

**AWS A5.16/A5.16M:2023
(ISO 24034:2010 MOD)
An American National Standard**

Specification for Titanium and Titanium-Alloy Welding Electrodes and Rods



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(ISO 24034:2010 MOD)
An American National Standard**

**Approved by the
American National Standards Institute
September 13, 2022**

Specification for Titanium and Titanium-Alloy Welding Electrodes and Rods

7th Edition

Revises AWS A5.16/A5.16M:2013 (ISO 24034:2010 MOD)

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. A guide is appended to the specification as a source of information concerning the classification system employed and the intended use of the titanium and titanium-alloy welding electrodes and rods.

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 It must be reviewed every five years, and if not revised, it must be either reaffirmed or withdrawn.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 requested 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 Committee's 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 NW 36 St, # 130, Miami, FL 33166.

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Foreword

This foreword is not part of this standard but is included for informational purposes only.

This document is the second adoption of ISO 24034 *Welding consumables – Solid wires and rods for arc welding of titanium and titanium-alloys – Classification*. The adoption of the modified ISO 24034, designated by MOD, is in accordance with ISO/IEC Guide 21-2005, Clause 4.3, with changes listed in Annex E.

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

The current specification is the seventh revision of the initial AWS/ASTM document, issued in 1961. The evolution took place as follows:

AWS A5.16-61T ASTM B362-61T	<i>Tentative Specification for Titanium Alloy Bare Welding Rods and Electrodes</i>
AWS A5.16-70 ANSI W3.16-1973	<i>Specification for Titanium and Titanium-Alloy Bare Welding Rods and Electrodes</i>
ANSI/AWS A5.16-90	<i>Specification for Titanium and Titanium Alloy Bare Welding Rods and Electrodes</i>
ANSI/AWS A5.16-90R	<i>Specification for Titanium and Titanium Alloy Welding Rods and Electrodes</i> , reaffirmed in 1997
AWS A5.16/A5.16M:2004	<i>Specification for Titanium and Titanium-Alloy Welding Electrodes and Rods</i>
AWS A5.16/A5.16M:2007	<i>Specification for Titanium and Titanium-Alloy Welding Electrodes and Rods</i>
AWS A5.16/A5.16M:2013 (ISO 24034:2010 MOD)	<i>Specification for Titanium and Titanium-Alloy Welding Electrodes and Rods</i>
AWS A5.16/A5.16M:2023 (ISO 24034:2010 MOD)	<i>Specification for Titanium and Titanium-Alloy Welding Electrodes and Rods</i>

Substantive changes in this revision include the following:

- There is now an option for classifying titanium alloy electrodes and rods that do not fit any of the listed classifications.
- Designator ERTi-G added for nonlisted compositions, as is the norm in AWS standards.
- New language for rules of Acceptance and Certification
- Compliance with current A5 standards guidelines

These substantive changes are shown in italic font.

The user's attention is called to the possibility that compliance with this standard may require use of an invention covered by patent rights. By publication of this standard, no position is taken with respect to the validity of any such claim(s) or of any patent rights in connection therewith. If a patent holder has filed a statement of willingness to grant a license under these rights on reasonable and nondiscriminatory terms and conditions to applicants desiring to obtain such a license, then details may be obtained from the standards developer.

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 NW 36 St #130, Miami, FL 33166.

All errata to a standard shall be published in the *Welding Journal* and posted on the AWS website.

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Specification for Titanium and Titanium-Alloy Welding Electrodes and Rods

1. Scope

1.1 This specification 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, cut lengths and spools of wire is based on their chemical composition. *In this standard, the word “titanium” is used for “titanium and titanium-alloys.”*

1.2 This specification makes use of both U.S. Customary Units and the International System of Units (SI). The measurements may not be exact equivalents; therefore, each system must be used independently when referring to material properties. *The specification with the designation A5.16 uses U.S. Customary Units. The specification A5.16M uses SI Units. The latter are shown within brackets [] or in appropriate columns in tables.* 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 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. *Some safety and health information can be found in Annex Clauses A5 and A10.*

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) 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 documents listed below are referenced within this publication and are mandatory to the extent specified herein. Unless otherwise defined in this document, welding terms are as defined in AWS A3.0M/A3.0. For undated references, the latest edition of the referenced standard shall apply. For dated references, subsequent amendments to or revisions of any of these publications do not apply.