TECHNICAL DELIVERY TERMS FOR TELECOM – MALT SPEAKER

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General TPD document 9922 580 00361 B

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Change History

12.03.03 T. Marek: Update Test descriptions

14.09.04 Ch. Haas: Update for MALT Slim

Table of Content

1 General Specifications

1.1 DELIVERY ITEM

TELECOM – MEDIUM SIZE AND LOUD TRANSDUCER (MALT) WITHOUT CUSTOMER SPECIFIC ASSEMBLY PARTS!

1.2 APPLICABLE DOCUMENTS

sheet group 190: PSS product documentation for corresponding product

IEC 268-5 Sound System equipment
Part 5: Loudspeaker

IEC 68-2

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

1.3 DESCRIPTION OF PRODUCTS

PSS transducers are determined for the use in mobile and cordless phones not only due to their small design but also due to their excellent acoustical transducer performance.

Such transducers are adjusted to an extended band-width of human speech and achieve a maximum on efficiency. Beyond that their resistance against high voltage static discharge and their excellent and steady quality level due to full automated production are very important feature.

MALT receiver are assembled from the following elements:

1.3.1 Magnet system

The metal system contains the magnetic system, made from neodymium-iron magnet and the iron pole pieces.

1.3.2 Membrane and voice coil

The membrane – hot formed plastic foil - is glued onto the plastic basket.

The self supporting voice coil is fixed to the membrane with UV-light hardening glue.

1.3.3 Terminal tags

For reliable and quick contacting the MALT speakers are provided with contact springs or solder pads.

1.4 PACKAGING

For protection against damages during transportation our MALT transducers are packed in Polystyrole trays, which enable an automatic pick and place at the customer.

1.5 OPERATIONAL CONDITIONS

1.5.1 Functionality

PSS - MALT transducer fulfil 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 Generally the function is guaranteed in a temperature range of **- 40°C to + 85 °C.**

1.5.2 Transportation

PSS - MALT transducer fulfil 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 and a following recovery period.

1.5.3 Storage

PSS - MALT transducer fulfil 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 and a following recovery period.

1.6 TERMS OF QUALITY AND ACCEPTANCE

As we know random testing is not applicable due to low AQL values and large sample quantities. So we recommend PPM-Management as tool for measuring and improving product quality in a customer - supplier relationship.

PPM - Management means reporting of all found defective Parts to the supplier. PSS - Vienna has to analyse the defect and to set up (and communicate) improvement plans to prevent found defects for future productions.

1.6.1 Delivery Quality (0-hours)

The review is made by PPM-management, a special agreement is to be set up to allow regular and concise measures of actual quality levels.This is useful at quantities exceeding:

360.000 pcs / year and

40.000 pcs / month.

The supplier aspires < 150 ppm for major defects A (= not fit for use).

< 1000 ppm for major defects B (= not according spec., but fit for use)

<= 2% minor defect

1.6.2 Lot size

The daily under same conditions (= continuous production sequence) produced quantity represents an independent lot.

1.6.3 AQL agreement and classification of defects

On request we are able to define an AQL agreement based on ISO 2859-1 for visual and dimensional inspection by attributes respectively ISO 3951 for dimensional and functional inspection by variables.

1.6.4 Ship to Stock agreements

After reaching the PPM - target we can accept a STS - agreement, if requested by the customer.

Remark: AQL or STS agreements do not exclude the buyer responsibility for assurance of quality of purchased goods. For details refer to related quality contract.

1.7 INTERNAL INSPECTIONS

1.7.1 Quality and Environmental system of PSS

PSS has implemented and is maintaining a Quality and Environmental Management System according to ISO 9001/2000 and ISO 14001, which is certified by Austrian authorities (ÖQS). Copy of certificate and an electronic copy of the business manual parts which were base of the certification are available on request.

1.7.2 Internal Inspections

Processes are controlled by SPC, the conformance of the products to the agreed specification is ensured by performing the tests laid down in chapter 3 - Test Regulations the scope of in-process and final inspections.

1.7.3 Work certificate

If requested by the customer the results of the internal inspections done by random check, will be laid down in a work certificate (Certificate of Conformity) in the following form and transmitted to the customer:

- Product: 12 NC (Identification code)
- Batch no.: lot no. of delivery
- Invoice no.:

- Quantity: amount of actual delivery
- Visual inspection: global result of visual inspection
- Dimensional inspection: global result of dimensional inspection

Functional inspection:

DC-resistance
Sensitivity
Frequency Response
Total Harmonic Distortion

1.8 TECHNICAL REQUIREMENTS

1.8.1 Visual inspections

Tests according TEST SHEET 1 in chapter 4

1.8.2 Dimensional inspections

According drawing sheet 190-1.
Tests according TEST SHEET 2 in chapter 4

1.8.3 Functional inspections

According mentioned specification sheet 190-3 and 190-4.
Tests according TEST SHEET 3 in chapter 4

1.9 PERIOD OF SHELF LIFE

The period of shelf life is 5 years.

2 ENVIRONMENTAL TESTS

2.1 Qualification test

According to our milestone plan (Product Creation Process), a complete qualification test will be done at design validation on products, manufactured under serial conditions and 1 x per year and product family. The qualification process covers all tests described under 2.4 and a complete inspection described under 3.

Depending on the severity and impact of planned process and product changes all or part of the tests under 2.4 will be performed. This is determined in the course of the change proposal process.

2.2 Reliability test

1x per month and product family samples are taken and submitted to tests being described under 2.4.2.

2.3 Sample Size, Sequence

Unless otherwise stated 20 arbitrary new samples will be used to perform each test for both, qualification and reliability test as being described under 2.1 and 2.2.

2.4 TESTING PROCEDURES

2.4.1 Storage Temperature Test

2.4.1.1 Low storage temperature test

Table 0-1

Parameter	Test Method and Conditions	Duration	Evaluation Standard
Low Storage Temperature (Ref. IEC60068-2-1, Ab)	-40 °C rel. humidity not controlled	72h	Measurement must be done in room temperature after 2 hours recovery. All samples fully operable. All measurements within specification with tolerances increased by 50 % for acoustical parameters. No obvious damage permitted.

2.4.1.2 High storage temperature test

Table 0-2

Parameter	Test Method and Conditions	Duration	Evaluation Standard
Dry Heat Storage (Ref. IEC60068-2-2, Bb)	+85 ° rel. humidity not controlled	72h	Measurement must be done in room temperature after 2 hours recovery. All samples fully operable. All measurements within specification with tolerances increased by 50 % for

			acoustical parameters. No obvious damage permitted.

2.4.2 Operating Temperature Range Test

2.4.2.1 Cold Operation Test

Table 0-3

Parameter	Test Method and Conditions	Duration	Evaluation Standard
Cold Operation Test (Ref. IEC60068-2-1, Ab)	-40 °C rel. humidity not controlled signal acc. sheet 190-4	500h	Measurement must be done in room temperature after 2 hours recovery. All samples fully operable. All measurements within specification with tolerances increased by 50 % for acoustical parameters. No obvious damage permitted.

2.4.2.2 Dry Heat Operation Test

Table 0-4

Parameter	Test Method and Conditions	Duration	Evaluation Standard
Dry Heat Operation Storage (Ref. IEC60068-2-2, Bb)	+85 ° rel. humidity not controlled signal acc. sheet 190-4	500h	Measurement must be done in room temperature after 2 hours recovery. All samples fully operable. All measurements within specification with tolerances increased by 50 % for acoustical parameters. No obvious damage permitted.

2.4.3 Temperature cycle test

Table 0-5

Parameter	Test Method and Conditions	Duration	Evaluation Standard
Change of Temperature (Ref. IEC60068-2-14 Na)	-40°C/+85°C Transition time <3 min. See figure below.	5 cycles >2h for each temperature	Measurement must be done in room temperature after 2 hours recovery.

			All samples fully operable. All measurements within specification with tolerances increased by 50 % for acoustical parameters. No obvious damage permitted.

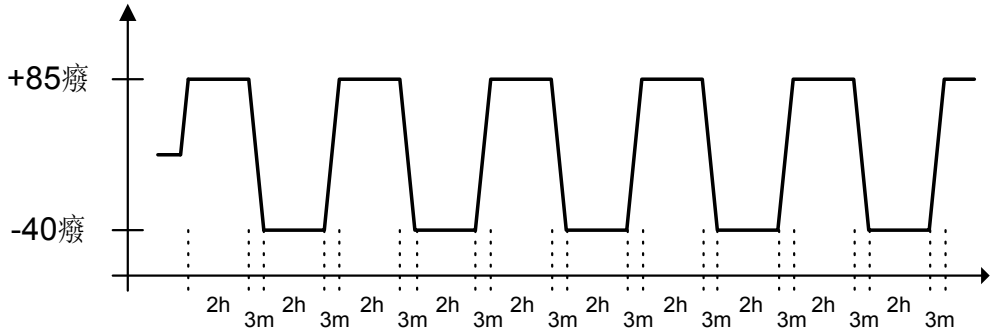

Figure 0-1: Temperature Change Cycle Test.

2.4.4 Temperature/humidity cyclic test

Table 0-6

Parameter	Test Method and Conditions	Duration	Evaluation Standard
Damp Heat Cyclic (Ref. IEC 60068-2-30, Db, Variant 1)	+25°C/+55°C 90 to 95% RH. Temp. change time <3h. See figure below. <u>Caution:</u> no condensed water on products !	6 cycles. 9h at each temperature	Measurement must be done in room temperature after 2 hours recovery. All samples fully operable. All measurements within specification with tolerances increased by 50 % for acoustical parameters. No obvious damage permitted.

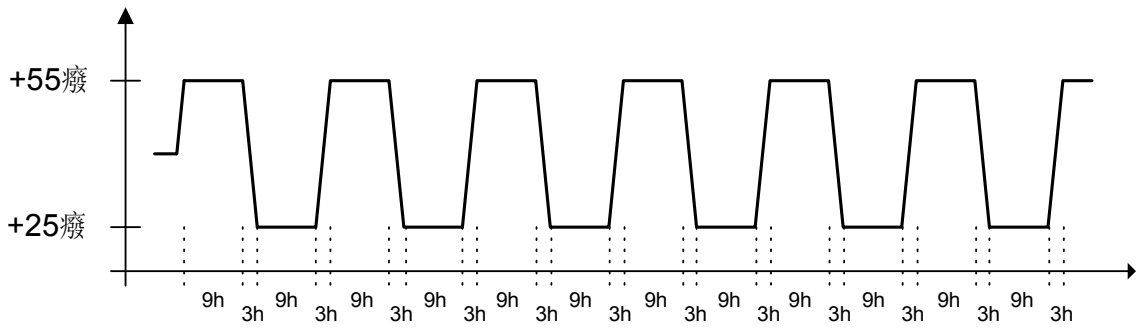

Figure 0-2: Temperature / Relative Humidity Cycle Test.

2.4.5 Vibration

2.4.5.1 Sinusoidal Vibration 1

Table 0-7

Parameter	Test Method and Conditions	Duration	Evaluation Standard
Sinusoidal Vibration 1 (Ref. IEC60068-2-6, Fc)	1) The part in its test box is subjected to a vibration cycle (swept sine wave) of 8 to 200 Hz. The sweep amplitude is 19.6 m/s2 (2g). From this is determined the frequency of maximum acceleration **in this frequency range, f1**. 2) The part in its test box is subjected to an acceleration of 19.6 m/s2 (2g) at the constant frequency f1 for 90 min. as described in the duration column.	90 min per plane in each three mutually perpendicular planes (X-, Y- & Z-axis) for a total of 4.5 hours.	Measurement must be done in room temperature after 2 hours recovery. All samples fully operable. All measurements within specification with tolerances increased by 50 % for acoustical parameters. No obvious damage permitted.

2.4.5.2 Sinusoidal Vibration 2

Table 0-8

Parameter	Test Method and Conditions	Duration	Evaluation Standard
Sinusoidal Vibration 2 (Ref. IEC60068-2-6, Fc)	1) The part in its test box is subjected to a vibration cycle (swept sine wave) of 2 to 8 Hz. The displacement amplitude is 15mm peak to peak and the rate of sweep 1 Oct/min. From this is determined the frequency of maximum acceleration **in this frequency range, f2**. 2) The part in its test	90 min per plane in each three mutually perpendicular planes (X-, Y- & Z-axis) for a total of 4.5 hours.	Measurement must be done in room temperature after 2 hours recovery. All samples fully operable. All measurements within specification with tolerances increased by 50 % for acoustical parameters. No obvious damage permitted.

	box is subjected to displacement amplitude of 15mm peak to peak at the constant frequency f2, as described in the duration column.		

2.4.5.3 Random Vibration test

Table 0-9

Parameter	Test Method and Conditions	Duration	Evaluation Standard
Random Vibration (IEC 60068-2-36, Fdb)	The part in its test box is subjected to the vibration: 10 - 100 Hz; 3 m2/s3 (0.031 g2/Hz) 100 - 500 Hz; -3dB/Oct.	60 min per plane in each three mutually perpendicular planes (X-, Y- & Z-axis) for a total of 3 hours.	Measurement must be done in room temperature after 2 hours recovery. All samples fully operable. All measurements within specification with tolerances increased by 50 % for acoustical parameters. No obvious damage permitted.

2.4.6 Salt mist, cyclic

Table 0-10

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, then be left at 40°C and 95% RH for 22 h.	3 cycles	The samples shall be washed after the test with aqua dest. and dried at < 50 °C. After recovery time the component may have reduced performance, but must still function.

2.4.7 Shock-resistance (free fall test) - unprotected product

Table 0-11

Parameter	Test Method and Conditions	Duration	Evaluation Standard
Mechanical shock	Drop of sample without	Each 3 shocks	All measurements within

(Ref. IEC60068-2-32 Ed), Procedure 1	fixation of release plane from a height of 1250 mm onto concrete floor.	in both directions of the 3 axis.	specification with tolerances increased by 50 % for acoustical parameters.

2.4.8 DC input test

Table 0-12

Parameter	Test Method and Conditions	Duration	Evaluation Standard
DC Voltage	3 VDC voltage must be applied to the pins of the part	For 1 h. Once.	no smoke or firing, transducer may be defect

2.4.9 Resonance Sinus Test

Table 0-13

Parameter	Test Method and Conditions	Duration	Evaluation Standard
Resonance Sinus Test	50 samples of old/new status in A/B-comparison Test to be done in life time test device. Maximum linear excursion must be reached by suitably sinusoidal input power.	Until 50% of samples failed or reasonable period of time	Purpose of the test is to evaluate changes of product, material or process by testing until failures are occurring. Therefore samples of the old/new status have to be tested in comparison. Use of statistical methods has to be made for evaluation.

2.5 TESTING PROCEDURES FOR SPRING CONTACT

Test set up: Test has to be done with a gold plated PCB (1μm Ni+ 0,2μm Au layer) and under load defined in the corresponding 190-1 data sheet.

General Requirement for each test:

contact resistance should be less than 100mOhm for each contact

Inspection of the force-way diagram of the spring before and after the test (1 product)

Sample size for each test: 4 products (8 springs) for each test
3 products with a force of 0,3 N (spring force of one contact)
1 product with a force of 0,95N

2.5.1 Tests

Same as whole receiver unit being described under 2.4.1 – 2.4.5

2.5.2 Lead flexibility of springs

Movement at elastic area, 6000 cycles.

2.5.3 Wearing of springs

Oscillating movement –1000 cycles of 1mm in perpendicular direction to contact force

2.6 Records

All results of tests are recorded. If requested the customer can have a look at the results.

Each failure will be analysed, actions for improvements established and the efficiency of those actions checked.

3 TEST REGULATIONS for VISUAL, DIMENSIONAL, and FUNCTIONAL INSPECTION

3.1 VISUAL INSPECTION

The visual inspection of is carried out according TEST SHEET 1 in chapter 4 by inspection at a distance of 0,5 m, with the naked eye and at normal illumination, in case of need using a 15 x luminous magnifying glass.

3.2 DIMENSIONAL INSPECTION

The dimensional inspection is carried out according TEST SHEET 2 in chapter 4 by using suitable, calibrated dimensional tools.

3.3 FUNCTIONAL INSPECTION

According TEST SHEET 3 in chapter 4.

measurement set up is defined in the corresponding product data sheet

3.3.1 DC-Resistance

The DC resistance is checked by an adequate equipment (low current ohmmeter)

This test is performed for each speaker in the production line

3.3.2 Sensitivity

SPL is expressed in dB rel 20μPa, computed according to IEC 268-5

Measurement set up and parameters according sheet 190-3.

This test is performed for each speaker in the production line

3.3.3 Frequency response

Frequency response is measured according test set up in 190-3 data sheet and checked against the tolerance window defined in the 190-3 data. This Test is performed for each speaker in the production line.

3.3.4 Total harmonic distortion (THD)

Is measured according IEC 268-5 (2^{nd} to 5^{th} harmonics) and test set up in 190-3 data sheet

3.3.5 Rub& Buzz

Rub & Buzz will be measured in the Inline-measuring device with a sinusoidal sweep. Rub & Buzz is defined as the maximum level of no harmonic energy, expressed as signal to non-harmonic content ratio, in a certain frequency-range. Parameters of signal and evaluating criteria's acc. to sheet 190.4

4 TECHNICAL PRODUCT DOCUMENTATION FOR TELECOM – MALT TRANSDUCERS

TEST SHEET 1: - visual inspection

TEST SHEET 2: Dimensional inspection

TEST SHEET 3: Functional inspection

Corresponding specification for each 12 NC

Sheet 190 - 1: Dimensional specification

Sheet 190 - 2: Mechanical specification

Sheet 190 - 3: Acoustical specification

Sheet 190 - 4: Electro-acoustical specification

Sheet 190 - 5: Design rules for measurement/test adapter

Sheet 190 - 6: Dimensional specification for additional assembled parts
Design rules for wires and spring contacts

4.1 VISUAL INSPECTION

Defect code:	Description of defect:	Defect class:
1.01.	Membrane damaged (if not affecting function)	MD
1.02.	Membrane dented, snap marking on dome (if not affecting function)	MD
1.03.	Membrane separating from basket (if not affecting function)	MjDB
1.11.	Metal system corroded	MjDB
1.21.	Basket broken (if not affecting function)	MjDB
1.22.	Front area damaged, dirty	MjDB
1.31.	Missing or wrong type of contact spring	MjDA
1.32.	Contact spring damaged, distorted (not able to be contacted)	MjDA
1.41.	Marking missing, wrong or illegible	MjDB

MjDA .....major defect A = not fit for use
MjDB .....major defect B = not according specification, but fit for use
MD .....minor defect

4.2 DIMENSIONAL INSPECTION

Def. code:	Description of defect:	Dimension:	Defect class
2.01.	External diameter	acc.Sheet 590-1	MjDB
2.02.	Height	acc.Sheet 590-1	MjDB
2.11.	Height including contact spring	acc.Sheet 590-1	MjDB
2.12.	position of contact points	acc.Sheet 590-1	MjDB
2.13.	Correct minimal bending of spring contact	acc.Sheet 590-1	MjDA

4.3 FUNCTIONAL INSPECTION

Def. code:	Description of defect:	Dimension:	Defect class
3.01.	no function	---	MjDA
3.11.	DC - resistance	NV (Ω) ± 10 %	MjDB
3.21.	Frequency response - tolerance reserve	mind. 0 dB	MjDB
3.22.	SPL	NV (dB) ± 2 dB	MjDB
3.23.	THD (total harmonic distortion)	max. NV (%)	MjDB
3.31.	Rub and Buzz	NV	MD

NV: nominal values according data sheet

Tolerances for condition „as new“. After treatment acc. appendix 1 Environmental Tests increased tolerances (+ 50 % of tolerance width) are permitted.