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IEEE Recommended Practice for Units in Published Scientific and Technical Work

Prepared by IEEE Standards Coordinating Committee 14 (Quantities and Units)

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Approved by IEEE Standards Committee, October 14, 1965

The recommendations contained in this document are based upon the following premises, which are believed to represent the broadest base of general agreement among proponents of the major unit systems:

a. That for most scientific work and technical work of an analytic nature the International System of Units (officially designated "SI")* is generally superior to other systems; that this is particularly true for the fields of electrical science and technology since the common electrical units (ampere, volt, ohm, etc.) are included among the SI units; that the International System is more widely accepted than any other as the common language in which scientific and technical data ought to be expressed.

b. That various units of the British and American systems (hereafter referred to as "British-American units"), particularly the inch and the pound, are the fundamental units used in the standards followed by a large part of the world's manufacturing industry; that this will continue to be true for some time.

c. That unit usage can and should be simplified, particularly in the fields of interest to the IEEE; that one means toward such simplification is the identification of obsolete and unneeded units, and that another is the adoption of more rational links between SI units and units of other systems.

1. RECOMMENDATIONS REGARDING PREFERRED SYSTEM OF UNITS

Technical and scientific data, except in cases such as those cited below, should be given in units of the International System, followed if desired by the equivalent data in other units given in parentheses.† *This recommendation applies only for the publication of data and does not in any way affect the choice of units for manufacturing processes or for industrial standards.*

1.1 Exceptions

1.1.1 When a nonmetric industrial standard is

*The International System includes as subsystems the MKS system of units, which covers mechanics, and the MKSA system, which covers mechanics, electricity, and magnetism. Appendix A describes the International System of Units.

†The size or description of apparatus, nominal or nonprecise dimensions, and other measurements not entering into the presentation of scientific data need not be "force-translated" into the SI; e.g., "The interferometer mirror, mounted on 1-inch rods, was advanced in 10-nanometer increments."

referred to, the nonmetric data should be given first place, with the SI equivalent data given in parentheses. Examples include standard inch sizes of nuts and bolts, American Wire Gauge sizes of electrical conductors, and the like.

1.1.2 Where, in special fields, for reasons related to the field, a unit not in the International System offers significant advantages, such a unit may be used, with the SI equivalent data given in parentheses. Examples include the use of the electronvolt in physics, the nautical mile in navigation, and the astronomical unit in astronomy.

1.1.3 Experimental data taken in non-SI units may be quoted without change, followed by the SI equivalents in parentheses.

1.1.4 When a non-SI unit is at present too widely used to be eliminated immediately, its use may be continued with the SI equivalent given in parentheses. Examples include the use of the horsepower to measure mechanical power and the use of the torr to measure air pressure. This exception is not intended as a permanent protection for irrational practices, however, and as future standards are drafted such anachronisms as the horsepower should be eliminated.

1.1.5 Some nonelectrical quantities are frequently expressed in units that are decimal multiples of SI units. Such units include the liter, the hectare, the bar, the tonne (metric ton), and the angstrom. These units may be used in appropriate fields. The SI units *newton* and *joule* are, however, to be used in place of the *dyne* and *erg*.

1.2 Specific Recommendations

1.2.1 The various CGS units of electrical and magnetic quantities are no longer to be used. This includes the various ab- and stat- designations (abvolt, statcoulomb, etc.) and the gilbert, oersted, gauss, and maxwell. It is of course recognized that in some cases it may be desirable to state CGS equivalents in parentheses following data given in the International System.

1.2.2 The use of prefixes‡ to express decimal mul-

‡The official list of prefixes is given in Appendix A. Compound prefixes (e.g., millimicro-) are not to be used. Multiplication beyond the range covered by the prefixes should be handled by using powers of ten.