

IEEE Standard on Magnetostrictive Materials: Piezomagnetic Nomenclature

Sponsor

**Subcommittee on Magnetostrictive Materials
of the Standards Activities Committee
of the
IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society**

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Abstract: IEEE Std 319-1990, *IEEE Standard on Magnetostrictive Materials: Piezomagnetic Nomenclature*, serves to aid the comparison of the relative merits of magnetostrictive, electromagnetic, piezoelectric, and electrostrictive transducers. The standard applies generally to magnetostrictive materials and was developed for those working on transducer applications. This revised standard was generated because of the development of a class of alloys that has made magnetostrictive materials more competitive with electrostrictive materials, especially for lower frequency applications.

Keywords: electromagnetic, electrostrictive, magnetostrictive, nomenclature, piezoelectric, transducers

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Foreword

(This Foreword is not a part of IEEE Std 319-1990, IEEE Standard on Magnetostrictive Materials: Piezomagnetic Nomenclature.)

The original purpose of this standard was to make possible the comparison of the relative merits of magnetostrictive, electromagnetic, piezoelectric, and electrostrictive transducers on a simple and straightforward basis. The nomenclature used in this standard has evolved from a proposed set of definitions [14]¹ for the parameters used in evaluating magnetostrictive materials. Every effort has been made to develop a nomenclature consistent with existing IEEE standards on piezoelectric crystals. The standard applies generally to magnetostrictive materials, except for some uncommon cases noted below. The need for such a standard is largely centered in laboratories working on transducer applications. In the past, the absence of a valid basis for direct comparison has resulted in independent work on each different transducer mechanism and the passing of judgment on it only at the end of an extensive development program.

In the literature, the symbol λ had been widely used for many quantities connected with magnetostriction. Sometimes it represented the magnetostriction constant, the saturation magnetostrictive strain, or occasionally, the slope of some other curve associated with magnetostrictive measurement. This obviously led to considerable confusion when dimensions were omitted or limited data given. No quantity is represented by λ in this standard.

The current purpose for revising this standard is the discovery of a new class of rare earth alloys of iron, cobalt, and nickel with extremely high maximum strain capability, on the order of one part per thousand. These new materials have made magnetostrictive materials more competitive with electrostrictive materials, especially for the lower frequency applications, below 3 kHz, where high strain capability is required for high power output.

The Institute wishes to acknowledge its indebtedness to those who have so freely given of their time and knowledge and have conducted experimental work, upon which many of the IEEE publications are based. This publication has been developed under the auspices of the IEEE Ultrasonics, Ferroelectrics, and Frequency Control (UFFC) Society. It was sponsored and approved by the Standards Committee of the UFFC and was prepared by the Technical Committee on Magnetostrictive Materials. The following persons were members of the subcommittee that prepared this standard:

S. L. Ehrlich, Chair

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A. E. Clark
M. B. Moffett
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¹The numbers in brackets correspond to those of the references in Section 3.

The following persons were members of the Standards Activities Committee of the UFFCS, which approved this standard for submittal to the IEEE Standards Board:

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Acknowledgments

(From the 1971 version of this standard)²

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²The following information is given to credit those individuals who worked on the development of the original version of this standard.