

An American National Standard

Specification for Zirconium and Zirconium-Alloy Welding Electrodes and Rods



American Welding Society®



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An American National Standard

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American National Standards Institute
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Specification for Zirconium and Zirconium-Alloy Welding Electrodes and Rods

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Prepared by the
American Welding Society (AWS) A5 Committee on Filler Metals and Allied Materials

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This specification prescribes the requirements for classification of zirconium and zirconium alloy electrodes and rods for gas metal arc welding, gas tungsten arc welding, and plasma arc welding. The compositions specified for each classification represent the latest state-of-the-art. Additional requirements are included for testing procedures, manufacture, sizes, lengths, and packaging. A guide is appended to the specification as a source of information concerning the classification system employed and the intended use of the zirconium-alloy filler metal.

This specification makes use of both U.S. Customary Units and the International System of Units (SI). Since these are not equivalent, each system must be used independently of the other.



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Foreword

This foreword is not part of AWS A5.24/A5.24M:2014, *Specification for Zirconium and Zirconium-Alloy Welding Electrodes and Rods*, but is included for informational purposes only.

This specification makes use of both U.S. Customary Units and the International System of Units (SI). The measurements are not exact equivalents; therefore, each system must be used independently of the other, without combining values in any way when referring to filler metal properties. In selecting rational metric units, the AWS A1.1, *Metric Practice Guide for the Welding Industry* and International Standard ISO 544, *Welding consumables—Technical delivery conditions for welding filler metals—Type of product, dimensions, tolerances, and markings*, are used where suitable. Tables and figures make use of both U.S. Customary and SI Units, which with the application of the specified tolerances provides for interchangeability of products in both the U.S. Customary and SI Units.

The first *Specification for Zirconium and Zirconium Bare Welding Rods and Electrodes* was prepared by the Subcommittee on Zirconium Filler Metal in 1976. This edition originally had three electrode classifications, ERZr1, ERZr2 and ERZr3. In the 1979 edition, the very pure grade of zirconium (ErZr1) was deleted and an additional grade, ERZr4 (with 2%–3% Niobium), was added to the specification and includes an addition to the check analysis tolerance by the joint AWS Subcommittee on Titanium and Zirconium Filler Metals. In 1990, the specification was revised to include the Acceptance and Certification clauses to the appendix. In 2005, the specification was revised to include an oxygen range for all electrode classifications. This was done to take into account the oxygen pickup during the zirconium welding process in order to create final weld strength similar to that of the parent metal. Additionally, the 2005 A5.24 specification was the first to use both the U.S. Customary Units and the International System Units (SI). AWS A5.24/A5.24M:2014, *Specification for Zirconium and Zirconium-Alloy Welding Electrodes and Rods*, is the fourth revision of the document. This revision primarily includes updates to the reference documents.

A vertical line in the margin or underlined text in clauses, tables, or figures indicates an editorial or technical change from the 2005 edition.

Previous editions of the document are as follows:

AWS A5.24-76, *Specification for Zirconium and Zirconium Alloy Bare Welding Rods and Electrodes*

AWS A5.24-79, *Specification for Zirconium and Zirconium Alloy Bare Welding Rods and Electrodes*

ANSI/AWS A5.24-90, *Specification for Zirconium and Zirconium Alloy Welding Electrodes and Rods*

AWS A5.24/A5.24M:2005, *Specification for Zirconium and Zirconium-Alloy Welding Electrode and Rods*

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS A5 Committee on Procedure and Performance Qualification, American Welding Society, 8669 NW 36 St, #130, Miami, FL 33166.

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Specification for Zirconium and Zirconium-Alloy Welding Electrodes and Rods

1. Scope

1.1 This specification prescribes requirements for the classification of zirconium and zirconium-alloy electrodes and rods for gas metal arc, gas tungsten arc, and plasma arc welding.

1.2 This standard makes use of both U.S. Customary Units and the International System of Units (SI). The latter are shown within brackets ([]) or in appropriate columns in tables and figures. The measurements may not be exact equivalents; therefore, each system must be used independently.

1.3 Safety. Safety and health issues and concerns are beyond the scope of this standard and therefore are not addressed herein. Safety and health information is available from the following sources:

American Welding Society:

- (1) ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*
- (2) AWS Safety and Health Fact Sheets
- (3) Other safety and health information on the AWS website

Material or Equipment Manufacturers:

- (1) Material Safety Data Sheets supplied by materials manufacturers
- (2) Operating Manuals supplied by equipment manufacturers

Applicable Regulatory Agencies

Work performed in accordance with this standard may involve the use of materials that have been deemed hazardous, and may involve operations or equipment that may cause injury or death. This standard does not purport to address all safety and health risks that may be encountered. The user of this standard should establish an appropriate safety program to address such risks as well as to meet applicable regulatory requirements. ANSI Z49.1 should be considered when developing the safety program.

2. Normative References

2.1 The following ANSI/AWS standards¹ are referenced in the mandatory sections of this document:

- (1) AWS A5.01M/A5.01 (ISO 14344 MOD), *Procurement Guidelines for Consumables-Flux and Gas Shielded Electrical Welding Processes*;
- (2) AWS A5.02/A5.02M: 2007, *Specification for Filler Metal Standard Sizes, Packaging, and Physical Attributes*; and
- (3) ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*.

¹ AWS standards are published by the American Welding Society, 8669 NW 36 St, #130, Miami, FL 33166.