



## TEST REPORT

Test report no.: 1-8548/14-01-07



Deutsche  
Akkreditierungsstelle  
D-PL-12076-01-01

### Testing laboratory

**CTC advanced GmbH**

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**Accredited Testing Laboratory:**

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS). The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-01

### Applicant

**Pilz GmbH & Co. KG**

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### Manufacturer

**Pilz GmbH & Co. KG**

Felix-Wankel-Straße 2  
73760 Ostfildern / GERMANY

### Test standard/s

47 CFR Part 15 Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices  
RSS – Gen. Issue 4 Spectrum Management and Telecommunications Radio Standards Specification - General Requirements and Information for the Certification of Radio Apparatus

For further applied test standards please refer to section 3 of this test report.

### Test Item

**Kind of test item:** RFID Proximity switch  
**Model name:** PSEN slock (n)  
**FCC ID:** VT8-PSENSLN  
**IC:** 7482A-PSENSLN  
Frequency: 125 kHz  
Technology tested: RFID  
Antenna: Integrated loop antenna  
Power supply: 24V DC by external power supply  
Temperature range: -20°C to +55°C



This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

### Test report authorised:

Marco Bertolino  
Lab Manager  
Radio Communications & EMC

### Test performed:

Andreas Luckenbill  
Lab Manager  
Radio Communications & EMC

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## 2 General information

### 2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CTC advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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### 2.2 Application details

Date of receipt of order:	2014-09-22
Date of receipt of test item:	2014-10-24
Start of test:	2014-10-24
End of test:	2016-05-19
Person(s) present during the test:	Mr. Blum / Mr. Schuchert (Pilz GmbH & Co. KG)

## 3 Test standard/s

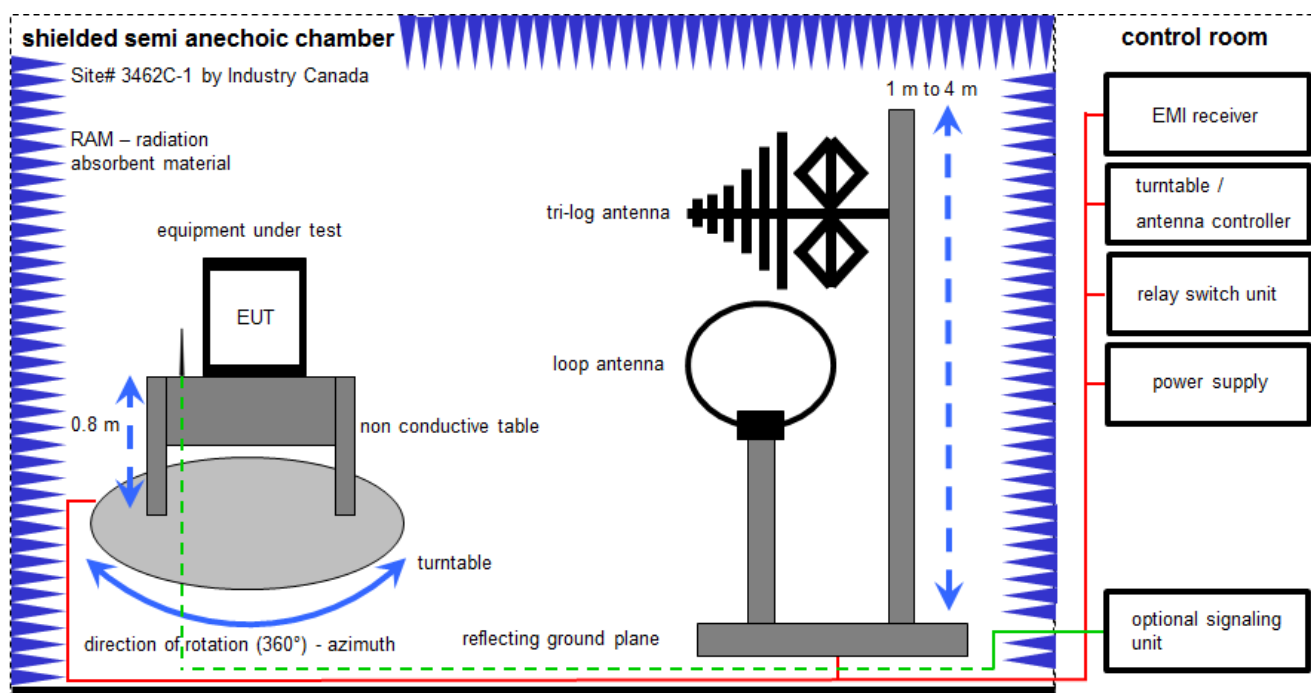
Test standard	Date	Test standard description
47 CFR Part 15		Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS – Gen. Issue 4	01.11.2014	Spectrum Management and Telecommunications Radio Standards Specification - General Requirements and Information for the Certification of Radio Apparatus



## 7 Description of the test setup

### 7.1 Radiated measurements

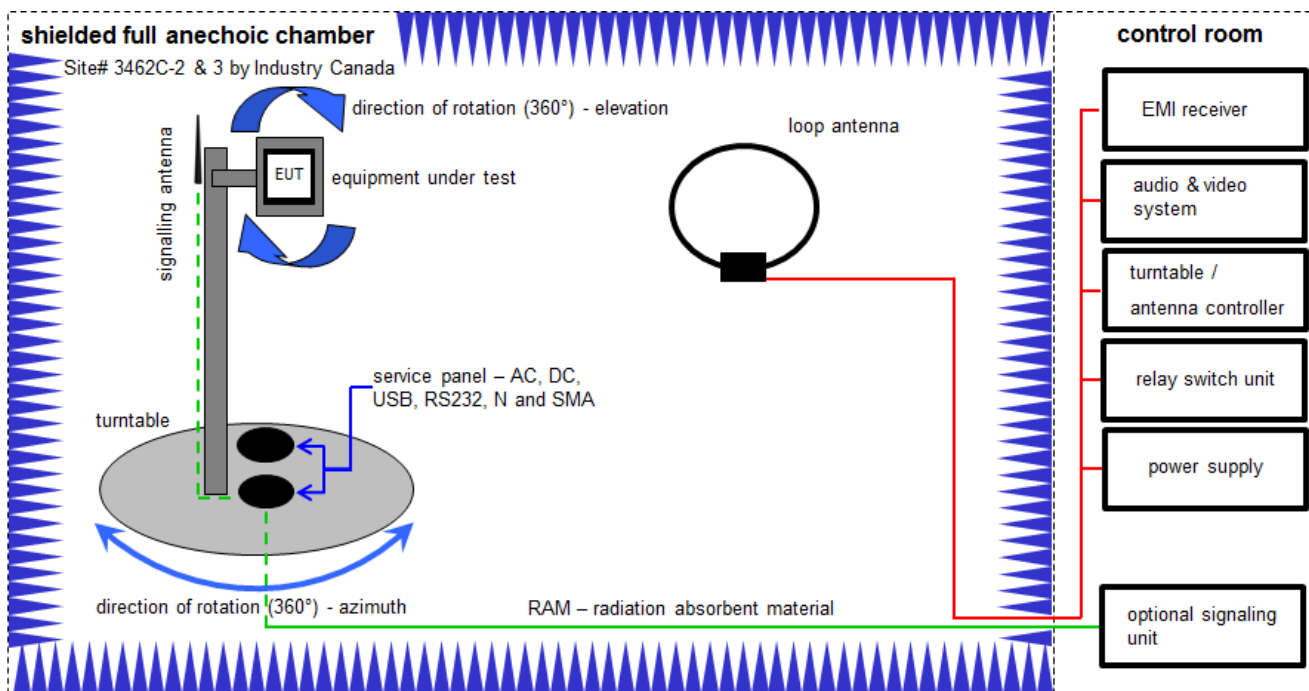
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



#### Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No CTC
Switch-Unit	3488A	HP Meßtechnik	2719A14505	30000368
DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	30000580
EMI Test Receiver	ESCI 3	R&S	100083	300003312
Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379
Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745
Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746
Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747
TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787
Test Receiver	ESH2	R&S	871921/095	300002505
Loop Antenna 9 KHz - 30 MHz	HFH2-Z2	R&S	872096/61	300001824
EMI Test Receiver 9 kHz - 3 GHz incl. Preselector	ESPI3	R&S	101713	300004059

**7.2 Open area site**



FS = UR + CA + AF  
 (FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

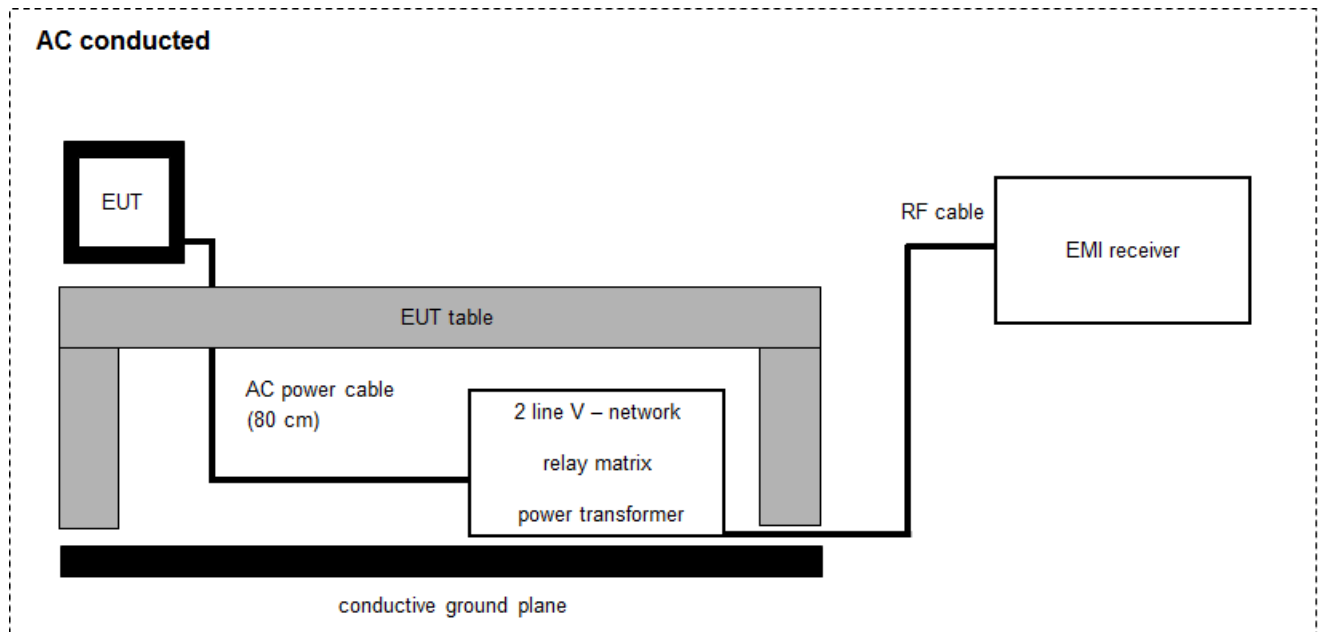
Example calculation:

$$FS [dB\mu V/m] = 40.0 [dB\mu V/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dB\mu V/m] (71.61 \mu V/m)$$

**Equipment table:**

Equipment	Type	Manufacturer	Serial No.	INV. No CTC
Test Receiver	ESH2	R&S	871921/095	300002505
Loop Antenna 9 KHz - 30 MHz	HFH2-Z2	R&S	872096/61	300001824

### 7.3 AC conducted



$$FS = UR + CF + VC$$

(FS-field strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

Example calculation:

$$FS [dB\mu V/m] = 37.62 [dB\mu V/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dB\mu V/m] (244.06 \mu V/m)$$

**Equipment table:**

Equipment	Type	Manufacturer	Serial No.	INV. No CTC
MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405
Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erfi	91350	300001155
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001168
Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210

## 8 Summary of measurement results

- No deviations from the technical specifications were ascertained**
- There were deviations from the technical specifications ascertained

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS-Gen., Issue 4	Passed	2016-12-14	-/-

Test Specification Clause	Test Case	Temperature Conditions	Power Source Voltages	Pass	Fail	NA	NP	Results
§ 15.35 (c) / RSS-GEN Issue 4 Section 4.5	Timing of the transmitter (Duty cycle correction factor)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 2.1049 / RSS-Gen.	Bandwidth of the modulated carrier	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.209 / RSS-Gen.	Fieldstrength of fundamental	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.209 (a) / RSS-Gen.	Fieldstrength of harmonics and spurious	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.109 / RSS-Gen.	Receiver spurious emissions	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	-/-
§ 15.107 / § 15.207	Conducted limits	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

**Note:** NA = Not Applicable; NP = Not Performed



## 8.1 Additional comments

Reference documents:           None

Special test descriptions:       None

Configuration descriptions:    None

**9 Measurement results**

**9.1 Timing of the transmitter**

Limits:

FCC	IC
Timing of the transmitter	
<p>(c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.</p>	

Duty cycle of the sample with test mode: 100 %

**In normal use the duty cycle is approximately 100% (declared by the manufacturer).**

Result: **Passed**

## 9.2 Bandwidth of the modulated carrier

### Limits:

FCC	IC
Bandwidth of the modulated carrier	

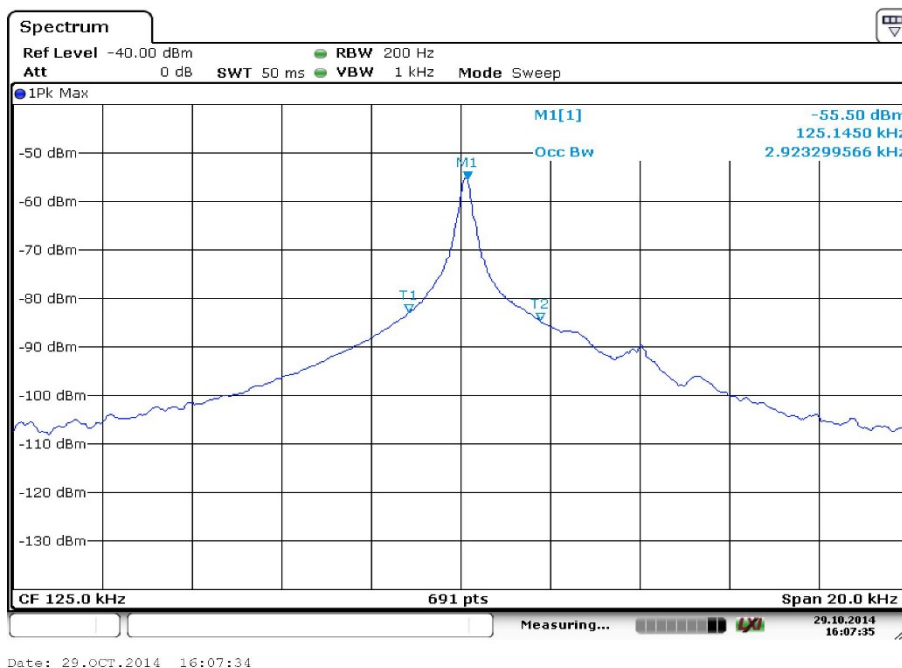
Measured with the integrated OBW-function of the spectrum analyzer (measurement criteria is the integrated power in %)

### Result:

	Occupied Bandwidth (kHz)
20 dB (99%)	2.92

### Plots of the measurement

Plot 1: 20dB (99%) – bandwidth



### 9.3 Field strength of the fundamental

**Measurement:**

Measurement parameter	
Detector:	AVG
Resolution bandwidth:	10kHz
Trace-Mode:	Max Hold
Test setup:	see chapter 7.2

**Limits:**

FCC		IC
Fundamental Frequency (MHz)	Field strength of Fundamental (dBµV/m)	Measurement distance (m)
125 kHz	26	300

**Result:**

TEST CONDITIONS		MAXIMUM POWER (dBµV/m)	
Frequency		125 kHz	125 kHz
Mode		at 10 m distance	at 300 m distance
T <sub>nom</sub>	V <sub>nom</sub>	53.0	-7
Measurement uncertainty		±3dB	

Recalculation to a measurement distance of 300m with a correction of 40 dB/decade.

**Result: Passed**

## 9.4 Fieldstrength of the harmonics and spurious

### Measurement:

Measurement parameter	
Detector:	Peak / Average / Quasi Peak
Sweep time:	Auto
Resolution bandwidth:	F < 150 kHz: 200 Hz 150 kHz > F > 30 MHz: 9 kHz F > 30 MHz: 120 kHz
Video bandwidth:	F < 150 kHz: 1 kHz 150 kHz > F > 30 MHz: 100 kHz F > 30 MHz: 300 kHz
Span:	See plot!
Trace-Mode:	Max hold
Test setup:	see chapter 7.1

### Limits:

FCC		IC	
Field strength of the harmonics and spurious.			
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)	
0.009 – 0.490	2400/F(kHz)	300	
0.490 – 1.705	24000/F(kHz)	30	
1.705 – 30	30 (29.5 dBµV/m)	30	
30 – 88	100 (40 dBµV/m)	3	
88 – 216	150 (43.5 dBµV/m)	3	
216 – 960	200 (46 dBµV/m)	3	

### Result:

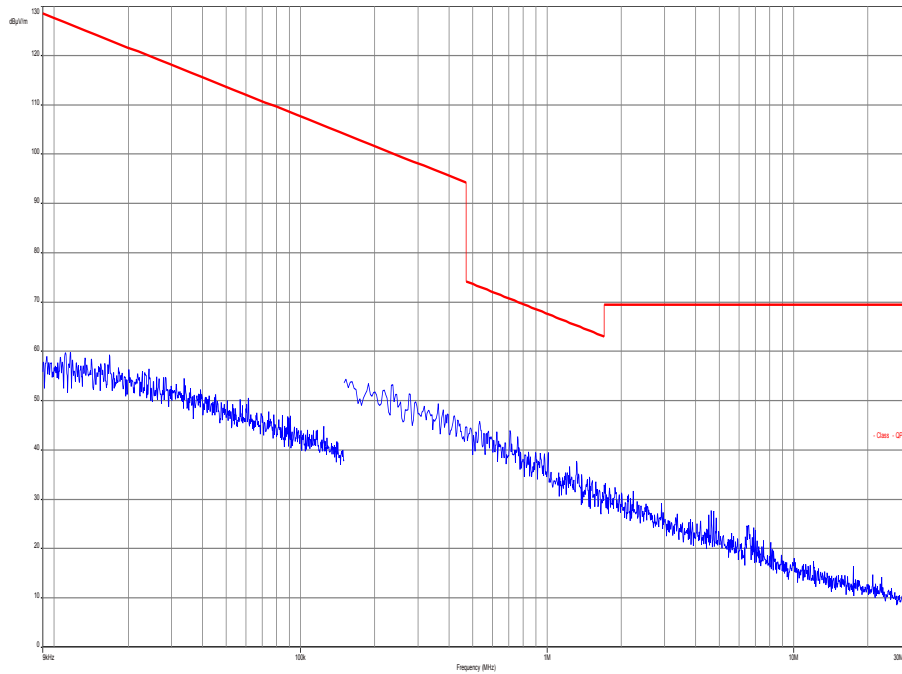
EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dBµV/m]	Amplitude of emission [dBµV/m]	Results
All detected peaks are more than 20 dB below the limit.				

**Result:** **Passed**

**Note:** The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

### Plots of the measurements

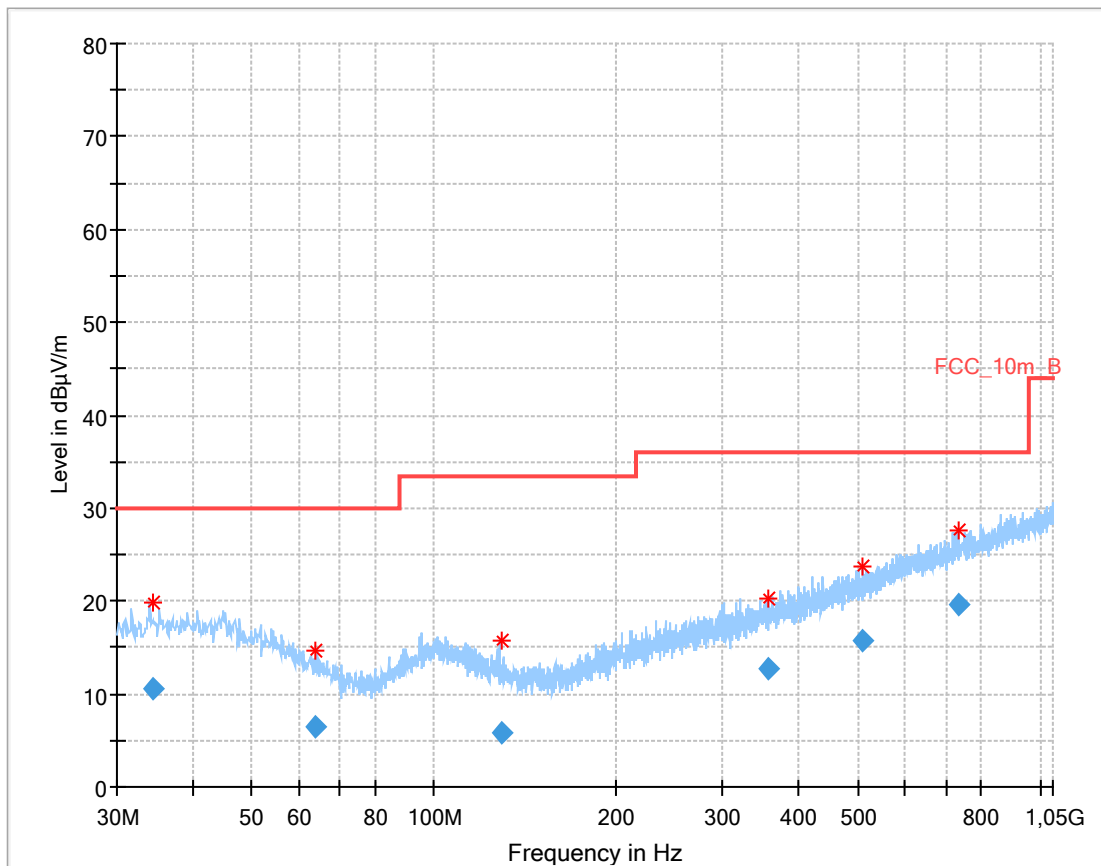
Plot 1: 9 kHz – 30 MHz



Plot 2: 30 MHz – 1000 MHz

**Common Information**

EUT: PILZ  
 Serial number:  
 Test description: FCC part 15 class B  
 Operating condition: testmode  
 Operator name: Wolsdorfer  
 Comment: DC 24V



**Final Result**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.468950	10.56	30.00	19.44	1000.0	120.000	101.0	H	180	13.7
63.614700	6.42	30.00	23.58	1000.0	120.000	101.0	V	180	9.8
129.014400	5.88	33.50	27.62	1000.0	120.000	170.0	V	90	9.5
355.743150	12.79	36.00	23.21	1000.0	120.000	101.0	H	-1	16.1
511.148400	15.69	36.00	20.31	1000.0	120.000	170.0	H	205	18.8
731.598900	19.63	36.00	16.37	1000.0	120.000	101.0	V	295	22.3

**9.5 Conducted limits**

**Measurement:**

Measurement parameter	
Detector:	Peak / Quasi-Peak / Average
Sweep time:	Auto
Resolution bandwidth:	9 kHz
Video bandwidth:	50 kHz
Span:	30 MHz
Trace-Mode:	Max Hold
Test setup:	see chapter 7.3

**Limits:**

FCC		IC	
Conducted limits			
Frequency of Emission (MHz)	Conducted Limit (dBµV)		
	Quasi-peak	Average	
0.15 – 0.5	66 to 56 *	56 to 46 *	
0.5 – 5	56	46	
5 - 30	60	50	

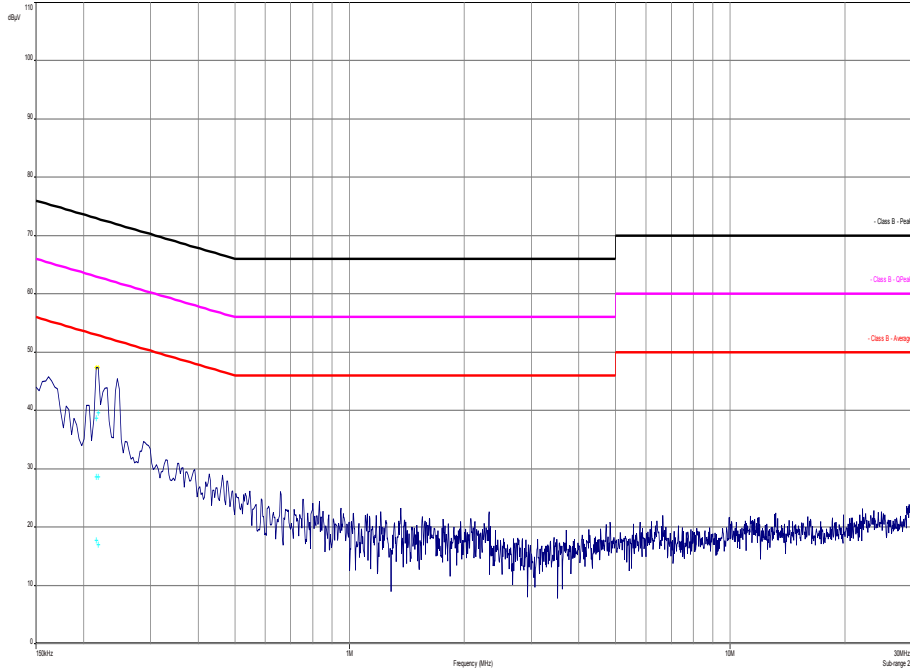
\*Decreases with the logarithm of the frequency

**Result: Passed**

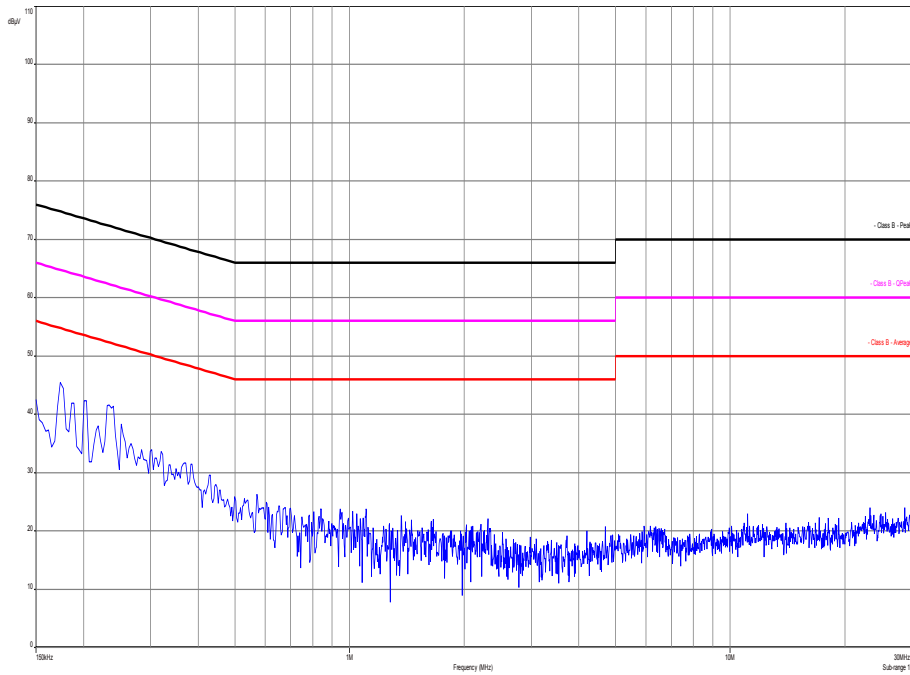


**Plots:**

**Plot 1: phase line**



**Plot 2: neutral line**



## Annex A Document history

Version	Applied changes	Date of release
	Initial release	2016-12-14

## Annex B Further information

### Glossary

AVG	-	Average
DUT	-	Device under test
EMC	-	Electromagnetic Compatibility
EN	-	European Standard
EUT	-	Equipment under test
ETSI	-	European Telecommunications Standard Institute
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	Not applicable
PP	-	Positive peak
QP	-	Quasi peak
S/N	-	Serial number
SW	-	Software

## Annex C Accreditation Certificate

Front side of certificate



Deutsche Akkreditierungsstelle GmbH

Befehle gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV  
Unterzeichnerin der Multilateralen Abkommen  
von EA, ILAC und IAF zur gegenseitigen Anerkennung

**Akkreditierung**



Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

**CTC advanced GmbH**  
Untertürkheimer Straße 6-10, 66117 Saarbrücken

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

**Funk**  
Mobilfunk (GSM / DCS) + OTA  
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Produktsicherheit  
SAR / EMF  
Umwelt  
Smart Card Technology  
Bluetooth®  
Automotive  
Wi-Fi-Services  
Kanadische Anforderungen  
US-Anforderungen  
Akustik  
Near Field Communication (NFC)

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 25.11.2016 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig bis 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 63 Seiten.

Registrierungsnummer der Urkunde: D-PL-12076-01-01

Frankfurt, 25.11.2016

Siehe Hinweis auf der Rückseite

Im Auftrag Dipl.-Ing. Ralf Eigner  
Abteilungsleiter

Back side of certificate

Deutsche Akkreditierungsstelle GmbH

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10117 Berlin

Standort Frankfurt am Main  
Europa-Allee 52  
60327 Frankfurt am Main

Standort Braunschweig  
Bundesallee 100  
38116 Braunschweig

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Der aktuelle Stand der Mitgliedschaft kann folgenden Webseiten entnommen werden:  
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ILAC: [www.ilac.org](http://www.ilac.org)  
IAF: [www.iaf.nu](http://www.iaf.nu)

**Note:**

The current certificate including annex may be received from CTC advanced GmbH on request.