AWS A5.11/A5.11M:2010
An American National Standard

Specification for Nickel and Nickel-Alloy Welding Electrodes for Shielded Metal Arc Welding

American Welding Society

Approved American National Standard
ANSI

AWS A5.11/A5.11M:2010
An American National Standard

Approved by the
American National Standards Institute
December 15, 2009

Specification for Nickel and Nickel-Alloy Welding Electrodes for Shielded Metal Arc Welding

10th Edition

Supersedes AWS A5.11/A5.11M:2005

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 composition, dimensions, soundness, and properties of weld metal from more than 30 classifications of nickel and nickel-alloy covered electrodes. Major topics include general requirements, testing, manufacturing, identification, and packaging. A guide to using the specification is included in Annex A.

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.

American Welding Society
550 N.W. LeJeune Road, Miami, FL 33126

International Standard Book Number: 978-0-87171-769-6
American Welding Society
550 N.W. LeJeune Road, Miami, FL 33126

Statement on the Use of American Welding Society Standards

All standards (codes, specifications, recommended practices, methods, classifications, and guides) of the American Welding Society (AWS) are voluntary consensus standards that have been developed in accordance with the rules of the American National Standards Institute (ANSI). When AWS American National Standards are either incorporated in, or made part of, documents that are included in federal or state laws and regulations, or the regulations of other governmental bodies, their provisions carry the full legal authority of the statute. In such cases, any changes in those AWS standards must be approved by the governmental body having statutory jurisdiction before they can become a part of those laws and regulations. In all cases, these standards carry the full legal authority of the contract or other document that invokes the AWS standards. Where this contractual relationship exists, changes in or deviations from requirements of an AWS standard must be by agreement between the contracting parties.

AWS American National Standards are developed through a consensus standards development process that brings together volunteers representing varied viewpoints and interests to achieve consensus. While the AWS administers the process and establishes rules to promote fairness in the development of consensus, it does not independently test, evaluate, or verify the accuracy of any information or the soundness of any judgments contained in its standards.

AWS disclaims liability for any injury to persons or to property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, or reliance on this standard. AWS also makes no guarantee or warranty as to the accuracy or completeness of any information published herein.

In issuing and making this standard available, AWS is neither undertaking to render professional or other services for or on behalf of any person or entity, nor is AWS undertaking to perform any duty owed by any person or entity to someone else. Anyone using these documents should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances. It is assumed that the use of this standard and its provisions are entrusted to appropriately qualified and competent personnel.

This standard may be superseded by the issuance of new editions. Users should ensure that they have the latest edition.

Publication of this standard does not authorize infringement of any patent or trade name. Users of this standard accept any and all liabilities for infringement of any patent or trade name items. AWS disclaims liability for the infringement of any patent or product trade name resulting from the use of this standard.

Finally, the AWS does not monitor, police, or enforce compliance with this standard, nor does it have the power to do so.

On occasion, text, tables, or figures are printed incorrectly, constituting errata. Such errata, when discovered, are posted on the AWS web page (www.aws.org).

Official interpretations of any of the technical requirements of this standard may only be obtained by sending a request, in writing, to the appropriate technical committee. Such requests should be addressed to the American Welding Society, Attention: Managing Director, Technical Services Division, 550 N.W. LeJeune Road, Miami, FL 33126 (see Annex B). With regard to technical inquiries made concerning AWS standards, oral opinions on AWS standards may be rendered. These opinions are offered solely as a convenience to users of this standard, and they do not constitute professional advice. Such opinions represent only the personal opinions of the particular individuals giving them. These individuals do not speak on behalf of AWS, nor do these oral opinions constitute official or unofficial opinions or interpretations of AWS. In addition, oral opinions are informal and should not be used as a substitute for an official interpretation.

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 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, 550 N.W. LeJeune Road, Miami, FL 33126.

This page is intentionally blank.

Personnel

AWS A5 Committee on Filler Metals and Allied Materials

J. S. Lee, Chair	*Chevron*
H. D. Wehr, 1st Vice Chair	*Arcos Industries, LLC*
J. J. DeLoach Jr., 2nd Vice Chair	*Naval Surface Warfare Center*
R. Gupta, Secretary	*American Welding Society*
T. Anderson	*ESAB Welding & Cutting Products*
J. M. Blackburn	*Naval Sea Systems Command*
J. C. Bundy	*Hobart Brothers Company*
D. D. Crockett	*The Lincoln Electric Company*
R. V. Decker	*Weldstar*
D. A. DelSignore	*Consultant*
J. DeVito	*ESAB Welding & Cutting Products*
H. W. Ebert	*Consultant*
D. M. Fedor	*The Lincoln Electric Company*
J. G. Feldstein	*Foster Wheeler North America*
S. E. Ferree	*ESAB Welding & Cutting Products*
D. A. Fink	*The Lincoln Electric Company*
G. L. Franke	*Naval Surface Warfare Center*
R. D. Fuchs	*Böhler Welding Group USA, Incorporated*
R. M. Henson	*J. W. Harris Company, Incorporated*
S. D. Kiser	*Special Metals*
P. J. Konkol	*Concurrent Technologies Corporation*
D. J. Kotecki	*Damian Kotecki Welding Consultants*
L. Kvidahl	*Northrop Grumman Shipbuilding*
A. Y. Lau	*Canadian Welding Bureau*
W. A. Marttila	*Chrysler LLC*
T. Melfi	*The Lincoln Electric Company*
R. Menon	*Stoody Company*
M. T. Merlo	*HyperTech Research, Incorporated*
B. Mosier	*Polymet Corporation*
A. K. Mukherjee	*Siemens Power Generation, Incorporated*
C. L. Null	*Consultant*
K. C. Pruden	*Hydril Company*
S. D. Reynolds, Jr.	*Consultant*
P. K. Salvesen	*Det Norske Veritas (DNV)*
K. Sampath	*Consultant*
W. S. Severance	*ESAB Welding & Cutting Products*
M. J. Sullivan	*NASSCO—National Steel & Shipbuilding*
R. Sutherlin	*ATI Wah Chang*
R. A. Swain	*Euroweld, Limited*
K. P. Thornberry	*Care Medical, Incorporated*
M. D. Tumuluru	*U.S. Steel Corporation*
H. J. White	*HAYNES International*

Advisors to the A5 Committee on Filler Metal and Allied Material

R. L. Bateman	*Electromanufacturas, S. A.*
R. A. Daemen	*Consultant*
C. E. Fuerstenau	*Lucas-Milhaupt, Incorporated*
J. P. Hunt	*Consultant*
S. Imaoka	*Kobe Steel, Limited*
D. R. Miller	*ABS Americas Materials Department*
M. P. Parekh	*Consultant*
M. A. Quintana	*The Lincoln Electric Company*
E. R. Stevens	*Stevens Welding Consulting*
E. S. Surian	*National University of Lomas de Zamora*

AWS A5E Subcommittee on Nickel and Nickel-Alloy Filler Metals

R. D. Fuchs, Chair	*Böhler Welding Group USA, Incorporated*
S. D. Kiser, Vice Chair	*Special Metals*
R. Gupta, Secretary	*American Welding Society*
G. J. Bruck	*Siemens Power Generation, Incorporated*
G. S. Clark	*Thyssen Krupp VDM USA, Incorporated*
J. J. DeLoach, Jr.	*Naval Surface Warfare Center*
S. R. Jana	*Select Arc, Incorporated*
D. D. Kiilunen	*Cor-Met, Incorporated*
G. A. Kurisky	*Consultant*
F. B. Lake	*ESAB Welding & Cutting Products*
W. E. Layo	*Midalloy*
J. S. Lee	*Chevron*
R. Menon	*Stoody Company*
S. J. Merrick	*Techalloy Welding Products*
R. A. Swain	*Euroweld, Limited*
J. F. Turner	*Electrode Engineering, Incorporated*
H. D. Wehr	*Arcos Industries LLC*
H. J. White	*HAYNES International*

Advisors to the AWS A5E Subcommittee on Nickel and Nickel-Alloy Filler Metals

F. S. Babish	*Sandvik Steel Company*
R. E. Cantrell	*Constellation Energy Group*
D. A. DelSignore	*Consultant*
P. Ditzel	*Parker Hannifin Corporation*
K. K. Gupta	*Westinghouse Electric Corporation*
V. W. Hartmann	*Westinghouse Electric Corporation*
J. P. Hunt	*Special Metals*
S. Imaoka	*Kobe Steel Limited*
V. van der Mee	*Lincoln Electric Europe bv*

Foreword

This foreword is not part of AWS A5.11/A5.11M:2010, *Specification for Nickel and Nickel-Alloy Welding Electrodes for Shielded Metal Arc Welding*, but is included for informational purposes only.

This document is the third revision to A5.11 specifications which 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. In selecting rational metric units, ANSI/AWS A1.1, *Metric Practice Guide for the Welding Industry*, and International Standard ISO 544, *Welding consumables — Technical delivery conditions for welding filler materials — 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. This document also relates its classifications to ISO 14172, *Welding consumables — Covered electrodes for manual metal arc welding of nickel and nickel alloys — Classification*.

The first specification for nickel and nickel-alloy covered electrodes was issued in 1954 by a joint committee of the American Society for Testing and Materials and the American Welding Society. The first revision in 1964 was also the result of the cooperative effort. This revision is the seventh prepared entirely by the AWS A5 Committee on Filler Metals and Allied Materials. *This revision contains new classifications ENiCrFe-13 and ENiCrMo-22. The Rounding-Off Procedure has been revised. Based on new Rounding-Off Procedure, tensile strength of ENiCrMo-11 in Table 4 has been rounded up from 585 MPa to 590 MPa, because new rounding off procedure requires rounding to the nearest 10 MPa Substantive changes are shown in the Italic font.*

Document Development

ASTM B295 54T AWS A5.11 54T	*Tentative Specification for Nickel-Base Alloy Covered Welding Electrodes*
AWS A5.11 64T ASTM B295 64T	*Tentative Specification for Nickel and Nickel-Alloy Covered Welding Electrodes*
AWS A5.11 69	*Specification for Nickel and Nickel-Alloy Covered Welding Electrodes*
AWS A5.11 Add 1 75	*Addenda to Specification for Nickel and Nickel Alloy Covered Welding Electrodes*
AWS A5.11 76	*Specification for Nickel and Nickel Alloy Covered Welding Electrodes*
ANSI/AWS A5.11 83	*Specification for Nickel and Nickel Alloy Covered Welding Electrodes*
ANSI/AWS A5.11-90	*Specification for Nickel and Nickel Alloy Welding Electrodes for Shielded Metal Arc Welding*
ANSI/AWS A5.11/A5.11M-97	*Specification for Nickel and Nickel-Alloy Welding Electrodes for Shielded Metal Arc Welding*
AWS A5.11/A5.11M:2005	*Specification for Nickel and Nickel-Alloy Welding Electrodes for Shielded Metal Arc Welding*

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, 550 N.W. LeJeune Road, Miami, FL 33126.

This page is intentionally blank.

Table of Contents

List of Tables

List of Figures

Specification for Nickel and Nickel-Alloy Welding Electrodes for Shielded Metal Arc Welding

1. Scope

1.1 This specification prescribes requirements for the classification of nickel and nickel-alloy covered electrodes for shielded metal arc welding. It includes those compositions in which the nickel content generally exceeds that of any other element.[1]

1.2 Safety and health issues and concerns are beyond the scope of this standard and, therefore, are not fully addressed herein. Some safety and health information can be found in the nonmandatory annex, Clauses A5 and A10. Safety and health information is available from other sources, including, but not limited to, ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*, and applicable federal and state regulations.

1.3 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 in any way when referring to material properties. The specification with the designation A5.11 uses U.S. Customary Units. The specification A5.11M uses SI Units. The latter are shown within brackets ([ ]) or in appropriate columns in tables and figures. Standard dimensions based on either system may be used for sizing of filler metal or packaging or both under A5.11 or A5.11M specifications.

2. Normative References

2.1 The following standards contain provisions which, through reference in this text, constitute provisions of this AWS standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreement based on this AWS standard are encouraged to investigate the possibility of applying the most recent edition of the documents shown below. For undated references, the latest edition of the standard referred to applies.

2.2 The following AWS standards[2] are referenced in the mandatory Clauses of this document:

(1) AWS A1.1, *Metric Practice Guide for the Welding Industry*

(2) AWS A5.01M/A5.01 (ISO 14344), *Procurement Guidelines for Consumables — Welding and Allied Processes — Flux and Gas Shielded Electrical Welding Processes*

(3) AWS B4.0, *Standard Methods for Mechanical Testing of Welds*

(4) AWS B4.0M, *Standard Methods for Mechanical Testing of Welds*

2.3 The following ANSI standard[3] is referenced in the mandatory Clauses of this document:

[1] Nickel-base covered electrodes for welding cast iron are treated separately in AWS A5.15, *Specification for Welding Electrodes and Rods for Cast Iron*.
[2] AWS standards are published by the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.
[3] ANSI Z49.1 is published by the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.