AGMA 914-B04
{Revision of AGMA 299.01)

AMERICAN GEAR MANUFACTURERS ASSOCIATION

Gear Sound Manual

Part I - Fundamentals of Sound as Related to Gears

Part II - Sources, Specifications and Levels of Gear Sound

Part III - Gear Noise Control

AGMA 914-B04

AGMA INFORMATION SHEET

(This Information Sheet is NOT an AGMA Standard)

American Gear Manufacturers Association

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[Tables or other self–supporting sections may be referenced. Citations should read: See AGMA 914–B04, *Gear Sound Manual: Part I – Fundamentals of Sound as Related to Gears; Part II – Sources, Specifications and Levels of Gear Sound; Part III – Gear Noise Control,* published by the American Gear Manufacturers Association, 500 Montgomery Street, Suite 350, Alexandria, Virginia 22314, http://www.agma.org.]

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ABSTRACT

Noise measurement and control on gear driven equipment is dependent upon the individual characteristics of the prime mover, gear unit and driven machine, as well as their combined effects as a system in a particular acoustical environment.

Because of the wide variation of gear driven systems and acoustical environments, this manual attempts to indicate certain areas where special considerations might be necessary, and must be agreed upon between purchaser and the gear manufacturer, when discussing gear sounds.

The information is arranged in three parts. Part I presents the fundamentals necessary to understand sound as related to gears. Part II describes the sources, specifications and levels of gear sound. Reduction or control of noise, as addressed in Part III, requires attention to connecting equipment and the acoustical environment, as well as the gear unit.

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Foreword

[The foreword, footnotes and annexes, if any, in this document are provided for informational purposes only and are not to be construed as a part of AGMA Information Sheet 914–B04, *Gear Sound Manual: Part I – Fundamentals of Sound as Related to Gears; Part II – Sources, Specifications and Levels of Gear Sound; Part III – Gear Noise Control*.]

Concern with industrial noise created a need for a sound standard on all types of products. Noise measurement, control and attenuation on gear driven equipment is dependent upon the individual characteristics of the prime mover, gear unit, and driven machine – as well as their combined effects as a system in a particular acoustical environment.

Proper assessment of these considerations is essential for realistic determination of acoustic values. The knowledge and judgment required to properly evaluate the various factors comes primarily from years of accumulated experience in designing, manufacturing, and operating gear units. For this reason, the detailed treatment of the testing and resultant conclusions for specific product applications is best accomplished by experts in the field.

The complexity makes most sound standards difficult to apply or interpret properly. The AGMA Acoustical Technology Committee developed the *Gear Sound Manual* 299.01 to provide improved communication between project engineers, gear manufacturer, and user in the areas of *Fundamentals of Sound as Related To Gears* (Part I), *Sources, Specifications and Levels of Gear Sound* (Part II), and *Gear Noise Control* (Part III).

This Information Sheet was originally issued as three separate documents: AGMA 299.01, Section I, *Fundamentals of Sound as Related to Gears*; AGMA 299.01, Section II, *Sources, Specifications and Levels of Gear Sound*; and AGMA 299.01 Section III, *Gear Noise Contro*l. Section I was approved by the membership in January 1978, Section II was approved in October 1978, and Section III was approved in October 1978. Combining the three entitled, AGMA SOUND MANUAL, was approved by the AGMA Technical Division Executive Committee in October 1987.

The first draft of AGMA 914–B04 was made in November, 2002. It combines all three parts into one document with three clauses, updates references, and adds a subclause on Fast Fourier Transform analysis. It was approved by the AGMA membership in March, 2004.

Suggestions for improvement of this document will be welcome. They should be sent to the American Gear Manufacturers Association, 500 Montgomery Street, Suite 350, Alexandria, Virginia 22314.

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Gear Sound Manual: Part I – Fundamentals of Sound as Related to Gears

1.1 Scope

The purpose of this manual is to establish a common base for communications pertaining to various types of gear units in differing applications and to encourage the maximum practical degree to uniformity and consistency between sound measurement practices within the gear industry.

Because of the wide variation of gear driven systems and acoustical environments, this manual attempts to indicate certain areas where special considerations might be necessary and must be agreed upon between purchaser and gear manufacturer when discussing gear sounds.

1.2 References

The following standards contain provisions which are referenced in the text of this information sheet. At the time of publication, the editions indicated were valid.

AGMA 913–A98, *Effect of Lubrication on Gear Surface Distress*

ANSI/AGMA 1012–F90, *Gear Nomenclature, Definitions Of Terms With Symbols*

ANSI/AGMA 6025–D98, *Sound for Enclosed Helical, Herringbone and Spiral Bevel Gear Drives*

1.3 Symbols and definitions

The terms used, wherever applicable, conform to ANSI/AGMA 1012–F90.

NOTE: The symbols and definitions used in this standard may differ from other AGMA standards. The user should not assume that familiar symbols can be used without a careful study of their definitions.

The symbols and terms, along with the clause numbers where they are first discussed, are listed in alphabetical order by symbol in table 1–1.

Table 1–1 – Symbols and definitions

Symbol	Definition	Units	First referenced
a_i	Sound pressure level from a single source or octave	dB	Eq 1.5
f	Frequency	Hz	Eq 1.1
L_p	Sound pressure level	dB	1.5.2.1
L_w	Sound power level	dB	1.5.2.2
N	Number of single levels investigated	--	Eq 1.5
p	Sound pressure being measured	$\mu N/m^2$	Eq 1.2
p_o	Sound pressure, reference	$\mu N/m^2$	Eq 1.2
v	Velocity	- -	Eq 1.1
W	Sound power	picowatt	1.5.2.2
W_o	Sound power reference	picowatt	1.5.2.2
λ	Wavelength	- -	Eq 1.1