

TEST REPORT

of the accredited test laboratory

TÜV Nr.:INE-AT/FG-18/163

Office:

TÜV AUSTRIA SERVICES GMBH

Deutschstrasse 10 1230 Vienna/Austria T: +43 5 0454-0 F: +43 5 0454-6505 E: pzw@tuv.at W: www.tuv.at

Business Area Industry & Energy Austria

Technik

Applicant:

PS GmbH

Melisau 1255

6863 Egg

Austria

Tested Product:

Electronic Lock

FCC-ID:

2ALMHM

IC-ID:

N/A

Manufacturer:

See Applicant

Output power /

51,2 dBµV/m @

power supply:

3V DC

internal battery

field strength:

3m distance

Frequency range:

13,56 MHz

Channel separation:

N/A

Standard:

FCC: 47 CFR Part 15 (October 1, 2017 edition)

RSS-210 Issue 9, August 2016

TUV Austria Services GmbH Test laboratory for EMC

Rundsiegel

19.11.2018

Supervisor of EMC-laboratory:

checked by:

Ing. Michael Emminger

Ing. Wilhelm Seier

Copy Nbr.:

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The results of this test report only refer to the provided equipment.



Testing Laboratory, Inspection Body, Certification Body, Calibration Laboratory, Verifizierungsstelle

Notified Body 0408 IC 2932K-1

Non-executive **Board of Directors:** KR DI Johann Marihart

Management: DI Dr. Stefan Haas Mag. Christoph Wenninger

Registered Office: Deutschstrasse 10 1230 Vienna/Austria

Branch Offices: www.tuv.at/standorte

Company Register Court / - Number: Vienna / FN 288476 f

Bank Details: **IBAN** AT13120005294900106 **BIC BKAUATWW**

AT15310000010409328 **BIC RZBAATWW**

VAT ATU63240488 DVR 3002476

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Test Report Reference: INE-AT/FG-18/163

Ambient temperature: 23°C Relative humidity: 52%

1. Applicant

Company: PS GmbH

Department: QMB

Address: Austria; 6863 Egg; Melisau 1255

Contact person: Mr. Peter Harrasser

EUT received on: 17.09.2018

Tests were performed on: 17.09.2018

Test Report Reference: INE-AT/FG-18/163

Ambient temperature: 23°C Relative humidity: 52%

2. **Description of EUT**

EUT: Door Lock "SOLO 13"

Serial Number: Prototype

Manufacturer: PS GmbH

Austria; 6863 Egg; Melisau 1255

Description: PS GmbH provided the following configuration for the

measurements:

Prototype

Operating mode: The measurements were carried out at the following running states:

Cyclic presentation of card for opening

Technical data EUT: 3VDC Rated voltage:

Rated current: <1A Rated frequency: DC

Mains voltage during the tests: 3V DC internal battery

Relative humidity: 52% Climatic conditions in the emc laboratory: 23°C

Temperature:

Test Report Reference: INE-AT/FG-18/163

Ambient temperature: 23°C Relative humidity: 52%

3. Standards / Final result

Name	Title	Deviation	Result
Title 47 CFR Part 15 October 1, 2017 edition	RADIO FREQUENCY DEVICES	none	ОК
RSS-210 Issue 9 August 2016	Licence-Exempt Radio Apparatus: Category I Equipment	none	ОК

Result: Opinions and interpretation of testing laboratory

OK: EUT passed NOK: EUT failed

4. Test results

4.1 TEST OBJECT DATA

General EUT Description

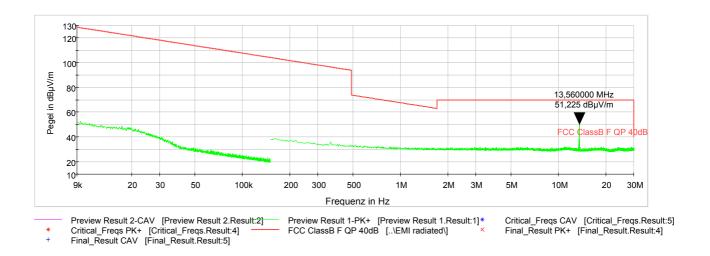
This Electronic Lock uses RFID at 13,56 kHz to read keycards or other forms of RFID-Tags.

- 2.1033 (c) Technical description
- 2.1033 (4) Type of emission: continuous transmission
- 2.1033 (5) Frequency range: only one operating frequency 13,56 MHz.
- 2.1033 (6) Power range and Controls: Fixed output power resulting in 51,2 dBμV/m field strength in 3m distance.
- 2.1033 (7) Maximum output power rating: 51,2 dB μ V/m @ 3m distance.
- 2.1033 (8) DC Voltage and Current: 3 V DC powered

maximum current consumption: 50 mA

4.2 Field strength of emissions at 13,110 - 14,010 MHz

§ 15.225 (a) (b) (c)



Field strength at 13,56 MHz: 51,2 dB μ V/m = 363 μ V/m at 3 m distance. Converted with 40dB per decade for the 30m Limit this would be a Level of 11,2 dB μ V/m or 3,63 μ V/m.

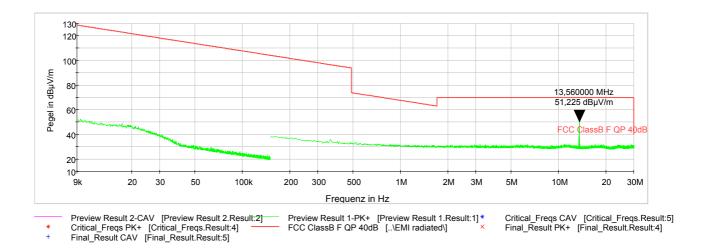
LIMIT SUBCLAUSE 15.225(a) (b) (c) (B.6)

- (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

Test Equipment used: EMV-100; EMV-101; EMV-103; EMV-105; NT-122; NT-151; EMV-200

4.3 Emissions outside 13,110 - 14,010 MHz

§ 15.225 (d) B.6



LIMIT SUBCLAUSE 15.225(d) (15.209) (B.6 / RSS-Gen)

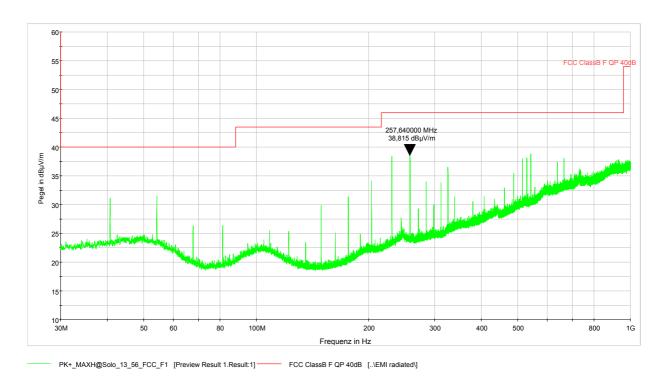
(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100**	3
88–216	150**	3
216–960	200**	3
Above 960	500	3

Test Equipment used: EMV-100; EMV-101; EMV-103; EMV-105; NT-122; NT-151; EMV-200

Emissions outside 13,110 – 14,010 MHz

§ 15.225 (d) B.6



Worst case Quasipeak Level at 257,64 MHz: 38,82 dBµV/m @ 3m.

LIMIT SUBCLAUSE 15.225(d) (15.209) (B.6 / RSS-Gen)

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100**	3
88–216	150**	3
216–960	200**	3
Above 960	500	3

Test Equipment used: EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-112; EMV-200

4.4 Frequency tolerance

§ 15.225 (e) B.6

Frequency error vs. Supply voltage

DC-Voltage	Frequency Error Hz	Frequency Error %
2,55 V	+36	+0,00026549
3 V	+36	+0,00026549
3,45 V	+36	+0,00026549

Frequency error vs. Temperature

Temperature °C	Frequency Error Hz	Frequency Error %
-20	+425	+0,00313422
+20	+36	+0,00026549
+50	-85	-0,00062684

LIMIT SUBCLAUSE 15.225(e) (B.6)

(e) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Equipment used: EMV-100; EMV-101; EMV-103; NT-122; NT-151; EMV-205

Appendix 1 Test equipment used

Anechoic Chamber with 3m measurement distance	NT-100	Spectrumanalyzer – FSP7 9 kHz – 7 GHz	NT-200	Division: Industry & Energy
Stripline according to ISO 11452-5	NT-108	ESCI - Test receiver 9 kHz - 7 GHz	NT-203/1	
MA4000 - Antenna mast 1 - 4 m height	NT-110/1	ESI26 – Test receiver 20 Hz – 26,5 GHz	NT-207	Department: FG Test report number:
DS - Turntable 0 - 400 ° Azimuth	NT-111/1	Digital Radio Tester CTS55	NT-208	INE-AT/FG-18/163
CO3000 Controller Mast+Turntable	NT-112/1	Noise-gen., ITU-R 559-2 20 Hz – 20 kHz	NT-209	Page: 1 of 4 Date: 19.11.2018
HUF-Z3 - Log. Per. Antenna 200 - 1000 MHz	NT-121	CMTA - Radiocommunication analyzer; 0,1 - 1000 MHz	NT-210	Checked by:
FMZB1513 - Loop Antenna 9 kHz - 30 MHz	NT-122/1	3271 - Spectrum analyzer 100 Hz - 26,5 GHz	NT-211	
HFH-Z6 - Rod Antenna 9 kHz - 30 MHz	NT-123	Digital Radio Tester Aeroflex 3920	NT-212/1	
3121C - Dipole Antenna 28 - 1000 MHz	NT-124	Mixer M28HW 26,5 GHz - 40 GHz	NT-214	
3115 - Horn Antenna 1 - 18 GHz (immunity)	NT-125	RubiSource T&M Timing reference	NT-216	
3116 - Horn Antenna 18 - 40 GHz	NT-126	Radiocommunicationanalyzer SWR 1180 MD	NT-217	
SAS-200/543 - Bicon. Antenna 20 MHz - 300 MHz	NT-127	Mixer M19HWD 40 GHz – 60 GHz	NT-218	
AT-1080 - Log. Per. Antenna 80 - 1000 MHz	NT-128	Mixer M12HWD 60 GHz – 90 GHz	NT-219	
HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-129	DSO9104 Digital scope	NT-220/1	
HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-130	TPS 2014 Digital scope	NT-222	
3146 - Log. Per. Antenna 200 – 1000 MHz	NT-131	Artificial Ear according to IEC 60318	NT-224	
VULB 9163 Trilog Antenna 30 – 3000 MHz	NT-131/1	1 kHz Sound calibrator	NT-225	
Loop Antenna H-Field	NT-132	B10 - Harmonics and flicker analyzer	NT-232	
Horn Antenna 500 MHz - 2900 MHz	NT-133	SRM-3006 Spectrumanalyzer	NT-233/1a	
Horn Antenna 500 MHz - 6000 MHz	NT-133/1	E-field probe SRM 75 MHz – 3 GHz	NT-234	
Log. per. Antenna 800 MHz - 2500 MHz	NT-134	Field Meter NBM-500 incl. E- and H-Field probes	NT-240a-e	
Log. per. Antenna 800 MHz - 2500 MHz	NT-135	Hall-Teslameter ETM-1	NT-241	
BiConiLog Antenna 26 MHz – 2000 MHz	NT-137	EFA-3 H-field- / E-field probe	NT-243	
Conical Dipol Antenna PCD8250	NT-138	EHP-50F H-field- / E-field probe	NT-243/1	
HF 906 - Horn Antenna 1 - 18 GHz (emission)	NT-139	Field Meter EMR-200 100 kHz – 3 GHz	NT-244	
HZ-1 Antenna tripod	NT-150	E-field probe 100 kHz – 3 GHz	NT-245	
BN 1500 Antenna tripod	NT-151	H-field probe 300 kHz – 30 MHz	NT-246	
Ant. tripod for EN61000-4-3 Model TP1000A	NT-156			
Power quality analyzer Fluke 1760 (complete set)	NT-160 - NT-173			

Appendix 1 (continued) Test equipment used

E-field probe 3 MHz – 18 GHz	NT-247	500W1000M7 - RF-Amplifier 80 - 1000 MHz / 500 W	NT-332	Division: Industry & Energy
H-field probe 27 MHz – 1 GHz	NT-248	AS0102-65R - RF-Amplifier 1 GHz - 2 GHz	NT-333	Department: FG
ELT-400 1 Hz – 400 kHz	NT-249	APA01 – RF-Amplifier 0,5 GHz – 2,5 GHz	NT-334	Test report number:
MDS 21 - Absorbing clamp 30 - 1000 MHz	NT-250	Preamplifier 1 GHz - 4 GHz	NT-335	INE-AT/FG-18/163
FCC-203I EM Injection clamp	NT-251	Preamplifier for GPS MKU 152 A	NT-336	Page: 2 of 4 Date: 19.11.2018
FCC-203I-DCN Ferrite decoupling network	NT-252	Preamplifier 100 MHz – 23 GHz	NT-337	Checked by:
PR50 Current Probe	NT-253	DC Block 10 MHz – 18 GHz Model 8048	NT-338	
i310s Current Probe	NT-254/1	2-97201 Electronic load	NT-341	
Fluke 87 V True RMS Multimeter	NT-260	TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-344	
Model 2000 Digital Multimeter	NT-261	TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-345	
Fluke 87 V Digital Multimeter	NT-262/1	VDS 200 Mobil-impuls-generator	NT-350	
ESH2-Z5-U1 Artificial mains network 4x25A	NT-300	LD 200 Mobil-impuls-generator	NT-351	
ESH3-Z5-U1 Artificial mains network 2x10A	NT-301	MPG 200 Mobil-Impuls-Generators	NT-352	
ESH3-Z6-U1 Artificial mains network 1x100A	NT-302	EFT 200 Mobil-impuls-generator	NT-353	
ESH3-Z6-U1 Artificial mains network 1x100A	NT-302a	AN 200 S1 Artificial Network	NT-354	
PHE 4500/B Power amplifier	NT-304	FP-EFT 32M 3 ph. Coupling filter (Burst)	NT-400/1	
EZ10 T-Artificial Network	NT-305	PHE 4500 - Mains impedance network	NT-401	
SMG - Signal generator 0,1 - 1000 MHz	NT-310	IP 6.2 Coupling filter for data lines (Surge)	NT-403	
SMA100A - Signal generator 9 kHz - 6 GHz	NT-310/1	TK 9421 High Power Volt. Probe 150 kHz - 30 MHz	NT-409	
RefRad Reference generator	NT-312	ESH2-Z3 - Probe 9 kHz - 30 MHz	NT-410	
SMP 02 Signal generator 10 MHz - 20 GHz	NT-313	IP 4 - Capacitive clamp (Burst)	NT-411	
40 MHz Arbitrary Generator TGA1241	NT-315	Highpass-Filter 100 MHz – 3 GHz	NT-412	
Artificial mains network NSLK 8127-PLC	NT-316	Highpass-Filter 600 MHz – 4 GHz	NT-413	
ESD 30 System up to 25 kV	NT-321	Highpass-Filter 1250 MHz – 4 GHz	NT-414	
PSURGE 4.1 Surge generator	NT-324	Highpass-Filter 1800 MHz – 16 GHz	NT-415	
IMU4000 Immunity test system	NT-325/1			
VCS 500-M6 Surge-Generator	NT-326			
Oscillatory Wave Simulator incl. Coupling networks	NT- 328a+b+c			
BTA-250 - RF-Amplifier 9 kHz - 220 MHz / 250 W	NT-330			
T82-50 RF-Amplifier 2 GHz – 8 GHz	NT-331			

Appendix 1 (continued) Test equipment used

Highpass-Filter 3500 MHz – 18 GHz	NT-416	FCC-801-AF10 Coupling decoupling network	NT-461	Division: Industry & Energy
RF-Attenuator 10 dB DC – 18 GHz / 50 W	NT-417	FCC-801-S25 Coupling decoupling network	NT-462	Department: FG
RF-Attenuator 6 dB DC – 18 GHz / 50 W	NT-418	FCC-801-T4 Coupling decoupling network	NT-463	Test report number:
RF-Attenuator 3 dB DC – 18 GHz / 50 W	NT-419	FCC-801-C1 Coupling decoupling network	NT-464	INE-AT/FG-18/163
RF-Attenuator 20 dB DC - 1000 MHz / 25 W	NT-421	SW 9605 - Current probe 150 kHz – 30 MHz	NT-465/1	Page: 3 of 4 Date: 19.11.2018
RF-Attenuator 30 dB DC - 1000 MHz / 1 W	NT-423	95242-1 – Current probe 1 MHz – 400 MHz	NT-468	Checked by:
RF-Attenuator 30 dB	NT-424	94106-1L-1 – Current probe 100 kHz – 450 MHz	NT-471	
RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-425	GA 1240 Power amplifier according to EN 61000-4-16	NT-480	
RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-426	Coupling networks according to EN 61000-4-16	NT-481 - NT-483	
RF-Attenuator 6 dB	NT-428	Van der Hoofden Test Head	NT-484	
RF-Attenuator 0 dB - 81 dB	NT-429	EMC Video/Audiosystem	NT-511/1	
WRU 27 - Band blocking 27 MHz	NT-430	ES-K1 Version 1.71 SP2 Test software	NT-520	
WHJ450C9 AA - High pass 450 MHz	NT-431	EMC32 Version 10.40.00 Test software	NT-520/1	
WHJ250C9 AA - High pass 250 MHz	NT-432	SRM-TS Version 1.3 software for SRM-3000	NT-522	
RF-Load 150 W	NT-433	SRM-TS Version 1.3.1 software for SRM-3006	NT-522/1	
Impedance transducer 1:4; 1:9; 1:16	NT-435	Spitzenberger und Spies Test software V4.1	NT-525	
RF-Attenuator DC – 18 GHz 6 dB	NT-436	Noise power test apparatus according to EN 55014	NT-530	
RF-Attenuator DC – 18 GHz 6 dB	NT-437	Vertical coupling plane (ESD)	NT-531	
RF-Attenuator DC – 18 GHz 10 dB	NT-438	Test cable #4 for EN 61000-4-6	NT-553	
RF-Attenuator DC – 18 GHz 20 dB	NT-439	Test cable #3 for conducted emission	NT-554	
I+P 7780 Directional coupler 100 - 2000 MHz	NT-440	Test cable #5+#6 ESD-cable (2x470k)	NT-555 + NT-556	
ESH3-Z2 - Pulse limiter 9 kHz - 30 MHz	NT-441	Test cable #8 Sucoflex 104EA	NT-559	
Power Divider 6 dB/1 W/50 Ohm	NT-443	Test cable #9 (for outdoor measurements)	NT-580	
Directional coupler 0,1 MHz – 70 MHz	NT-444	Test cable #10 (for outdoor measurements)	NT-581	
Directional coupler 0,1 MHz – 70 MHz	NT-445	Test cable #13 Sucoflex 104PE	NT-584	
Tube imitations according to EN 55015	NT-450	Test cable #21 for SRM-3000	NT-592	
FCC-801-M3-16A Coupling decoupling network	NT-458	Shield chamber	NT-600	
FCC-801-M2-50A Coupling decoupling network	NT-459	Climatic chamber	M-1200	
FCC-801-M5-25 Coupling decoupling network	NT-460			

Appendix 1 (continued) Test equipment used

Anechoic Chamber 3 m / 5 m measuring distance	EMV-100	Log.per Antenna 0,7 – 9 GHz STLP9149	EMV-305	Division: Industry & Energy
Turntabel 6 m diameter	EMV-101	HF- Ampflifier 9 kHz-250 MHz BBA150 (low noise)	EMV-306	Department: FG
Antenna mast 1 – 4 m	EMV-102	Load Dump Generator LD 200N	EMV-350	Test report number:
Mast and Turntable controller FC-06	EMV-103	Ultra Compact Symulator UCS 200N100	EMV-351	INE-AT/FG-18/163 Page: 4 of 4
EMC Video/Audiosystem	EMV-104	Automotive Power fail module PFM 200N100.1	EMV-352	Date: 19.11.2018
EMC Software EMC32 Version 10.40.00	EMV-105	Voltage Drop Symulator VDS 200Q100	EMV-353	Checked by:
Hornantenna 1 – 18 GHz HF 907	EMV-110	Arb. Generator AutoWave	EMV-354	
Antennapre.amp. 1 – 18 GHz ERZ-LNA0200-1800-30-2	EMV-111	Ultra Compact Symulator UCS 500N7	EMV-355	
Trilog Antenna 30-3000 MHz VULB9163	EMV-112	Coupling decoupling network CNI 503B7 / 32 A	EMV-356	
Monopol 9 kHz – 30 MHz VAMP 9243	EMV-113	Coupling decoupling network CNI 503B7 / 63 A	EMV-357	
Antennapre.amp 18 – 40 GHz BBV 9721	EMV-114	Telecom Surge Generator TSurge 7	EMV-358	
Hornantenna 200 – 2000 MHz AH-220	EMV-115	Coupling decoupling network CNI 508N2	EMV-359	
DC Artificial Network PVDC 8300	EMV-150	Coupling decoupling network CNV 504N2.2	EMV-360	
AC Artificial Network NNLK 8121 RC	EMV-151	Immunity generator NSG4060/NSG4060-1	EMV-361	
EMI Receiver ESR26	EMV-200	Coupling network CDND M316-2	EMV-362	
Signalgenerator 9 kHz – 40 GHz N5173B	EMV-201	Coupling network CT419-5	EMV-363	
GPS Frequency normal B-88	EMV-202	ESD Generator NSG 437	EMV-364	
DC Power supply N5745A	EMV-203	Pulse Limiter VTSD 9561-F BNC	EMV-405	
Spektrum Analyzator FSV40	EMV-205	Transient emission BSM200N40+BS200N100	EMV- 450+451	
Thd Multimeter Model 2015	EMV-206	Cap. Coupling Clamp HFK	EMV-455	
Poweramplifier PAS15000	EMV- 207/abc	Mag. Field System MS100N+MC26100+MC2630	EMV- 456-458	
Inrush Current Source	EMV- 208/abc	Coupling network CDN M2-100A	EMV-459	
Arbgenerator Sycore	EMV-209	Coupling network CDN M3-32A	EMV-460	
Harmonics/Flicker analyzer ARS 16/3	EMV-210	Coupling network CDN M5-100A	EMV-461	
HF- Ampflifier 9 kHz-250 MHz BBA150	EMV-300	Current Clamp CIP 9136A	EMV-462	
HF- Amplifier 80 -1000 MHz BBA150	EMV-301	DC Artificial Network HV-AN 150	EMV- 464+465	
HF- Amplifier 0,8 - 6 GHz BBA150	EMV-302	Coupling Clamp EM 101	EMV-466	
High Power Ant. 20-200 MHz VHBD 9134	EMV-303	Decoupling Clamp FTC 101	EMV-467	
Log.per Antenna 80-2700 MHz STLP 9128 E special	EMV-304	Power attenuator 10 dB / 250 Watt	EMV-469/2	2

Description: Front view

Division: Industry & Energy

Department: FG

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Description: Backside view

Division: Industry & Energy

Department: FG

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Date: 19.11.2018



Description: Case opened view #1

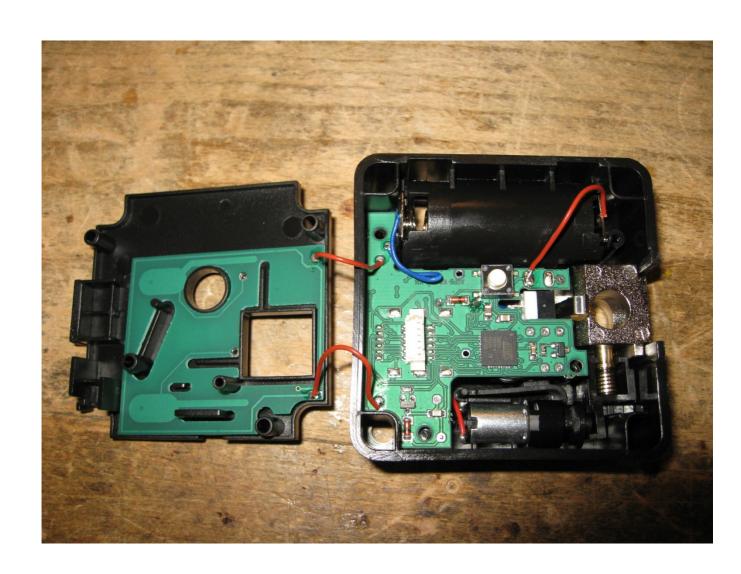
Division: Industry & Energy

Department: FG

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Description: Case opened view #2

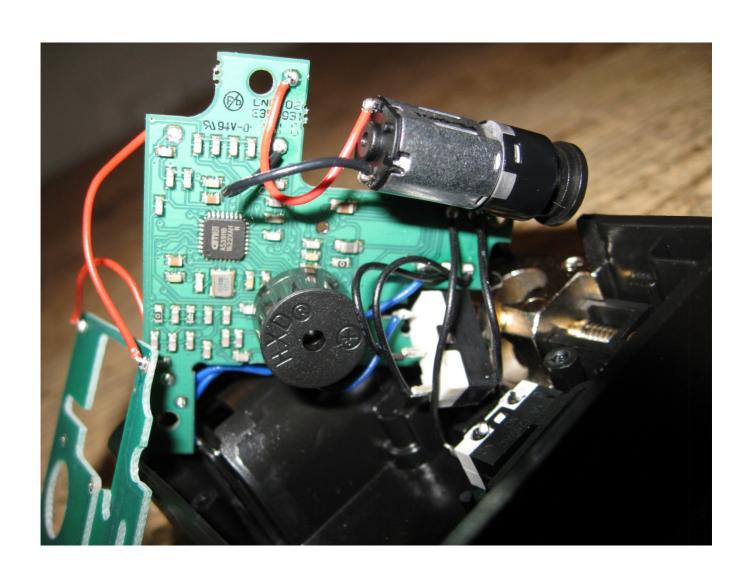
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Description: Test setup below 30 MHz

Division: Industry & Energy

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Description: Test setup above 30 MHz

Division: Industry & Energy

Department: FG

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