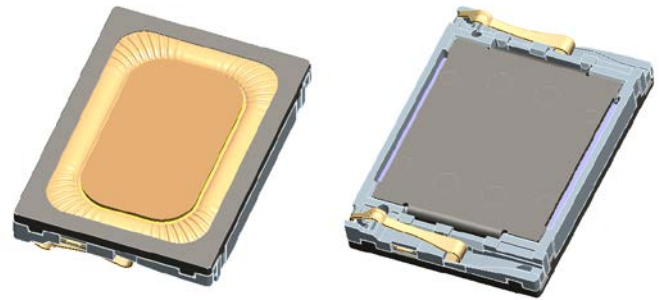


SPEAKER-1318-2.5-SC-GRAND

The 13x18x2.5 mm Grand speaker provides maximum space efficiency and audio performance in small, slim consumer devices, such as mobile handsets or smartphones. The extremely flat speaker has the same space consumption compared to conventional 11x15x3.5 mm speakers but provides an improved acoustic performance resulting in a lower resonance frequency (750Hz) and higher power handling capacity (600mW).

An advanced triple magnet concept provides optimized acoustic sensitivity.



Features:

- Extremely slim design with only 2.5mm height
- Low resonance frequency (750Hz)
- 600 mW power handling capacity
- Triple magnet technology for improved sensitivity
- Very robust spring connectors
- 100% in-line measurement of all specified electrical and acoustical parameters

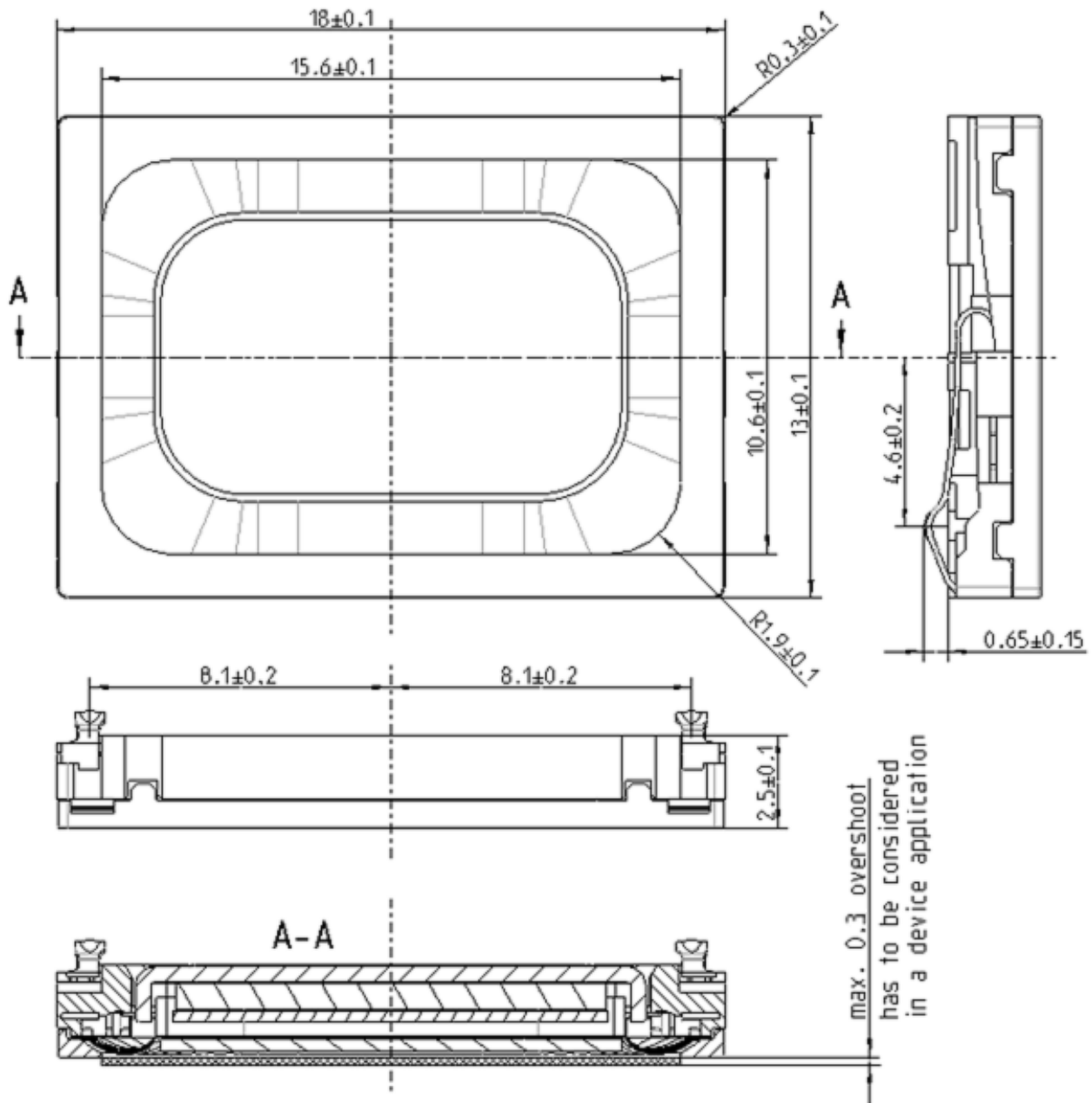
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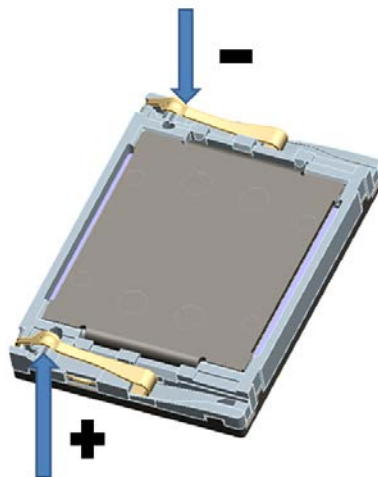
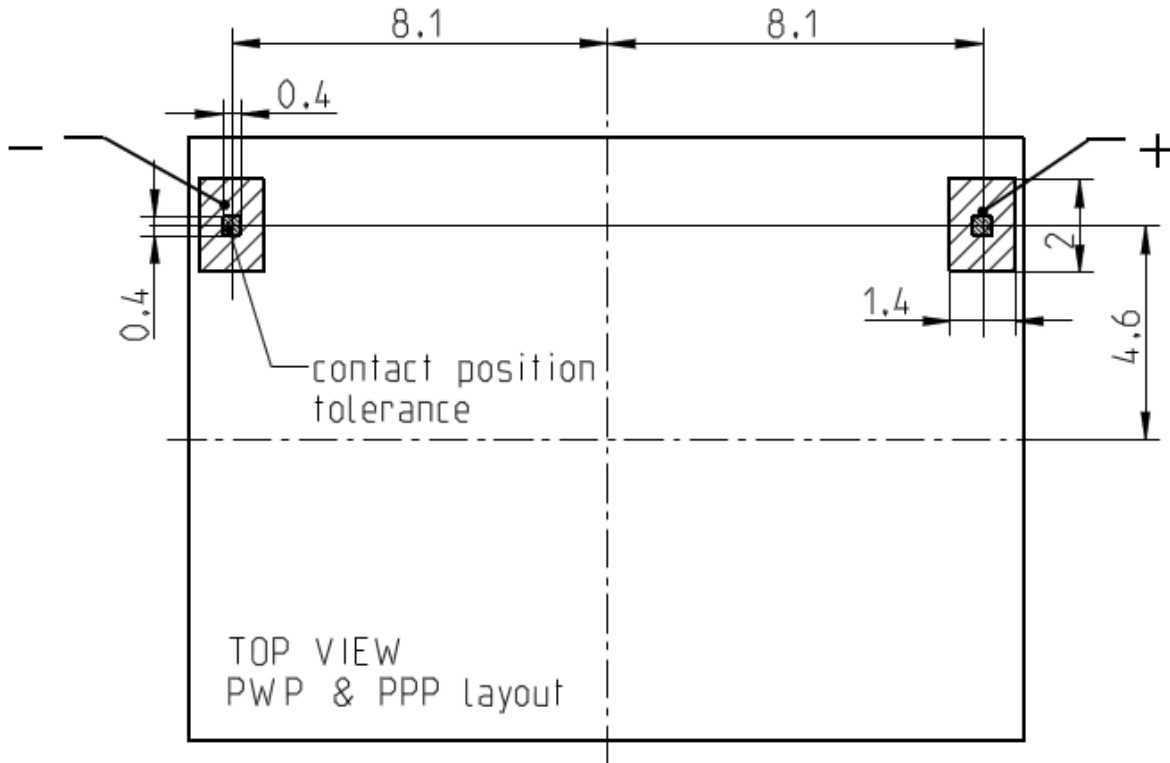
1. Mechanical Layout and Dimensions

1.1. Main Dimensions

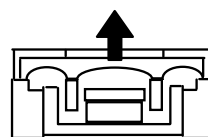


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1.2. PWB Layout Top View

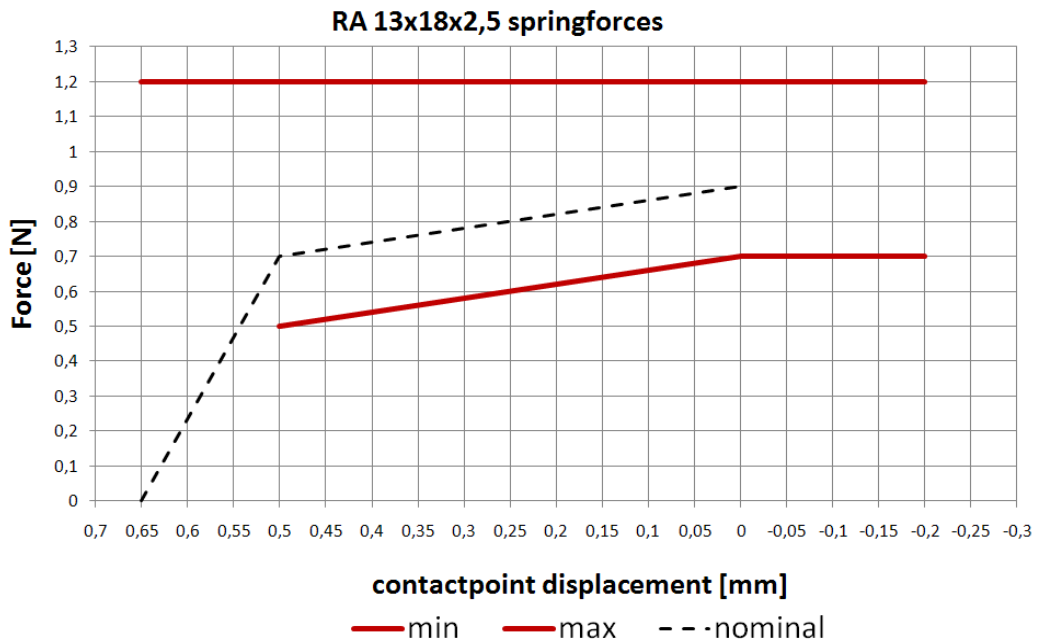
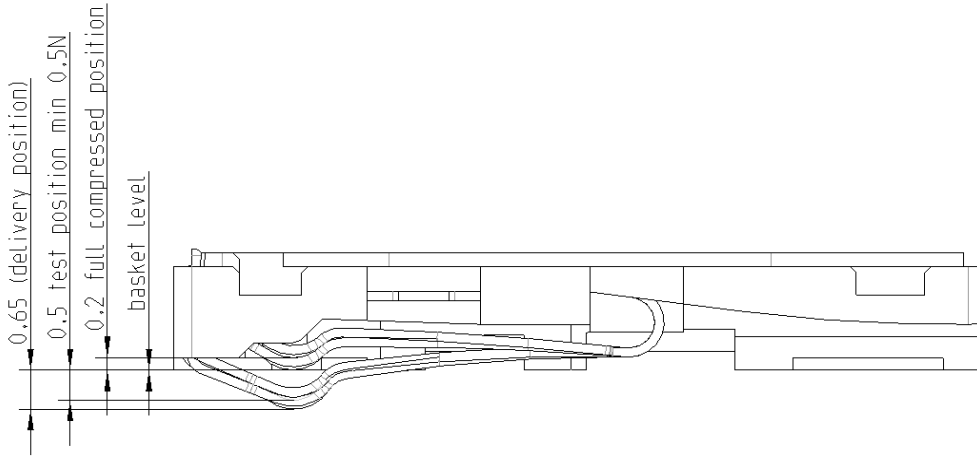


positive voltage on pin +
moves membrane in direction of arrow



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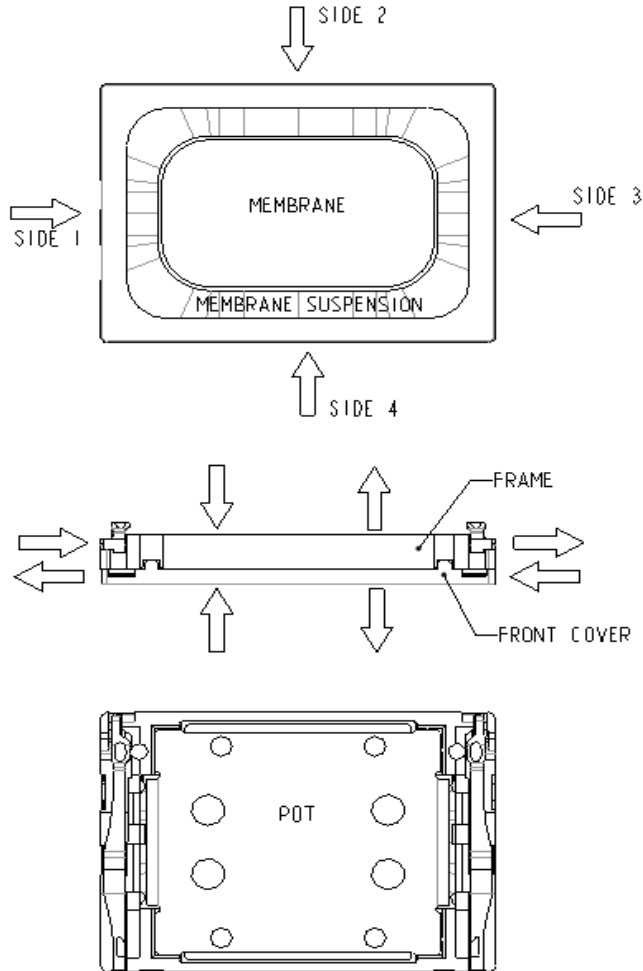
1.3. Spring Force



| SPRING FORCE TABLE | | |
|----------------------------------|-----------------|-----------|
| Force at Baskte level | 0 mm | max 1,2 N |
| Force at Start Workingposition | 0,5 mm | min 0,5N |
| uncompressed (delivery position) | 0,65 +/- 0,15mm | 0 N |
| Force at PPP level | -0,2 mm | max 1,2 N |

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1.4. Force on component

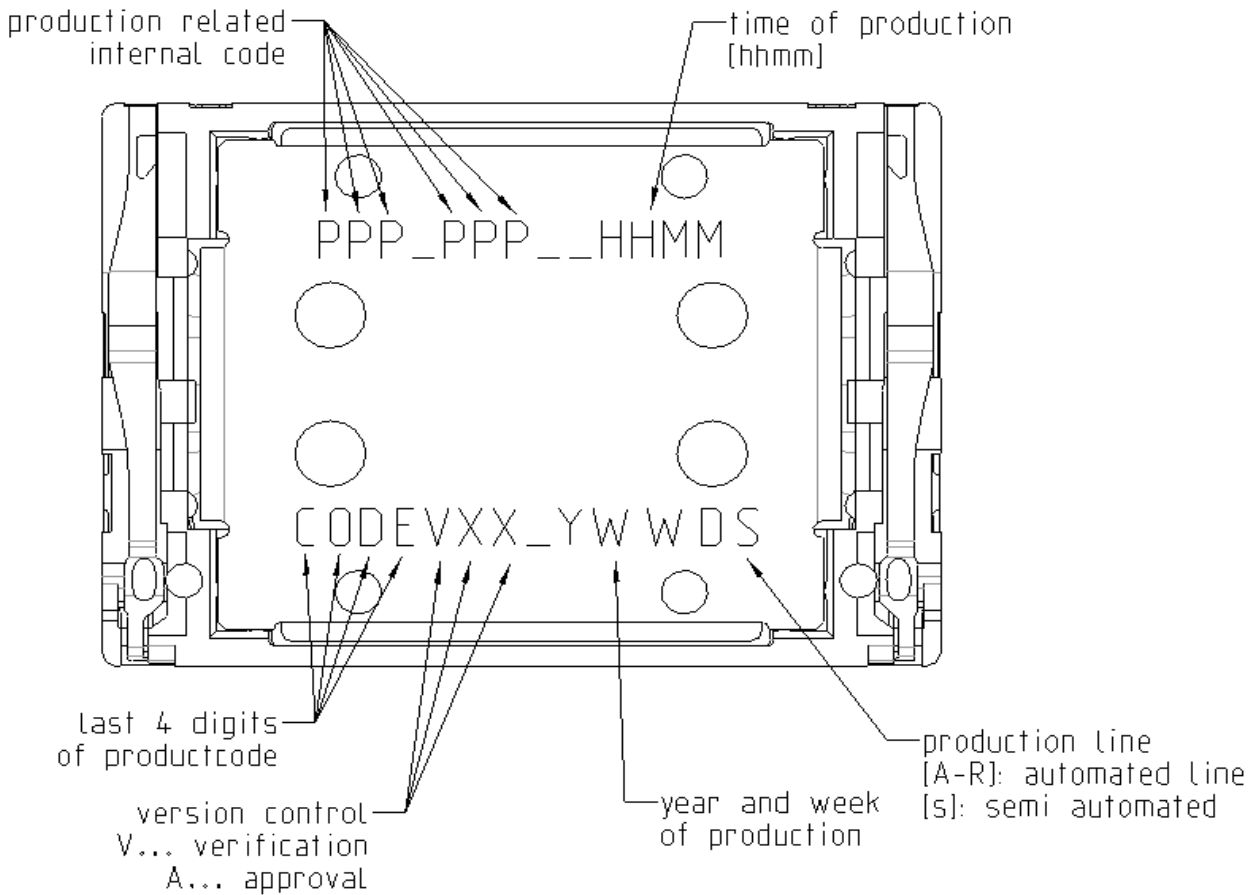


| FORCES ON DIFFERENT STATE OF COMPONENT | | | |
|---|---|-------------------------|------------------------|
| STATE | MIN. SURFACE OF PRESSURE [mm ²] | MAX PERMANENT FORCE [N] | MAX HANDLING FORCE [N] |
| SIDE FORCE ON FRONT COVER AND FRAME (1,2,3,4) | 10 | 10 | 15 |
| PUSH FORCE FRONT COVER | Complete top area | 10 | 15 |
| PULL FORCE FRONT COVER | Complete top area | 5 | 10 |
| PUSH FORCE POT | 10 | 10 | 20 |
| PULL FORC POT | 10 | 5 | 10 |
| PUSH FORCE MEMBRANE AND SUSPENSION | 0 | 0 | 0 |
| PULL FORCE MEMBRANE AND SUSPENSION | 0 | 0 | 0 |
| PUSH FORCE FRAME BACKSIDE | 10 | 10 | 20 |
| SHEER FORCE FRONT COVER-FRAME | 10 | 15 | 20 |

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1.5. Part marking/labeling

The products have a serial number on bottom (pot) side



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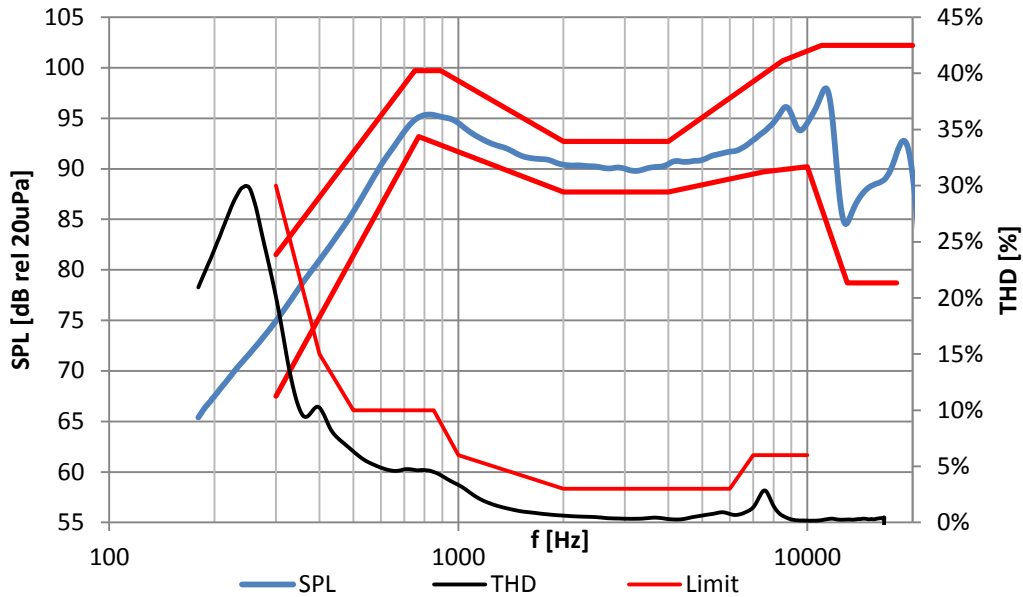
1.6. Material list

- | | |
|--------------------------|------------------------------|
| 1. MATERIAL of BASKET: | Polycarbonate (Halogen free) |
| 2. MATERIAL of MEMBRANE: | Polyarylate-Compound |
| 3. MATERIAL of POT: | soft magnetic iron |
| 4. MATERIAL of MAGNET: | Nd Fe B |
| 5. MATERIAL of CONTACT | CrNi Steel gold plated |
| 6. MATERIAL of COVER: | Polybutylene |
| 7. DIMENSION: | 13x18x2,5 |
| 8. MASS: | 1,65 g |

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2. Electro-acoustic characteristics

2.1. Frequency response



TYPICAL FREQUENCY RESPONSE measured on Baffle according to Chapter 2.4 : distance d = 10cm, P= 600mW, 1ccm back cavity

| f | lower limit (floating) | f | upper limit(Floating) | f | upper limit |
|-------|------------------------|-------|-----------------------|-------|-------------|
| [Hz] | [dB SPL] | [Hz] | [dB SPL] | [Hz] | [%THD] |
| 300 | 67.5 | 300 | 81.5 | 300 | 30% |
| 770 | 93.2 | 750 | 99.7 | 400 | 15% |
| 2000 | 87.7 | 890 | 99.7 | 500 | 10% |
| 4000 | 87.7 | 2000 | 92.7 | 850 | 10% |
| 7500 | 90 | 4000 | 92.7 | 1000 | 6% |
| 10000 | 90.2 | 8500 | 100.7 | 2000 | 3% |
| 13000 | 78.7 | 11000 | 102.2 | 6000 | 3% |
| 18000 | 78.7 | 20000 | 102.2 | 7000 | 6% |
| | | | | 10000 | 6% |

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2.2. Electro-Acoustic Parameters

LOUDSPEAKER MOUNTED IN ADAPTER ACC. TO 2.6

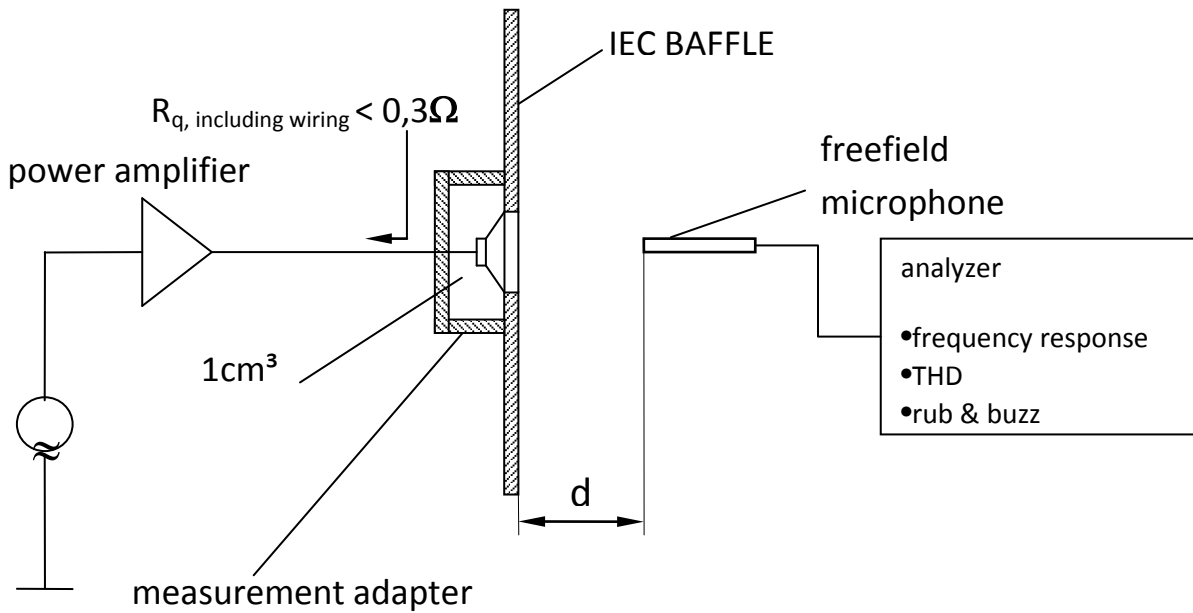
| | | |
|---|---------|--------------------------|
| 1. RATED IMPEDANCE | Z: | 8 Ω |
| 2. VOICE COIL RESISTANCE | R: | 7.2 $\Omega \pm 10 \%$ |
| 3. RESONANCE FREQUENCY At 600mW, 1ccm | f_0 : | 750 Hz $\pm 7.5 \%$ |
| 4. MAXIMUM useable EXCURSION | Xmax: | +/- 0.30mm |
| 5. NOMINAL CHARACT. SENSITIVITY (calculated for 1W in 1m) average from 2kHz to 4kHz | | 73 ± 2.5 dB |
| 5.1. MEASURED CHARACT. SENSITIVITY (at 600mW in 1cm) average from 2kHz to 4kHz | | 110.8 ± 2.5 dB |
| 6. THD | | according to chapter 2.1 |
| 7. RUB & BUZZ | | no audible rub & buzz |

2.3. Power handling

SPEAKER MOUNTED IN LIFETIME TEST DEVICE (closed Box 1ccm, open front)
(pink noise, 2nd order high pass, f-3dB at 800Hz, Crest factor of 2 (6 dB))

| | | |
|----|---|--------------|
| 1. | MAX.SHORT TERM POWER (0,5sec. ON / 3sec. OFF) | 1000mW (RMS) |
| 2. | MAX. CONTINUOUS POWER (500h) | 600mW (RMS) |

2.4. Measurement setup



2.5. Measured Parameters

2.5.1. Sensitivity

SPL is expressed in dB rel $20\ \mu\text{Pa}$, computed according to IEC 268-5. Measurement set up and parameters according chapter 2.4. This test is performed for 100% of products in the production line.

2.5.2. Frequency response

Frequency response is measured according test set up in chapter 2.4 data sheet and checked against the tolerance window defined in chapter 2.1. This Test is performed for 100% of products in the production line.

2.5.3. Total harmonic distortion (THD)

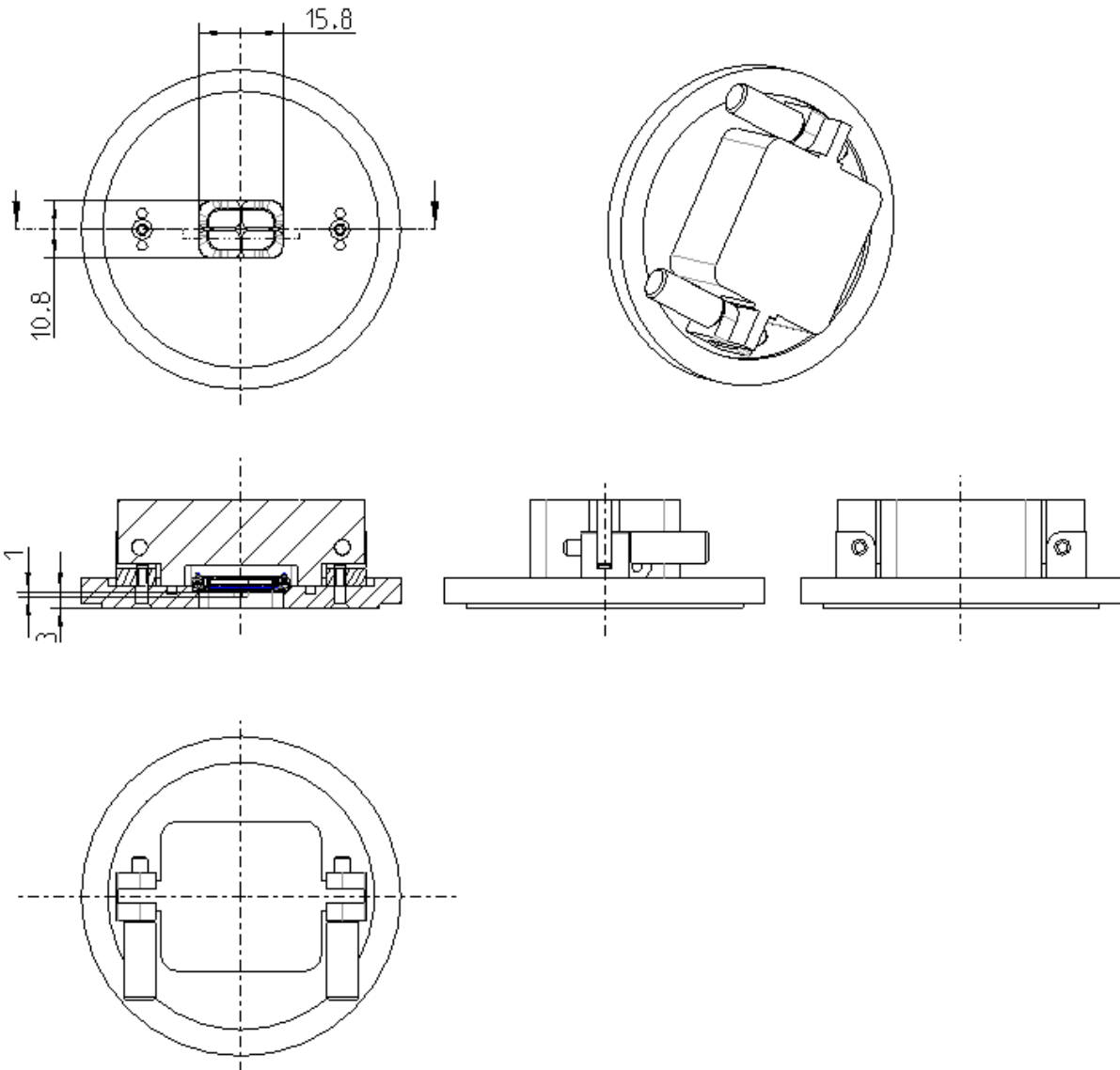
Is measured according IEC 268-5 (2nd to 5th harmonics) and test set up in chapter 2.4. This test is performed for 100% of products in the production line.

2.5.4. Rub& Buzz

Rub & Buzz will be measured in the Inline-measuring device with a sinusoidal sweep. Rub and Buzz is defined as the maximum peak sound pressure in transmission range of the 5kHz high pass filter. Signal and evaluation criteria are according to chapter 2.2. This test is performed for 100% of products in the production line.

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2.6. Measurement Adapter



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3. Environmental Conditions

3.1. Storage

The transducer fulfills the specified data after treatment according to the conditions of

ETS 300 019-2-1 Specification of environmental test: Storage
Test spec. T 1.2: Weather protected, not temperature controlled storage locations.

3.2. Transportation

The transducer fulfills the specified data after treatment according to the conditions of

ETS 300 019-2-2 Specification of environmental test: Transportation
Test Spec. T 2.3: Public Transportation

3.3. Functionality

The transducer fulfills the specified data after treatment according to the conditions of

ETS 300 019-2-5 Specification of environmental test: Ground vehicle installations
Test spec. T 5.1: Protected installation

ETS 300 019-2-7 Specification of environmental test: Portable and non-stationary use
Test spec. T 7.3E: Partly weather protected and non-weather protected locations.

4. Environmental tests

4.1. Qualification tests

According to our milestone plan (Product Creation Process), a complete qualification test will be done at design validation of products manufactured under serial conditions.

1x per year and product family a requalification takes place. The qualification process covers all tests described under 4.5 and a complete inspection.

4.2. Reliability tests

1x per month and product family samples are taken and submitted to tests described under 4.5.2

4.3. Sample Size, Sequence

Unless otherwise stated 20 arbitrary new samples will be used to perform each test for both, qualification and requalification test as described under 4.1 and 4.2.

4.4. Period of Shelf-Life

The period of shelf-life is 2 years.

4.5. Testing Procedures

4.5.1. Storage Tests

4.5.1.1. Low Temperature Storage Test

| Parameter | Test Method and Conditions | Duration | Evaluation Standard |
|--|---------------------------------------|----------|--|
| Low Temperature Storage (Ref. EN 60068-2-1) | -40°C rel. humidity not controlled | 168h | Measurements after 2 hours recovery time. All samples fully operable. All acoustical parameters according specification with tolerances increased by 50 %. |

4.5.1.2. High Temperature Storage Test

| Parameter | Test Method and Conditions | Duration | Evaluation Standard |
|---|---------------------------------------|----------|--|
| Dry Heat Storage (Ref. EN 60068-2-2) | +85°C rel. humidity not controlled | 168h | Measurements after 2 hours recovery time. All samples fully operable. All acoustical parameters according specification with tolerances increased by 50 %. |

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4.5.1.3. Temperature Cycle Test

| Parameter | Test Method and Conditions | Duration | Evaluation Standard |
|---|--|--|--|
| Change of Temperature (Ref. EN 60068-2-14) | -40°C/+85°C Transition time <3 min. | 20 cycles 30 min for each temperature | Measurements after 2 hours recovery time. All samples fully operable. All acoustical parameters according specification with tolerances increased by 50 %. |

4.5.1.4. Temperature / Humidity Cycle Test

| Parameter | Test Method and Conditions | Duration | Evaluation Standard |
|--|--|--|--|
| Damp heat, cyclic (Ref. IEC 60068-2-30) | +30°C/+65°C 90% to 95% RH. Temp. change time 1,5h <u>Caution:</u> no condensed water on products! | 18 cycles. 1h each +30°C 4h at +65°C Temp. change time 1,5h Totally 144h | Measurements after 2 hours recovery time. All samples fully operable. All acoustical parameters according specification with tolerances increased by 50 %. |

4.5.2. Operating Tests

4.5.2.1. Cold Operation Test

| Parameter | Test Method and Conditions | Duration | Evaluation Standard |
|--|--|----------|---|
| Cold Operation Test (Ref. EN 60068-2-1) | -20°C rel. humidity not controlled signal acc. Chapter 2.3 | 72h | Measurements after 2 hours recovery time. All samples fully operable. THD may be increased after test. All other acoustical parameters according specification with tolerances increased by 50 %. |

4.5.2.2. Dry Heat Operation Test

| Parameter | Test Method and Conditions | Duration | Evaluation Standard |
|---|--|----------|--|
| Dry Heat Operation (Ref. EN 60068-2-2) | +70°C rel. humidity not controlled signal acc. Chapter 2.3 | 500h | Measurements after 2 hours recovery time. All samples fully operable. The allowable change in sensitivity shall not be greater than 3 dB. All other acoustical parameters according specification with tolerances increased by 50 %. |



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4.5.3. Salt Mist Test

| Parameter | Test Method and Conditions | Duration | Evaluation Standard |
|--|--|-------------------------------|--|
| Salt Mist (Ref. IEC60068-2-52, Kb / Severity 2) | The part must be subjected to 2 hours spray of 5% NaCl salt mist, at 35°C then be left at 40°C and 95% RH for 22h. | 3 cycles; Total test time 72h | The samples shall be washed after the test with distilled water and dried at T< 50°C. Component may have reduced performance, but must still function properly. The allowable sensitivity difference shall not be greater than ±3dB from initial sensitivity. |

4.5.4. Shock Resistance Test (Free Fall Test) - protected product

| Parameter | Test Method and Conditions | Conditions / Sample size | Evaluation Standard |
|---|--|---|---|
| Mechanical shock (Ref. IEC60068-2-32 Ed) | Drop in test box or test adapter of release plane from a height of 1.5m onto concrete floor. | Two drops on each side (2x6); One drop on each edge (1x12); Two drops on each corner (2x8); 40 drops in total. | Component may have reduced performance, but must still function properly. The allowable sensitivity difference shall not be greater than ±3dB from initial sensitivity. |

4.5.5. Impact Durability Test (Tumble Test) – protected product

| Parameter | Test Method and Conditions | Conditions / Sample size | Evaluation Standard |
|---|---|--|--|
| Impact durability (in a Tumble Tester) (Ref. IEC60068-2-32 Ed) (SPR a7.1.1) | Speaker in drop test box or representative mechanics. Random drops on steel base. | 20 units 100 drops, 1m DUT power off | Component may have reduced performance, but must still function properly. The allowable sensitivity difference shall not be greater than ±3 dB from initial sensitivity. |

4.5.6. Resistance to Electrostatic Discharge

| Parameter | Test Method and Conditions | Conditions / Sample size | Evaluation Standard |
|--|--|--|--|
| Resistance to ESD IEC61000-4-2 Level 4 (SPR c 2.5.1) | Level 4: contact +/- 8kV, air +/- 15kV | 10 exposures on each polarity / 5 units DUT Power off | All samples fully operable. All acoustical parameters according specification with tolerances increased by 50%. |



5. Related Documents

| | |
|------------------------|---|
| IEC 268-5 | Sound System equipment Part 5: Loudspeaker |
| IEC 68-2 | Environmental testing |
| EN 60068-2 | Environmental testing |
| ISO 2859 - 1 | Sampling procedures for inspection by attributes Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection |
| ISO 3951 | Sampling procedures and charts for inspection by variables for percent defectives. |
| ETS 300 019-2-1 | Specification of environmental test: Storage Test spec. T 1.2: Weather protected, not temperature controlled storage locations |
| ETS 300 019-2-2 | Specification of environmental test: Transportation Test spec. T 2.3: Public Transportation |
| ETS 300 019-2-5 | Specification of environmental test: Ground vehicle installations Test spec. T 5.1: Protected installation |
| ETS 300 019-2-7 | Specification of environmental test: Portable and non-stationary use Test spec. T 7.3E: Partly weather protected and non-weather protected locations |

6. Additional documents

1) Packaging information

9922 580 12511 Standard packing and barcode label description

2) Application Note

t.b.d.

3) Handling Instruction

9922 580 13271

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7. Change History

| Status | Version | Date | ECR | Comment / Changes | Initials of owner |
|----------|---------|----------|------|--|-------------------|
| Obsolete | A | 01.06.11 | 3152 | First Release | AH/CS/CP |
| Release | B | 06.12.12 | 3898 | THD below 300Hz; SPL frequency response limits adapted, Sensitivity wider, overshoot, Removed requirement for Nickel coating, Plate material removed, name adapted | OL/EP/MB/CP |

8. Disclaimer

Stresses above the Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only. The device may not function when operated at these or any other conditions beyond those indicated under “Electrical and Acoustical Specifications”. Exposure beyond those indicated under “Electrical and Acoustical Specifications” for extended periods may affect device reliability.

This product is not qualified for use in automotive applications

Frequency range for telecom use

The information contained in this literature is based on our experience to date and is believed to be reliable and it is subject to change without notice. It is intended as a guide for use by persons having technical skill at their own discretion and risk. We do not guarantee favorable results or assume any liability in connection with its use. Dimensions contained herein are for reference purposes only. For specific dimensional requirements consult factory. This publication is not to be taken as a license to operate under, or recommendation to infringe any existing patents. This supersedes and voids all previous literature.

