

Australian Standard<sup>®</sup>

---

**Letter symbols for use in  
electrotechnology**

**Part 3: Logarithmic quantities and  
units**

---

[IEC title: Letter symbols to be used in electrical technology  
Part 3: Logarithmic quantities and units]

This Australian Standard was prepared by Committee TE/13, Symbols, Units and Quantities for Electrotechnology. It was approved on behalf of the Council of Standards Australia on 9 May 1991 and published on 12 July 1991.

---

The following interests are represented on Committee TE/13:

The Association of Consulting Engineers, Australia  
Board of Works, Melbourne  
Civil Aviation Authority  
Confederation of Australia Industry  
Department of Defence  
Department of Technical and Further Education, N.S.W.  
Department of Technical and Further Education, S.A.  
Electricity Supply Association of Australia  
Institute of Draftsmen, Australia  
Institution of Radio and Electronics Engineers, Australia  
Queensland Chamber of Mines  
Railways of Australia Committee  
Royal Melbourne Institute of Technology  
State Training Board of Victoria

---

**Review of Australian Standards.** To keep abreast of progress in industry, Australian Standards are subject to periodic review and are kept up to date by the issue of amendments or new editions as necessary. It is important therefore that Standards users ensure that they are in possession of the latest edition, and any amendments thereto.

Full details of all Australian Standards and related publications will be found in the Standards Australia Catalogue of Publications; this information is supplemented each month by the magazine 'The Australian Standard', which subscribing members receive, and which gives details of new publications, new editions and amendments, and of withdrawn Standards.

Suggestions for improvements to Australian Standards, addressed to the head office of Standards Australia, are welcomed. Notification of any inaccuracy or ambiguity found in an Australian Standard should be made without delay in order that the matter may be investigated and appropriate action taken.

---

*This Standard was issued in draft form for comment as DR 90179.*

Australian Standard<sup>®</sup>

---

**Letter symbols for use in  
electrotechnology**

**Part 3: Logarithmic quantities and  
units**

---

First published as AS 1046.3—1991.

## PREFACE

This Standard was prepared by the Standards Australia Committee on Symbols, Units and Quantities for Electrotechnology. It is identical with and has been reproduced from IEC 27-3 (1989), *Letter symbols to be used in electrical technology, Part 3: Logarithmic quantities and units*.

This Standard is the third part of a series which deals with letter symbols used in the electrical field, viz.:

AS

1046 *Letter symbols for use in electrotechnology*

1046.1 *Part 1: General*

1046.2 *Part 2: Telecommunications and electronics*

1046.3 *Part 3: Logarithmic quantities and units*

1046.4 *Part 4: Symbols for quantities to be used for rotating electrical machines.*

Under arrangements made between Standards Australia and the International Standards bodies, ISO and IEC, as well as certain other Standards organizations, users of this Australian Standard are advised of the following:

- (a) Copyright is vested in Standards Australia.
- (b) The number of this Standard is not reproduced on each page; its identity is shown only on the cover and title pages.
- (c) There may be occasional dual language sections, but English is always one of the languages reproduced.

For the purposes of this Australian Standard, the IEC text should be modified as follows:

- (i) *Decimal marker* Substitute a full point for a comma as a decimal marker.
- (ii) *References* Replace references to International Standards by references to Australian Standards as follows:

<i>Reference to International Standard</i>		<i>Australian Standard</i>	
IEC		AS	
50	International electrotechnical vocabulary (IEV)	1852	International electrotechnical vocabulary
50(702)	Chapter 702: Oscillations, signals and related devices (in preparation)	—	
ISO			
31	General principles concerning quantities, units and symbols	2900	Quantities, units and symbols
31-11	Part 11: Mathematical signs and symbols for use in the physical sciences and technology	2900.11	Part 11: Mathematical signs and symbols for use in the physical sciences and technology
2382	Data processing—Vocabulary	1189	Data processing—Vocabulary
2382-16	Part 16: Information theory	1189.16	Part 16: Information theory

© Copyright — STANDARDS AUSTRALIA

Users of Standards are reminded that copyright subsists in all Standards Australia publications and software. Except where the Copyright Act allows and except where provided for below no publications or software produced by Standards Australia may be reproduced, stored in a retrieval system in any form or transmitted by any means without prior permission in writing from Standards Australia. Permission may be conditional on an appropriate royalty payment. Requests for permission and information on commercial software royalties should be directed to the head office of Standards Australia.

Standards Australia will permit up to 10 percent of the technical content pages of a Standard to be copied for use exclusively in-house by purchasers of the Standard without payment of a royalty or advice to Standards Australia.

Standards Australia will also permit the inclusion of its copyright material in computer software programs for no royalty payment provided such programs are used exclusively in-house by the creators of the programs.

Care should be taken to ensure that material used is from the current edition of the Standard and that it is updated whenever the Standard is amended or revised. The number and date of the Standard should therefore be clearly identified.

The use of material in print form or in computer software programs to be used commercially, with or without payment, or in commercial contracts is subject to the payment of a royalty. This policy may be varied by Standards Australia at any time.

## CONTENTS

	Page
SCOPE AND INTRODUCTION .....	4
Clause	
1. Logarithmic quantities .....	4
1.1 General .....	4
1.2 Transmission path quantities .....	5
1.3 Levels .....	6
1.4 Frequency interval .....	6
1.5 Quantities related to information content .....	6
2. Units for logarithmic quantities .....	7
2.1 Neper and bel .....	7
2.2 Octave and decade .....	7
2.3 Shannon, hartley and natural unit of information .....	7
2.4 Multiples of units .....	8
3. Numerical values of logarithmic quantities .....	8
4. Logarithmic quantities with units .....	9
4.1 Attenuation $A$ .....	9
4.2 Gain $G$ .....	10
4.3 Attenuation coefficient $\alpha$ .....	11
4.4 Level, absolute level $L$ .....	11
4.5 Relative level $L_r$ .....	11
4.6 Frequency interval .....	11
5. Notation for expressing the reference of a level .....	12

## STANDARDS AUSTRALIA

---

**Australian Standard****Letter symbols for use in electrotechnology**

---

**Part 3: Logarithmic quantities and units**

---

## SCOPE AND INTRODUCTION

This standard applies to logarithmic quantities and units.

Quantities that can be expressed as the logarithm of a dimensionless quantity, such as the ratio of two physical quantities of the same kind, can be regarded and treated in different ways. In many cases, differences in principle do not affect the practical treatment.

Logarithmic quantities are here treated in a way that makes it possible, for example, to express the attenuation of a certain linear two-terminal network by the equally valid expressions  $A = 4,6$  nepers = 4,0 bels = 40 decibels, where 4,6, 4,0 and 40 are regarded as numerical values and “neper”, “bel” and “decibel” as units with specified relationships.

The fact that this standard is based on certain principles and assumptions implies no opinion whether any other principle or assumption is “right” or “wrong”. This standard relates to the handling of logarithmic quantities, without regard to their interpretation or specific application.

The fact that only some logarithmic quantities are particularly dealt with here does not imply that other logarithmic quantities do not exist. It is possible that other logarithmic quantities will be particularly dealt with in a later edition or separately.

**1. Logarithmic quantities****1.1 General***logarithmic quantity*

A quantity expressed as the logarithm of the ratio of two quantities of the same kind (two voltages, two powers, two frequencies) or as the logarithm of any dimensionless quantity. For a complete definition of a logarithmic quantity, the base of the logarithm shall be specified.

In the set of logarithmic quantities can also be included quantities which are derivatives of a logarithmic quantity, or quotients of a logarithmic quantity and another quantity. An example of such a derivative is the attenuation coefficient (see Sub-clause 4.3).

The logarithmic quantities particularly dealt with here are transmission path quantities, levels, frequency intervals and decision content.

For transmission path quantities and levels, one must deal with two sets of the quantities to whose ratios the logarithmic quantities correspond, namely field quantities and power quantities.

*Field quantity* is a quantity such as voltage, current, sound pressure, electric field strength, velocity and charge density, the square of which in linear systems is proportional to power.

*Power quantity* is power or a quantity directly proportional to power, e.g. energy density, acoustic intensity and luminous intensity.