PHOENIX TESTLAB

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Test Report

Report Number:

F231771E4 2nd version

Equipment under Test (EUT):

GIRO TA

Applicant:

Martin Lehmann GmbH & Co. KG

Manufacturer:

Martin Lehmann GmbH & Co. KG

ilac-MRA

DAkkS
Deutsche
Akkreditierungsstelle
D-PL-17186-01-00

References

[1] **ANSI C63.4:2014** American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

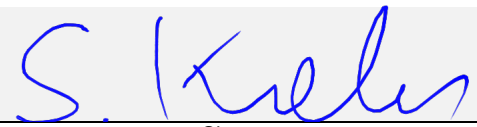
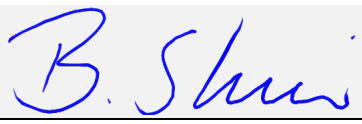
[2] **FCC 47 CFR Part 2:** General Rules and Regulations

[3] **FCC 47 CFR Part 15:** Radio Frequency Devices (Subpart B)

[4] **ICES-003 Issue 7: (October 2020)** Spectrum Management and Telecommunications. Interference-Causing Equipment Standard. Information Technology Equipment (Including Digital Apparatus) —Limits and Methods of Measurement

Test Result

The requirements of the tests performed as shown in the overview (clause 4) were fulfilled by the equipment under test. The complete test results are presented in the following.
“Passed” indicates that the equipment under test conforms with the relevant limits of the testing standard without taking any measurement uncertainty into account as stated in clause 10.2.8.2 of ANSI C63.4 (2014). However, the measurement uncertainty is calculated and shown in this test report.

Tested and written by:		Sebastian KREHS 23.04.2024
	Signature	
Reviewed and approved by:		Bernd STEINER 25.04.2024
	Signature	

This test report is only valid in its original form.

The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

Contents: Page

1 Identification

1.1 Applicant

Name:	Martin Lehmann GmbH & Co. KG
Address:	Uphauser Weg 82, 32429 Minden
Country:	Germany
Name for contact purposes:	-
Phone:	0571-5046-0
eMail address:	info@lehmann-locks.com
Applicant represented during the test by the following person:	-

1.2 Manufacturer

Name:	Martin Lehmann GmbH & Co. KG
Address:	Uphauser Weg 82, 32429 Minden
Country:	Germany
Name for contact purposes:	-
Phone:	0571-5046-0
eMail address:	info@lehmann-locks.com
Manufacturer represented during the test by the following person:	-

1.3 Test Laboratory

The tests were carried out by:

PHOENIX TESTLAB GmbH
Königswinkel 10
32825 Blomberg
Germany

Accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-05 and D-PL-17186-01-06, FCC Test Firm Designation Number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

1.4 EUT (Equipment under Test)

Test object: *	GIRO TA
Model name: *	GIRO TA
Model number: *	TAMTXPDX
Order number: *	-
FCC ID: *	W2Y-TAMTXPDX

	EUT number		
	1	2	3
Serial number: *	Engineering Sample	-	-
PCB identifier: *	SA023-1	-	-
Hardware version: *	SA023-11G	-	-
Software version: *	V.2.0.0	-	-

* Declared by the applicant

One EUT was used for all tests.

Note: PHOENIX TESTLAB GmbH does not take samples. The samples used for tests are provided exclusively by the applicant.

1.5 Technical Data of Equipment

General	
Power supply EUT: *	Battery powered (1 x CR123A)
Supply voltage EUT: *	U_{nom} = 3.0 V_{DC}
Temperature range: *	Operating: -5 °C to +60 °C Storage temperature -25 °C to +70 °C
Lowest / highest internal frequency: *	32.768 kHz RTC / 32 MHz CPU Clk

* Declared by the applicant

Equipment used for testing	
MIFARE RFID-Reader*1	Lehmann L033-A02 (L2NF13MX)
-	-

*1 Provided by the applicant

Ancillary equipment	
-	-
-	-

*1 Provided by the applicant

1.6 Dates

Date of receipt of test sample:	18.10.2023
Start of test:	08.02.2024
End of test:	08.02.2024

2 Operational States

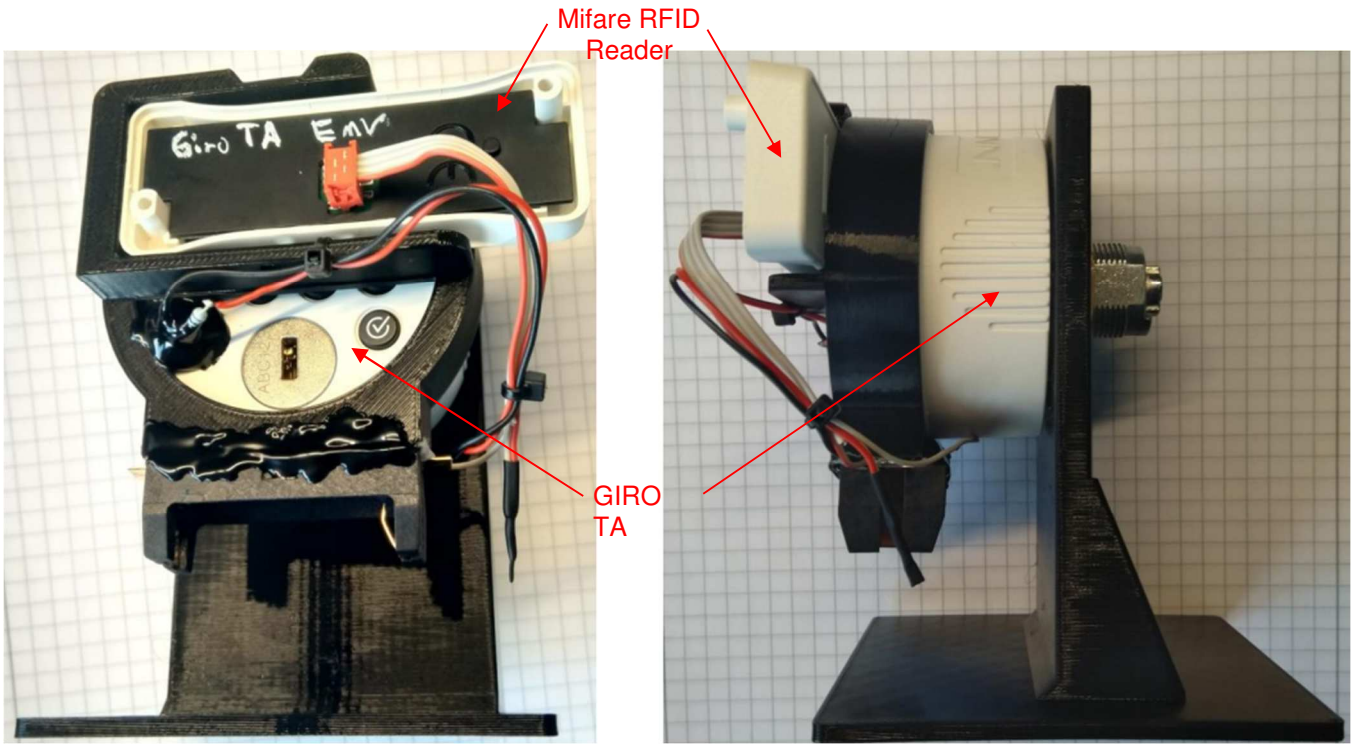
Description of function of the EUT:

The Lehmann GIRO TA serves as an electronic lock for furniture. The EUT is supplied via an internal primary battery. The furniture is locked by rotating the lock housing and the locking bar/bolt. After locking the furniture, the lock itself can be locked or unlocked by entering a PIN code and confirming with hook button. If the lock is locked successfully then the rotation of the housing towards the open position is blocked. To unlock the locking mechanism, it is necessary to re-enter a valid PIN code. The EUT has an internal passive 13.56 MHz NFC tag which can be used only to configure the lock via a smartphone app.

The following states were defined as the operating conditions:

A Lehmann L033-A02 (L2NF13MX) MIFARE RFID reader is attached to the EUT, which is in continuous field mode and continuously attempts to read an RFID transponder. As the EUT contains a passive NFC tag, the L033-A02 lights up green if it can read the tag IC. If the tag can no longer be read (e.g. due to interference), the LED of the L033-A02 lights up red. In addition, the "x" button of the EUT was removed and instead an optocoupler was attached to the button, which is controlled on the input side by the L033-A02 and short-circuits the contact surface of the "x" button on the output side, thus simulating a button press at an interval of 430 ms.
The EUT contains a modified standard firmware that executes a bolt movement each time a button is pressed and signals this visually (red LED when locking, green LED when unlocking) and acoustically.

The system was setup as follows:



3 Additional Information

The EUT was not labeled as required by FCC / IC.
A modified EUT was used for the test (see operational conditions).

4 Overview

Conducted emissions FCC 47 CFR Part 15 section 15.107 (a), (b) [3] ICES-003 Issue 7 section 3.2.1[4]					
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
AC supply line Class B	0.15 to 0.5 MHz 0.5 to 5 MHz 5 to 30 MHz	66 to 56 dB(µV) QP* 56 to 46 dB(µV) AV* 56 dB(µV) QP 46 dB(µV) AV 60 dB(µV) QP 50 dB(µV) AV	ANSI C63.4	1	Not applicable because battery powered
*: Decreases with the logarithm of the frequency					

Radiated emissions FCC 47 CFR Part 15 section 15.109 (a), (b) [3]					
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
Radiated Emission Class B	30 to 88 MHz 88 to 216 MHz 216 to 960 MHz 960 to 1000 MHz above 1000 MHz	40.0 dB(µV/m) QP at 3 m 43.5 dB(µV/m) QP at 3 m 46.0 dB(µV/m) QP at 3 m 54.0 dB(µV/m) QP at 3 m 54.0 dB(µV/m) AV at 3 m and 74.0 dB(µV/m) PK at 3 m	ANSI C63.4	1	Passed

Radiated emissions ICES-003 Issue 7 section 3.2.2 [4]					
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
Radiated Emission Class B	30 to 88 MHz 88 to 216 MHz 216 to 230 MHz 230 to 960 MHz 960 to 1000 MHz above 1000 MHz	40.0 dB(µV/m) QP at 3 m 43.5 dB(µV/m) QP at 3 m 46.0 dB(µV/m) QP at 3 m 47.0 dB(µV/m) QP at 3 m 54.0 dB(µV/m) QP at 3 m 54 dB(µV/m) AV at 3 m and 74 dB(µV/m) PK at 3 m	ANSI C63.4	1	Passed

Remark: As declared by the applicant the highest internal clock frequency is < 108 MHz.
Therefore, the radiated emission measurement must be carried out up to 1 GHz.

The EUT was classified by the applicant as CLASS B equipment.

5 Results

5.1 Test setups

5.1.1 Radiated: 30 MHz to 1 GHz

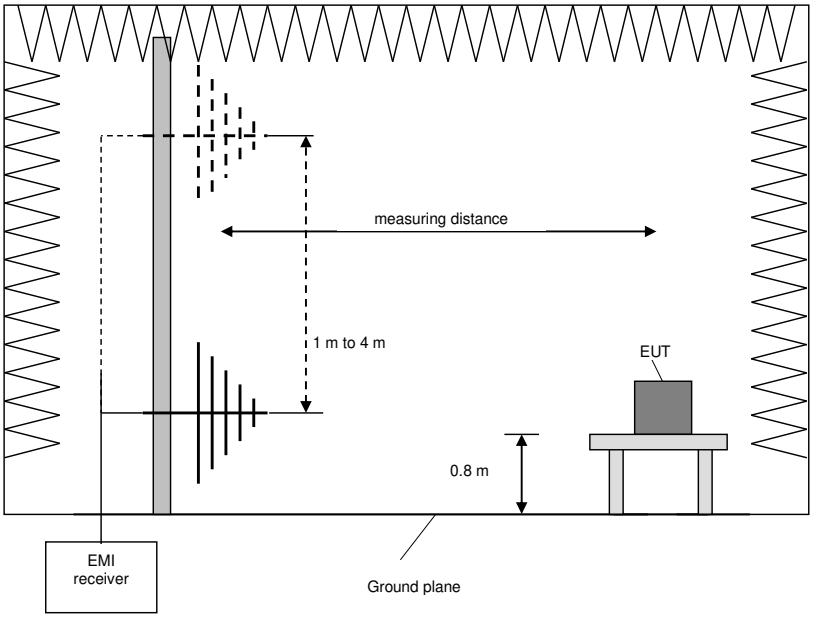
5.1.1.1 Preliminary and final measurement 30 MHz to 1 GHz

The preliminary and final measurements are performed in a semi-anechoic chamber with a metal ground plane at a measuring distance of 3 meters. Table-top devices are set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices are placed directly on the turntable / ground plane. The setup of the equipment under test is in accordance with [1].

During the tests the EUT is rotated in the range of 0 ° to 360 °, the measuring antenna is set to horizontal and vertical polarization and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

The resolution bandwidth of the EMI receiver is set to the following values:

Test	Frequency range	Step-size	Resolution bandwidth	Measuring time	Detector
Preliminary measurement	30 MHz to 1 GHz	30 kHz	120 kHz	-	Peak Average
Frequency peak search	± 120 kHz	10 kHz	120 kHz	1 s	Peak
Final measurement	30 MHz to 1 GHz	-	120 kHz	1 s	QuasiPeak



Procedure preliminary measurement:

The following procedure is used:

1) Set the measuring antenna to 1 m height.
2) Monitor the frequency range at horizontal polarization of the measuring antenna and an EUT / turntable azimuth of 0 °.
3) Rotate the EUT by 360° to maximize the detected signals.
4) Repeat steps 2 to 3 with the vertical polarization of the measuring antenna.
5) Increase the height of the measuring antenna for 0.5 m and repeat steps 2 to 4 until the final height of 4 m is reached.
6) The highest values for each frequency are saved by the software, including the measuring antenna height and polarization and the turntable azimuth for that value.

Procedure final measurement:

The following procedure is used:

1) Select the highest frequency peaks (lowest margin to the limit) for the final measurement.
2) The software determines the exact peak frequencies by doing a partial scan with reduced step size of the pre-scan of the selected peaks.
3) If the EUT is portable or ceiling mounted, find the worst-case EUT orientation (x, y, z) for the final test.
4) The worst-case measuring antenna height is found via varying the height by ± 0.5 m from the value obtained in the preliminary measurement while monitoring the emission level.
5) The worst-case turntable position is found via varying the turntable azimuth by ± 30° from the value obtained in the preliminary measurement while monitoring the emission level.
6) The final measurement is performed at the worst-case measuring antenna height and the worst-case turntable azimuth.
7) Steps 2 to 6 are repeated for each frequency peak selected in step 1.

5.2 Radiated emissions

5.2.1 Test setup (Maximum unwanted emissions)

Test setup (Maximum unwanted emissions)			
Used	Setup	See sub-clause	Comment
☒	Radiated: 30 MHz to 1 GHz	5.1.1	-

5.2.2 Test method (Maximum unwanted emissions)

☒ Test method (radiated) see sub-clause 5.1.1 as described herein

5.2.3 Test results (Maximum unwanted emissions)

5.2.3.1 Test results (30 MHz – 1 GHz)

Ambient temperature:	23 °C
Relative humidity:	23 %

Date:	08.02.2024
Tested by:	S. KREHS

Position of EUT: For tests for f between 30 MHz to 1 GHz, the EUT was set-up on a table with a height of 80 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: Plots for each frequency range are submitted below.

Remark: The EUT was measured in its normal position / orientation

Calculations:

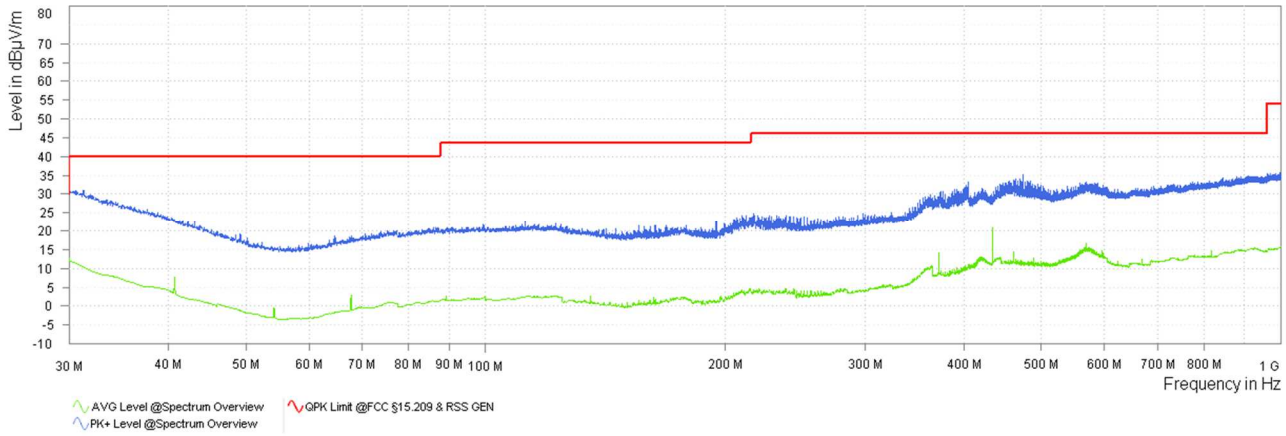
Result [dBµV/m] = Reading [dBµV] + Correction [dB/m]

Correction [dB/m] = AF [dB/m] + Cable attenuation [dB] + optional preamp gain [dB]

Margin [dB] = Limit [dBµV/m] - Result [dBµV/m]

The measured points and the limit line in the following diagram refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured points marked with "◆" are the measured results of the standard subsequent measurement in a semi-anechoic chamber.

Spurious emissions from 30 MHz to 1 GHz:



Result tables:

Results according to FCC 47 CFR Part 15 section 15.109 (a), (b) [3]

Frequency [MHz]	Result (QP) [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Readings [dBµV]	Correction [dB/m]	Height [cm]	Azimuth [deg]	Pol. (H/V)
30.46	17.98	40.0	22.02	-7.62	25.60	109	95	H
371.26	19.80	46.0	26.20	-1.05	20.85	175	202	V
433.90	21.24	46.0	24.76	-1.05	22.29	106	289	V
474.43	19.88	46.0	26.12	-3.67	23.55	106	82	V

Results according to ICES-003 Issue 7 section 3.2.2 [4]

Frequency [MHz]	Result (QP) [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Readings [dBµV]	Correction [dB/m]	Height [cm]	Azimuth [deg]	Pol. (H/V)
30.46	17.98	40.0	22.02	-7.62	25.60	109	95	H
371.26	19.80	47.0	27.20	-1.05	20.85	175	202	V
433.90	21.24	47.0	25.76	-1.05	22.29	106	289	V
474.43	19.88	47.0	27.12	-3.67	23.55	106	82	V

Test result: Passed

Test equipment (please refer to chapter 7 for details)
1 – 7

6 Measurement Uncertainties

Conducted measurements		
Measurement method	Standard used for calculating measurement uncertainty	Expanded measurement uncertainty (95 %) U_{lab}
Conducted emissions from 150 kHz to 30 MHz with LISN	CISPR 16-4-2	2.8 dB

Radiated measurements		
Radiated field strength M276		
R&S HL562E @ 3 m 30 MHz – 1 GHz	CISPR 16-4-2	4.8 dB
R&S HL050 @ 3 m	-	
1 – 6 GHz	CISPR 16-4-2	5.1 dB
6 – 18 GHz	CISPR 16-4-2	5.4 dB
Flann Standard Gain Horns 18 – 40 GHz	-	5.9 dB

7 Test Equipment used for Tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal Due
1	Attenuator 6 dB	WA2-6	Weinschel		482793	Calibration not necessary	
2	Ultralog Antenna	HL562E	Rohde & Schwarz	101079	482978	18.03.2021	18.03.2024
3	Turntable	TT3.0-3t	Maturo	825/2612/.01	483224	Calibration not necessary	
4	Antennasupport	BAM 4.5-P-10kg	Maturo	222/2612.01	483225	Calibration not necessary	
5	Controller	NCD	Maturo	474/2612.01	483226	Calibration not necessary	
6	Semi Anechoic Chamber M276	SAC5-2	Albatross Projects	C62128-A540-A138-10-0006	483227	Calibration not necessary	
7	Testsoftware M276	Elektra 5.01	Rohde & Schwarz	101381	483755	Calibration not necessary	
8	EMI Testreceiver	ESW44	Rohde & Schwarz	101828	482979	08.12.2021	28.02.2024

8 Test site Verification

Test equipment	PM. No.	Frequency range	Type of validation	According to	Val. Date	Val Due
Semi anechoic chamber M276	483227	30 – 1000 MHz	NSA/RSM	CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017	01.03.2023	28.02.2026

9 Report History

Report Number	Date	Comment
F231771E4	20.03.2024	Initial Test Report
F231771E4 2nd version	23.04.2024	Page 6: FCC ID added Page 7: Correction power supply EUT Page 10: Update setup figure Page 13: Correction margin Page 14: Calibration date corrected
-	-	-

10 List of Annexes

Annex A	Test Setup Photos	1 pages
Annex B	EUT External Photos	3 pages
Annex C	EUT Internal Photos	3 pages