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Quantities and units —

Part 15: Logarithmic and related quantities

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This draft is submitted to a parallel vote in ISO and in IEC.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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QUANTITIES AND UNITS –

Part 15: Logarithmic quantities and their units

FOREWORD

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International Standard IEC 80000-15 has been prepared by subcommittee JWG 2: Revision and amendments of IEC-related parts of ISO/IEC 80000 series of IEC technical committee TC25: Quantities and units.

This 1st edition cancels and replaces the IEC 60027-3, 4th edition as 25/524/CD, closing date 2015-07-03. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- Template corresponding to the ISO/IEC 80000 series;
- Introduction corresponding to the ISO/IEC 80000 series;
- Extension of types of logarithmic quantities;
- In 4.2.2, dB and Np has been stressed as units, as well as Sh, nat, Hart in 5, and oct, dec in 6.2;
- Musical intervals have been added in 8 and Table 3;
- Tables 2 and 3 have been added;
- The original contents of IEC 60027-3 has been reduced to fit to the ISO/IEC 80000 series and name “Logarithmic quantities”.

The text of this International Standard is based on + the following documents:

CD	Report on voting
XX/XX/CD	XX/XX/RVD

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

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

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IEC 80000 consists of the following parts, published by IEC, under the general title *Quantities and units*:

- *Part 6: Electromagnetism*
- *Part 13: Information science and technology*

The following parts are published by ISO:

- *Part 1: General*
- *Part 2: Mathematics*
- *Part 3: Space and time*
- *Part 4: Mechanics*
- *Part 5: Thermodynamics*
- *Part 7: Light and radiation*
- *Part 8: Acoustics*
- *Part 9: Physical chemistry and molecular physics*
- *Part 10: Atomic and nuclear physics*
- *Part 11: Characteristic numbers*
- *Part 12: Condensed matter physics*

The National Committees are requested to note that for this document the stability date is 20XX.

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

INTRODUCTION

0 Introduction

0.1 General

This document provides general information about commonly used logarithmic quantities and their units. These include those used in science and engineering, information theory and music.

There are logarithmic quantities other than those described here which have their own units and are described in standards that cover the corresponding disciplines. Examples include optical density, pH, loudness level, star brightness, and earthquake magnitude.

0.2 Arrangements of the tables

The tables of quantities and units in this document are arranged so that the quantities and the units are presented on the same page.

The names of units for the corresponding quantities are given together with the international symbols and the definitions. These unit names are language-dependent, but the symbols are international and the same in all languages. For further information, see the SI Brochure (9th edition 2019) [1] from BIPM, ISO 80000-1 and ISO 80000-16 [2].

0.3 Numerical statements in this standard

The sign = is used to denote “is exactly equal to”, the sign ≈ is used to denote “is approximately equal to”, and the sign := is used to denote “is by definition equal to”. Three dots after the last digit of a decimal number mean that digits follow and the number is not rounded: $\pi = 3{,}141\,592\ldots$. Here, mostly 6 decimal digits are used but this is not obligatory. See ISO 80000-2:2019, items 2-8.1, 2-8.3, 2-8.5 and Clause 4.

0.4 Special remarks

The items given in IEC 80000-15 are generally in conformity with the International Electrotechnical Vocabulary (IEV) with some exceptions. For each quantity, the reference to IEV is given in the form: “See IEC 60050-xxx, item xxx-yy-yyy”.

QUANTITIES AND UNITS –

Part 15: Logarithmic quantities and their units

1 Scope

This part of ISO/IEC 80000 provides information about logarithmic quantities and their units.

The scope includes quantities and units commonly used for logarithmic ratios in science and engineering, especially in acoustics and electrical engineering. Also included are logarithmic quantities used in information theory, and logarithmic frequency ranges used in acoustics and musical theory.

Some logarithmic quantities describing logarithmic scales have been omitted from the scope. These have their own units and are typically described in standards that cover the corresponding scientific disciplines for those application fields. Examples include optical density, pH, loudness level, star brightness, and earthquake magnitude.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 80000-1:2022, Quantities and units – Part 1: General

ISO 80000-2:2019, Quantities and units – Part 2: Mathematics

ISO 80000-8:2020, Quantities and units – Part 8: Acoustics

IEC 80000-13:2025, Quantities and units – Part 13: Information science and technology

3 Terms and definitions

For the purposes of this document, the terms and definitions in the ISO/IEC 80000 series of standards apply.

Guidance is also available in the ISO and IEC terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

For logarithmic quantities for science and engineering, a summary is given in Table 1.

The names, symbols, and definitions for units for logarithmic quantities are given in the Table 2.

Table 3 gives the names and definitions of frequency intervals used in music based on the octave (2 : 1) and its musical subdivisions.

4 Logarithmic functions and quantities

4.1 Logarithmic functions

4.1.1 General

A general description of the logarithmic function is given in Annex A. For the purpose of the logarithmic quantities and units considered in this document, the following definition applies. If $a = b^c$, where the base, b, is a positive real number and $b \neq 1$, and a is a positive real number, then