

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

Noise suppression sheet for digital devices and equipment –  
Part 3: Characterization of parameters of noise suppression sheet  
(standards.iteh.ai)

Plaque réduisant le bruit des dispositifs et appareils numériques –  
Partie 3: Caractérisation des paramètres des plaques réduisant le bruit

IEC 62333-3:2010  
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**NOISE SUPPRESSION SHEET FOR DIGITAL  
DEVICES AND EQUIPMENT –**
**Part 3: Characterization of parameters of noise suppression sheet**

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International Standard IEC 62333-3 has been prepared IEC technical committee 51: Magnetic components and ferrite materials.

The text of this standard is based on the following documents:

FDIS	Report on voting
51/970/FDIS	51/977/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 62333 series, under the general title *Magnetic components and ferrite materials*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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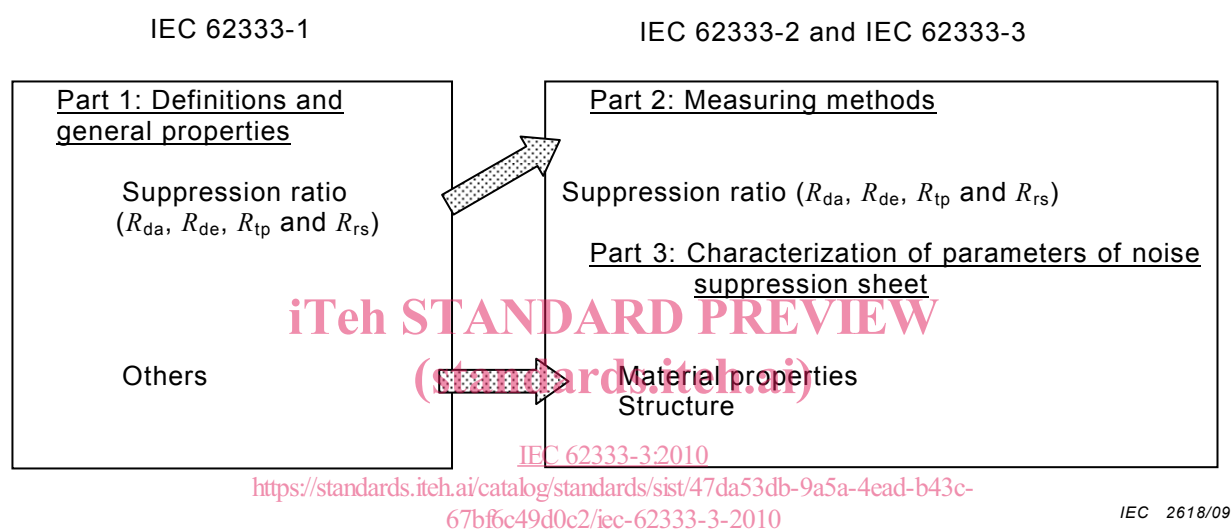
## INTRODUCTION

There are established standards for noise suppression sheet (NSS) as in IEC 62333-1 and in IEC 62333-2.

Figure 1 shows the framework of IEC 62333 series for NSS.

Part 1 issues the general guidelines of IEC 62333 series. Part 2 establishes measurement methods of four important suppression ratios for NSS.

This Part 3 specifies characterization of each parameter except suppression ratio of NSS, which is determined in Part 2. Parameters prescribed in this part are divided into material properties and structure.



**Figure 1 – Framework of IEC 62333 series for noise suppression sheet**

# NOISE SUPPRESSION SHEET FOR DIGITAL DEVICES AND EQUIPMENT –

## Part 3: Characterization of parameters of noise suppression sheet

### 1 Scope

This part of IEC 62333 provides characterization of parameters for electromagnetic noise suppression sheet (NSS) for digital devices and equipment used in a frequency range between 30 MHz to 30 GHz. Guidance is given for uniform presentation of the properties of noise suppression sheet, intended for use in manufacturers and users technical data. NSS suppresses noise at its source, rather than absorbing noise at a distance. Therefore NSS is distinguished from RF wave absorbers used in free space.

This standard addresses the following purposes of NSS manufacturers and users:

- it assists users in understanding the published technical data in catalogues;
- it guides users in selecting the most preferable NSS for each application;
- it establishes measurement benchmarking for manufacturers of performance in new development of NSS; and
- it maintains high reliability of NSS and applied products.

The numerical values given in this standard are typical values of parameters (properties) of the related NSS. The purpose of NSS testing is the benchmarking of materials. Predictions of specific device performance values are not always easy or even possible.

Every detailed material and NSS specification should be agreed between the user and the manufacturer.

### 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60093, *Methods of test for volume resistivity and surface resistivity of solid electrical insulating materials*

ISO 527-1, *Plastics – Determination of tensile properties – Part 1: General principles*

ISO 1183-1:2004, *Plastics – Methods for determining the density non-cellular plastics – Part 1: immersion method, liquid pycnometer method and titration method*

ISO 3611, *Micrometer callipers for external measurement*



ISO 22007-1, *Plastics – Determination of thermal conductivity and thermal diffusivity – Part 1: General principles*

ISO 22007-2, *Plastics – Determination of thermal conductivity and thermal diffusivity – Part 2: Transient plane heat source (Hot Disc) method*

ISO 22007-3, *Plastics – Determination of thermal conductivity and thermal diffusivity – Part 3: Temperature wave analysis method*

ISO 22007-4, *Plastics – Determination of thermal conductivity and thermal diffusivity – Part 4: Laser flash method*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

#### 3.1

##### density

$\rho$

ratio of the mass of a sample to its volume, expressed in kg/m<sup>3</sup> or g/cm<sup>3</sup>

#### 3.2

##### specific gravity

ratio of material density (mass per unit volume) at 23 °C to the density of gas-free distilled water at 23 °C

#### 3.3

##### tensile strength

##### $\sigma_M$ (Young's modulus, Et)

maximum tensile stress sustained by the test specimen during a tensile test. It is expressed in MPa

[ISO 527-1:1993, definition 4.3.3]

### 4 General

In selecting the optimum NSS, apart from the noise suppression ratios specified in Part 2, material properties and structure are important factors.

Part 3 hereby, specifies measurement methods and data presentation methods of each parameter except suppression ratio of NSS.

Part 2 gives guidance on suppression characteristics and this part gives guidance on the characteristics of NSS with regards to material properties and structure.

The material properties in this standard consist of

- surface resistivity;
- mechanical characteristics (density, Young's modulus and/or hardness);
- thermal characteristics (thermal conductivity, thermal expansion coefficient);
- environmental conditions (operating and/or storage temperature, flammability).

These parameters are required for indicating the installation availability and reliability after long time usage.

The structures in this standard consist of

- thickness;

– layer structure.

These parameters are closely related to the four specific noise suppression effects prescribed in Part 2.

NOTE 1 The adhesive will have a direct influence on material properties. The definitions in this part are for NSS without adhesive. Manufacturers and users should make specific agreement concerning properties with adhesive.

NOTE 2 Permeability is not a defined NSS material characteristic or structure. Permeability is considered by the manufacturer in the design of the material, to achieve the target suppression properties in Part 2.

NOTE 3 Manufacturers often recommend frequency ranges in their datasheets based on typical applications and operating conditions. Therefore, recommended frequency range is not included in material properties of this standard.

## 5 Parameters, descriptions and measuring methods

### 5.1 Material properties

#### 5.1.1 Surface resistivity

Surface resistivity shall be determined, and the results reported, as specified in IEC 60093:1980.

Surface resistivity is the quotient of a d.c. electric field strength, and the linear current density in a surface layer of NSS. In practice it is taken as the surface resistance reduced to a square area. The size of the square is immaterial.

NOTE The SI unit of surface resistivity is the ohm ( $\Omega$ ). In practice, this is sometimes referred to as “ohms per square”.

#### 5.1.2 Mechanical characteristics IEC 62333-3:2010

[https://standards.iteh.ai/catalog/standards/sist/47da53db-9a5a-4ead-b43c-](https://standards.iteh.ai/catalog/standards/sist/47da53db-9a5a-4ead-b43c-67bf6c49d0c2/iec-62333-3-2010)

##### 5.1.2.1 Density 67bf6c49d0c2/iec-62333-3-2010

Density shall be determined, and the results reported, by method A specified in ISO 1183-1.

##### 5.1.2.2 Specific gravity

Specific gravity can be converted to density ( $\text{kg}/\text{cm}^3$  or  $\text{g}/\text{cm}^3$ ) by multiplying specific gravity by  $9,975 \times 10^{-4}$  or 0,997 5, respectively.

##### 5.1.2.3 Tensile strength (Young's modulus)

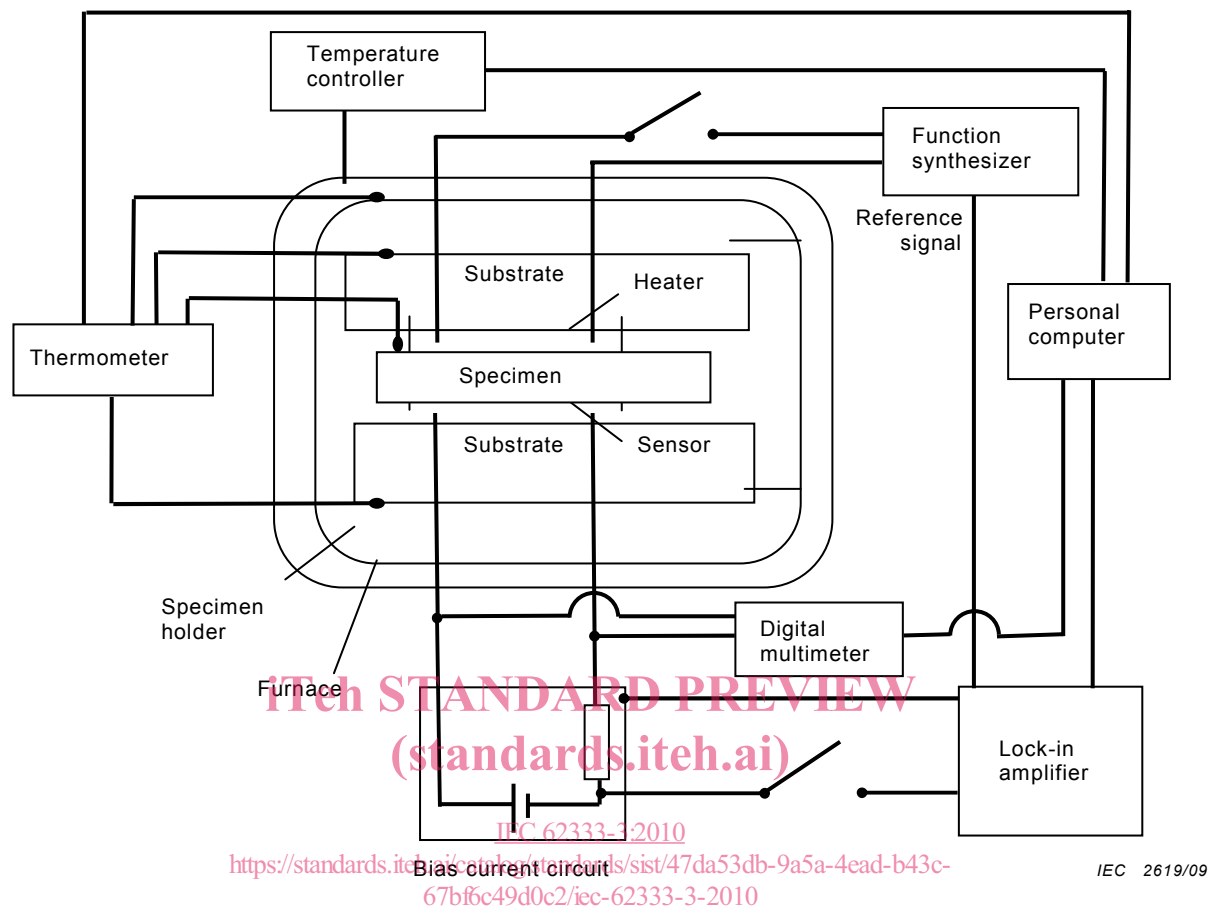
Tensile testing is performed by elongating a specimen and measuring the load carried by the specimen. From knowledge of the specimen dimensions, the load and deflection data can be translated into a stress-strain curve.

Results shall be reported as described in ISO 527-1.

### 5.1.3 Thermal conductivity

- Thermal conductivity ( $\lambda$ ) shall be determined with  $\lambda = \alpha \cdot C_p \cdot \rho$ , where,  $\alpha$  is thermal diffusivity,  $C_p$  is specific heat and  $\rho$  is density. Thermal diffusivity can be measured and determined by the following standards: ISO 22007-1, ISO 22007-2, ISO 22007-3 and ISO 22007-4. The measuring standard used shall be identified, and the results shall be reported as described in that standard.
- Thermal conductivity should be measured under the standard atmospheric conditions specified in 5.3.1 of IEC 60068-1:1988.
- If additional data is necessary, the physical structure of the test and the test conditions should be noted.

Figure 2 shows a schematic diagram of measuring apparatus. (Reference from Figure 1 of ISO 22007-3.)



**Figure 2 – Schematic diagram of thermal conductivity measuring apparatus**

#### 5.1.4 Environmental conditions

##### 5.1.4.1 Operating temperature

Operating temperature range should be guaranteed within  $-30\%$  variation of  $x$ , where  $x = 1 - 10^{(-R_{tp}/10)}$  at  $20\text{ °C}$ .

The measurement frequency should be described.

##### 5.1.4.2 Storage temperature

Highest and lowest storage temperatures should be guaranteed within  $-30\%$  variation of  $x$ , where  $x = 1 - 10^{(-R_{tp}/10)}$ , after NSS is removed from each storage temperature to  $20\text{ °C}$ .

The measurement frequency should be described. Storage temperature and storage time should be prescribed by test “Ab” specified in IEC 60068-2-1 and test “Bb” specified in IEC 60068-2-2.

##### 5.1.4.3 Flammability

Manufacturer’s datasheet for NSS should report whether or not the material is compliant with flammability safety requirements.

NOTE For example, IEC 60695-11-10 or UL94 grade.