

# Test report

**Customer:**

SOEKS Limited Liability Company  
Altuflevskoye shosse,h.48,bld.1pr.1,room39  
Moscow,127566  
Russia

**EMC test report**  
130504-AU01+E04



**SOEKS Limited Liability Company**  
**radiation & nitrate measuring device**  
Ecotester



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EMV **TESTHAUS** GmbH  
Revision: 1.3



# EMV **TESTHAUS** GmbH

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Accreditation:



Location of Testing:

EMV **TESTHAUS** GmbH  
Gustav-Hertz-Straße 35  
94315 Straubing

The technical accuracy is guaranteed through the quality management of the  
EMV **TESTHAUS** GmbH.



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# 1. Test regulation

## Emission

EN 55011:2009  
+A1:2010

Industrial, scientific and medical (ISM)  
radio-frequency - Radio disturbance  
characteristics -  
Limits and methods of measurement

Group 1

Group 1 contains all ISM equipment in which there is intentionally generated and/or used conductively coupled radio-frequency energy which is necessary for the internal functioning of the equipment itself.

Group 2

Group 2 contains all ISM equipment in which radio-frequency energy is intentionally generated and/or used in the form of electromagnetic radiation for the treatment of material, and spark erosion equipment.

Class A

Class A equipment is equipment suitable for use in all establishments other than domestic and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

Class B:

Class B equipment is equipment suitable for use in domestic establishments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.



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**Includes the following tests:**

EN 55011:2009 +A1:2010

Measurement of the conducted disturbance at mains ports in a frequency range from 150 kHz to 30 MHz.

Measurement of radiated disturbance in a frequency range from 30 MHz to 1 GHz.

**Emission in the frequency range of  $\leq 2$  kHz:**

EN 61000-3-2:2006

Harmonic current emissions  
(equipment input current  $\leq 16$  A per phase)

EN 61000-3-3:1995  
+ A1:2001

Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current  $\leq 16$  A

Deviation of regulations and standards: No



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# Susceptibility

EN 61326-1:2006

Electrical equipment for measurement, control and laboratory use- EMC requirements - Part 1: General requirements.

Includes Basic EMC Publications:

EN 61000-4-2:1995  
+ A1:1998 + A2:2001

Testing and measurement techniques - Electrostatic discharge immunity test.

EN 61000-4-3:2002

Testing and measurement techniques - Radiated, radio frequency, immunity test.

EN 61000-4-4:2004

Testing and measurement techniques - Electrical fast transient (EFT)/burst immunity test.

EN 61000-4-5:1995  
+ A1:2001

Testing and measurement techniques - Surge immunity test.

EN 61000-4-6:1996  
+ A1:2001

Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.

EN 61000-4-8:1993  
+ A1:2001

Testing and measurement techniques - Power frequency magnetic field immunity test.

EN 61000-4-11:2004

Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests.

Deviation of Regulation and Standards: No



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## Not applied tests:

EN 55011:2009 +A1:2010	Measurement of the conducted disturbance at mains ports in a frequency range from 150 kHz to 30 MHz.
EN 61000-3-2:2006	Harmonic current emissions (equipment input current $\leq 16$ A per phase)
EN 61000-3-3:1995 + A1:2001	Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current $\leq 16$ A
EN 61000-4-4:2004	Testing and measurement techniques - Electrical fast transient (EFT)/burst immunity test.
EN 61000-4-5:1995 + A1:2001	Testing and measurement techniques - Surge immunity test.
EN 61000-4-6:1996 + A1:2001	Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.
EN 61000-4-11:2004	Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests.
Remark:	The EUT is battery powered.
EN 61000-4-8:1993 + A1:2001	Testing and measurement techniques - Power frequency magnetic field immunity test.
Remark:	Only for equipment containing devices susceptible to magnetic fields.



## 2. Equipment under test

Product type: radiation & nitrate measuring device  
Model name: Ecotester  
Serial number: 4 612748 570033  
Manufacturer: SOEKS Limited Liability Company



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## Photo documentation



Picture 1: Equipment under test

### 3. Test configuration and mode of operation

#### Test configuration

Device	Model:	S/N
radiation & nitrate measuring device	Ecotester	4 612748 570033

#### Mode of operation

The EUT was tested in the following mode of operation:

Settings: measuring

Applied Software: None

Failure criterion for test of immunity from disturbances:

It was observed whether the EUT is influenced in any form or program interruptions occurred.



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## 4. Measurement of radiated emission

according to EN 55011 Group 1 Class B

Procedure of radiated emission measurement:

- Scan with max-peak detector in 3 m CDC
- Final CISPR measurement with quasi peak detector on 10m open area test site

### Location of measurement

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	E00026
Open area test site	EMV <b>TESTHAUS</b> GmbH	E00354

### Measurement equipment

	Description	Manufacturer	Inventory No.
<input checked="" type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	E00001
<input type="checkbox"/>	ESU26	Rohde & Schwarz	W00002
<input checked="" type="checkbox"/>	ESCS 30 (OATS)	Rohde & Schwarz	E00003
<input checked="" type="checkbox"/>	VULB 9160 (CDC)	Schwarzbeck	E00011
<input checked="" type="checkbox"/>	VULB 9163 (OATS)	Schwarzbeck	E00012

Test related measurement inaccuracies have to be taken into consideration when evaluating the test results.  
All used test instrument as well as the test accessories are calibrated at regular intervals.



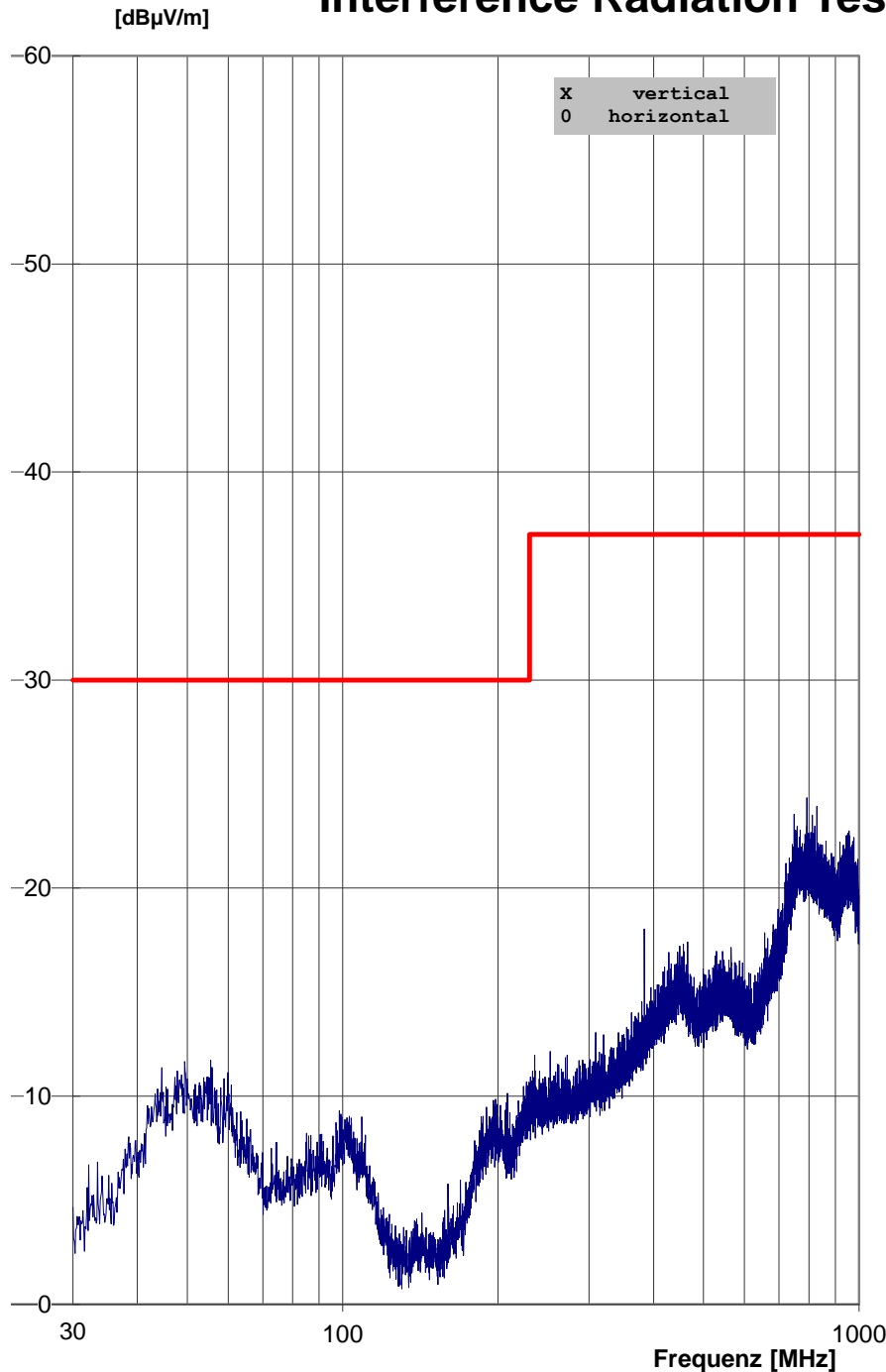
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# Interference Radiation Test



REGULATIONS:  
EN 55011 Group 1 Class B  
PEAK / CISPR

TEST EQUIPMENT:  
R&S ESCS30 (E00003)  
VULB 9163 (E00013)

ORDER NO.:  
130504-AU01+E04

EUT:  
SOEKS Limited Liability  
Company  
radiation & nitrate measuring  
device  
Ecotester  
4 612748 570033

OPERATION MODE:  
measuring

TEST FACILITY:  
EMV TESTHAUS GmbH  
Gustav-Hertz-Straße 35  
94315 Straubing

DATE / TIME:  
2014-01-20 10:58:40  
2,7°C, 100%, 101kPa

TEST ENGINEER:  
Martin Müller

130504-AU01+E04 OATS.E10

Picture 2: Measurement report of radiated emission



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## Photo documentation



Picture 3: Test setup radiated emission

## Test result

The requirements according to EN 55011 Group 1 Class B are

**Kept**

**Not kept**

Information about measurement uncertainty is on page 23.



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# 5. Electrostatic discharge immunity test

according to EN 61000-4-2

## Location of measurement

Description	Manufacturer	Inventory No.
Shielded chamber	Siemens - Matsushita	E00107

## Measurement equipment

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESD 3000	EMC Partner	E00040
<input checked="" type="checkbox"/>	NSG 435	Teseq	E00412
<input checked="" type="checkbox"/>	VCP	EMV <b>TESTHAUS</b> GmbH	E00047
<input checked="" type="checkbox"/>	HCP	EMV <b>TESTHAUS</b> GmbH	E00048

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## Test conditions

### Air discharge

Test voltage:  2 kV test level 1  
 4 kV test level 2  
 8 kV test level 3  
 15 kV test level 4  
 kV test level x

Polarity:  positive  
 negative

Discharges:  $\geq 10$  discharges per polarity

Discharging points: screws, housing slots  
no discharges

### Contact discharge

Test voltage:  2 kV test level 1  
 4 kV test level 2  
 6 kV test level 3  
 8 kV test level 4  
 kV test level x

Polarity:  positive  
 negative

Discharges:  $\geq 10$  discharges per polarity

Discharging points: direct: USB shield,  
measuring probe  
no discharges

indirect: HCP, VCP

Climatic conditions: Ambient temp.: 21,9 °C  
Relative humidity.: 32,2 %  
Barometric pressure: 97 kPa



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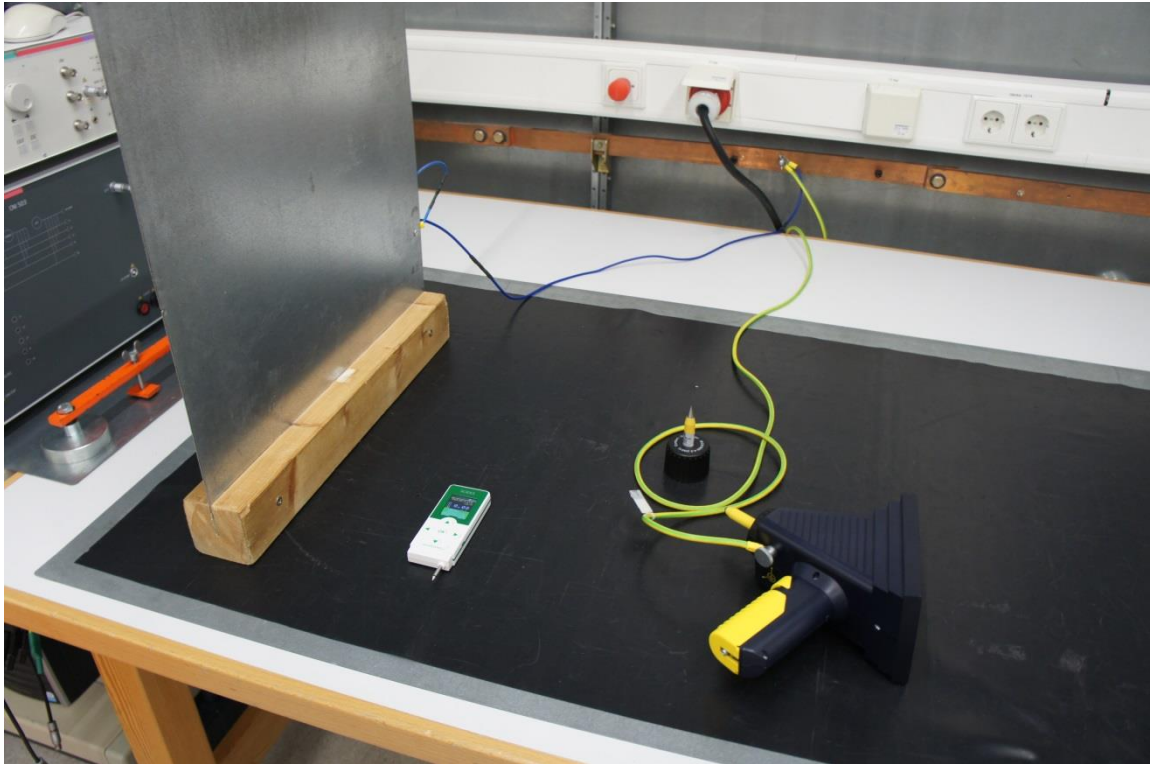
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## Photo documentation



Picture 4: Test setup ESD

## Test result

The requirements according to EN 61000-4-2 are

- Kept**
- Not kept**

Information about measurement uncertainty is on page 23.

### Operating conditions during test:

Criterion

- A** The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
- B** After the test, the equipment shall continue to operate as intended without operator invention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
- C** Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

Comments: During the test the function of the EUT was observed. Influences in any form or program interruptions did not occur.



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## 6. Radiated, radio-frequency, electromagnetic field immunity test

according to EN 61000-4-3

### Location of measurement

Description	Manufacturer	Inventory No.
Anechoic chamber	EMV <b>TESTHAUS</b> GmbH	E00100

### Measurement equipment

	Model	Description	Manufacturer	Inventory
<input checked="" type="checkbox"/>	VULB 9163	Antenna 30 – 3000 MHz	Schwarzbeck	E00013
<input checked="" type="checkbox"/>	BBHA 9120E	Antenne 1000 – 2700 MHz	Schwarzbeck	E00018
<input checked="" type="checkbox"/>	SMT06	Signal Generator	Rohde & Schwarz	E00036
<input checked="" type="checkbox"/>	COSF 3312	Power Switching Unit	Conformitas	E00037
<input checked="" type="checkbox"/>	NRVD	Power Meter	Rohde & Schwarz	E00038
<input checked="" type="checkbox"/>	AS0104-55/30	Amplifier 1 - 4GHz	Milmega	E00070
<input checked="" type="checkbox"/>	BTA 0122-150W	Amplifier 9 kHz-220 MHz	Bonn	E00071
<input checked="" type="checkbox"/>	BLWA 2010-100W	Amplifier 200-1000 MHz	Bonn	E00072
<input checked="" type="checkbox"/>	NRV-Z51	Power Measuring Head	Rohde & Schwarz	E00075
<input checked="" type="checkbox"/>	NRV-Z51	Power Measuring Head	Rohde & Schwarz	E00076

Test related measurement inaccuracies have to be taken into consideration when evaluating the test results.  
All used test instrument as well as the test accessories are calibrated at regular intervals.



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# Test Conditions

Frequency range:  80 MHz - 1000 MHz with test level 3  
 1400 MHz - 2000 MHz with test level 2  
 2000 MHz - 2700 MHz with test level 1

Step size:  1 % of output frequency  
 4 % of output frequency

Field strength:  1 V/m test level 1  
 3 V/m test level 2  
 10 V/m test level 3  
 V/m test level x

Modulation: Kind of Modulation: AM  
Modulation factor: 80 %  
Modulation frequency: 1 kHz

Dwell time:  3 seconds  
 X seconds

Antenna polarization:  vertical  
 horizontal

Test distance:  1 m  
 3 m

EUT position:  front side  
 rear side  
 left side  
 right side  
 top  
 bottom

Observation of EUT: Via video camera

Climatic conditions: Ambient temp.: 21,9 ° C  
Relative humidity.: 32,2 %  
Barometric pressure: 97 kPa



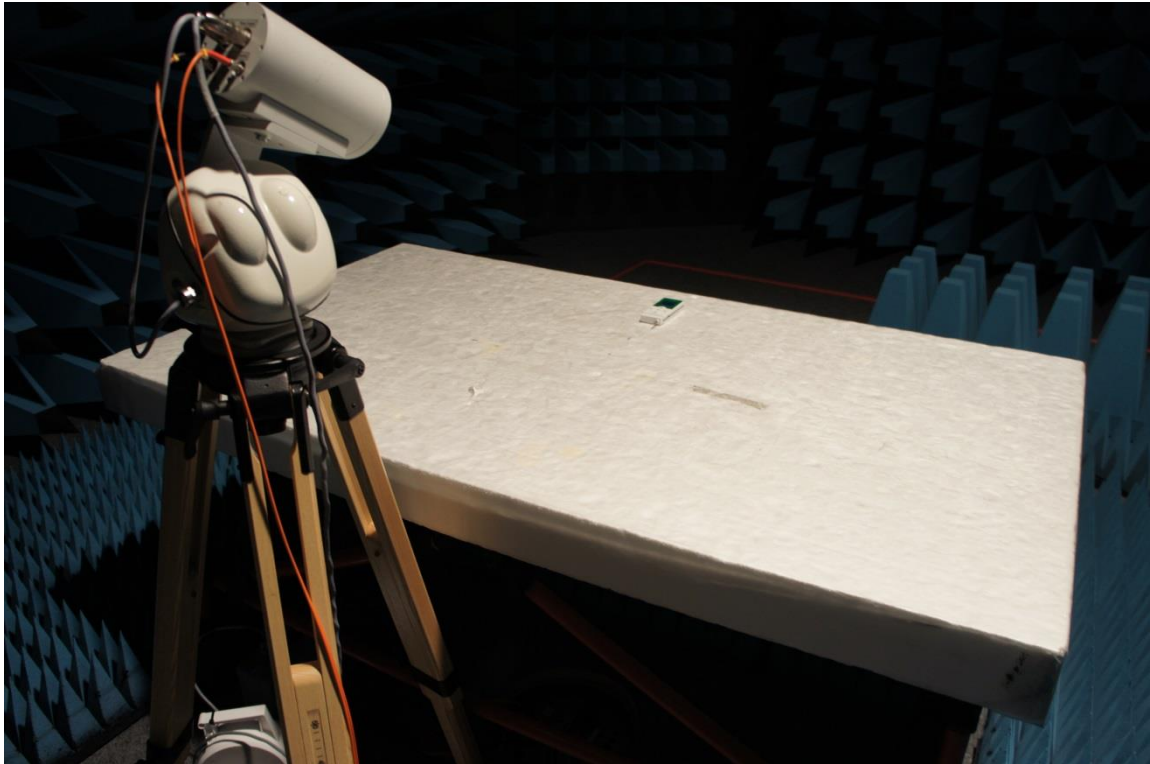
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## Photo documentation



Picture 5: Test setup radiated immunity test

## Test result

The requirements according to EN 61000-4-3 are

- Kept**
- Not kept**

Information about measurement uncertainty is on page 23.

### Operating conditions during test:

Criterion

- A** The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
- B** After the test, the equipment shall continue to operate as intended without operator invention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
- C** Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

Comments: During the test the function of the EUT was observed. Influences in any form or program interruptions did not occur.



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# 7. Measurement uncertainty

Standard	Description	Max. deviation	k=
EN 55011	Conducted emission AMN (150kHz to 30 MHz)	+/- 4,1 dB	2
EN 55011	Radiated emission open field (30 MHz to 300 MHz) (300MHz to 1 GHz)	+/- 5,4 dB +/- 4,7 dB	2
EN 61000-4-2	ESD	inside specification *	
EN 61000-4-3	Radiated immunity	+/- 1,8 dB <sup>a.)</sup>	1,64
EN 61000-4-4	Burst	inside specification *	
EN 61000-4-5	Surge	inside specification *	
EN 61000-4-6	Conducted immunity with CDN (150 kHz to 230 MHz)	+/- 2,4 dB <sup>b.)</sup>	1,64
EN 61000-4-6	Conducted immunity with BCI (150 kHz to 230 MHz)	+/- 2,4 dB <sup>c.)</sup>	1,64
EN 61000-4-8	Magnetic field	+/- 0,9 dB	2
EN 61000-4-11	Dips	inside specification *	2
EN 61000-3-2	Harmonic currents	+/- 0,2 % <sup>d.)</sup>	1
EN 61000-3-3	Flicker	annotation <sup>e.)</sup>	

Comment: The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor k. If k=2 the value of the measurands lies within the assigned range of values with a probability of 95 %.

- \* The specific requirements regarding to the standard was kept
- a.) To maintain the claimed test level with a probability of 90 % an additional test level of 38 % percent must be added.
  - b.) To maintain the claimed test level with a probability of 90 % an additional test level of 35 % percent must be added.
  - c.) To maintain the claimed test level with a probability of 90 % an additional test level of 39 % percent must be added.
  - d.) Measuring uncertainty (current): +/- 0,2% (fundamental oscillation), +/- 0,2% (rated current), voltage metering +/- 0,2% of the reading. Impacts on the measuring system by the EUT are not included.
  - e.) Measuring uncertainty (flicker): dc and dmax +/- 5%, Pst +/- 8%. Impacts on the measuring system by the EUT are not included.



## 8. Summary

The EMC regulations according to the marked specifications are

**Kept**

The Equipment under Test fulfills the general approval requirements mentioned.

**Not kept**

The Equipment under Test does not fulfill the general approval requirements mentioned.

Straubing, January 21<sup>st</sup>, 2014



Martin Müller  
Test engineer  
EMV **TESTHAUS** GmbH



Christian Kiermeier  
Technical executive  
EMV **TESTHAUS** GmbH



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