AWS A5.16/A5.16M:2013
(ISO 24034:2010 MOD)
An American National Standard

Specification for Titanium and Titanium-Alloy Welding Electrodes and Rods

American Welding Society®

Approved American National Standard
ANSI

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Approved by the
American National Standards Institute
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Specification for Titanium and Titanium-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 the classification of over 30 titanium and titanium-alloy welding electrodes and rods. Classification is based upon the chemical composition of the electrode. Major topics include general requirements, testing, packaging, and application guidelines.

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

This specification adopts the requirements of ISO 24034 and incorporates the provisions of earlier versions of A5.16/A5.16M, allowing for classifications under both specifications.

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This standard is subject to revision at any time by the AWS A5 Committee on Filler Metals and Allied Materials. It must be reviewed every five years, and if not revised, it must be either reaffirmed or withdrawn. Comments (recommendations, additions, or deletions) and any pertinent data that may be of use in improving this standard are required and should be addressed to AWS Headquarters. Such comments will receive careful consideration by the AWS A5 Committee on Filler Metals and Allied Materials and the author of the comments will be informed of the CommitteeÕs response to the comments. Guests are invited to attend all meetings of the AWS A5 Committee on Filler Metals and Allied Materials to express their comments verbally. Procedures for appeal of an adverse decision concerning all such comments are provided in the Rules of Operation of the Technical Activities Committee. A copy of these Rules can be obtained from the American Welding Society, 8669 Doral Blvd., Suite 130, Doral, FL 33166.

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Foreword

This foreword is not part of AWS A5.16/A5.16M:2013 (ISO 24034:2010 MOD), *Specification for Titanium and Titanium – Alloy Welding Electrodes and Rods*, but is included for informational purposes only.

This document is the first adoption of ISO 24034:2010: *Welding consumables – Solid wires and rods for arc welding of titanium and titanium-alloys – Classification*. With its insertion of references and additional informative annexes it replaces A5.16/A5.16M: 2007. The adoption of the modified ISO 24034, designated by MOD, is in accordance with ISO/IEC Guide 21-2005, Clause 4.3. All changes are listed in Annex F. The modifications to ISO 24034:2010 are also shown in *Italic* font.

Please note that ISO uses commas (,) and AWS uses periods (.) for decimals.

Document Development

The current specification is the sixth edition of the initial AWS/ASTM document issued in 1961 as shown below:

AWS A5.16-61T ASTM B362-61T	*Tentative Specification for Titanium-Alloy Bare Welding Rods and Electrodes*
AWS A5.16-70 ANSI W3.16-1973	*Specification for Titanium and Titanium-Alloy Bare Welding Rods and Electrodes*
ANSI/AWS A5.16-90	*Specification for Titanium and Titanium-Alloy Bare Welding Rods and Electrodes*
ANSI/AWS A5.16-90R	*Specification for Titanium and Titanium-Alloy Bare Welding Rods and Electrodes*, reaffirmed in 1997
AWS A5.16/A5.16M:2004	*Specification for Titanium and Titanium-Alloy Bare Welding Electrodes and Rods*
AWS A5.16/A5.16M:2007	*Specification for Titanium and Titanium-Alloy Bare Welding Electrodes and Rods*

Attention is drawn to the possibility that some of the elements of this part of ISO 24034 may be the subject of patent rights. AWS and ISO shall not be held responsible for identifying any or all such patent rights.

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS A5 Committee on Filler Metals and Allied Materials, American Welding Society, 8669 Doral Blvd., Suite 130, Doral, FL 33166.

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Specification for Titanium and Titanium-Alloy Welding Electrodes and Rods

1. General Requirements

1.1 Scope. This standard specifies requirements for the classification of solid wire electrodes, solid wires and rods for fusion welding of titanium and titanium-alloys. The classification *of the solid wires and cut lengths and spools of wire is* based on their chemical composition.

For titanium welding consumables, the compositions of the wire electrodes for *the gas metal arc welding (GMAW) process* are the same as *for the gas tungsten arc welding (GTAW) process*, the plasma arc *welding (PAW) process, the* laser beam *welding (LBW) process*, and *other* fusion welding processes. *Therefore, the use of the word "wires/rods" in this classification refers to both "wire electrodes" and "wires and rods" in this standard.*

NOTE: In this standard, the word "titanium" is used for "titanium and titanium-alloys."

The classification of titanium wires/rods is based upon the chemical composition of the wires/rods.

1.2 Units of Measure. *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 when referring to material properties. Standard dimensions based on either system may be used for sizing of electrodes or packaging or both under A5.16 or A5.16M specifications.*

1.3 Safety. *Safety and health issues and concerns are beyond the scope of this standard; some safety and health information is provided, but such issues are not fully addressed herein.*

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

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

2.1 *The following AWS standards[1] are referenced in the mandatory sections of this document*:

[1] *AWS standards are published by the American Welding Society, 8669 Doral Blvd., Suite 130, Doral, FL 33166.*