(Revision of
AGMA 904–B89)

Reaffirmed January 2017

AMERICAN GEAR MANUFACTURERS ASSOCIATION

Metric Usage

AGMA INFORMATION SHEET

(This Information Sheet is NOT an AGMA Standard)

Contents

Foreword

[This foreword, footnotes, and appendices, if any, are provided for informational purposes only and should not be construed as a part of American Gear Manufacturers Association Information Sheet 904–C96, *Metric Usage*.]

In 1972, the AGMA Technical Division Executive Committee (TDEC) started the formation of a committee referred to as the *Metric Study Committee*. The first meeting of this Metric Study Committee was on January 23, 1973. In March 1974, the AGMA Board of directors instructed its Technical Division to:

- Form a standing Metric Resource and Advisory Committee.
- Establish detailed procedures to effect a changeover, i.e., create a metric usage standard.

The first meeting of the Metric Resource and Advisory Committee was held on November 4, 1974. A proposed *AGMA Information Sheet, Guide for Use of SI (Metric) Units in Gearing*, AGMA 600.XX was drafted over the next years. On September 21, 1977, the Metric Resource and Advisory Committee changed the name of the proposed standard 600.XX to *AGMA Standard for Metric Usage*. The standard 600.01 was issued in March 1979.

On September 12, 1979, the first draft of *Procedural Guidelines for Metrication of AGMA Standards* was written. This document was released on June 4, 1980 as Policy and Practice guide Number 040.17, *Procedure for the Metrication of AGMA Standards*. The *Guidelines for Metrication* were approved by the AGMA Board on November 2, 1977.

In 1988, the TDEC converted this revision to an Information Sheet and assigned compliance review to AGMA Headquarters Staff. In 1996, it was uptdated and the symbols tables 10.1 and 10.2 were removed, which can be found in AGMA 900–F96.

This Information Sheet is to be used as an editorial guide when preparing the AGMA metric standards and information sheets. It describes the SI system of units and the multiples and sub–multiples to be used in AGMA standards.

The guidelines for metrication are as follows:

(1) The intent of the process is conversion to SI units, not the revision of content.

(2) The purpose of these guidelines is to assure uniformity of metric terms and abbreviations.

(3) Generally, metrication will be performed by the responsible committee. Exception will be at the discretion of the TDEC.

(4) There shall be two methods of generating metric standards, the choice of which shall be at the discretion of the originating committee. All standards on which revision is begun after January 1, 1991 shall be prepared in accordance with one of the two following methods.

(a) Standards may be developed in hard metric only.

(b) Parallel standards, in which both hard conversion SI and conventional inch versions of standards will be available for the same purpose.

(5) Metrication shall conform to AGMA 904–C96 which references ANSI/IEEE 268–1982 and ISO 1000.

(6) Preparation of a hard metric document shall be approved by the TDEC prior to starting work.

(7) The documents shall be reviewed for conformance to the Information Sheet concurrently with committee comment.

This addition, AGMA 904–C96, was approved by the TDEC on October 28, 1996.

Suggestions for the improvement of this information sheet will be welcome. They should be sent to the American Gear Manufacturers Association, 1500 King Street, Suite 201, Alexandria, Virginia, 22314.

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1. Scope

This editorial manual describes the SI system of units to be used in AGMA standards. Where necessary, specialized metric dimensions, tolerances and units are used which are specifically suited to the gear industry and may not be part of the referenced documents.

1.1 Historical Background. The 11th Conference Generale des Poids et Mesures (1960) (CGPM), by its Resolution 12, adopted the name International System of Units, with the international abbreviation SI, for this practical system of units of measurement and laid down rules for the prefixes, the derived and dimensionless derived units and other matters, thus establishing a comprehensive specification for units of measurement. The expressions *SI Units*, *SI Prefixes* and *Dimensionless Derived Units* as used in this Information Sheet, are in accordance with the metric practices in ANSI/IEEE Std. 268–1982.

2. SI Units

2.1 Classes of Units. SI units are divided into three classes:

(1) Base units
(2) Derived units
(3) Dimensionless derived units

2.2 Base Units. SI consists of seven base units shown with their symbols in Table 2–1. Refer to 5.1.1 through 5.1.7 for definitions of base units.

2.3 Dimensionless Derived Units. Dimensionless derived units are shown in Table 2–2. Refer to 5.2.1 and 5.2.2 for definitions of dimensionless derived units.

2.4 Derived Units. Derived units are expressed algebraically in terms of base, or dimensionless derived units, or both by means of the mathematical symbols of multiplication and division. Several derived units have been given special names and symbols which may themselves be used to express other derived units in a simpler way than in terms of the base units.

Derived units may therefore be classified under three headings. Examples of them are given in Tables 2–3, 2–4 and 2–5.

2.5 Mass and Force Units. The principal departure of SI from the previous gravimetric form of Metric Engineering Units is the separate and distinct units for mass and force. In previous Metric Systems, the kilogram was used as both a force and mass unit. Technically, units should have been labeled as kilogram–force or kilogram–mass but it was common practice to ignore such labeling, which often resulted in confusion as to whether mass or force was intended. The same practice was true in the non–metric inch–pound system where the pound was also used as both a mass or force unit and rarely labeled. In SI, the kilogram is restricted to the unit of mass. The newton is the unit of force and should be used in place of kilogram–force. Likewise, the newton, instead of kilogram–force, should be used in combination units which include force.

Example:

Pressure or Stress (N/m^2 = Pa),
Energy ($N \cdot m$ = J), and Power
($N \cdot m/s = m^2 kg \cdot s^{-3}$ = W).

Table 2–1
Base Units

Quantity	Name of Base SI Unit	Symbol
length	meter	m
mass	kilogram	kg
time	second	s
electric current	ampere	A
thermodynamic temperature*	kelvin	K
amount of substance	mole	mol
luminous intensity	candela	cd

* Temperature is in general expressed in degrees Celsius (°C). The unit *degree Celsius* is equal to the unit *kelvin*.

Table 2–2
Dimensionless Derived Units

Quantity	Name of SI Unit	Symbol
plane angle	radian	rad
solid angle	steradian	sr