



American  
Gear Manufacturers  
Association

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Technical Resources

Revision of  
ANSI/AGMA 6033-B98

## **American National Standard**

# **Materials for Marine Propulsion Gearing**

**ANSI/AGMA 6033-C08**

# American National Standard

## **Materials for Marine Propulsion Gearing**

ANSI/AGMA 6033-C08

[Revision of ANSI/AGMA 6033-B98]

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[Tables or other self-supporting sections may be referenced. Citations should read: See ANSI/AGMA 6033-C08, *Materials for Marine Propulsion Gearing*, published by the American Gear Manufacturers Association, 500 Montgomery Street, Suite 350, Alexandria, Virginia 22314, <http://www.agma.org>.]

Approved September 29, 2008

### **ABSTRACT**

This document identifies commonly used alloy steels, heat treatments and inspection requirements for through hardened, case hardened and surface hardened gearing for main propulsion marine service over 1500 hp. Forged and hot rolled alloy steel bar stock are specified to two metallurgical quality grades (1 and 2) according to cleanliness and test requirements. Cast steel gearing is specified to a single metallurgical quality level. Mechanical, metallurgical and nondestructive test requirements are provided for various heat treat processes and metallurgical quality grades of gearing.

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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 Standard 6033-C08, *Materials for Marine Propulsion Gearing*.]

The purpose of ANSI/AGMA 6033-C08 is to provide alloy steel specifications and quality assurance measures for pinions and gears used in main propulsion marine applications.

This document consolidates and adapts the material specifications generally used for pinions and gears in the defined marine propulsion applications.

ANSI/AGMA 6033-A88 was proposed to the Technical Division Executive Committee in 1979 by the Chairman of the Marine Gearing Committee. Interest in, and the need for this standard was expressed at a committee meeting in February 1980. Work began on rolled ring forgings for rims of large fabricated gears. Metallurgists from several member companies attended that and subsequent meetings. The committee continued work on the standard, expanding the contents to include other forms of gearing, properties of commonly available alloy steels, heat treatment methods and inspection requirements.

The Marine Gearing Committee submitted the standard, and it was approved by the entire AGMA membership in its final edited version in March 1988. On May 31, 1988 it was approved as an American National Standard.

In late 1993 the AGMA Technical Division Executive Committee recommended that the Marine Gearing Committee review and update ANSI/AGMA 6033-A88, *Standard for Marine Propulsion Gear Units, Part 1, Materials*. This review and update was initiated in early 1994. ANSI/AGMA 6033-B98 was renamed *Materials for Marine Propulsion Gearing*.

ANSI/AGMA 6033-B98 was approved by the membership in July, 1997 and approved as an American National Standard on June 19, 1998.

ANSI/AGMA 6033-C08 is a revision of ANSI/AGMA 6033-B98 to reflect metallurgy and materials practices currently in use in marine applications, and to refer to other recent AGMA publications.

AGMA Standards are subject to constant improvement, revision, or withdrawal as dictated by experience. Any person who refers to an AGMA technical publications should be sure that the publication is the latest available from the Association on the subject matter.

The first draft of ANSI/AGMA 6033-C08 was made in January 2003. It was approved by the AGMA membership in July, 2008. It was approved as an American National Standard on September 29, 2008.

Suggestions for improvement of this standard 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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# American National Standard – Materials for Marine Propulsion Gearing

## 1 Scope

This standard is applicable to marine gearing made from steel forgings, bar stock and castings intended for main propulsion service over 1500 horsepower. Alloy steel specifications and quality assurance measures presented represent the state of the art and are not intended to assure the performance of subject assembled marine gear drive systems.

This standard pertains to through hardened gearing, as well as carburized, nitrided and induction contour surface hardened gear teeth of pinions and gears. This standard presents the properties of commonly available alloy steels used for marine gearing. It is recognized that modifications of these alloys and other suitable alloy steels are available which may be used in marine gearing. It does not address other forms of surface hardening, such as flame hardening and spin coil induction hardening.

Requirements for Quality Grades 1 and 2 are defined in this standard. Although reference is made to Grade 3 melting practice for carburized steels, the experience with the use of these steels is limited and therefore outside the scope of this standard.

This standard is intended for use by those experienced in gear design or manufacture. It is not intended for use by the engineering public at large.

## 2 Normative references

Abbreviations are used in the references to specific documents in this standard. The abbreviations include: AGMA, American Gear Manufacturers Association; ANSI, American National Standards Institute; ASME, American Society of Mechanical

Engineers; ASTM, American Society for Testing Materials; AWS, American Welding Society; ISO, International Organization for Standardization; SAE, Society of Automotive Engineers; and AMS, Aerospace Material Specification.

The following documents contain provisions which, through reference in this standard, constitute provisions of this document. At the time of publication, the editions were valid. All publications are subject to revision, and the users of this standard are encouraged to investigate applying the most recent editions of the publications listed.

Elsewhere in this document if no revision level is shown, the revision level used in this clause is applicable.

AGMA 923-B05, *Metallurgical Specifications for Steel Gearing*

AGMA 938-A05, *Shot Peening of Gears*

ANSI/AGMA 2007-C00, *Surface Temper Etch Inspection After Grinding*

ANSI/AGMA 6032-A94, *Standard for Marine Gear Units: Rating*

ASTM A148-05, *Specification for Steel Castings, High Strength, for Structural Purposes*

ASTM A255-02, *Test Methods for Determining Hardenability of Steel*

ASTM A275-06, *Test Method for Magnetic Particle Examination of Steel Forgings*

ASTM A290-05, *Specification for Carbon and Alloy Steel Forgings for Rings for Reduction Gears*

ASTM A291-05, *Specification for Steel Forgings, Carbon and Alloy, for Pinions, Gears and Shafts for Reduction Gears*

ASTM A304-05, *Specification for Carbon and Alloy Steel Bars Subject to End-Quench Hardenability Requirements*

ASTM A356-07, *Specification for Steel Castings, Carbon, Low Alloy, and Stainless Steel, Heavy Walled for Steam Turbines*

ASTM A370-07, *Test Methods and Definitions for Mechanical Testing of Steel Products*

ASTM A388-07, *Practice for Ultrasonic Examination of Heavy Steel Forgings*

ASTM A487-93, *Specification for Steel Castings Suitable For Pressure Service*