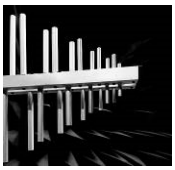
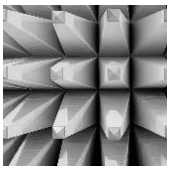




CETECOM ICT Services is now

CTC advanced
member of RWTÜV group

TEST REPORT

Test report no.: 1-8548/14-01-10

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-01

Testing laboratory

CTC advanced GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: http://www.ctcadvanced.com
e-mail: mail@ctcadvanced.com

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
Felix-Wankel-Straße 2
73760 Ostfildern / GERMANY
Phone: +49 711 340-90
Fax: +49 711 340-99691
Contact: Jürgen Kitzing
e-mail: j.kitzing@pilz.de
Phone: +49 711 340-9691

Manufacturer

Pilz GmbH & Co. KG
Felix-Wankel-Straße 2
73760 Ostfildern / GERMANY

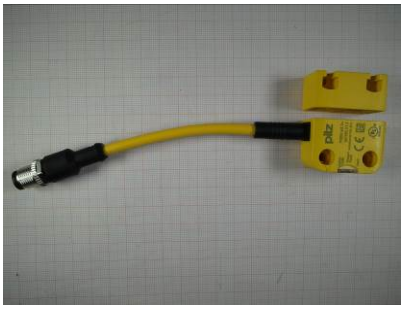
Test standard/s

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 cs5.x/6.x**
FCC ID:	**VT8-PSENCS5**
IC:	**7482A-PSENCS5**
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:

cn=Marco Bertolino, o=CTC advanced GmbH, ou=BTL-161128, email=Marco.Bertolino@ctcadvanced.com, c=DE
2016.12.14 09:05:17 +01'00'

Marco Bertolino
Lab Manager
Radio Communications & EMC

Test performed:

cn=Andreas Luckenbill, o=CTC advanced GmbH, ou, email=Andreas.Luckenbill@ctcadvanced.com, c=DE
2016.12.14 08:45:30 +01'00'

Andreas Luckenbill
Lab Manager
Radio Communications & EMC

1 Table of contents

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.
The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CTC advanced GmbH.
The testing service provided by CTC advanced GmbH has been rendered under the current "General Terms and Conditions for CTC advanced GmbH".
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In no case this test report can be considered as a Letter of Approval.

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

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

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	No tests under extreme conditions
	T_{min}	No tests under extreme conditions
Relative humidity content:		55 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	24 V DC by external power supply
	V_{max}	No tests under extreme conditions
	V_{min}	No tests under extreme conditions

5 Test item

Kind of test item	:	RFID Proximity switch
Type identification	:	PSEN cs5.x/6.x
PMN:		PSEN cs5.x/6.x
HVIN:		PSEN cs5.1p; PSEN cs5.11 M12/8; PSEN cs5.1n; PSEN cs5.13 M12/8 EX; PSEN cs5.1 M12/8; PSEN cs6.1p; PSEN cs6.11 M12/8; PSEN cs6.1n; PSEN cs6.1 M12/8; PSEN cs6.2p; PSEN cs6.21 M12/8; PSEN cs6.2n; PSEN cs6.2 M12/8
FVIN:		-/-
HMN:		-/-
S/N serial number	:	SA002551998
HW hardware status	:	-/-
SW software status	:	-/-
Frequency band [MHz]	:	125 kHz
Type of radio transmission **Use of frequency spectrum**	: :	Modulated carrier
Number of channels	:	1
Antenna	:	Integrated loop antenna
Power supply	:	24 V DC by external power supply
Temperature range	:	-20°C to +55°C

5.1 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup- and EUT-photos are included in test report: 1-8548/14-01-10_AnnexA
1-8548/14-01-10_AnnexB
1-8548/14-01-10_AnnexD

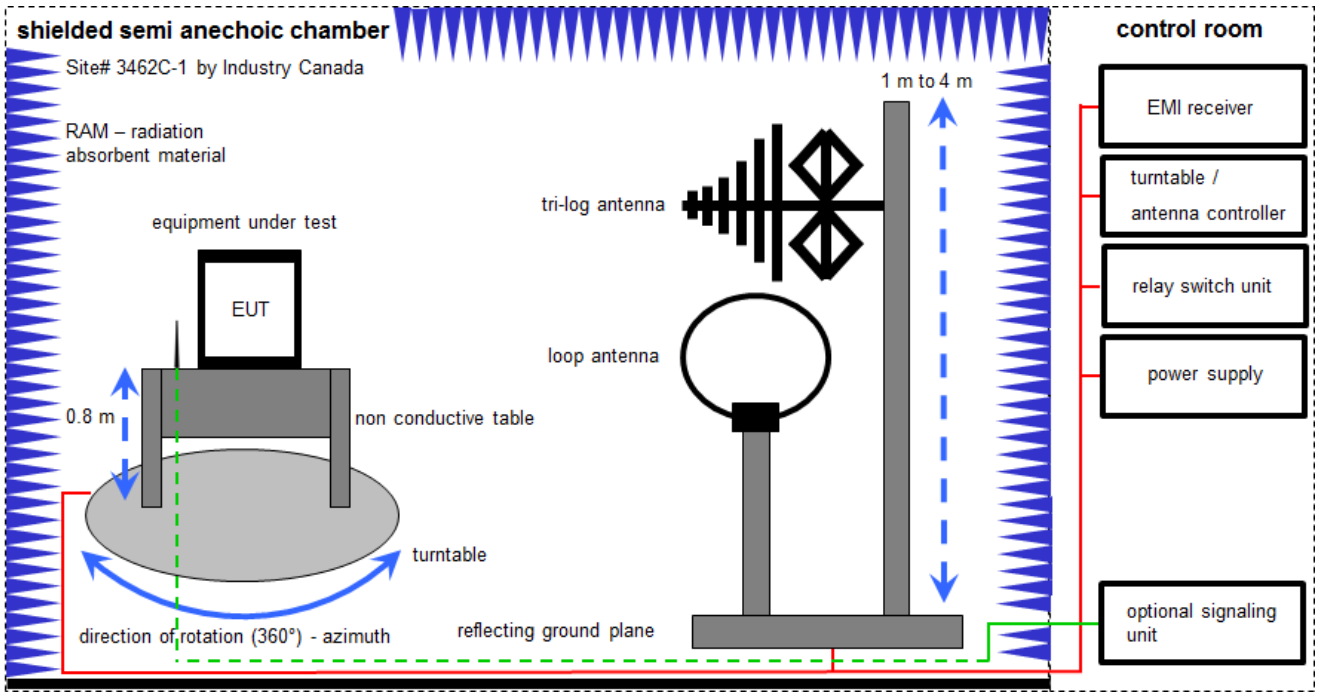
6 Test laboratories sub-contracted

None

7 Description of the test setup

7.1 Radiated measurements

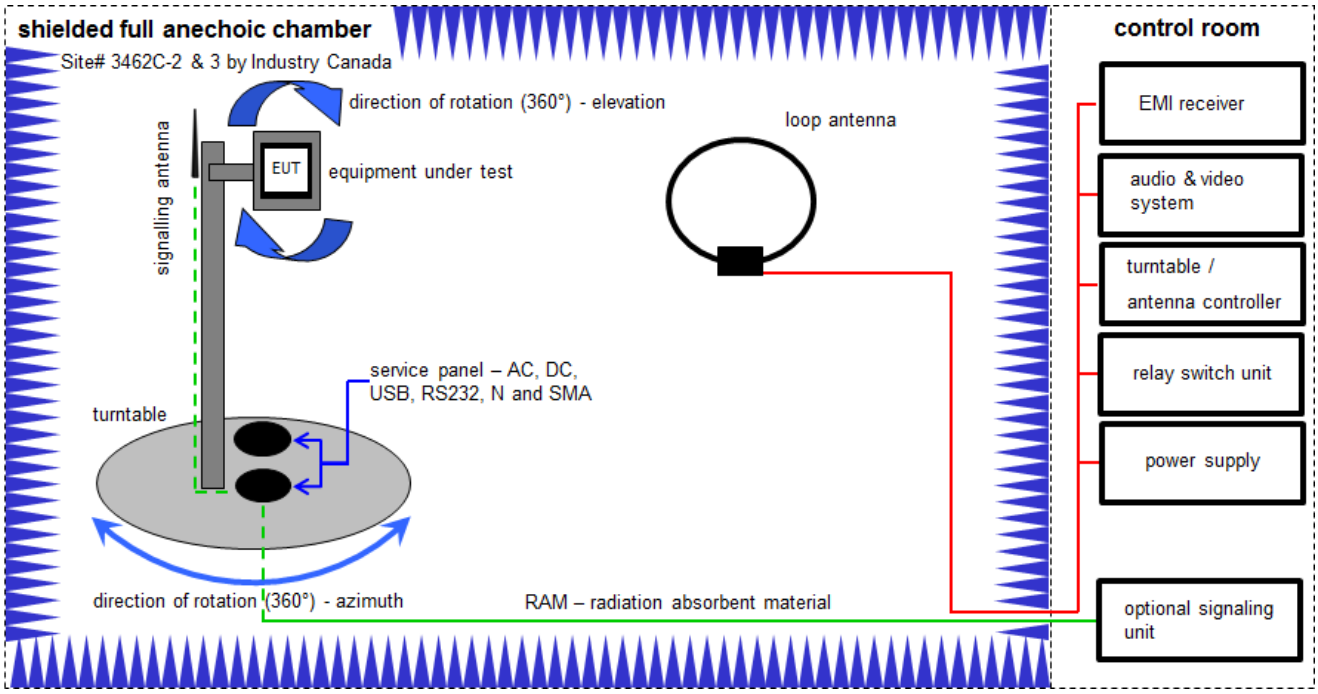
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas 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	300000368
DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580
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



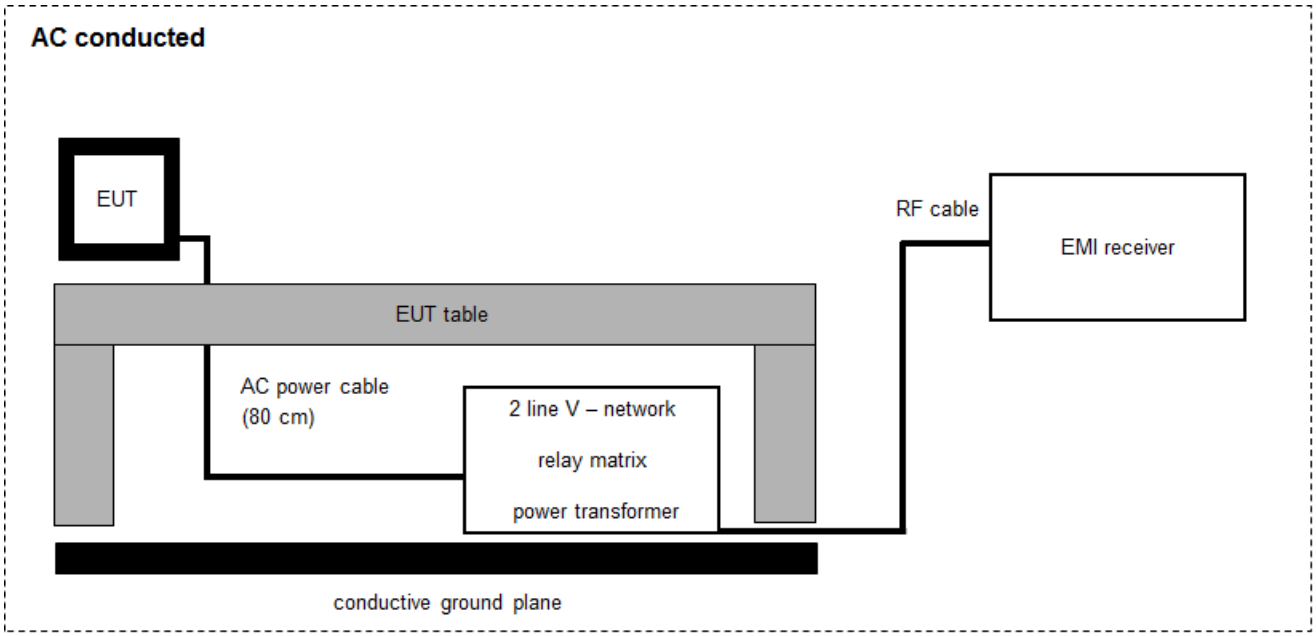
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dBµV/m] (71.61 µV/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 [dBµV/m] = 37.62 [dBµV/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dBµV/m] (244.06 µV/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	☒	☐	☐	☐	complies
§ 2.1049 / RSS-Gen.	Bandwidth of the modulated carrier	Nominal	Nominal	☒	☐	☐	☐	complies
§ 15.209 / RSS-Gen.	Fieldstrength of fundamental	Nominal	Nominal	☒	☐	☐	☐	complies
§ 15.209 (a) / RSS-Gen.	Fieldstrength of harmonics and spurious	Nominal	Nominal	☒	☐	☐	☐	complies
§ 15.109 / RSS-Gen.	Receiver spurious emissions	Nominal	Nominal	☐	☐	☒	☐	-/-
§ 15.107 / § 15.207	Conducted limits	Nominal	Nominal	☒	☐	☐	☐	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	
(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.	

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	

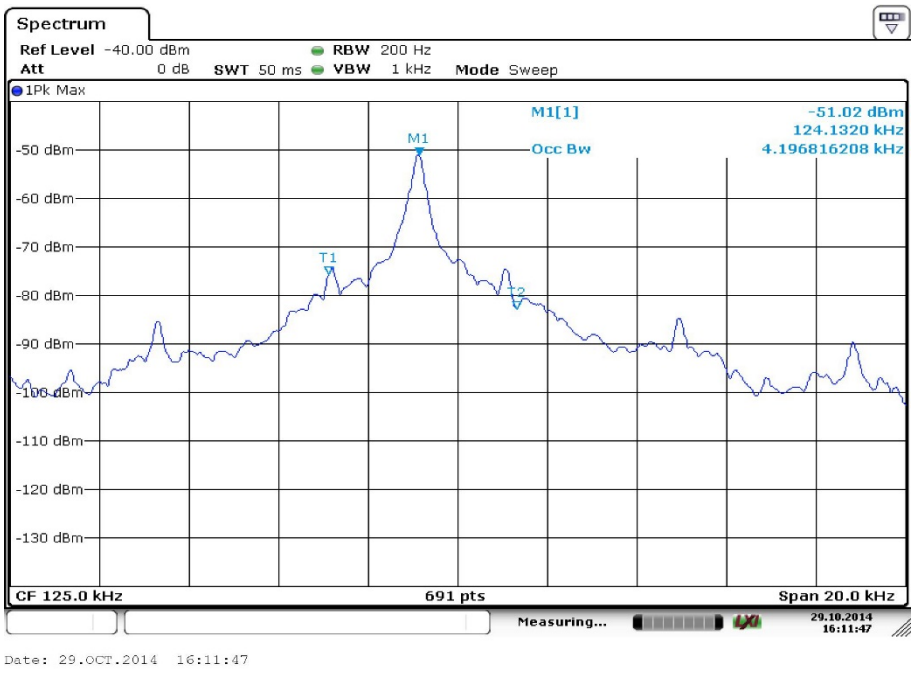
Measured with the integrated OBW-function of the spectrum analyser (measurement criteria is the integrated power in %)

Result:

	Occupied Bandwidth (kHz)
20 dB (99%)	4.20

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_{nom}	V_{nom}	51.0	-9
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:

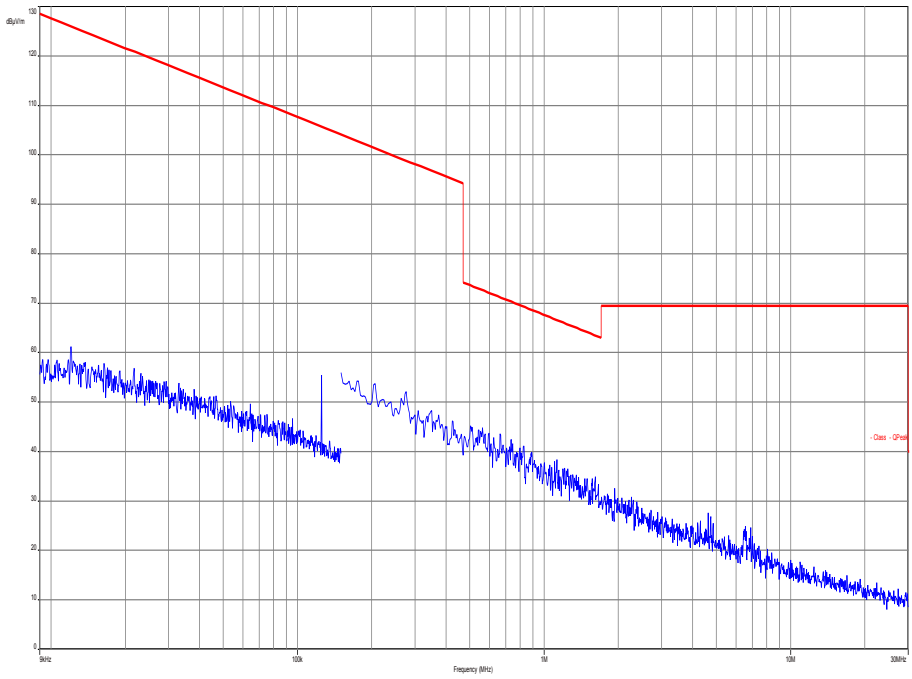
EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dBµV/m]	Amplitude of emission [dBµV/m]	Results
	All detected peaks are more than 20 dB below the limit.			

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

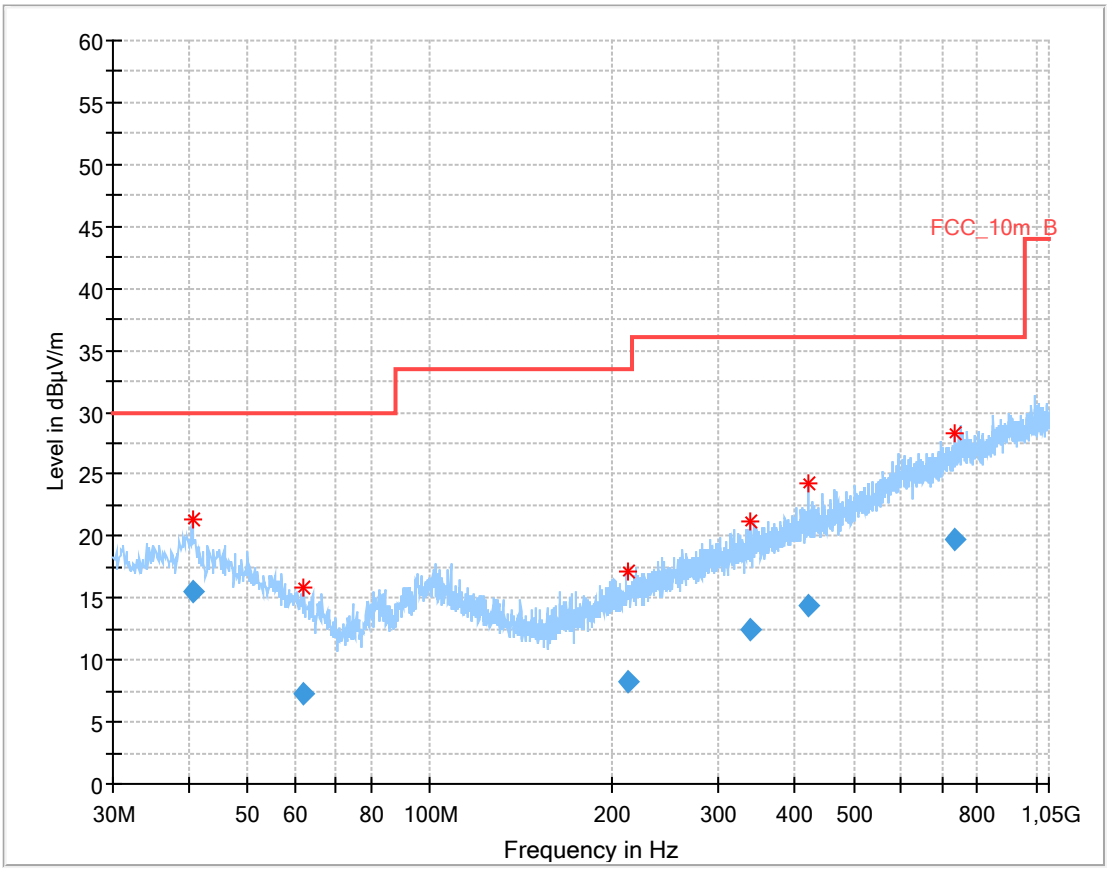
Plot 1: 9 kHz – 30 MHz



Plot 2: 30 MHz – 1000 MHz

Common Information

EUT:	PILZ
Serial number:	
Test description:	FCC part 15 class B
Operating condition:	active
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)
40.707750	15.59	30.00	14.41	1000.0	120.000	172.0	V	-9	14.0
61.674900	7.33	30.00	22.67	1000.0	120.000	272.0	H	5	10.2
211.601100	8.26	33.50	25.24	1000.0	120.000	273.0	V	36	12.1
338.876700	12.43	36.00	23.57	1000.0	120.000	400.0	V	81	15.7
420.962250	14.35	36.00	21.65	1000.0	120.000	200.0	V	140	17.2
732.568200	19.75	36.00	16.25	1000.0	120.000	273.0	H	126	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:

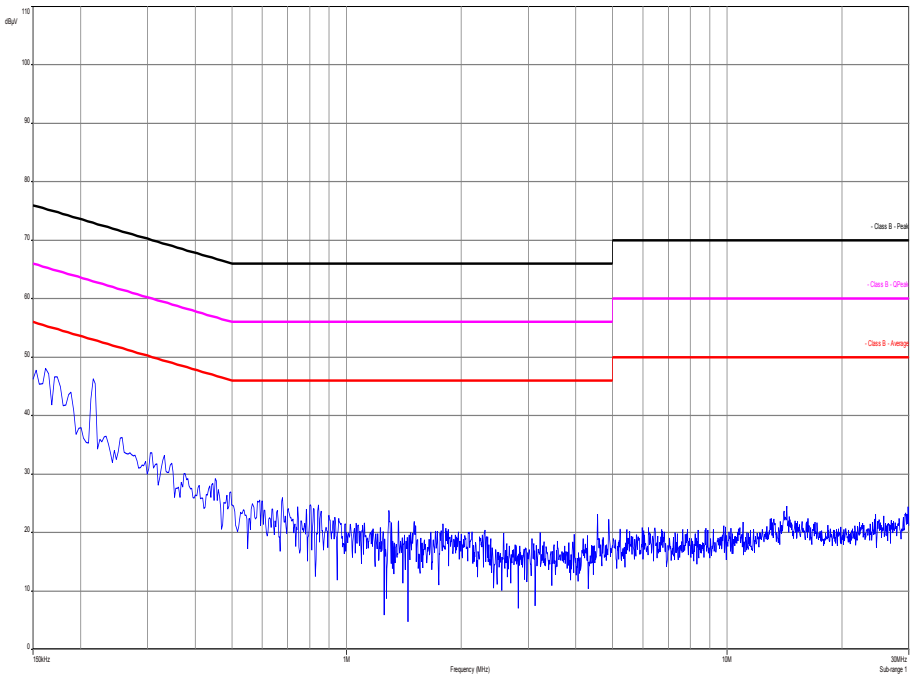
FCC	IC	
Conducted limits		
Frequency of Emission (MHz)	**Conducted Limit (dBµV)**	
	Quasi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 - 30	60	50

*Decreases with the logarithm of the frequency

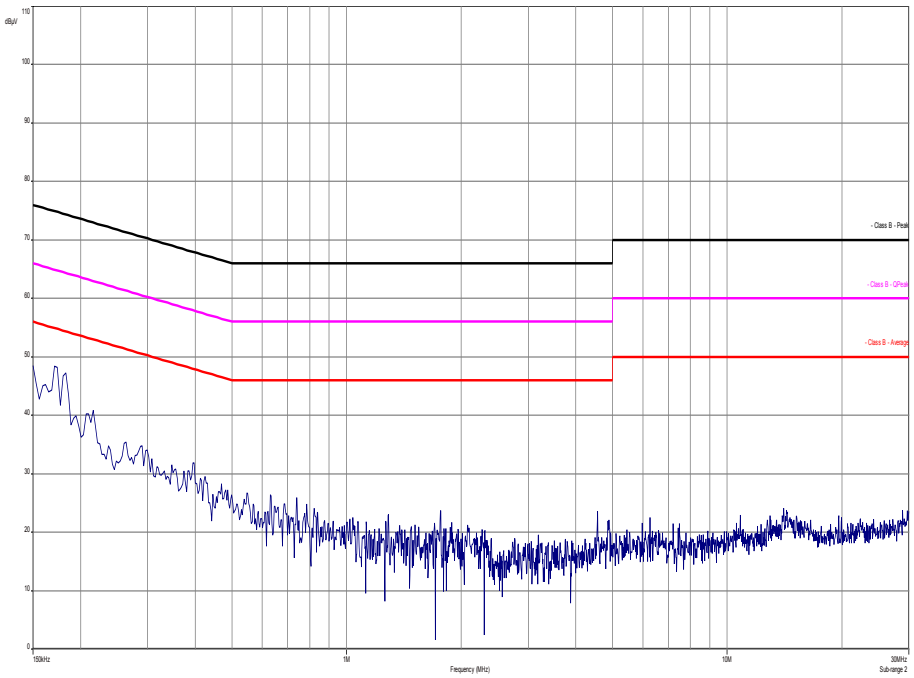
Result: Passed

Plots:

Plot 1: phase line



Plot 2: neutral line



Annex A Document history

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

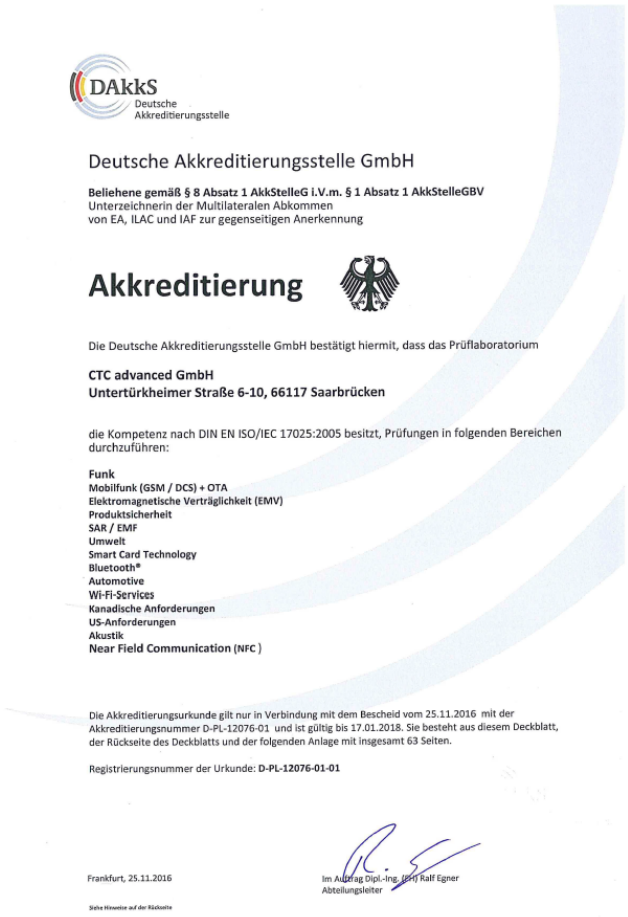
Annex B Further information

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



DAkkS
Deutsche
Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Beliehene 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
Elektromagnetische Verträglichkeit (EMV)
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.

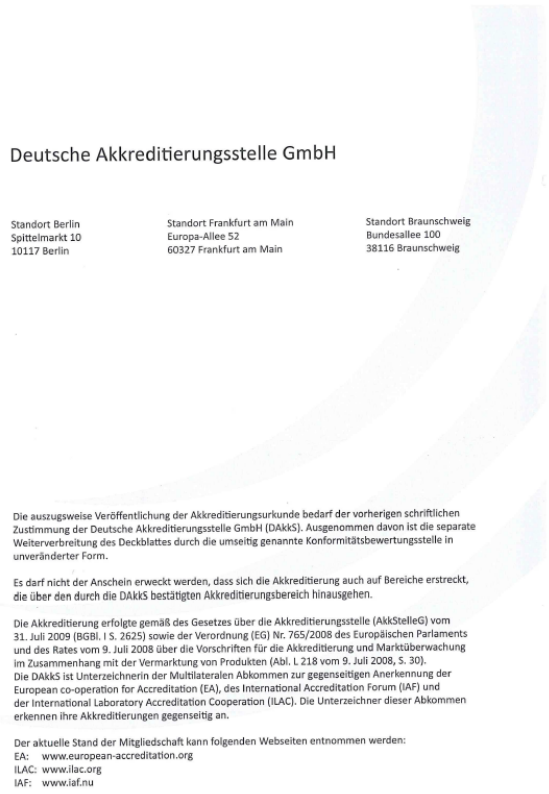
Registrierungsnummer der Urkunde: **D-PL-12076-01-01**

Frankfurt, 25.11.2016

Im Auftrag Dipl.-Ing. (FH) Ralf Egner
Abteilungsleiter

Siehe Hinweise auf der Rückseite

Back side of certificate



Deutsche Akkreditierungsstelle GmbH

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10117 Berlin

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Europa-Allee 52
60327 Frankfurt am Main

Standort Braunschweig
Bundesallee 100
38116 Braunschweig

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Es darf nicht der Anschein erweckt werden, dass sich die Akkreditierung auch auf Bereiche erstreckt, die über den durch die DAkkS bestätigten Akkreditierungsbereich hinausgehen.

Die Akkreditierung erfolgte gemäß des Gesetzes über die Akkreditierungsstelle (AkkStelleG) vom 31. Juli 2009 (BGBl. I S. 2625) sowie der Verordnung (EG) Nr. 765/2008 des Europäischen Parlaments und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung im Zusammenhang mit der Vermarktung von Produkten (Abl. L 218 vom 9. Juli 2008, S. 30).
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Der aktuelle Stand der Mitgliedschaft kann folgenden Webseiten entnommen werden:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

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