



**CENTRE OF TESTING SERVICE  
INTERNATIONAL**

**OPERATE ACCORDING TO ISO/IEC 17025**

# **EMC TEST REPORT**

**TEST REPORT NUMBER : CGZ2110119-0009-E**



**CTS (Ningbo) Testing Service Technology Co., Ltd.**  
Building F, Dachuang industrial park, No.379, Zhongshan Dadao,  
Guangzhou, China.



<b>TEST REPORT</b> <b>EN 55022:2006</b> Information technology equipment-Radio disturbance characteristics-Limits of measurement <b>EN 55024:1998+A1:2001+A2:2003</b> Information technology equipment-Immunity characteristics-Limits and methods of measurement of measurement	
<b>Report Reference No.</b> .....	CGZ2110119-0009-E
Date of issue .....	26 January 2011
<b>Testing Laboratory Name</b> ..... <b>CTS (Ningbo) Testing Service Technology Co., Ltd.</b>	
Address.....	Building F, Dachuang industrial park, No.379, Zhongshan Dadao, Guangzhou, China.
Testing location/ procedure.....	Full application of Harmonised standards <input checked="" type="checkbox"/> Partial application of Harmonised standards <input type="checkbox"/> Other standard testing method <input type="checkbox"/>
<b>Applicant's name</b> .....	
Address.....	
<b>Test specification:</b>	
Standard .....	<b>EN 55022:2006, EN 55024:1998+A1:2001+A2:2003, EN 61000-3-2: 2006, EN 61000-3-3: 1995+A1:2001+A2:2005</b>
<b>Test Report Form No.</b> .....	CTSEMC-1.0
TRF Originator.....	CENTRE OF TESTING SERVICE CO., LTD
Master TRF .....	Dated 2009-01
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<b>Test item description.</b> .....	
Speaker	
Trade Mark.....	/
Manufacturer .....	/
Model/Type reference .....	TT-1028
Ratings .....	AC 230V, 50Hz for PC / Battery DC 3.7V for speaker
Result .....	<b>Positive</b>

Compiled by:

Violet Lee / File administrators

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**EMC -- TEST REPORT**

<b>Test Report No. : CGZ2110119-0009-E</b>	<u>26 January 2011</u> Date of issue
--	---

Type / Model..... TT-1028 EUT..... Speaker
<b>Applicant</b> ..... Address..... Telephone..... Fax..... Contact.....
<b>Manufacturer</b> ..... / Address..... / Telephone..... / Fax..... / Contact..... /
<b>Factory</b> ..... Address..... Telephone..... Fax..... Contact.....

**Test Result** according to the standards on page 3: **Positive**

The test report merely corresponds to the test sample.  
 It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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## 1 TEST STANDARDS

The tests were performed according to following standards:

EN 55022: 2006 Information technology equipment-Radio disturbance characteristics-Limits of measurement.

EN 55024:1998+A1:2001+A2:2003 Information technology equipment-Immunity characteristics-Limits and methods of measurement of measurement.

EN 61000-3-2: 2006 Electromagnetic compatibility (EMC) -- Part 3-2: Limits - Limits for harmonic current emissions (equipment input current up to and including 16 A per phase).

EN 61000-3-3: 1995+A1:2001+A2:2005 Electromagnetic compatibility (EMC) -- Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current  $\leq$  16 A per phase and not subject to conditional connection.

## 2 SUMMARY

### 2.1 GENERAL REMARKS

Date of receipt of test sample	19 January 2011
Testing commenced on	25 January 2011
Testing concluded on	25 January 2011

### 2.2 FINAL ASSESSMENT

The EMC requirements pertaining to the technical standards and tested operation modes are

- fulfilled.
- **not** fulfilled.

The equipment under test

- fulfils the EMC requirements cited on page 3.
- **does not** fulfil the EMC requirements cited on page 3.



## 3 EQUIPMENT UNDER TEST

### 3.1 Power supply system utilised

Power supply voltage:  AC 230V, 50Hz for PC / Battery DC 3.7V for speaker  
 Other (Specified blank below)

### 3.2 Short description of the Equipment under Test (EUT)

Number of tested samples: 1  
 Serial number: Prototype  
 Note: EUT Clock Frequency<=108MHz

### 3.3 EUT operation mode

The equipment under test was operated during the measurement under the following conditions:

- Standby
- Test programme (H - Pattern)
- Test programme (colour bar)
- Operating mode 2500 U/min. (1 cylinder)
- Operating mode 1500 U/min. (> 1 cylinder)
- Ignition on , Motor off
- Speed 50 km/h
- Test program (customer specific)

**Operating Mode:** On

Emissions tests.....: According to EN 55022, searching for the highest disturbance.

Immunity tests .....: According to EN 55024, searching for the highest susceptibility.

Harmonic current..... : According to EN 61000-3-2, searching for the highest disturbance.

Voltage fluctuation.....: According to EN 61000-3-3, searching for the highest disturbance.

### 3.4 EUT configuration

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurement:

#### 3.4.1. Monitor

M/N	:	E7722-f
S/N	:	CN-02W486-64180-3B7-01MP
Manufacturer	:	DELL
Power Cord	:	Unshielded, Detachable, 1.8m , 3Pin
Certificate	:	By DoC

#### 3.4.2. Keyboard

M/N	:	SK-8110
S/N	:	CN-07N244-71616-37T-B293
Manufacturer	:	DELL
Power Cord	:	Shielded, Detachable
Certificate	:	By DoC

#### 3.4.3. Mouse

M/N	:	M-468
S/N	:	090604940
Manufacturer	:	VISUAL TOOLS
Power Cord	:	Unshielded, Detachable, 1.8m
Certificate	:	By DoC

#### 3.4.4. Printer

M/N	:	LaserJet 2200d
S/N	:	SGKGB50919
Manufacturer	:	HP
Power Cord	:	Shielded, Detachable, 1.8m. 3Pin
Certificate	:	By DoC

#### 3.4.5. Personal Computer

M/N	:	DIMENSION 4600
S/N	:	CN-OTO486-42940-37M-00XB
Manufacturer	:	DELL
Power Cord	:	Unshielded, Detachable, 1.8m , 3Pin
FCC ID	:	By DoC

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## 3.4.6. Modem

M/N	:	MT800
S/N	:	421033
Manufacturer	:	HUAWEI
Power Cord	:	Shielded, Detachable, 1.8m , 2Pin
Certificate	:	By DoC

### 3.5 Performance level

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level defined by its manufacturer or the requestor of the test, or agreed between the manufacturer and the purchaser of the product.

### 3.6 Definition related to the performance level

- based on the used product standard
- based on the declaration of the manufacturer, requestor or purchaser

**Criterion A:**

Definition: normal performance within limits specified by the manufacturer, requestor or purchaser:

**Criterion B:**

Definition: temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention:

**Criterion C:**

Definition: temporary loss of function or degradation of performance, the correction of which requires operator intervention:

**Criterion D:**

Definition: loss of function or degradation of performance, which is not recoverable, owing to damage to hardware or software, or loss of data:



## 4 TEST ENVIRONMENT

### 4.1 Address of the test laboratory

Building F, Dachuang industrial park, No.379, Zhongshan Dadao, Guangzhou, China

Tel: +86-20-85543113 (32 lines)

Fax: +86-20-38780406

### 4.2 Test facility

The test facility is recognized, certified, or accredited by the following organizations:

#### CNAS-Lab Code: L3394

CTS (Ningbo) Testing Service Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01: 2006 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

#### IC-Registration No.: 8374

The 3m Alternate Test Site of CTS (Ningbo) Testing Service Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 8374 on June 24, 2009 .

#### FCC-Registration No.: 971995

CTS (Ningbo) Testing Service Technology Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration No.971995, July 21, 2009.

### 4.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35 ° C
Humidity:	25~75 %
Atmospheric pressure:	86~106 kPa

### 4.4 Definitions of symbols used in this test report

- - The black square indicates that the listed condition, standard or equipment is applicable for this report.
- - The empty square indicates that the listed condition, standard or equipment is **not** applicable for this report.

### 4.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the CTS quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

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## 4.6 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Conduction disturbance	150kHz~30MHz	±1.22dB	(1)
Power disturbance	30MHz~300MHz	±1.38dB	(1)
Radiation emission (3m)	30MHz~300MHz	±3.14dB	(1)
	300MHz~1000MHz	±3.18dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

## 4.7 Test Description

### 4.7.1 Description of Standards and Results

EMISSION			
Description of Test Item	Standard	Limits	Results
Conducted disturbance at mains terminals	EN 55022:2006	Class B	PASS
Conducted disturbance at telecommunication port	EN 55022:2006	Class B	N/A
Radiated disturbance	EN 55022:2006	Class B	PASS
Harmonic current emissions	EN 61000-3-2:2006	Class D	PASS
Voltage fluctuations & flicker	EN 61000-3-3:1995+A1:2001+A2:2005	-----	PASS
IMMUNITY (EN 55024:1998+A1:2001+A2:2003)			
Description of Test Item	Basic Standard	Performance Criteria	Results
Electrostatic discharge (ESD)	IEC 61000-4-2:1995+A1:1998+A2:2000	B	PASS
Radio-frequency, Continuous radiated disturbance	IEC 61000-4-3:2008	A	PASS
Electrical fast transient (EFT)	IEC 61000-4-4:2007	B	PASS
Surge (Input a.c. power ports)	IEC 61000-4-5:2005	B	PASS
Surge (Telecommunication ports)		B	N/A
Radio-frequency, Continuous conducted disturbance	IEC 61000-4-6:2008	A	PASS
Power frequency magnetic field	IEC 61000-4-8:2001	A	PASS
Voltage dips, >95% reduction	IEC 61000-4-11:2004	B	PASS
Voltage dips, 30% reduction		B	PASS
Voltage interruptions		C	PASS
N/A is an abbreviation for Not Applicable.			

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## 5 TEST CONDITIONS AND RESULTS

### 5.1 Conducted disturbance

For test instruments and accessories used see section 6 part 6.3.

#### 5.1.1 Description of the test location

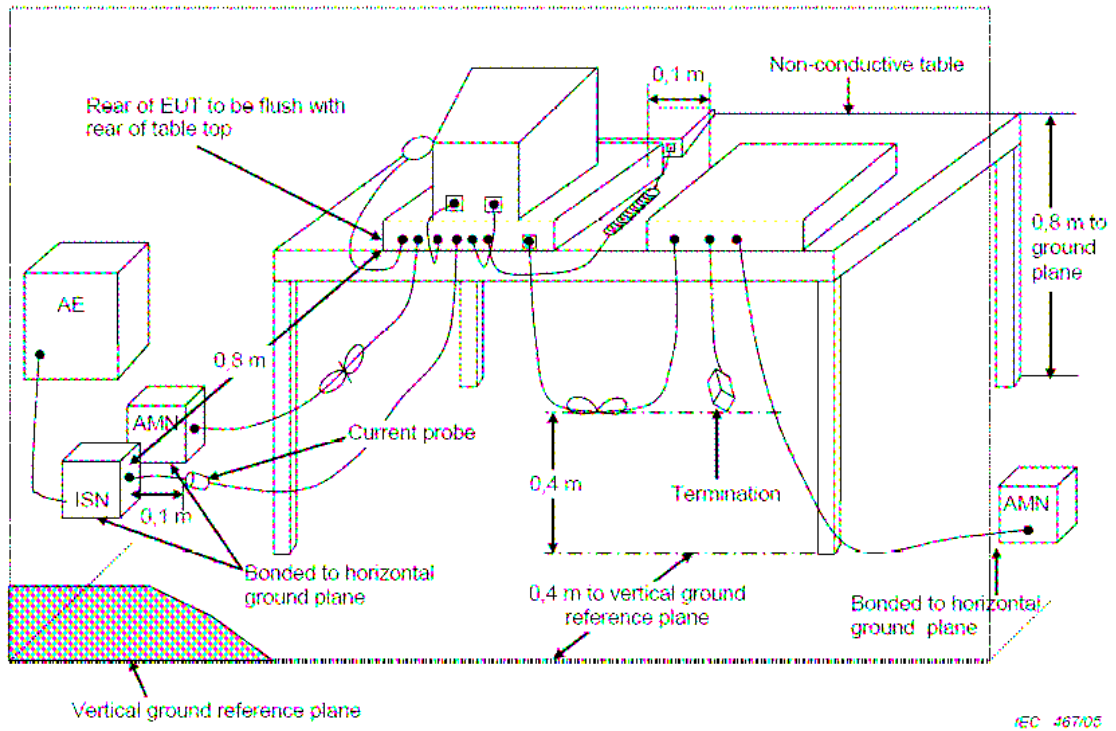
Test location: Shielded room

#### 5.1.2 Description of the test set-up

##### 5.1.2.1 Operating Condition

The EUT is engraving during the test, and the results of the maximum emanation are recorded

##### 5.1.2.2 Block Diagram of Test Setup



#### 5.1.3 Limits disturbance

Frequency	Maximum RF Line Voltage (dB $\mu$ V)	
	Quasi-peak Level	Average Level
150kHz ~ 500kHz	66 ~ 56 *	56 ~ 46 *
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Note: (1) The tighter limit shall apply at the edge between two frequency bands.

**5.1.4 Test result**

The requirements are	<b>Fulfilled</b>
Band width	9kHz
Frequency range	0.15 MHz - 30 MHz
Min. limit margin	>6.0 dB at 0.15 - 30 MHz

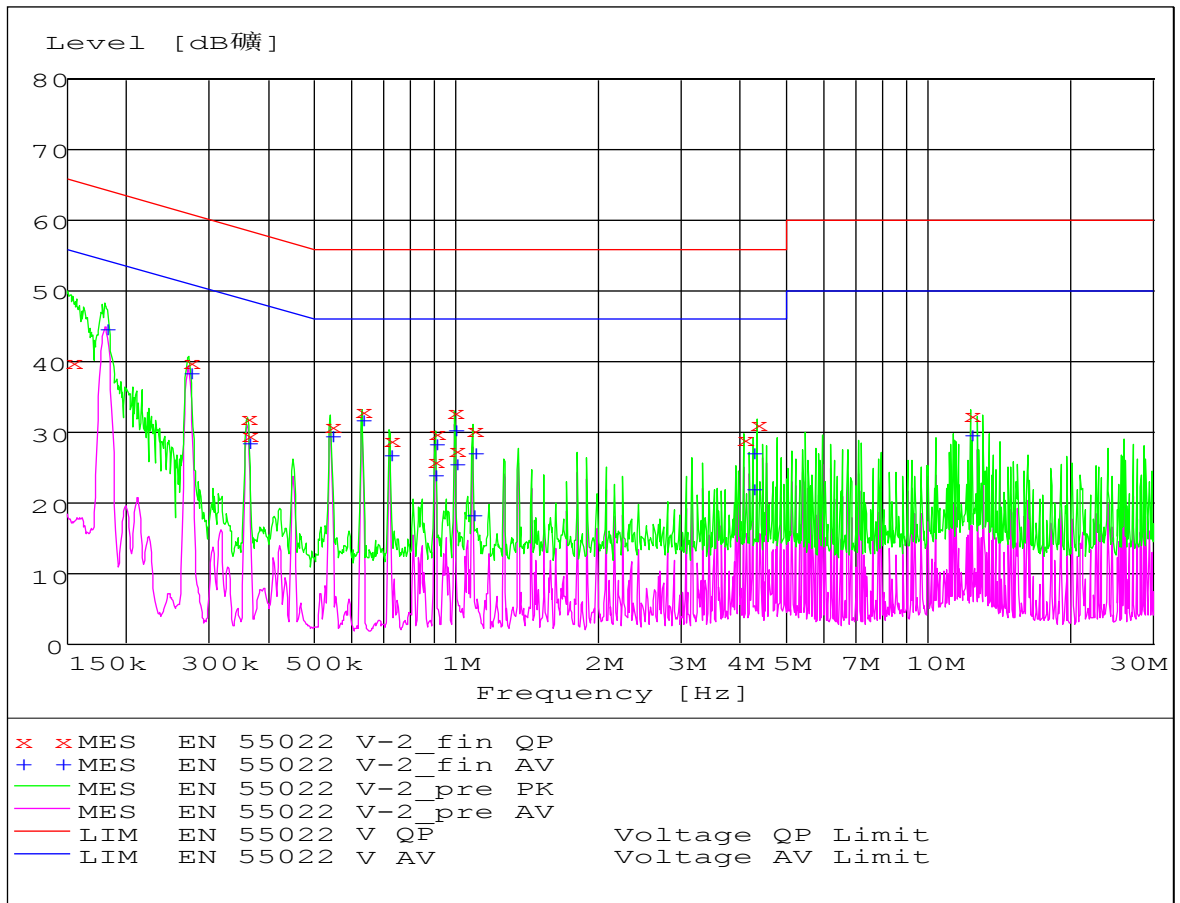
**Remarks:** The limits are kept. For detailed results, please see the following page(s).



5.1.5 Test protocol

Test point	L	Result:	■ - passed □ - not passed
Operation mode			
Remarks:			

EUT	Speaker
Firm Name	
Operating Condition	AC 230V, 50Hz for PC / Battery DC 3.7V for speaker
Test Condition	Ambient Temperature: 20°C Humidity: 43%
Operator	Peter
MODEL NO.	TT-1028



MEASUREMENT RESULT: "EN 55022 V-2\_fin QP"

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dB $\mu$ V	dB	dB $\mu$ V	dB		
0.150600	40.90	10.2	66	25.1	L1	GND
0.151202	40.20	10.2	66	25.7	L1	GND
0.270814	41.10	10.2	61	20.0	L1	GND
0.271897	40.30	10.2	61	20.7	L1	GND
0.360991	32.30	10.1	59	26.4	L1	GND

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0.362435	30.90	10.1	59	27.7	L1	GND
0.540266	32.30	10.1	56	23.7	L1	GND
0.542427	31.30	10.1	56	24.8	L1	GND
0.628765	32.10	10.1	56	23.9	L1	GND
0.631280	33.30	10.1	56	22.7	L1	GND
0.720177	30.50	10.1	56	25.5	L1	GND
0.723058	29.10	10.1	56	27.0	L1	GND
0.897004	26.10	10.1	56	29.9	L1	GND
0.900592	30.50	10.1	56	25.5	L1	GND
0.991142	33.20	10.1	56	22.8	L1	GND
0.995106	28.30	10.1	56	27.7	L1	GND
1.082125	31.10	10.1	56	24.9	L1	GND
4.056367	29.30	10.1	56	26.7	L1	GND
4.323915	31.50	10.1	56	24.5	L1	GND
12.256779	32.50	9.9	60	27.5	L1	GND

**MEASUREMENT RESULT: "EN 55022 V-2\_fin AV"**

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Line	PE
0.180233	45.00	10.2	55	9.5	L1	GND
0.180954	44.80	10.2	54	9.6	L1	GND
0.270814	39.50	10.2	51	11.6	L1	GND
0.271897	38.70	10.2	51	12.4	L1	GND
0.360991	31.00	10.1	49	17.7	L1	GND
0.362435	29.50	10.1	49	19.1	L1	GND
0.540266	30.80	10.1	46	15.2	L1	GND
0.542427	29.80	10.1	46	16.2	L1	GND
0.628765	30.70	10.1	46	15.4	L1	GND
0.631280	31.80	10.1	46	14.2	L1	GND
0.720177	28.50	10.1	46	17.5	L1	GND
0.723058	27.10	10.1	46	19.0	L1	GND
0.897004	24.20	10.1	46	21.8	L1	GND
0.900592	28.40	10.1	46	17.6	L1	GND
0.991142	31.10	10.1	46	14.9	L1	GND
0.995106	25.90	10.1	46	20.1	L1	GND
1.082125	27.60	10.1	46	18.4	L1	GND
1.086454	18.70	10.1	46	27.3	L1	GND
4.238466	22.20	10.1	46	23.9	L1	GND
4.255420	27.40	10.1	46	18.6	L1	GND
4.464231	28.50	10.1	46	17.5	L1	GND
12.256779	30.00	9.9	50	20.0	L1	GND

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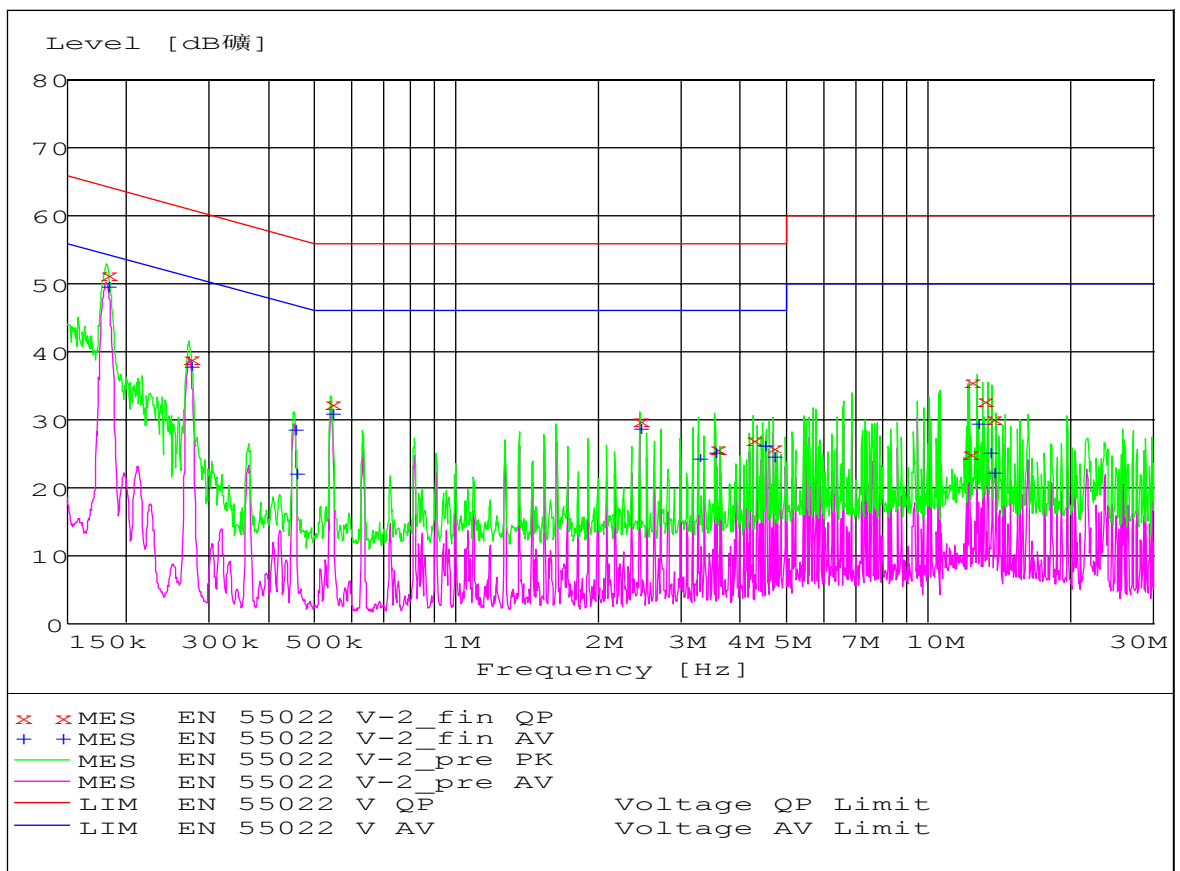
E-mail: cts@cts-lab.com.cn

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Test point: Operation mode Remarks:	N	Result:	<input checked="" type="checkbox"/> - passed <input type="checkbox"/> - not passed
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EUT	Speaker
Firm Name	Tints Development (H.K.) Ltd
Operating Condition	AC 230V, 50Hz for PC / Battery DC 3.7V for speaker
Test Condition	Ambient Temperature: 20°C Humidity: 43%
Operator	Peter
MODEL NO.	TT-1028



**MEASUREMENT RESULT: "EN 55022 V-2\_fin QP"**

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.180230	52.30	10.2	65	12.2	N	GND
0.181675	51.60	10.2	64	12.8	N	GND
0.270814	41.20	10.2	61	19.9	N	GND
0.271897	40.40	10.2	61	20.7	N	GND
0.540272	33.60	10.1	56	22.4	N	GND
0.542434	32.70	10.1	56	23.3	N	GND
2.433445	31.20	10.1	56	24.8	N	GND

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3.513367	27.20	10.1	56	28.8	N	GND
4.255420	28.30	10.1	56	27.7	N	GND
4.683289	27.10	10.1	56	28.9	N	GND
12.159312	24.90	9.9	60	35.1	N	GND
12.256783	35.80	9.9	60	24.2	N	GND
12.705150	34.60	9.9	60	25.4	N	GND
13.065186	33.10	9.9	60	26.9	N	GND
13.435434	31.20	9.9	60	28.8	N	GND

**MEASUREMENT RESULT: "EN 55022 V-2 fin AV"**

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Line	PE
0.180228	50.50	10.2	55	4.0	N	GND
0.181673	49.80	10.2	54	4.6	N	GND
0.270819	39.70	10.2	51	11.4	N	GND
0.271902	39.00	10.2	51	12.1	N	GND
0.451429	28.80	10.1	47	18.1	N	GND
0.455047	22.30	10.1	47	24.5	N	GND
0.540272	32.00	10.1	46	14.0	N	GND
0.542434	31.20	10.1	46	14.8	N	GND
2.433445	29.70	10.1	46	16.3	N	GND
3.243763	25.70	10.1	46	20.3	N	GND
3.513367	25.50	10.1	46	20.6	N	GND
4.464231	26.40	10.1	46	19.6	N	GND
4.683289	24.80	10.1	46	21.2	N	GND
12.705150	30.20	9.9	50	19.8	N	GND
13.435434	25.10	9.9	50	24.9	N	GND
13.706298	22.50	9.9	50	27.5	N	GND

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## 5.2 Radiated disturbance (electric field)

For test instruments and accessories used see section 6 part 6.1.

### 5.2.1 Description of the test location

Test location : Semi-Anechoic chamber

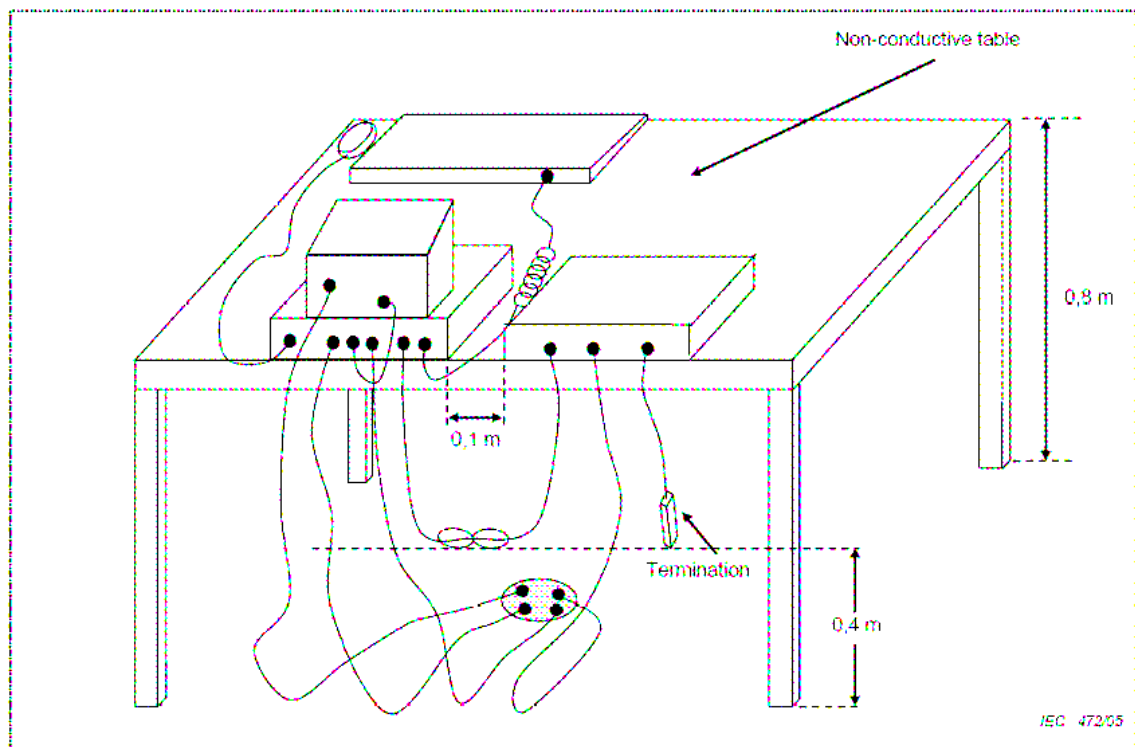
Test disturbance: 3 Meter

### 5.2.2 Description of the test set-up

#### 5.2.2.1 Operating Condition

The EUT is engraving during the test, and the results of the maximum emanation are recorded

#### 5.2.2.2 Block Diagram of Test Setup



### 5.2.3 Limits of disturbance (Class B)

Frequency (MHz)	Distance (Meters)	Field Strengths Limits (dB $\mu$ V/m)
30 ~ 230	3	40
230 ~ 1000	3	47

- Note: (1) The tighter limit shall apply at the edge between two frequency bands.  
 (2) Distance refers to the distance in meters between the test instrument antenna and the closest point of any part of the E.U.T.

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**5.2.4 Test result**

The requirements are	<b>Fulfilled</b>
Band width	120kHz
Frequency range	30 MHz - 1000 MHz
Min. limit margin	>6.0 dB at 30 - 1000 MHz

**Remarks:** The limits are kept. For detailed results, please see the following page(s).

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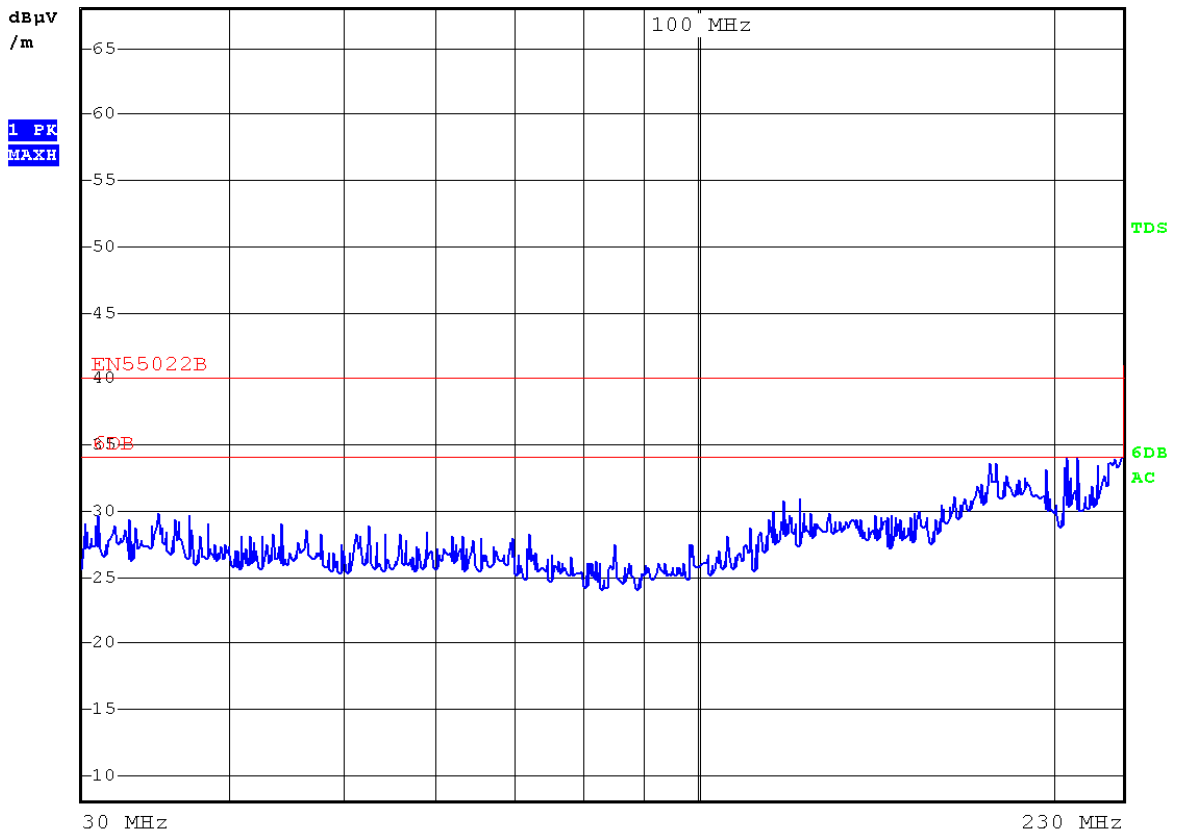
5.2.5 Test protocol

Test point: Operation mode Remarks:	Horizontal	Result:	<input checked="" type="checkbox"/> - passed <input type="checkbox"/> - not passed
EUT	Speaker		
Firm Name			
Operating Condition	AC 230V, 50Hz for PC / Battery DC 3.7V for speaker		
Test Condition	Ambient Temperature: 20°C Humidity: 43%		
Operator	Peter		
MODEL NO.	TT-1028		



RBW 120 kHz  
MT 100 μs  
PREAMP OFF

Att 10 dB



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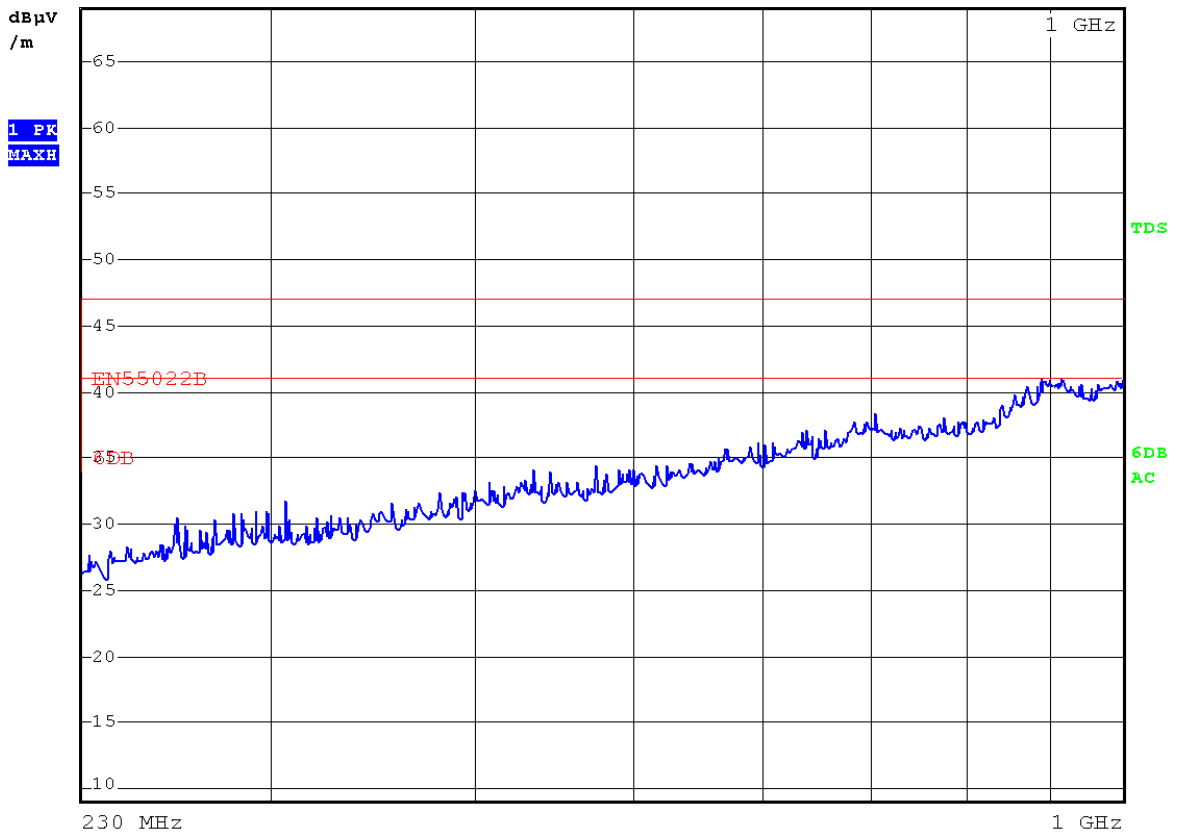


EUT	Speaker
Firm Name	
Operating Condition	AC 230V, 50Hz for PC / Battery DC 3.7V for speaker
Test Condition	Ambient Temperature: 20°C Humidity: 43%
Operator	Peter
MODEL NO.	TT-1028



RBW 120 kHz  
 MT 100 μs  
 PREAMP OFF

Att 10 dB



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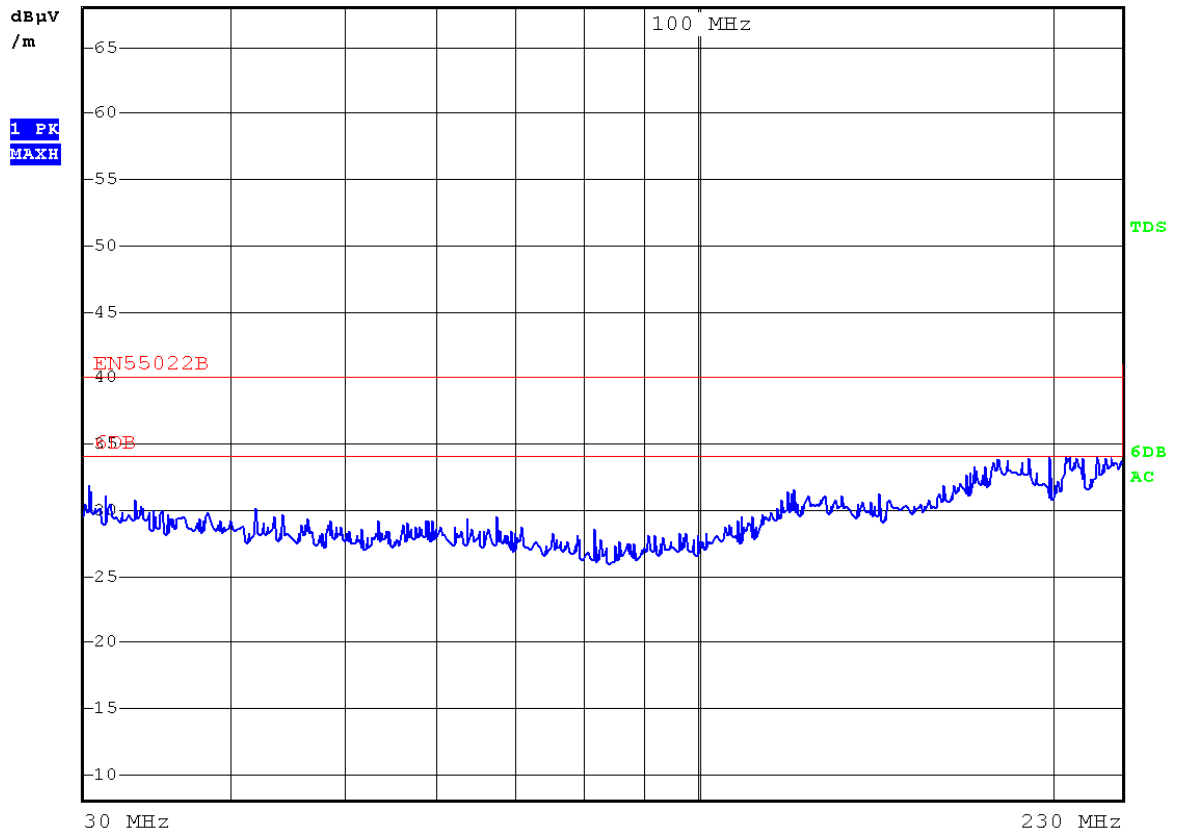
Test point: Operation mode Remarks:	Vertical	Result:	<input checked="" type="checkbox"/> - passed <input type="checkbox"/> - not passed
---	----------	---------	---

EUT	Speaker
Firm Name	
Operating Condition	AC 230V, 50Hz for PC / Battery DC 3.7V for speaker
Test Condition	Ambient Temperature: 20°C Humidity: 43%
Operator	Peter
MODEL NO.	TT-1028



RBW 120 kHz  
MT 100 μs  
PREAMP OFF

Att 10 dB



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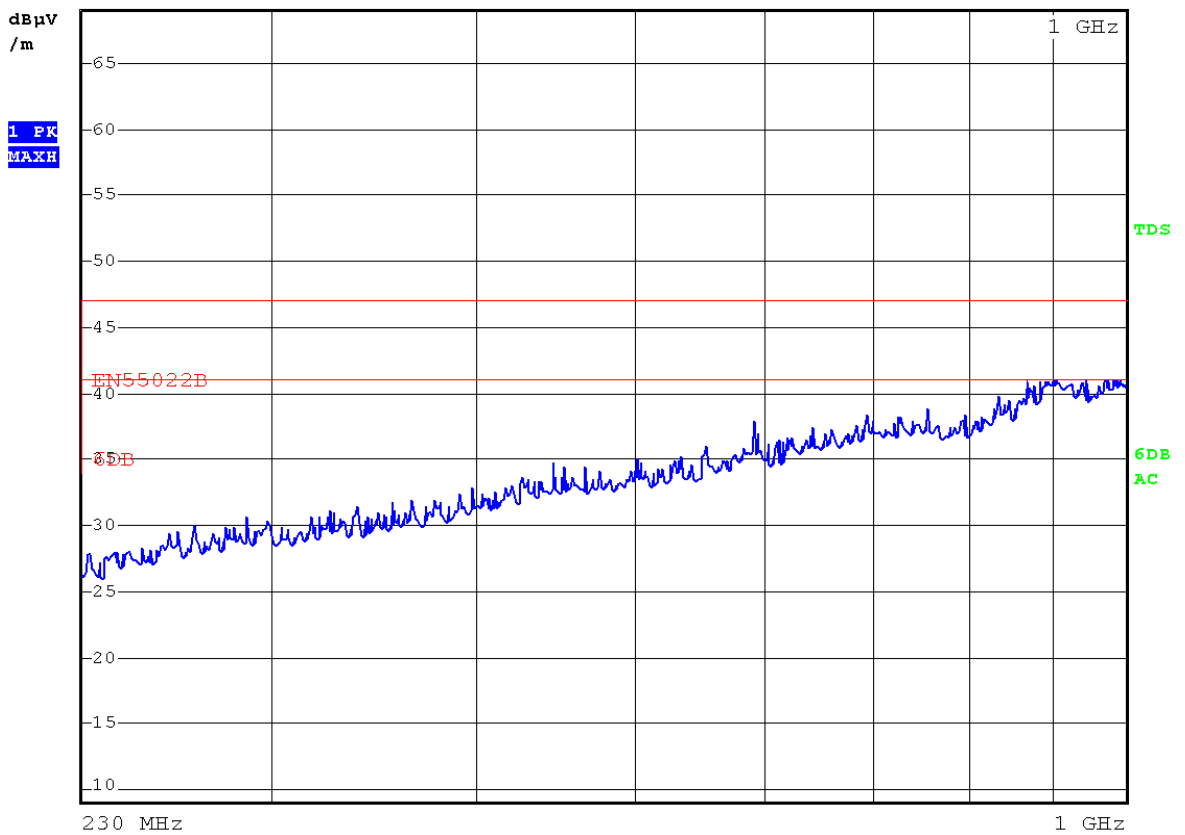
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EUT	Speaker
Firm Name	
Operating Condition	AC 230V, 50Hz for PC / Battery DC 3.7V for speaker
Test Condition	Ambient Temperature: 20°C Humidity: 43%
Operator	Peter
MODEL NO.	TT-1028



RBW 120 kHz  
 MT 100 μs  
 Att 10 dB  
 PREAMP OFF



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### 5.3 Harmonic current

For test instruments and accessories used see section 6 part 6.4.

#### 5.3.1 Description of the test location

Test location : Test location no. 1

#### 5.3.2 Limits of harmonic current

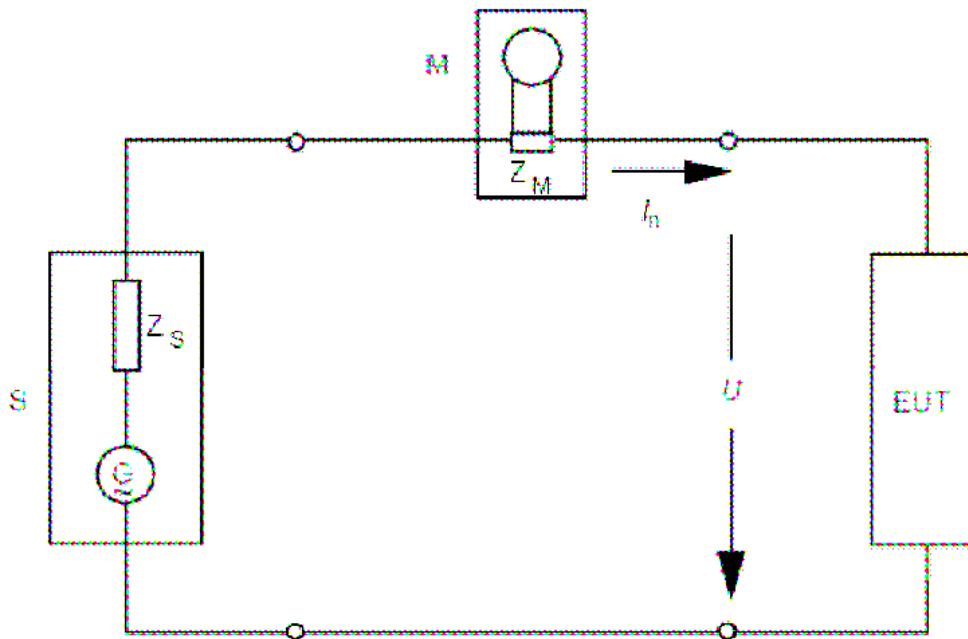
Test configuration and procedure see clause 7.1 of standard EN 61000-3-2: 2006.

#### 5.3.3 Description of the test set-up

##### 5.3.3.1 Operating Condition

The EUT is engraving during the test, and the results of the maximum emanation are recorded

##### 5.3.3.2 Block Diagram of Test Setup



#### 5.3.4 Test result

The requirements are **Fulfilled**

**Remarks:** The limits are kept. For detailed results, please see the following page(s).

## 5.3.5 Test protocol

Operation mode Remarks:	Result:	<input checked="" type="checkbox"/> - passed <input type="checkbox"/> - not passed
Standard used:	EN 61000-3-2 Quasi-Stationary – Equipment class A	
Observation time:	1 min	
Windows width:	10 periods – (EN/IEC 61000-4-7 Edition 2002)	
Mains supply voltage:	AC 230V, 50Hz	
Ambient Temperature:	20°C	
Humidity:	43%	
Barometric Pressure:	86~106KPa	
E. U. T.:	Speaker	
M/N:	TT-1028	
Date of test:	25 January 2011	
Tester:	<b>Peter</b>	

**Test result**

E. U. T.:	PASS
Power Source:	PASS

**Check harmonics 2..40 [exception odd 21..39]:**

Harmonic(s) > 150%:	
Order (n):	None
Harmonic(s) with average > 100%:	
Order (n):	None

**Check odd harmonics 21..39:**

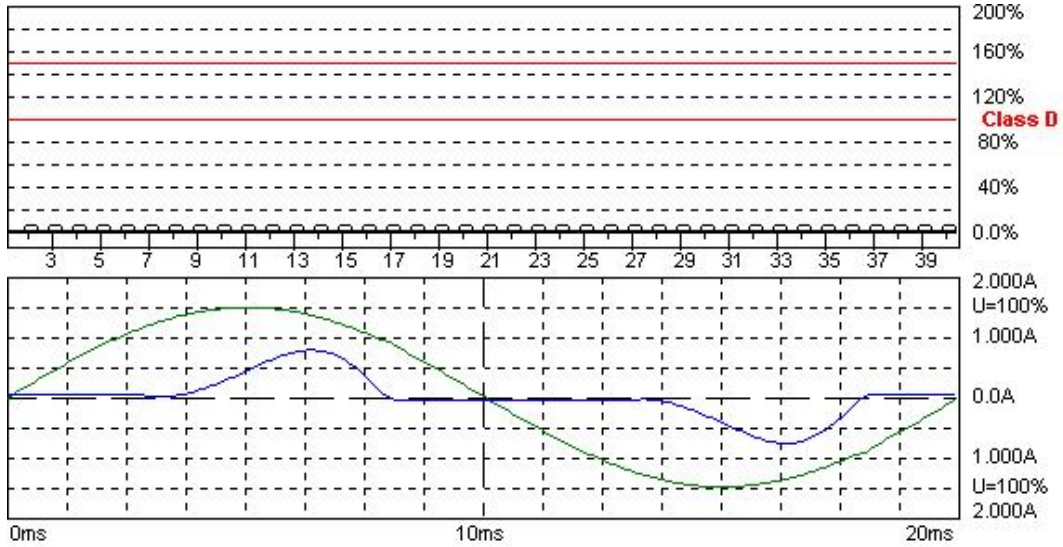
<b>All Partial Odd Harmonics below partial limits.</b>
<b>Harmonic(s) &gt; 150%:</b> Order (n): None
<b>Harmonic(s) with average &gt; 150%:</b> Order (n): None

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**Harmonic Emission - IEC 61000-3-2 , EN 61000-3-2 , (EN60555-2)**

15.09.09 17:18:28

Urms = 230.5 V    P = 61.06 W    THC = 0.000 A    Range: 2 A  
 Irms = 0.351 A    pf = 0.756    Pmax = 101.4 W    V-nom: 230 V  
 TestTime: 5 min (100%)

**Test completed, Result: PASSED**

HAR-1000 EMC-Partner

Order	Freq. [Hz]	Iavg [A]	Iavg%L [%]	Imax [A]	Imax%L [%]	Limit [A]	Status
1	50	0.0000		0.0006			
2	100	0.0000		0.0000			
3	150	0.0000	0.0000	0.0000	0.0000	0.3446	
4	200	0.0000		0.0000			
5	250	0.0000	0.0000	0.0000	0.0000	0.1926	
6	300	0.0000		0.0000			
7	350	0.0000	0.0000	0.0000	0.0000	0.1014	
8	400	0.0000		0.0000			
9	450	0.0000	0.0000	0.0000	0.0000	0.0507	
10	500	0.0000		0.0000			
11	550	0.0000	0.0000	0.0000	0.0000	0.0355	
12	600	0.0000		0.0000			
13	650	0.0000	0.0000	0.0000	0.0000	0.0300	
14	700	0.0000		0.0000			
15	750	0.0000	0.0000	0.0000	0.0000	0.0260	
16	800	0.0000		0.0000			
17	850	0.0000	0.0000	0.0000	0.0000	0.0230	
18	900	0.0000		0.0000			
19	950	0.0000	0.0000	0.0000	0.0000	0.0205	
20	1000	0.0000		0.0000			

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21	1050	0.0000	0.0000	0.0000	0.0000	0.0186	
22	1100	0.0000		0.0000			
23	1150	0.0000	0.0000	0.0000	0.0000	0.0170	
24	1200	0.0000		0.0000			
25	1250	0.0000	0.0000	0.0000	0.0000	0.0156	
26	1300	0.0000		0.0000			
27	1350	0.0000	0.0000	0.0000	0.0000	0.0145	
28	1400	0.0000		0.0000			
29	1450	0.0000	0.0000	0.0000	0.0000	0.0135	
30	1500	0.0000		0.0000			
31	1550	0.0000	0.0000	0.0000	0.0000	0.0126	
32	1600	0.0000		0.0000			
33	1650	0.0000	0.0000	0.0000	0.0000	0.0118	
34	1700	0.0000		0.0000			
35	1750	0.0000	0.0000	0.0000	0.0000	0.0111	
36	1800	0.0000		0.0000			
37	1850	0.0000	0.0000	0.0000	0.0000	0.0105	
38	1900	0.0000		0.0000			
39	1950	0.0000	0.0000	0.0000	0.0000	0.0100	
40	2000	0.0000		0.0000			

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## 5.4 Voltage fluctuations and flicker

For test instruments and accessories used see section 6 part 6.5.

### 5.4.1 Description of the test location

Test location : Test location no. 1

### 5.4.2 Limits of voltage fluctuation and flicker

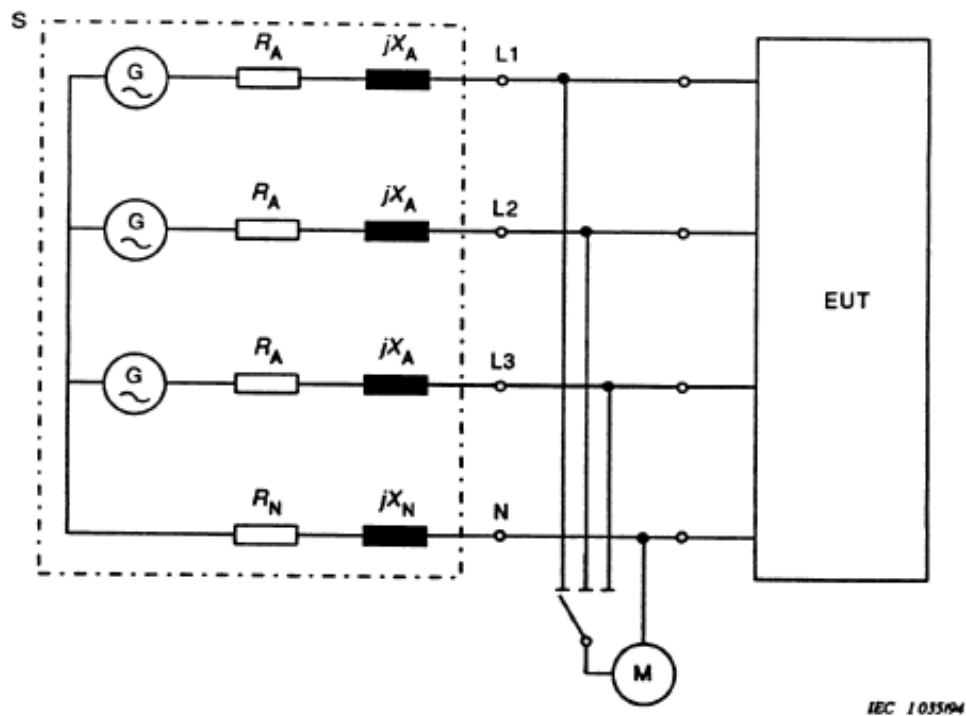
Test configuration and procedure see clause 5 of standard EN 61000-3-3: 1995+A1:2001+A2:2005.

### 5.4.3 Description of the test set-up

#### 5.4.3.1 Operating Condition

The EUT is engraving during the test, and the results of the maximum emanation are recorded

#### 5.4.3.2 Block Diagram of Test Setup



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#### 5.4.4 Test result

The requirements are **Fulfilled**

Remarks: The limits are kept. For detailed results, please see the following page(s).

#### 5.4.5 Test protocol

Operation mode	Result:	<input checked="" type="checkbox"/> - passed
Remarks:		<input type="checkbox"/> - not passed

Standard used:	EN 61000-3-3 Flicker
Short time (Pst):	1 min
Observation time:	10 min (1 Flicker measurement)
Flickermeter:	AC 230V, 50Hz
Ambient Temperature:	20°C
Humidity:	43%
Barometric Pressure:	86~106KPa
E. U. T.:	Speaker
M/N:	TT-1028
Date of test:	25 January 2011
Tester:	<b>Peter</b>

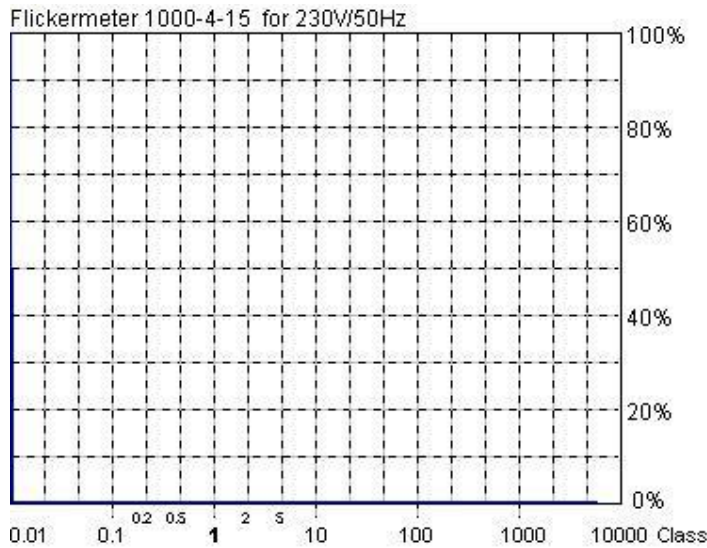
#### Maximum Flicker results

	EUT values	Limit	Result
Pst	0.07	1.00	PASS
dc [%]	0.40	3.30	PASS
dmax [%]	0.39	4.00	PASS
dt [s]	0.00	0.50	PASS

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**Actual Flicker (Fl):** 0.00  
**Short-term Flicker (Pst):** 0.07  
 Limit (Pst): 1.00  
**Long-term Flicker (Plt):** 0.07  
 Limit (Plt): 0.65  
**Maximum Relative Volt. Change (dmax):** 0.00%  
 Limit (dmax): 4.00%  
**Relative Steady-state Voltage Change (dc):** 0.00%  
 Limit (dc): 3.30%  
**Maximum Interval exceeding 3.30% (dt):** 0.00ms  
 Limit (dt>Lim): 500ms

**Flicker Emission - IEC 61000-3-3, EN 61000-3-3, (EN60555-3)**

Urms = 230.5 V P = 59.20 W  
 Irms = 0.340 A pf = 0.756

15.09.09 17:31:19

Range: 2 A  
 V-nom: 230 V  
 TestTime: 10 min (100%)

**Test completed, Result: PASSED**

HAR-1000 EMC-Partner

## 5.5 Electrostatic discharge

For test instruments and accessories used see section 6 part 6.6.

### 5.5.1 Description of the test location

Test location :	Test location no. 2
Power supply:	AC 230V, 50Hz for PC / Battery DC 3.7V for speaker
Test condition:	Ambient Temperature: 20°C, Humidity:43%
Date of test :	25 January 2011
Operator :	<b>Peter</b>

### 5.5.2 Severity of levels electrostatic discharge

5.5.2.1 Severity level: Contact discharge at  $\pm 4\text{KV}$  air discharge at  $\pm 8\text{KV}$

Level	Test Voltage Contact Discharge (kV)	Test Voltage Air Discharge (kV)
1	2	2
2	4	4
3	6	8
4	8	15
X	Special	Special

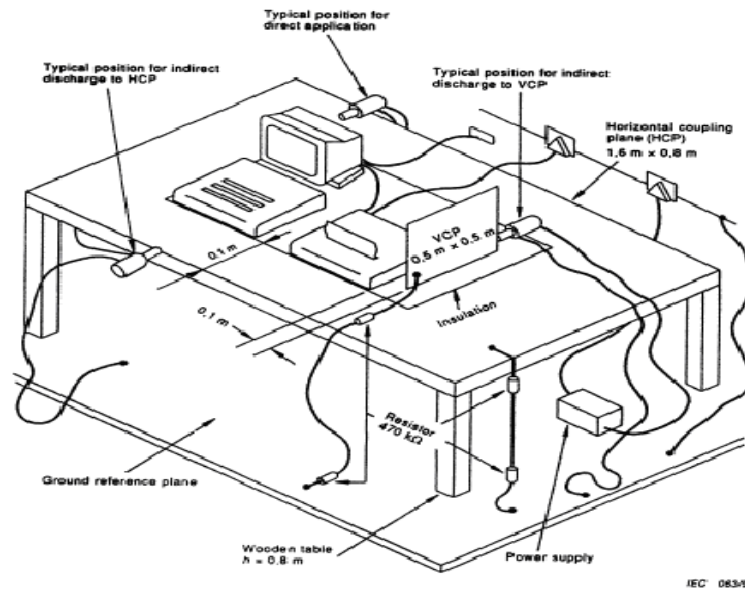
5.5.2.2 Performance criterion: B

### 5.5.3 Description of the test set-up

5.5.3.1 Operating Condition

The EUT is engraving during the test, and the results of the maximum emanation are recorded

5.5.3.2 Block Diagram of Test Setup



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## 5.5.4 Test specification:

Contact discharge voltage:	<input checked="" type="checkbox"/> 2 kV	<input checked="" type="checkbox"/> 4 kV	
Air discharge voltage:	<input checked="" type="checkbox"/> 2 kV	<input checked="" type="checkbox"/> 4 kV	<input checked="" type="checkbox"/> 8 kV
Discharge impedance:	<input checked="" type="checkbox"/> 330 $\wedge$ / 150 pF		
Discharge factor:	<input checked="" type="checkbox"/> $\geq$ 1 sec.		
Number of discharges:	<input checked="" type="checkbox"/> $\geq$ 10		
Type of discharge:	Direct discharge	<input checked="" type="checkbox"/> Air discharge	
		<input checked="" type="checkbox"/> Contact discharge	
	Indirect discharge	<input checked="" type="checkbox"/> Contact discharge	
Polarity:	<input checked="" type="checkbox"/> Positive	<input checked="" type="checkbox"/> Negative	
Discharge location:	<input checked="" type="checkbox"/> see photo documentation of the test set-up		
	<input checked="" type="checkbox"/> all external locations accessible by hand		
	<input checked="" type="checkbox"/> horizontal plate (HCP)		
	<input checked="" type="checkbox"/> vertical coupling plate (VCP)		

## 5.5.5 Test result

The requirements are **Fulfilled**Performance Criterion: **B**

**Remarks:** During the test no deviation was detected to the selected operation mode(s).

## 5.6 Radiated, radio-frequency, electromagnetic field

For test instruments and accessories used see section 6 part 6.7.

### 5.6.1 Description of the test location

Test location :	GTEM chamber
Power supply:	AC 230V, 50Hz for PC / Battery DC 3.7V for speaker
Test condition:	Ambient Temperature: 20°C, Humidity:43%
Date of test :	25 January 2011
Operator :	<b>Peter</b>

### 5.6.2 Severity levels of radiated, Radio-frequency, electromagnetic field

#### 5.6.2.1 Severity level: 3V/m

Level	Field strenght(V/m)
1	1
2	3
3	10
X	Special

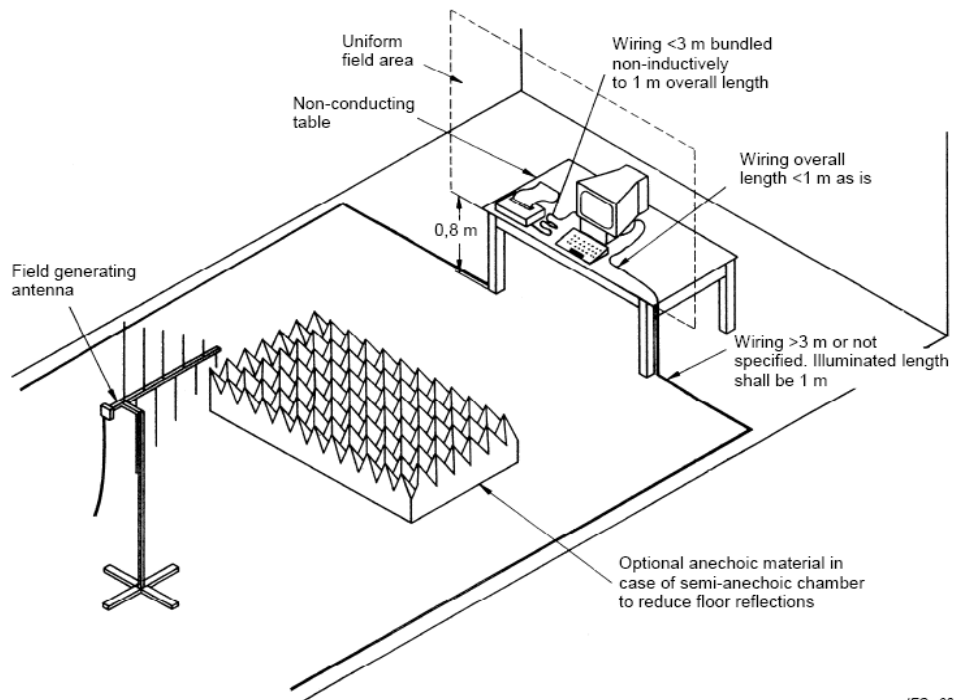
#### 5.6.2.2 Performance criterion: A

### 5.6.3 Description of the test set-up

#### 5.6.3.1 Operating Condition

The EUT is engraving during the test, and the results of the maximum emanation are recorded

#### 5.6.3.2 Block Diagram of Test Setup



IEC 034/06

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#### 5.6.4 Test specification:

Frequency range:	■ 80 MHz to 1000 MHz
Field strength:	■ 3 V/m
EUT - antenna separation:	■ 3 m
Modulation:	■ AM: 80 % ■ sinusoidal 1000Hz
Frequency step:	■ 1 % with 3 s dwell time
Antenna polarisation:	■ horizontal      ■ vertical

#### 5.6.5 Test result

The requirements are **Fulfilled**

Performance Criterion: **A**

**Remarks:** During the test no deviation was detected to the selected operation mode(s).

### 5.7 Electrical fast transients / Burst

For test instruments and accessories used see section 6 part 6.8.

#### 5.7.1 Description of the test location

Test location :	Test location no. 2
Power supply:	AC 230V, 50Hz for PC / Battery DC 3.7V for speaker
Test condition:	Ambient Temperature: 20°C, Humidity:43%
Date of test :	25 January 2011
Operator :	<b>Peter</b>

#### 5.7.2 Severity levels of electrical fast transients / Burst

5.7.2.1 Severity level: ±1000V for AC power supply lines

Open circuit output test voltage and repetition rate of the impulses				
Level	On power port, PE		On I/O signal, data and control ports	
	V peak (KV)	Repetition rate (KHz)	Voltage peak	Repetition rate (KHz)
1	0.5	5 or 100	0.25	5 or 100
2	1	5 or 100	0.5	5 or 100
3	2	5 or 100	1	5 or 100
4	4	5 or 100	2	5 or 100
X	Special	Special	Special	Special

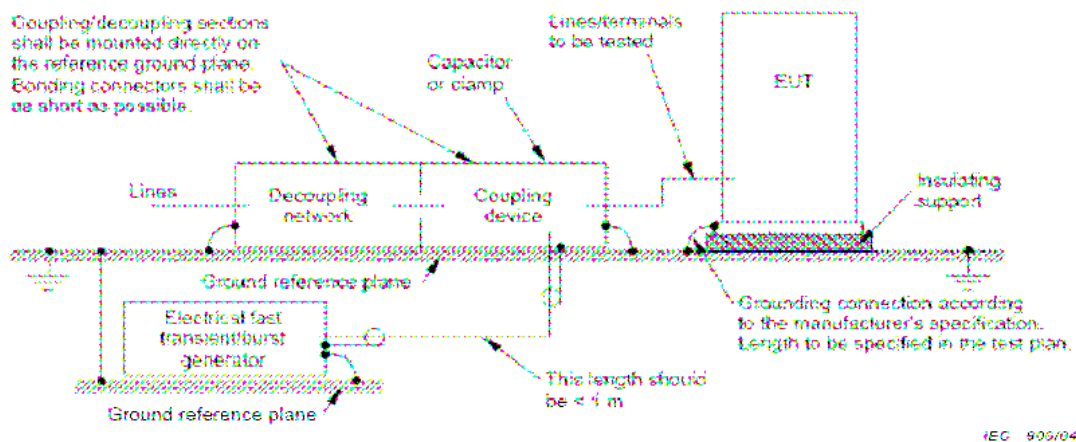
5.7.2.2 Performance criterion: B

#### 5.7.3 Description of the test set-up

##### 5.7.3.1 Operating Condition

The EUT is engraving during the test, and the results of the maximum emanation are recorded

##### 5.7.3.2 Block Diagram of Test Setup



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## 5.8 Surge

For test instruments and accessories used see section 6 part 6.9.

### 5.8.1 Description of the test location

Test location :	Test location no. 2
Power supply:	AC 230V, 50Hz for PC / Battery DC 3.7V for speaker
Test condition:	Ambient Temperature: 20°C, Humidity:43%
Date of test :	25 January 2011
Operator :	<b>Peter</b>

### 5.8.2 Severity levels of surge

5.8.2.1 Severity level: Line to line:  $\pm 1\text{KV}$  Line to earth:  $\pm 2\text{KV}$

Level	Test Voltage (KV)
1	0.5
2	1.0
3	2.0
4	4.0
X	Special

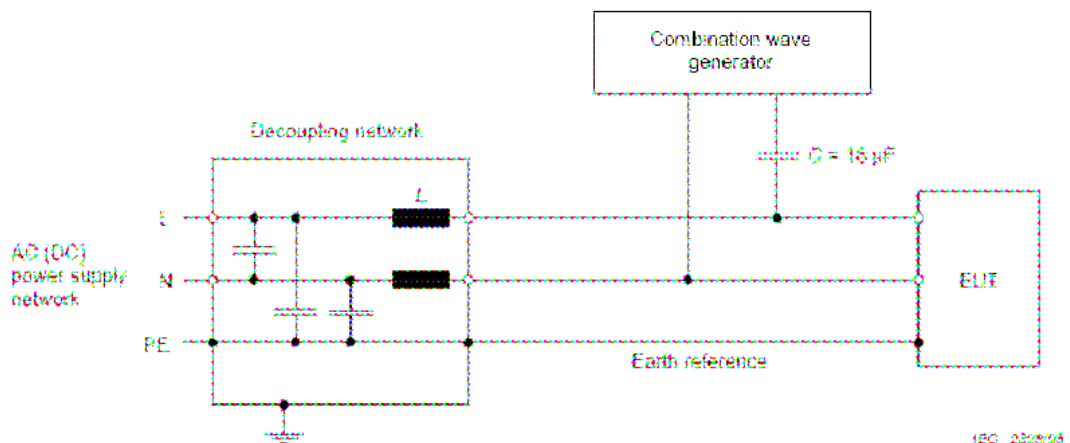
5.8.2.2 Performance Criterion: B

### 5.8.3 Description of the test set-up

#### 5.8.3.1 Operating Condition

The EUT is engraving during the test, and the results of the maximum emanation are recorded

#### 5.8.3.2 Block Diagram of Test Setup



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#### 5.8.4 Test specification:

Pulse amplitude-Power line sym.: Source impedance: 2 $\wedge$ + 18 $\mu$ F	<input checked="" type="checkbox"/> 0.5 kV <input checked="" type="checkbox"/> 1 kV <input type="checkbox"/> 2 kV <input type="checkbox"/> 4 kV
Pulse amplitude-Power line unsym.: Source impedance: 12 $\wedge$ + 9 $\mu$ F	<input checked="" type="checkbox"/> 0.5 kV <input checked="" type="checkbox"/> 1 kV <input checked="" type="checkbox"/> 2 kV <input type="checkbox"/> 4 kV
Number of surges:	<input checked="" type="checkbox"/> 5 Surges/Phase angle
Phase angle:	<input checked="" type="checkbox"/> 0 ° <input checked="" type="checkbox"/> 90 ° <input checked="" type="checkbox"/> 180 ° <input checked="" type="checkbox"/> 270 °
Repetition rate:	<input checked="" type="checkbox"/> 60 s
Polarity:	<input checked="" type="checkbox"/> positive <input checked="" type="checkbox"/> negative

#### 5.8.5 Coupling points

Cable description:	AC power line: L+N, L+PE, N+PE
Screening:	<input type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened
Status:	<input type="checkbox"/> passive <input checked="" type="checkbox"/> active
Signal transmission:	<input checked="" type="checkbox"/> analogue <input type="checkbox"/> digital
Length:	<input checked="" type="checkbox"/> 1.5 m

#### 5.8.6 Test result

The requirements are **Fulfilled**

Performance Criterion: **B**

**Remarks:** During the test no deviation was detected to the selected operation mode(s).

### 5.9 Conducted disturbances induced by radio-frequency fields

For test instruments and accessories used see section 6 part 7.0.

#### 5.9.1 Description of the test location

Test location :	Test location no. 2
Power supply:	AC 230V, 50Hz for PC / Battery DC 3.7V for speaker
Test condition:	Ambient Temperature: 20°C, Humidity:43%
Date of test :	25 January 2011
Operator :	Peter

#### 5.9.2 Severity levels of conducted disturbances induced by radio-frequency fields discharge

##### 5.9.2.1 Severity Level: 3V

Level	Field Strength (V)
1	1
2	3
3	10
X	Special

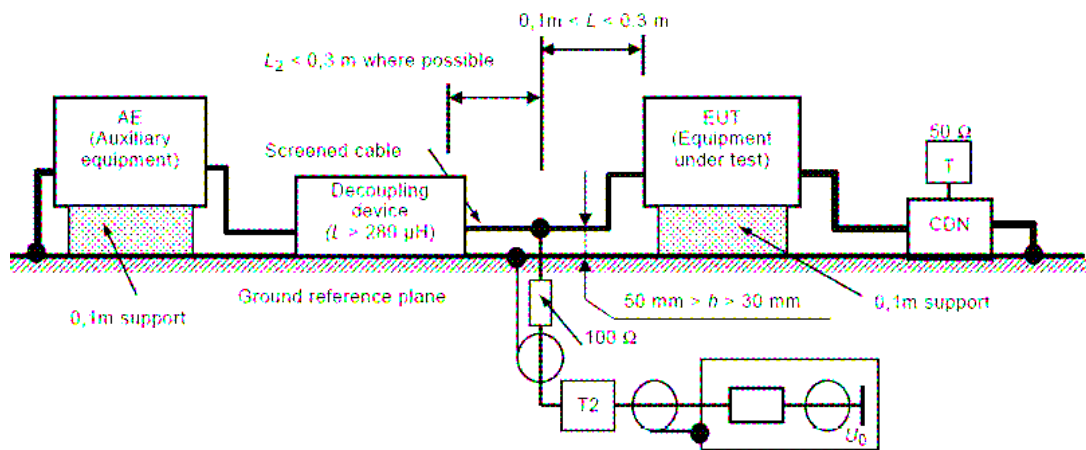
##### 5.9.2.2 Performance Criterion: A

#### 5.9.3 Description of the test set-up

##### 5.9.3.1 Operating Condition

The EUT is engraving during the test, and the results of the maximum emanation are recorded

##### 5.9.3.2 Block Diagram of Test Setup



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**5.9.4 Test specification:**

Frequency range:	■ 0.15 MHz to 230 MHz
Test voltage:	■ 3 V
Modulation:	■ AM: 80 % ■ sinusoidal 1000Hz
Frequency step:	■ 1 % with 3 s dwell time

**5.9.5 Coupling points**

Cable description (Port1):	AC power line: L+N, L+PE, N+PE
Screening:	<input type="checkbox"/> screened      ■ unshielded
Status:	<input type="checkbox"/> passive      ■ active
Signal transmission:	■ analogue <input type="checkbox"/> digital
Length:	■ 0.3 m

**5.9.6 Test result**The requirements are **Fulfilled**Performance Criterion: **A****Remarks:** During the test no deviation was detected to the selected operation mode(s).

### 5.10 Power frequency magnetic field

For test instruments and accessories used see section 6 part 6.11.

#### 5.10.1 Description of the test location

Test location :	Test location no. 2
Power supply:	AC 230V, 50Hz for PC / Battery D 3.7V C for speaker
Test condition:	Ambient Temperature: 20°C, Humidity:43%
Date of test :	25 January 2011
Operator :	<b>Peter</b>

#### 5.10.2 Severity levels of magnetic field immunity

##### 5.10.2.1 Severity Level: 1A/m

Level	Magnetic Field Strength (A/m)
1	1
2	3
3	10
4	30
5	100
X	Special

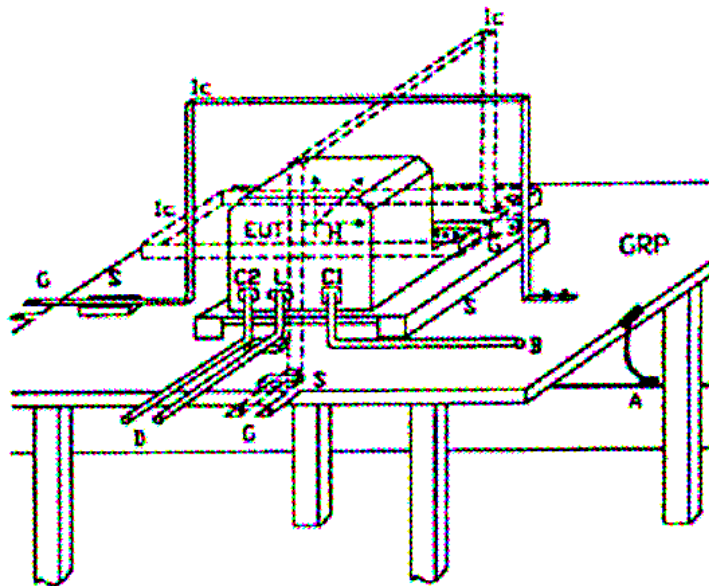
##### 5.10.2.2 Performance Criterion: A

#### 5.10.3 Description of the test set-up

##### 5.10.3.1 Operating Condition

The EUT is engraving during the test, and the results of the maximum emanation are recorded

##### 5.10.3.2 Block Diagram of Test Setup



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#### 5.10.4 Test specification:

Test frequency:	■ 50 Hz		
Continuous field:	■ 1 A/m		
Duration (Continuous field):	■ 60 s each Axis		
Short duration (1-3s):	■ 300 A/m		
Axis:	■ x-axis	■ y-axis	■ z-axis

#### 5.10.5 Test result

The requirements are **Fulfilled**

Performance Criterion: **A**

**Remarks:** During the test no deviation was detected to the selected operation mode(s).

### 5.11 Voltage dips

For test instruments and accessories used see section 6 part 7.2.

#### 5.11.1 Description of the test location

Test location :	Test location no. 2
Power supply:	AC 230V, 50Hz for PC / Battery DC 3.7V for speaker
Test condition:	Ambient Temperature: 20°C, Humidity:43%
Date of test :	25 January 2011
Operator :	Peter

#### 5.11.2 Severity levels of voltage dips

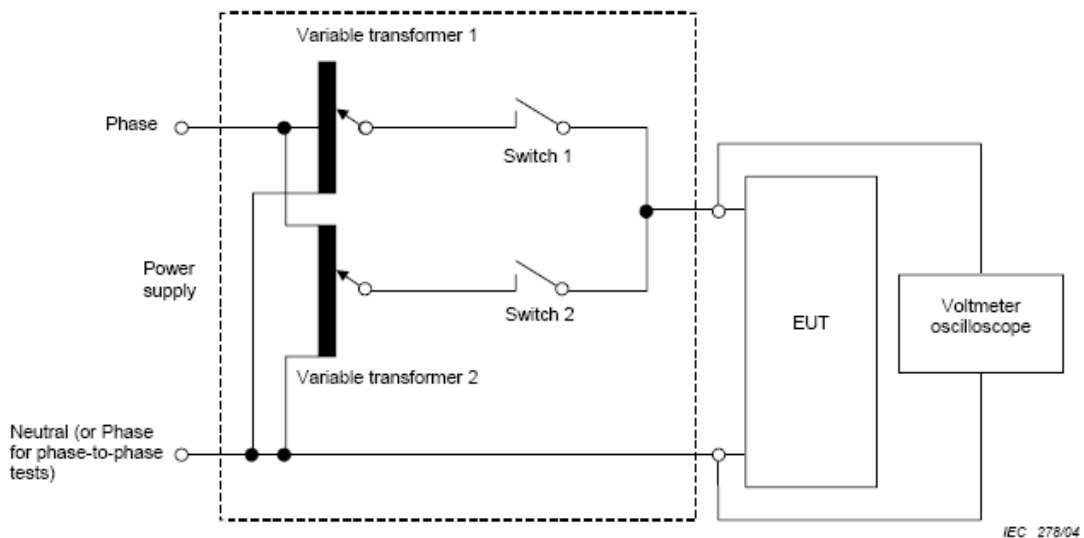
Test Level (%Ut)	Voltage Dips (%Ut)	Performance Criterion	Duration (in period)
0	100	B	5
70	30	B	25

#### 5.11.3 Description of the test set-up

##### 5.11.3.1 Operating Condition

The EUT is engraving during the test, and the results of the maximum emanation are recorded

##### 5.11.3.2 Block Diagram of Test Setup



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**5.11.4 Test specification:**

Nominal Mains Voltage (V <sub>N</sub> ):	■ AC 230V
Number of voltage fluctuations:	■ 3
Level of reduction(dip) / duration:	■ 30 % / 1000ms

**5.11.5 Test result**The requirements are **Fulfilled**Performance Criterion: **C****Remarks:** During the test no deviation was detected to the selected operation mode(s).

## 5.12 Voltage Short interruptions

For test instruments and accessories used see section 6 part 7.3.

### 5.12.1 Description of the test location

Test location :	Test location no. 2
Power supply:	AC 230V, 50Hz for PC / Battery DC 3.7V for speaker
Test condition:	Ambient Temperature: 20°C, Humidity:43%
Date of test :	25 January 2011
Operator :	<b>Peter</b>

### 5.12.2 Severity levels of voltage short interruptions

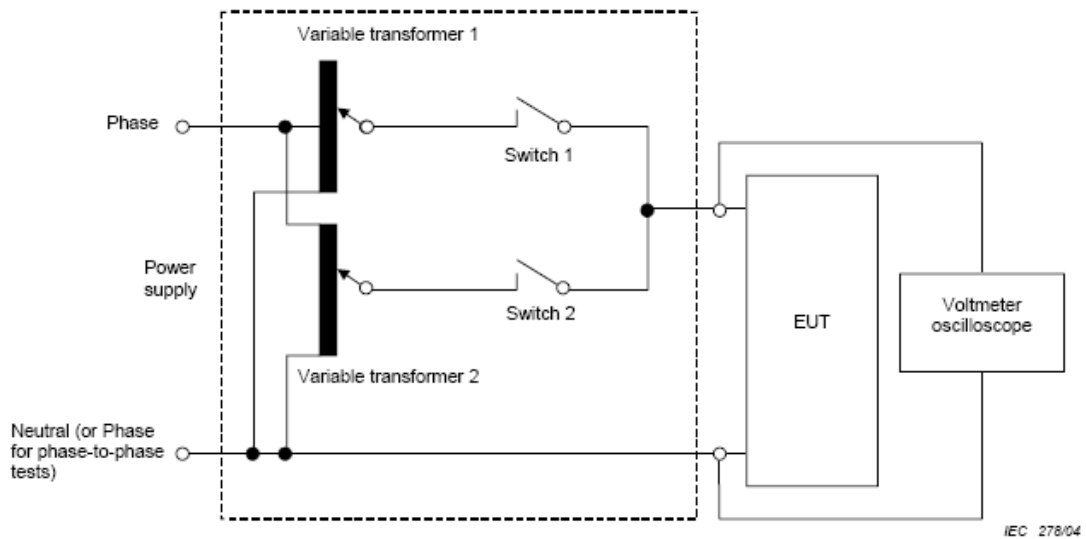
Test Level (%Ut)	Voltage Short Interruptions (%Ut)	Performance Criterion	Duration (in period)
0	100	C	250

### 5.12.3 Description of the test set-up

#### 5.12.3.1 Operating Condition

The EUT is engraving during the test, and the results of the maximum emanation are recorded

#### 5.12.3.2 Block Diagram of Test Setup



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**5.12.4 Test specification:**

Nominal Mains Voltage ( $V_N$ ):	■ AC 230 V
Number of voltage fluctuations:	■ 3
Level of reduction(dip) / duration:	■ 100 ms

**5.12.5 Test result**

The requirements are **Fulfilled**

Performance Criterion: **C**

**Remarks:** During the test no deviation was detected to the selected operation mode(s).

## 6 USED TEST EQUIPMENT

### 6.1

Radiated disturbance (electric field)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	100868	2010/12
2	Biconical Antenna	ROHDE & SCHWARZ	HK116	100221	2010/12
3	Log per Antenna	ROHDE & SCHWARZ	HL223	100226	2010/12
4	Log per Antenna	ROHDE & SCHWARZ	HL050	100186	2010/12
5	EMI Test Software	ROHDE & SCHWARZ	ESK1	N/A	2010/12

### 6.2

Power Disturbance					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	ROHDE & SCHWARZ	ESVS10	842885/001	2010/12
2	Absorbing clamp	ROHDE & SCHWARZ	MDS 21	03466	2010/12
3	EMI Test Software	ROHDE & SCHWARZ	ESK1	N/A	2010/12

### 6.3

Conducted Disturbance					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	ROHDE & SCHWARZ	ESHS10	842884/012	2010/12
2	Artificial Mains	ROHDE & SCHWARZ	ESH3-Z5	832479/025	2010/12
3	Pulse Limiter	ROHDE & SCHWARZ	ESHSZ2	100301	2010/12
4	EMI Test Software	ROHDE & SCHWARZ	ESK1	N/A	2010/12

### 6.4

Harmonic Current					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Harmonic And Flicker Analyzer	EMC Partner	HAR1H01B	HAR1000-48	2010/12

### 6.5

Voltage fluctuation and Flicker					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Harmonic And Flicker Analyzer	EMC Partner	HAR1H01B	HAR1000-48	2010/12

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## 6.6

Electrostatic Discharge					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	ESD Simulator	Schlöder	SESD 200	0302016	2010/12

## 6.7

RF Field Strength Susceptibility					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	SIGNAL GENERATOR	ROHDE & SCHWARZ	SMY 01	843215/014	2010/12
2	AMPLIFIER	KALMUS	713FC	7385-1	2010/12
3	EMS Test Software	ROHDE & SCHWARZ	ESK1	N/A	2010/12

## 6.8

Electrical Fast Transient/Burst					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMC test system Transient-1000	EMC Partner	TRA1H01B	HAR1000-78	2010/12
2	Coupling Clamp	EMC Partner	SFT 410	0302015	2010/12

## 6.9

Surge					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMC test system Transient-1000	EMC Partner	TRA1H01B	HAR1000-78	2010/12

## 6.10

Conducted Susceptibility					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	RF generator / amplifier	Schlöder	CDG 6000	HU906007	2010/12
2	CDN	Schlöder	CDN M3	A3003008	2010/12
3	CDN	Schlöde	CDN T2	A3010005	2010/12
4	EM injection clamp	Liithi	EM101	35670	2010/12
5	EMS Test Software	ROHDE & SCHWARZ	ESK1	N/A	2010/12

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## 6.11

Power Frequency Magnetic Field Susceptibility					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Power frequency mag-field generator System	EM TEST	EMS61000-8K	409001	2010/12

## 6.12

Voltage Dips					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMC test system Transient-1000	EMC Partner	TRA1H01B	HAR1000-78	2010/12

## 6.13

Voltage Short Interruptions					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMC test system Transient-1000	EMC Partner	TRA1H01B	HAR1000-78	2010/12

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## 7 External and Internal Photos of the EUT



External view front



External view side



External view base

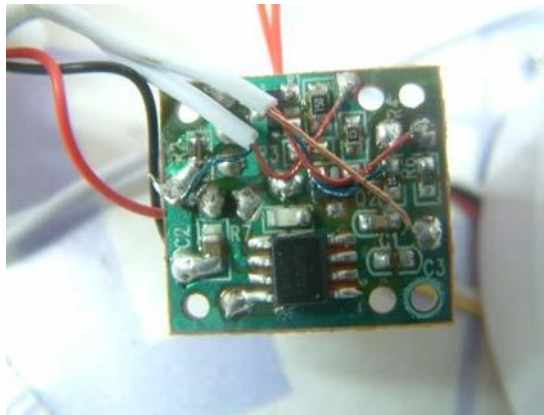
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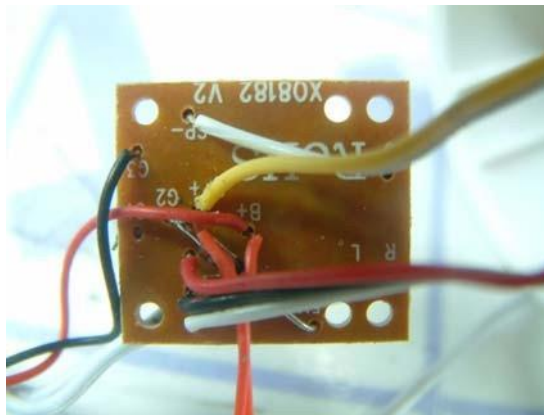
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Internal view



PCB layout



PCB solder

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## 8 Manufacturer/ Approval holder Declaration

The following identical model(s):

N/A

Belong to the tested device:

Product description: **Speaker**  
Model name: **TT-1028**

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