Recognized as an
American National Standard (ANSI)

ANSI/IEEE
Std 260.1-1993
(Revision and redesignation of IEEE Std 260-1978)

American National Standard Letter Symbols for Units of Measurement
(SI Units, Customary Inch-Pound Units, and Certain Other Units)

Sponsor

Standards Coordinating Committee 14 on Quantities, Units, and Letter Symbols

Approved June 17, 1993

IEEE Standards Board

Approved November 24, 1993

American National Standards Institute

Abstract: General principles of letter symbol standardization are discussed. Symbols are given for general use and for use with limited character sets. The symbols given are intended for all applications, incuding use in text and equations; in graphs and diagrams; and on panels, labels, and nameplates.
Keywords: abbreviations, letter symbols, measurement, SI, symbols, units

---

The Institute of Electrical and Electronics Engineers, Inc.
345 East 47th Street, New York, NY 10017-2394, USA

Copyright © 1994 by the Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 1994. Printed in the United States of America

ISBN 1-55937-336-9

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

IEEE Standards documents are developed within the Technical Committees of the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Board. Members of the committees serve voluntarily and without compensation. They are not necessarily members of the Institute. The standards developed within IEEE represent a consensus of the broad expertise on the subject within the Institute as well as those activities outside of IEEE that have expressed an interest in participating in the development of the standard.

Use of an IEEE Standard is wholly voluntary. The existence of an IEEE Standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE Standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard. Every IEEE Standard is subjected to review at least every five years for revision or reaffirmation. When a document is more than five years old and has not been reaffirmed, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE Standard.

Comments for revision of IEEE Standards are welcome from any interested party, regardless of membership affiliation with IEEE. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments.

Interpretations: Occasionally questions may arise regarding the meaning of portions of standards as they relate to specific applications. When the need for interpretations is brought to the attention of IEEE, the Institute will initiate action to prepare appropriate responses. Since IEEE Standards represent a consensus of all concerned interests, it is important to ensure that any interpretation has also received the concurrence of a balance of interests. For this reason IEEE and the members of its technical committees are not able to provide an instant response to interpretation requests except in those cases where the matter has previously received formal consideration.

Comments on standards and requests for interpretations should be addressed to:

Secretary, IEEE Standards Board
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331
USA

IEEE standards documents may involve the use of patented technology. Their approval by the Institute of Electrical and Electronics Engineers, Inc. does not mean that using such technology for the purpose of conforming to such standards is authorized by the patent owner. It is the obligation of the user of such technology to obtain all necessary permissions.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Introduction

[This introduction is not a part of ANSI/IEEE Std 260.1-1993, American National Standard Letter Symbols for Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).]

Since the first edition of this standard appeared in 1965, there has been worldwide acceptance of the International System of Units (SI) and of the associated rules for unit symbols. The US Congress has declared, in the Omnibus Trade and Competitiveness Act of 1988, that it is "the Policy of the United States (1) to designate the metric system of measurement as the preferred system of weights and measurements for United States trade and commerce; (2) to require that each Federal Agency, by a date certain and to the extent economically feasible by the end of fiscal year 1992, use the metric system of measurements in its procurements, grants, and other business-related activities . . . ."

This standard covers the symbols for SI units and for certain other units of practical importance at present. As in previous editions, SI units are clearly identified, and the most recent (1991) actions of the International Committee for Weights and Measures have been incorporated.

This revision was prepared under the auspices of IEEE Standards Coordinating Committee 14 on Quantities, Units, and Letter Symbols (SCC14) by its Subcommittee on Letter Symbols for Units (SCC14.3). At the time of approval of this standard, the membership of Subcommittee 14.3 was as follows:

Bruce B. Barrow, *Chair*
Barry N. Taylor, *Vice-Chair*

Stan R. Jakuba	Joseph G. Langenstein	John T. Scott
Chris Kuyatt	Chester H. Page	Joe D. Simmons

The following persons were on the balloting committee:

Bruce B. Barrow	Harry M. Hesse	Arthur O. McCoubrey
Andrew F. Dunn	Ron K. Jurgen	Conrad R. Muller
Stanley L. Ehrlich	William R. Kruesi	Chester H. Page
Robert V. Esperti	Chris E. Kuyatt	Ralph M. Showers
John A. Goetz	Jack M. Loudon	Alan S. Whelihan

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

When the IEEE Standards Board approved this standard on June 17, 1993, it had the following membership:

Wallace S. Read, *Chair* **Donald C. Loughry,** *Vice Chair*
Andrew G. Salem, *Secretary*

Gilles A. Baril
José A. Berrios de la Paz
Clyde R. Camp
Donald C. Fleckenstein
Jay Forster*
David F. Franklin
Ramiro Garcia
Donald N. Heirman
Jim Isaak
Ben C. Johnson
Walter J. Karplus
Lorraine C. Kevra
E. G. "Al" Kiener
Ivor N. Knight
Joseph L. Koepfinger*
D. N. "Jim" Logothetis
Don T. Michael*
Marco W. Migliaro
L. John Rankine
Arthur K. Reilly
Ronald H. Reimer
Gary S. Robinson
Leonard L. Tripp
Donald W. Zipse

*Member Emeritus

Also included are the following nonvoting IEEE Standards Board liaisons:

Satish K. Aggarwal
James Beall
Richard B. Engelman
David E. Soffrin
Stanley Warshaw

Mary Lynne Nielsen
IEEE Standards Project Editor

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Contents

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

American National Standard Letter Symbols for Units of Measurement
(SI Units, Customary Inch-Pound Units, and Certain Other Units)

1. Scope

This standard covers letter symbols[1] for units of measurement. It does not include abbreviations for technical terms, nor does it cover symbols for physical quantities.[2]

The symbols given in this standard are intended for all applications, including use in text and equations; in graphs and diagrams; and on panels, labels, and nameplates.

2. References

ANSI/IEEE Std 268-1992, American National Standard for Metric Practice.[3]

3. Abbreviations

The following abbreviations are used in this standard:

ANSI American National Standards Institute
CGPM Conférence Générale des Poids et Mesures (General Conference on Weights and Measures)
CGS centimeter-gram-second
CIPM Comité International des Poids et Mesures (International Committee for Weights and Measures)

---

[1]"Letter symbol" as a technical term does not have the same meaning as either "name" or "abbreviation." An abbreviation is a letter or a combination of letters (plus sometimes an apostrophe or a full stop, i.e., a period) that by convention represents a *word* or a *name* in a particular language; hence, an abbreviation may be different in a different language. A symbol represents a *physical quantity* or a *unit* and is therefore independent of language. For example, the symbol for electromotive force is *E*, whereas the abbreviation is emf in English, fem in French, and EMK in German. The unit names "ampere" and "second" have sometimes been abbreviated amp and sec, respectively, but this usage is now deprecated. The standard unit symbols for ampere and second are A and s, respectively.

[2]As used in this standard, the term *physical quantity* means a measurable attribute of phenomena or matter. Examples are length, mass, and time.

[3]IEEE publications are available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

IEC International Electrotechnical Commission
ISO International Organization for Standardization
SI Système International d'Unités (International System of Units)

4. General principles of letter symbol standardization

4.1 Letter symbols

Letter symbols include symbols for physical quantities (quantity symbols) and symbols for the units in which these quantities are measured (unit symbols).

A quantity symbol is, in general,[4] a single letter (for example, *I* for electric current) specified as to general form of type and modified when appropriate by one or more subscripts or superscripts. In a given work, the same letter symbol should appear throughout for the same physical quantity, regardless of the units employed or of special values assigned.

A unit symbol[5] is a letter or group of letters (for example, mm for millimeter), or in a few cases a special sign, that may be used in place of the name of a unit.

4.2 Alphabets and typography

Letter symbols are mainly restricted to the English and Greek alphabets. Greek letters that are easily confused with English letters shall be avoided. The type families that are used for text in modern book and journal publishing all include italic (oblique) type faces and related roman (upright) faces. The former are used for quantity symbols; the latter, for unit symbols. The distinctions are discussed more fully in the following paragraphs. (In the context of this standard, the term *roman* is used simply to mean upright in contrast with oblique and carries no connotation regarding serifs, line widths, or the like.) In situations where roman and italic are not both available, care shall be taken to avoid confusion between quantities and units. For example, an underline is frequently used to indicate italic type, and where an underline can be provided, as in manual typewriting, this practice is often helpful.

Unconventional typefaces should generally not be used for letter symbols. Script and Old English faces, for example, are not appropriate for unit symbols. Such special faces have seen limited use for quantity symbols, but good modern practice avoids them.

Symbols for physical quantities, mathematical variables, indexes, and general functions[6] are printed in italic type. For example:

A	area
e	elementary electric charge
x, y, z	Cartesian coordinates
i, j, k, n	indexes
f(x)	function of *x*

[4]Symbols comprised of two letters are sometimes used for numerical transport parameters, such as *Re* for Reynolds number.

[5]Unit symbols have sometimes been treated in the same manner as general abbreviations, but the recommendations of the International Committee for Weights and Measures (CIPM), and of many other international and national bodies concerned with standardization, emphasize the symbolic character of these designations and rigidly prescribe the manner in which they shall be treated. This concept of the unit symbol is therefore adopted in this standard.

[6]The term *general functions* is here used to contrast with *specific mathematical functions*, for which roman type is to be used.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Symbols for units of measurement, mathematical constants, specific mathematical functions, operators, and numerals used as indexes are printed in roman type. For example:

cm	centimeter
e	base of natural logarithms
sin x	sine of x
$J_2(z)$, $J_n(z)$	Bessel functions
dx	differential of x

Subscripts and superscripts are governed by the above principles. Those that are letter symbols for quantities or for indexes are printed in italic type, while all others are printed in roman type. For example:

C_p	heat capacity at constant pressure p
a_{ij}, a_{45}	matrix elements
I_i, I_o	input current, output current
x_av	average value of x

For indicating the vector character of a quantity, boldface italic type is used. For example:

$\boldsymbol{F}$	force
$\boldsymbol{H}$	magnetic field strength

Ordinary italic type is used to represent the magnitude of a vector quantity. It is also commonly used for a vector quantity when there is no need to draw attention to the vector character of the quantity.

When tensor quantities of second or higher order are to be represented by a single letter, sans serif type should be used (for example, A, B).

4.3 Remarks concerning quantity symbols

Quantity symbols may be used in mathematical expressions in any way consistent with good mathematical usage. The product of two quantities, a and b, is indicated by writing ab. The quotient may be indicated by writing

$$\frac{a}{b},\ a/b,\ \text{or}\ ab^{-1}$$

If more than one slash (/) is used in any algebraic term, parentheses shall be inserted to remove any ambiguity. Thus, one may write $(a/b)/c$, or $a/(b/c)$, but not $a/b/c$.

Subscripts and superscripts are widely used with quantity symbols. Several subscripts or superscripts, sometimes separated by commas, may be attached to a single letter. But, so far as logical clarity permits, subscripts and superscripts should not be attached to other subscripts and superscripts. A symbol that has been modified by a superscript should be enclosed in parentheses before an exponent is attached.

Conflicts that occur because different quantities are assigned identical symbols in the same or different standard symbol lists should be resolved in one of the following ways:

a) By use of a reserve symbol (alternative symbol) if one is listed

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

b) By use of a subscript or superscript selected by the author for one or more of the conflicting requirements
c) By use of uppercase letters as variants for lowercase letters and vice versa, but only if no ambiguity results

4.4 Remarks concerning unit symbols

A roman (upright) type font shall be used for unit symbols, even when the surrounding text is in an italic font. In general, unit symbols are lowercase letters, except for a very few that use special signs (such as ° for degree). If, however, the symbol is for a unit whose name is derived from a proper name, uppercase roman type is used for the first letter.[7] As a further exception to the general rule, the symbol L is used for liter to avoid confusion between the lowercase letter l and the numeral 1. Some additional exceptions arise in the special cases where symbols are joined, as in eV, the symbol for electronvolt, and in mmHg, the symbol for conventional millimeter of mercury, a unit of pressure. The distinction between upper- and lowercase letters shall be followed, even if the symbol appears in applications where the other lettering is uppercased. The form of unit symbols is the same for both singular and plural, and they are not followed by a period except at the end of a sentence.

In the complete expression for a quantity, a space should be left between the numerical value and the unit symbol. For example, write 35 mm, not 35mm, and 2.371 m, not 2.371m. When the quantity is used in an adjectival sense, a hyphen is often used in lieu of a space between the number and the unit name or between the number and the symbol.

Examples:

A 3-meter pole ..... The length is 3 meters.
A 35-mm film ..... The width is 35 mm.

EXCEPTION: No space is left between the numerical value and the symbols for degree, minute, and second of plane angle.

When a compound unit is formed by multiplication of two or more other units, its symbol consists of the symbols for the separate units joined by a raised dot (preferred) or separated by a space (for example, N·m or N m for newton meter). The dot may be omitted in the case of familiar compounds such as watthour (symbol Wh) if confusion is unlikely. Hyphens should not be used in symbols for compound units. Positive and negative exponents may be used with the symbols for units.

When a compound unit is formed by division of one unit by another, its symbol is constructed in one of the following forms:

$$\text{m/s} \quad \text{or} \quad \text{m}\cdot\text{s}^{-1} \quad \text{or} \quad \frac{\text{m}}{\text{s}}$$

In simple cases use of the slash is preferred, but in no case should more than one slash, or a slash followed by a product, be used in the same expression unless parentheses are inserted to avoid ambiguity. For example, write:

$$\text{J/(mol}\cdot\text{K)} \quad \text{or} \quad \text{J}\cdot\text{mol}^{1}\cdot\text{K}^{-1} \quad \text{or} \quad \text{(J/mol)/K}$$

but *not* J/mol/K or J/mol·K

[7] Prefixes are considered separately (see 4.5).

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

In complicated cases, negative powers should be used.[8]

Letter symbols and mathematical notation should not be mixed with unit names in the same expression. For example, write joules per kilogram or J/kg. Do not write joules/kilogram or joules/kg, or J/kilogram.

4.5 The International System of Units (SI)

In this standard, some units are identified as SI units. These units belong to the International System of Units (Système International d'Unités), which is the name given in 1960 by the General Conference on Weights and Measures (Conférence Générale des Poids et Mesures) to the coherent system of units built upon the base units in table 1.

Table 1—SI Base Units

Unit	Physical quantity
meter	length
kilogram	mass
second	time
ampere	electric current
kelvin	thermodynamic temperature
mole	amount of substance
candela	luminous intensity

The spellings *meter* and *liter* are recommended.[9] The variant spellings *metre* and *litre* are also used.[10]

The prefixes in table 2 are used to indicate decimal multiples or submultiples of SI units.

Compound prefixes, formed by the juxtaposition of two or more SI prefixes, are not to be used. For example, use

nm, *not* mμm
pF, *not* μμF

For historical reasons, although the SI unit of mass is the kilogram (kg), the SI prefixes are attached to the gram (g). Thus, use milligram (mg), *not* microkilogram (μkg).

If values are required outside the range covered by the prefixes, they should be expressed using powers of ten applied to the unit in question. Thus, 10^{-34} J.

[8]The notation for products and quotients of unit symbols is intentionally made more explicit than that given in 4.3 for quantity symbols because some unit symbols are comprised of more than one letter.

[9]This is in accordance with guidance given by the US Department of Commerce, which, under the Metric Conversion Act of 1975, is given the responsibility of interpreting SI for the United States.

[10]The spelling of some unit names varies from language to language. One of the principal advantages of unit symbols is that they are language invariant.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Table 2—SI Prefixes

Multiple	SI prefix	Symbol
10^{24}	yotta	Y
10^{21}	zetta	Z
10^{18}	exa	E
10^{15}	peta	P
10^{12}	tera	T
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{2}	hecto	h
10	deka	da
10^{-1}	deci	d
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a
10^{-21}	zepto	z
10^{-24}	yocto	y

An exponent attached to a symbol containing a prefix indicates that the multiple or submultiple of the unit (the unit with its prefix) is raised to the power expressed by the exponent. For example:

$$\begin{aligned} \mathrm{cm}^3 &\quad \underline{\Delta}\ (10^{-2}\ \mathrm{m})^3 &&= 10^{-6}\ \mathrm{m}^3 \\ \mathrm{ns}^{-1} &\quad \underline{\Delta}\ (10^{-9}\ \mathrm{s})^{-1} &&= 10^{9}\ \mathrm{s}^{-1} \\ \mathrm{mm}^2/\mathrm{s} &\quad \underline{\Delta}\ (10^{-3}\ \mathrm{m})^2/\mathrm{s} &&= 10^{-6}\ \mathrm{m}^2/\mathrm{s} \end{aligned}$$

where $\underline{\Delta}$ indicates equality by definition.

For further information concerning metric practice and SI, refer to ANSI/IEEE Std 268-1992.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

4.6 Usage

The use of unit symbols in place of full names of the units is frequently desirable where space is restricted. Their use presupposes that the reader will find them intelligible. When an unfamiliar unit symbol is first used in text, it should be followed by its name in parentheses or the name should be given with the symbol in parentheses; the symbol may be used alone thereafter. Explanatory notes or keys should be included where appropriate on drawings and in tabular matter.

Attachment of letters to a unit symbol as a means of giving information about the quantity under consideration is incorrect. Thus MWe for "megawatts electrical (power)," Vac for "volts ac," and kJt for "kilojoules thermal (energy)" are not acceptable. For this reason, no attempt should be made to construct SI equivalents of the abbreviations "psia" and "psig," so often used to distinguish between absolute and gage pressure. If the context leaves any doubt as to which is meant, the word pressure shall be qualified appropriately. For example:

"...at a gage pressure of 13 kPa" *or*
"...at an absolute pressure of 13 kPa"

When space limitations make it necessary to juxtapose information about the quantity being measured with the unit name or unit symbol, such information shall be separated from the unit symbol by a space, by a comma followed with a space, or by the equivalent. Thus, the following examples are appropriate for use on nameplates, gage scale plates, table headings, graph labels, etc.:

rating—115 V ac
kPa, gage
kPa (abs)

On the other hand, letters may be attached to a unit symbol where needed to identify properly the unit involved. In such symbols as inHg, mmHg, and ftH_2O, the suffixes are needed to identify the units, which are units of pressure, not of length. Similarly, it is proper to write Btu_{IT}, cal_{th}, gal_{US}, etc. to distinguish from the related but different units Btu_{60}, cal_{15}, gal_{UK}, etc.

5. Unit symbols

Symbols for units are listed in table 3 alphabetically by the name of the unit. The list is intended to be reasonably complete but could not possibly include all units in current use.

Obsolescent units, such as apothecaries' weights, and units used almost exclusively in narrow fields of commerce, such as the bushel and hundredweight, have been omitted. Many compound symbols and many illustrations of the use of the SI prefixes are included. Other combined forms may easily be constructed using multiplication, division, and exponentiation according to the principles set forth in 4.4.

The distinction between uppercase and lowercase letters shown in the list is part of the standardization of the symbol, following international rules. Changing the letter case changes the symbol and violates this standard. There are situations in which the standard symbols cannot be used, for example, when the printing equipment has no provision for Greek letters or for lowercase letters. These situations are discussed in clause 6.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Table 3—Unit symbols for general use

Unit	Symbol	Notes*
ampere	A	SI unit of electric current.
ampere (turn)	A	SI unit of magnetomotive force.
ampere-hour	Ah	Also A·h.
ampere per meter	A/m	SI unit of magnetic field strength.
ångström	Å	Å $\underline{\Delta}$ 10^{-10} m. Deprecated (see ANSI/IEEE Std 268-1992).
atmosphere, standard	atm	atm $\underline{\Delta}$ 101 325 Pa. Deprecated (see ANSI/IEEE Std 268-1992).
atmosphere, technical	at	at $\underline{\Delta}$ kgf/cm^2. Deprecated (see ANSI/IEEE Std 268-1992).
atomic mass unit (unified)	u	The (unified) atomic mass unit is defined as one twelfth of the mass of an atom of the carbon-12 nuclide. Use of the old atomic mass unit (amu), defined by reference to oxygen, is deprecated.
atto	a	SI prefix for 10^{-18}.
attoampere	aA	
bar	bar	bar $\underline{\Delta}$ 100 kPa. Use of the bar is strongly discouraged (see ANSI/IEEE Std 268-1992) except for limited use in meteorology.
barn	b	b $\underline{\Delta}$ 10^{-28} m^2.
barrel	bbl	bbl $\underline{\Delta}$ 42 gal_{US} = 158.99 L. This is the standard barrel used for petroleum and petroleum products. Different standard barrels are used for other commodities.
barrel per day	bbl/d	
baud	Bd	In telecommunications, a unit of signaling speed equal to one element per second. The signaling speed in bauds is equal to the reciprocal of the signal element length in seconds.
bel	B	See the annex for guidance concerning notation.
becquerel	Bq	SI unit of activity of a radionuclide.
billion electronvolts	GeV	The name *gigaelectronvolt* is preferred for this unit.
bit	b	In information theory, the bit is a unit of information content equal to the information content of a message, the *a priori* probability of which is one-half. In computer science, the name bit is used as a short form of *binary digit*.
bit per second	b/s	

*The notes give exact definitions (indicated by the symbol $\underline{\Delta}$) for many of the units and give conversion factors in other cases. The conversion factors indicated with the equals sign are accurate to the number of figures shown. For more accurate conversion factors and other general information about units, see ANSI/IEEE Std 268-1992.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Table 3—Unit symbols for general use (*Continued*)

Unit	Symbol	Notes*
British thermal unit	Btu	
byte	B	A byte is a string of bits, usually eight bits long, operated on as a unit. A byte is capable of holding one character in the local character set.
calorie (International Table)	cal_{IT}	cal_{IT} $\underline{\Delta}$ 4.1868 J. Deprecated (see ANSI/IEEE Std 268-1992).
calorie (thermochemical)	cal	cal $\underline{\Delta}$ 4.184 J. Deprecated (see ANSI/IEEE Std 268-1992).
candela	cd	SI unit of luminous intensity.
candela per square inch	cd/in^2	Use of the SI unit, cd/m^2, is preferred.
candela per square meter	cd/m^2	SI unit of luminance.
candle	cd	The unit of luminous intensity has been given the name candela; use of the name candle for this unit is deprecated.
centi	c	SI prefix for 10^{-2}.
centimeter	cm	
centipoise	cP	cP $\underline{\Delta}$ mPa·s. The name centipoise is deprecated (see ANSI/IEEE Std 268-1992).
centistokes	cSt	cSt $\underline{\Delta}$ mm^2/s. The name centistokes is deprecated (see ANSI/IEEE Std 268-1992).
circular mil	cmil	cmil $\underline{\Delta}$ $(\pi/4)\cdot 10^{-6}$ in^2
coulomb	C	SI unit of electric charge.
cubic centimeter	cm^3	
cubic foot	ft^3	
cubic foot per minute	ft^3/min	
cubic foot per second	ft^3/s	
cubic inch	in^3	
cubic meter	m^3	
cubic meter per second	m^3/s	
cubic yard	yd^3	
curie	Ci	Ci $\underline{\Delta}$ 3.7 X 10^{10} Bq. A unit of activity of a radionuclide. Use of the SI unit, the becquerel, is preferred.
cycle per second	Hz	See hertz.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Table 3—Unit symbols for general use (*Continued*)

Unit	Symbol	Notes*
darcy	D	D $\triangleq$ cP·(cm/s)·(cm/atm) = 0.986 923 μm^2. A unit of permeability of a porous medium. By traditional definition, a permeability of one darcy will permit a flow of 1 cm^3/s of fluid of 1 cP viscosity through an area of 1 cm^2 under a pressure gradient of 1 atm/cm. Deprecated (see ANSI/IEEE Std 268-1992).
day	d	d $\triangleq$ 24 h.
deci	d	SI prefix for 10^{-1}.
decibel	dB	See the annex for guidance concerning notation.
degree (plane angle)	°	
degree (temperature):		
degree Celsius	°C	SI unit of Celsius temperature. The degree Celsius is a special name for the kelvin, used in expressing Celsius temperatures or temperature intervals.
degree Fahrenheit	°F	Note that the symbols for °C, °F, and °R are comprised of two elements, written with no space between the ° and the letter that follows. The two elements that make the complete symbol are not to be separated.
degree Kelvin		See kelvin.
degree Rankine	°R	
deka	da	SI prefix for 10.
dyne	dyn	dyn $\triangleq 10^{-5}$ N. Deprecated (see ANSI/IEEE Std 268-1992).
electronvolt	eV	
erg	erg	erg $\triangleq 10^{-7}$ J. Deprecated (see ANSI/IEEE 268-1992).
exa	E	SI prefix for 10^{18}.
farad	F	SI unit of capacitance.
femto	f	SI prefix for 10^{-15}.
femtometer	fm	
foot	ft	ft $\triangleq$ 0.3048 m.
foot of water	ftH_2O	ftH_2O = 2989.1 Pa (ISO).†
foot per minute	ft/min	
foot per second	ft/s	
foot per second squared	ft/s^2	
foot pound-force	ft·lbf	

†The term "(ISO)" means that the definition is from ISO 31 (see clause 7).

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Table 3—Unit symbols for general use (*Continued*)

Unit	Symbol	Notes*
footcandle	fc	fc $\underline{\Delta}$ lm/ft^2. The name lumen per square foot is also used for this unit. Use of the SI unit of illuminance, the lux (lumen) per square meter, is preferred.
footlambert	fL	fL $\underline{\Delta}$ (1/π)cd/ft^2. A unit of luminance. One lumen per square foot leaves a surface whose luminance is one footlambert in all directions within a hemisphere. Use of the SI unit, the candela per square meter, is preferred.
gal	Gal	Gal $\underline{\Delta}$ cm/s^2. Deprecated (see ANSI/IEEE Std 268-1992).
gallon	gal	gal_{UK} = 4.5461 L. gal_{US} $\underline{\Delta}$ 231 in^3 = 3.7854 L.
gauss	G	The gauss is the electromagnetic CGS unit of magnetic flux density. Deprecated (see ANSI/IEEE Std 268-1992).
giga	G	SI prefix for 10^9.
gigaelectronvolt	GeV	
gigahertz	GHz	
gigabyte	GB	GB $\underline{\Delta}$ 10^9 B.
gilbert	Gb	The gilbert is the electromagnetic CGS unit of magnetomotive force. Deprecated (see ANSI/IEEE Std 268-1992).
grain	gr	gr $\underline{\Delta}$ lb/7000.
gram	g	
gram per cubic centimeter	g/cm^3	
gray	Gy	SI unit of absorbed dose in the field of radiation dosimetry.
hecto	h	SI prefix for 10^2.
henry	H	SI unit of inductance.
hertz	Hz	SI unit of frequency.
horsepower	hp	hp $\underline{\Delta}$ 550 ft·lbf/s = 746 W. The horsepower is an anachronism in science and technology. Use of the SI unit of power, the watt, is preferred.
hour	h	
inch	in	in $\underline{\Delta}$ 2.54 cm.
inch of mercury	inHg	inHg = 3386.4 Pa (ISO).
inch of water	inH_2O	inH_2O = 249.09 Pa (ISO).
inch per second	in/s	
joule	J	SI unit of energy, work, and quantity of heat.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Table 3—Unit symbols for general use (*Continued*)

Unit	Symbol	Notes*
joule per kelvin	J/K	SI unit of heat capacity and of entropy.
kelvin	K	In 1967, the CGPM gave the name *kelvin* to the SI unit of temperature, which had formerly been called *degree kelvin*, and assigned it the symbol K (without the symbol °).
kilo	k	SI prefix for 10^3. The symbol K shall not be used for kilo. The prefix kilo shall not be used to mean 2^{10} (that is, 1024).
kilobit per second	kb/s	
kilobyte	kB	kB $\underline{\Delta}$ 1000 bytes.
kilogauss	kG	Deprecated (see ANSI/IEEE Std 268-1992).
kilogram	kg	SI unit of mass.
kilogram-force	kgf	Deprecated (see ANSI/IEEE Std 268-1992). In some countries the name kilopond (kp) has been used for this unit.
kilohertz	kHz	
kilohm	kΩ	
kilometer	km	
kilometer per hour	km/h	
kilopound-force	klbf	Kilopound-force should not be misinterpreted as kilopond (see kilogram-force).
kilovar	kvar	
kilovolt	kV	
kilovoltampere	kVA	
kilowatt	kW	
kilowatthour	kWh	Also kW·h.
knot	kn	kn $\underline{\Delta}$ nmi/h.
lambert	L	L $\underline{\Delta}$ $(1/\pi)$cd/cm^2. A CGS unit of luminance. One lumen per square centimeter leaves a surface whose luminance is one lambert in all directions within a hemisphere. Deprecated (see ANSI/IEEE Std 268-1992).
liter	L	L $\underline{\Delta}$ 10^{-3} m^3. In 1979, the CGPM approved L and l as alternative symbols for the liter. Because of frequent confusion with the numeral 1, the letter symbol l is not recommended for US use (see Federal Register notice of December 20, 1990, vol. 55, no. 245, p. 52242). The script *l* shall not be used as a symbol for liter.
liter per second	L/s	
lumen	lm	SI unit of luminous flux.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Table 3—Unit symbols for general use (*Continued*)

Unit	Symbol	Notes*
lumen per square foot	lm/ft^2	A unit of illuminance and also a unit of luminous exitance. Use of the SI unit, lumen per square meter, is preferred.
lumen per square meter	lm/m^2	SI unit of luminous exitance.
lumen per watt	lm/W	SI unit of luminous efficacy.
lumen second	lm·s	SI unit of quantity of light.
lux	lx	lx $\underline{\Delta}$ lm/m^2. SI unit of illuminance.
maxwell	Mx	The maxwell is the electromagnetic CGS unit of magnetic flux. Deprecated (see ANSI/IEEE Std 268-1992).
mega	M	SI prefix for 10^6. The prefix mega shall not be used to mean 2^{20} (that is, 1 048 576).
megabit per second	Mb/s	
megabyte	MB	MB $\underline{\Delta}$ 1 000 000 bytes.
megaelectronvolt	MeV	
megahertz	MHz	
megohm	MΩ	
meter	m	SI unit of length.
metric ton	t	t $\underline{\Delta}$ 1000 kg. Use of the name *tonne* is deprecated in the US (see ANSI/IEEE Std 268-1992).
mho	S	The name *mho* was formerly given to the recriprocal ohm. Deprecated; see siemens (S).
micro	µ	SI prefix for 10^{-6}.
microampere	µA	
microfarad	µF	
microgram	µg	
microhenry	µH	
microinch	µin	
microliter	µL	See note for liter.
micrometer	µm	
micron	µm	The name micron is deprecated. Use micrometer.
microsecond	µs	
microwatt	µW	
mil	mil	mil $\underline{\Delta}$ 0.001 in.
mile (statute)	mi	mi $\underline{\Delta}$ 5280 ft = 1609 m.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Table 3—Unit symbols for general use (*Continued*)

Unit	Symbol	Notes*
mile per hour	mi/h	Although use of mph as an abbreviation is common, it should not be used as a symbol.
milli	m	SI prefix for 10^{-3}.
milliampere	mA	
millibar	mbar	Use of the bar is strongly discouraged in ANSI/IEEE Std 268-1992 except for limited use in meteorology.
milligram	mg	
millihenry	mH	
milliliter	mL	See note for liter.
millimeter	mm	
millimeter of mercury	mmHg	mmHg = 133.322 Pa. Deprecated (see ANSI/IEEE Std 268-1992).
millimicron	nm	Use of the name millimicron for the nanometer is deprecated.
millipascal second	mPa·s	SI unit-multiple of dynamic viscosity.
millisecond	ms	
millivolt	mV	
milliwatt	mW	
minute (plane angle)	'	
minute (time)	min	Time may also be designated by means of superscripts as in the following example: $9^{h}\ 46^{m}\ 30^{s}$.
mole	mol	SI unit of amount of substance. The mole is the amount of substance of a system that contains as many elementary entities as there are atoms in 0.012 kg of carbon 12. When the mole is used, the elementary entities shall be specified and may be atoms, molecules, ions, electrons, other particles, or specified groups of such particles.
month	mo	
nano	n	SI prefix for 10^{-9}.
nanoampere	nA	
nanofarad	nF	
nanometer	nm	
nanosecond	ns	
nautical mile	nmi	nmi $\underline{\Delta}$ 1852 m.
neper	Np	See the annex for guidance concerning notation.
newton	N	SI unit of force.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Table 3—Unit symbols for general use (*Continued*)

Unit	Symbol	Notes*
newton meter	N·m	
newton per square meter	N/m^2	SI unit of pressure or stress; see pascal.
oersted	Oe	The oersted is the electromagnetic CGS unit of magnetic field strength. Deprecated (see ANSI/IEEE Std 268-1992).
ohm	Ω	SI unit of resistance.
ounce (avoirdupois)	oz	oz $\underline{\Delta}$ 1/16 lb = 28.350 g.
pascal	Pa	Pa $\underline{\Delta}$ N/m^2. SI unit of pressure or stress.
pascal second	Pa·s	SI unit of dynamic viscosity.
peta	P	SI prefix for 10^{15}.
phot	ph	ph $\underline{\Delta}$ lm/cm^2. CGS unit of illuminance. Deprecated (see ANSI/IEEE Std 268-1992).
pico	p	SI prefix for 10^{-12}.
picofarad	pF	
picowatt	pW	
pint	pt	pt (UK) = 0.568 26 L. pt (US dry) = 0.550 61 L. pt (US liquid) = 0.473 18 L.
poise	P	Deprecated (see ANSI/IEEE Std 268-1992).
pound (avoirdupois)	lb	lb $\underline{\Delta}$ 0.453 592 37 kg.
pound per cubic foot	lb/ft^3	
pound-force	lbf	lbf = 4.4482 N.
pound-force foot	lbf·ft	
pound-force per square foot	lbf/ft^2	
pound-force per square inch	lbf/in^2	Although use of the abbreviation psi is common, it should not be used as a symbol.
poundal	pdl	pdl $\underline{\Delta}$ $lb·ft/s^2$ = 0.1383 N.
quart	qt	qt (UK) = 1.1365 L. qt (US dry) = 1.1012 L. qt (US liquid) = 0.946 35 L.
rad	rd	rd $\underline{\Delta}$ 0.01 Gy. A unit of absorbed dose in the field of radiation dosimetry. Use of the SI unit, the gray, is preferred.
radian	rad	SI unit of plane angle.
rem	rem	rem $\underline{\Delta}$ 0.01 Sv. A unit of dose equivalent in the field of radiation dosimetry. Use of the SI unit, the sievert, is preferred.
revolution per minute	r/min	Although use of rpm as an abbreviation is common, it should not be used as a symbol.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Table 3—Unit symbols for general use (*Continued*)

Unit	Symbol	Notes*
revolution per second	r/s	
roentgen	R	A unit of exposure in the field of radiation dosimetry.
second (plane angle)	"	
second (time)	s	SI unit of time.
siemens	S	S $\triangleq \Omega^{-1}$. SI unit of conductance.
sievert	Sv	SI unit of dose equivalent in the field of radiation dosimetry.
slug	slug	slug $\triangleq$ lbf·s^2/ft = 14.594 kg.
square foot	ft^2	
square inch	in^2	
square meter	m^2	
square meter per second	m^2/s	SI unit of kinematic viscosity.
square millimeter per second	mm^2/s	SI unit-multiple of kinematic viscosity.
square yard	yd^2	
steradian	sr	SI unit of solid angle.
stilb	sb	sb $\triangleq$ cd/cm^2. A CGS unit of luminance. Deprecated (see ANSI/IEEE Std 268-1992).
stokes	St	Deprecated (see ANSI/IEEE Std 268-1992).
tera	T	SI prefix for 10^{12}.
terabyte	TB	TB $\triangleq$ 10^{12} B.
tesla	T	T $\triangleq$ N/(A·m) $\triangleq$ Wb/m^2. SI unit of magnetic flux density (magnetic induction).
therm	thm	thm $\triangleq$ 100 000 Btu.
ton (short)	ton	ton $\triangleq$ 2000 lb.
ton, metric	t	t $\triangleq$ 1000 kg. Use of the name *tonne* for this unit is deprecated in the US (see ANSI/IEEE Std 268-1992).
(unified) atomic mass unit	u	The (unified) atomic mass unit is defined as one-twelfth of the mass of an atom of the carbon-12 nuclide. Use of the old atomic mass unit (amu), defined by reference to oxygen, is deprecated.
var	var	IEC name and symbol for the SI unit of reactive power.
volt	v	SI unit of voltage.
volt per meter	V/m	SI unit of electric field strength.
voltampere	VA	IEC name and symbol for the SI unit of apparent power.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Table 3—Unit symbols for general use (*Continued*)

Unit	Symbol	Notes*
watt	W	SI unit of power.
watt per meter kelvin	W/(m·K)	SI unit of thermal conductivity.
watt per steradian	W/sr	SI unit of radiant intensity.
watt per steradian square meter	$W/(sr \cdot m^2)$	SI unit of radiance.
watthour	Wh	
weber	Wb	Wb $\underline{\Delta}$ V·s. SI unit of magnetic flux.
yard	yd	yd $\underline{\Delta}$ 0.914 4 m.
year	a	Also W·h.
yocto	y	SI prefix for 10^{-24}.
yotta	Y	SI prefix for 10^{24}.
zepto	z	SI prefix for 10^{-21}.
zetta	Z	SI prefix for 10^{21}.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

6. Unit symbols to be used with limited character sets

This clause is to be applied when only a limited set of characters is available to express unit symbols and when the unit symbols are intended for interpretation by human beings. Such applications often arise when text is transmitted by teleprinter or when information is prepared for computer display. It has to be stressed that the limited-character-set symbols of this clause shall never be used when in fact the available character set would permit the use of the general standard symbols as given in clause 5.

This clause is generally consistent with ANSI X3.50-1986 [B1] and ISO 2955: 1983 [B12], but both standards are intended for applications in the field of information processing, where unambiguous transmission of information between computers is required. This clause gives guidance for the preparation of unit symbols that are intended for use by human beings. The fact that the character set is limited leads to a few cases of ambiguity. However, in almost all cases this ambiguity is theoretical rather than real, which means that no confusion in human interpretation can reasonably be expected. In the very few cases where only a limited character set is available and the application of the symbols of this clause would lead to possible confusion, the unit names should be written in full.

Various types of character-set limitations are listed below, together with the rules to be followed in these situations and with comments, where appropriate, on the application of the rules.

6.1 Character set lacks Greek letters

a) For μ, substitute u.
   Example: μA for microampere becomes uA.
   Remark: In typewritten text or masters prepared for photoreproduction, a “tail” should be added to the μ by hand.
b) For Ω, substitute Ohm.
   Example: The symbol for kilohm (kΩ) becomes kOhm.
   Remark: Note the use of the uppercase O, where available, in the substitute symbol Ohm, following the rule of 4.4.

6.2 Character set lacks superscript symbols

a) For °C, °F, and °R, substitute, C, F, and R.
   Example: A temperature of 12 degrees Celsius becomes 12 C.
b) For units of plane angle, substitute as follows:

degree	°	use	deg
minute	'	use	min
second	"	use	sec

6.3 Character set lacks superscript numerals

Use numerals on the line. Do not use any space between the principal unit symbol and its exponent, whether positive or negative.

Example: The symbol for square millimeter becomes mm2. The symbol for watt per square meter becomes W/m2 or W m-2.

6.4 Character set lacks raised dot

Use a space to indicate multiplication of units.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Example: N m for newton meter.

6.5 Character set limited to a single case

Use of the symbols in clause 5, writing them in the single available case (whether uppercase or lowercase) without change, is recommended. In those rare cases where the context does not eliminate all reasonable chance of ambiguity, the unit names should be written in full. The examples below are given in uppercase only for simplicity.

Example: Use M for mega and M for milli. Very few units are used with both these prefixes, and in the few cases where both are possible, such as MW for milliwatt or megawatt, the context almost always makes the intention clear. Where this is not the case, write the unit name in full.

Example: Use P for pico and P for peta.

Example: Use H for henry and H for hour.

Example: Use S for second (time) and S for siemens.

Example: Use T for tesla and T for metric ton. Confusion is extremely unlikely because of context and because the tesla is such a very large unit of magnetic flux density that it almost always appears with submultiple prefixes. If necessary to avoid all possible ambiguity, write “metric ton” in full.

6.6 Examples of symbols for limited character sets

Table 4 shows many examples of how the foregoing principles may be applied.

The column labeled Form I applies to data systems that have the capability to use both uppercase and lowercase letters; digits; and at least the graphic characters apostrophe (’), quotation mark (“), hyphen (-), period (.), and slash (/). However, they do not have the capability to use the Greek letters μ and Ω; the degree sign (°); or letters, digits, and signs in superscript position.

The column labeled Form II applies to data systems that are further limited in that they have only one case (either uppercase or lowercase), and they lack the apostrophe and quotation mark.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Table 4—Examples of symbols for limited character sets

	Form I	Form II	
	(Both cases)	(Lowercase only)	(Uppercase only)
ampere	A	a	A
ampere per meter	A/m	a/m	A/M
ångström	A	a	A
barrel	bbl	bbl	BBL
becquerel	Bq	bq	BQ
British thermal unit	Btu	btu	BTU
candela per square meter	cd/m2	cd/m2	CD/M2
centimeter	cm	cm	CM
coulomb	c	c	C
cubic meter per second	m3/s	m3/s	M3/S
decibel	dB	db	DB
degree (angle)	deg	deg	DEG
degree Celsius	c	c	C
degree Fahrenheit	F	f	F
farad	F	f	F
foot per second	ft/s	ft/s	FT/S
henry	H	h	H
hour	h	h	H
joule per kelvin	J/K	j/k	J/K
kilogram	kg	kg	KG
kilometer	km	km	KM
kilowatthour	kWh	kwh	KWH
lumen per watt	lm/w	lm/w	LM/W
megahertz	MHz	mhz	MHZ
megohm*	MOhm	mohm	MOHM
meter	m	m	M
metric ton	t	t	T
microfarad	uF	uf	UF
microsecond	us	us	US
mile per hour	mi/h	mi/h	MI/H

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Table 4—Examples of symbols for limited character sets (*Continued*)

	Form I	Form II	
	(Both cases)	(Lowercase only)	(Uppercase only)
milliliter	mL	mi	ML
millipascal second	mpa s	mpa s	MPA S
newton meter	N m	n m	N M
picowatt	pW	PW	PW
pound-force foot	lbf ft	lbf ft	LBF FT
tesla	T	t	T
volt per meter	V/m	v/m	V/M
watt per steradian square meter	W/(sr m2)	w/(sr m2)	W/(SR M2)
weber	Wb	wb	WB
yard	yd	yd	YD

*If the context permits confusion with milliohm, write in full.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

7. Bibliography

[B1] ANSI X3.50-1986 (Reaff. 1992), American National Standard for Information Systems—Representations for U.S. Customary, SI, and Other Units to Be Used in Systems with Limited Character Sets.[1]

[B2] ISO 31-0: 1992, Quantities and units—Part 0: General principles.[2]

[B3] ISO 31-1: 1992, Quantities and units—Part 1: Space and time.

[B4] ISO 31-2: 1992, Quantities and units—Part 2: Periodic and related phenomena.

[B5] ISO 31-3: 1992, Quantities and units—Part 3: Mechanics.

[B6] ISO 31-4: 1992, Quantities and units—Part 4: Heat.

[B7] ISO 31-5: 1979, Quantities and unit of electricity and magnetism.

[B8] ISO 31-6: 1992, Quantities and units—Part 6: Light and related electromagnetic radiations.

[B9] ISO 31-7: 1992, Quantities and units—Part 7: Acoustics.

[B10] ISO 31-8: 1980, Quantities and units of physical chemistry and molecular physics.

[B11] ISO 1000: 1981, SI units and recommendations for the use of their multiples and of certain other units.

[B12] ISO 2955: 1983, Information processing—Representation of SI and other units in systems with limited character sets.

[B13] NIST Special Publication 330, The International System of Units (SI).[3]

[1]ANSI publications are available from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, USA.

[2]ISO publications are available from ISO, Case Postale 56, 1 rue de Varembé, CH-1211, Genève 20, Switzerland/Suisse. ISO publications are also available in the United States from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, USA.

[3]NIST publications are available from the Superintendent of Documents, US Government Printing Office, Washington, DC 20402, USA.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.

Annex

Notation for expressing the reference of a level

(informative)

[This annex is not a part of ANSI/IEEE Std 260.1-1993, American National Standard Letter Symbols for Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units), but is included for information only.]

The *level* representing a physical quantity x with a reference quantity x_{ref} may be indicated by

L_x (ref x_{ref}) or by $L_{x/x\text{ref}}$

Examples:

The statement that a certain sound pressure level is 15 dB above the level corresponding to a reference pressure of 20 μPa can be written as

L_p (ref 20 μPa) = 15 dB

or as

$L_{p/(20\ \mu\text{Pa})}$ = 15 dB

The statement that the level of an electric current is 10 Np below 1 A can be written as

L_I (ref 1 A) = -10 Np

The statement that a certain power level is 7 dB above 1 mW can be written as

L_P (ref 1 mW) = 7 dB

The statement that a certain electric field strength is 50 dB above 1 μV/m can be written as

L_E (ref 1 μV/m) = 50 dB

In presenting data, particularly in tabular form or in graphical symbols, a condensed notation is often needed for identifying the reference value. Then the following condensed form, illustrated by application to the above examples, may be used:

15 dB (20 μPa)
-10 Np (1 A)
7 dB (1 mW)
50 dB (1 μV/m)

A “1” in the expression of a reference quantity is sometimes omitted. This is not recommended in cases where confusion is likely to occur.

When a constant reference quantity is used repeatedly in a given context and explained in the text, it may be omitted.

Licensed to /Mark M. Evans
ANSI Store order #X99520 Downloaded: 7/3/2003 5:55:13 PM ET
Single user license only. Copying and networking prohibited.