	± 4.9 dB
300 MHz to 1 GHz	2	± 4.9 dB
The expanded uncertainty reported according to CISPR16-4-2: 2011 + A1 + A2 + Cor1 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$		

Table 11 Measurement uncertainty based on CISPR 16-4-2



<i>Radio Interference Emission Testing</i>		
<i>Test Name</i>	<i>kp</i>	<i>Expanded Uncertainty</i>
Occupied Bandwidth	2	± 5 %
Conducted Power		
9 kHz ≤ f < 30 MHz	2	± 1.0 dB
30 MHz ≤ f < 1 GHz	2	± 1.5 dB
1 GHz ≤ f ≤ 40 GHz	2	± 2.5 dB
1 MS/s power sensor (TS8997)	2	± 1.5 dB
Occupied Bandwidth	2	± 5 %
Power Spectral Density	2	± 3.0 dB
Radiated Power		
25 MHz – 6 GHz	1.96	±4.4 dB
1 GHz – 18 GHz	1.96	±4.7 dB
18 GHz – 40 GHz	1.96	±4.9 dB
40 GHz – 325 GHz	1.96	±6.1 dB
Conducted Spurious Emissions	2	± 3.0 dB
Radiated Spurious Emissions	2	± 6.0 dB
Voltage		
DC	2	± 1.0 %
AC	2	± 2.0 %
Time (automatic)	2	± 5 %
Frequency	2	± 10 ⁻⁷
The expanded uncertainty reported according to ETSI TR 100 028:2001 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%		

Table 12 Measurement uncertainty based on ETSI TR 100 028

The measurement uncertainty in the laboratory is less than or equal to the maximum measurement uncertainty according to CISPR16-4-2: 2011 + A1 + A2 + Cor1 (U_{CISPR}) and as specified in the test report below. This normative regulation means that the measured value is also the value to be assessed in relation to the limit value.



Test Name	Expanded Uncertainty
Occupied Bandwidth	±5 %
Conducted Power	
9 kHz ≤ f < 30 MHz	±1.0 dB
30 MHz ≤ f < 1 GHz	±1.5 dB
1 GHz ≤ f ≤ 40 GHz	±2.5 dB
1 MS/s power sensor (2.4 / 5 GHz band)	±1.5 dB
Power Spectral Density	±3.0 dB
Radiated Power	
25 MHz – 26.5 GHz	±6.0 dB
26.5 GHz – 66 GHz	±8.0 dB
40 GHz – 325 GHz	±10.0 dB
Conducted Spurious Emissions	±3.0 dB
Radiated Field Strength 9 kHz – 40 GHz	±6.0 dB
Voltage	
DC	± 1.0 %
AC	± 2.0 %
Time (automatic)	± 5 %
Frequency	± 10 ⁻⁷

Table 13 Decision Rule: Maximum allowed measurement uncertainty