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Conductor Softness Testing Methods

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Foreword

This Standards publication was prepared by the NEMA Magnet Wire Section Technical Committee and reflects the input of various industries that use magnet wire. All information in this publication is Authorized Engineering Information.

NEMA magnet wire publications are periodically reviewed by the NEMA Magnet Wire Section and revised as necessary, to keep them current with technological changes. Proposed revisions should be submitted to:

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This Standards publication was developed by the Magnet Wire Section. Section approval of the Standard does not necessarily imply that all section Member s voted for its approval or participated in its development. At the time it was approved, the Magnet Wire Section was composed of the following Member s:

CONDUMEX—Mexico City, Mexico
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Introduction

The testing of conductor “softness” incorporates different metallurgical principles such as ductility, malleability, and surface hardness characteristics. The purpose of MW 820 is to present different wire testing methodologies used by magnet wire manufacturers and users to characterize the “softness of the conductor” in order to predict how well the magnet wire will wind and be formed into its final desired shape and position.

Significance and Use

NEMA MW 1000 describes two different conductor softness test methods. Total percent elongation and springback test methods and specifications are described in NEMA MW 1000, part 3, section 3.4, Elongation, and section 3.7, Springback. The intent is not to duplicate these test methods, but it is important to recognize and reference them in this publication. Other test methods for conductor malleability and formability need to be described.

Maximum formability is desirable because it facilitates winding magnet wire more compactly, yields coils that will retain their shape best after removal from the winding forms, and permits the most rapid possible winding with minimum force, minimum wire breakage, and reduced abrasive effects. Each of these test methods provides a more significant measure of formability than do tests for hardness, tensile strength, or total percentage of elongation.

These test methods do not necessarily cover identical zones of the total stress-strain region. The springback method employs mild bending, hence a combination of elongation and compression. The low-stress elongation method employs very slight elongation, and the elastic ratio method employs the greatest elongation. Both the low-stress elongation and springback methods allow the deformed film-insulated magnet wire to return partially or entirely to the unstressed condition, while the elastic ratio method does not.

Section 1
General

1.1 Scope

This publication describes ultimate tensile, yield strength, elastic ratio, low-stress elongation (LSE), and Rockwell hardness test methods and the equipment that may be used to determine these measurements.