


**AWS A5.10/A5.10M:2012
(ISO 18273:2004 MOD)
An American National Standard**



**Welding
Consumables—
Wire Electrodes,
Wires and Rods
for Welding of
Aluminum and
Aluminum-Alloys—
Classification**



American Welding Society®



**AWS A5.10/A5.10M:2012
(ISO 18273:2004 MOD)
An American National Standard**

**Approved by the
American National Standards Institute
October 4, 2012**

Welding Consumables—Wire Electrodes, Wires and Rods for Welding of Aluminum and Aluminum-Alloys—Classification

10th Edition

Supersedes AWS A5.10/A5.10M:1999

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 requirements for the classification of bare, wrought and cast aluminum-alloy electrodes and rods for use with the gas metal arc, gas tungsten arc, oxyfuel gas, and plasma arc welding processes.

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®

International Standard Book Number: 978-0-87171-825-9
American Welding Society
8669 Doral Blvd., Suite 130, Doral, FL 33166
© 2012 by American Welding Society
All rights reserved
Printed in the United States of America

Photocopy Rights. No portion of this standard may be reproduced, stored in a retrieval system, or transmitted in any form, including mechanical, photocopying, recording, or otherwise, without the prior written permission of the copyright owner.

Authorization to photocopy items for internal, personal, or educational classroom use only or the internal, personal, or educational classroom use only of specific clients is granted by the American Welding Society provided that the appropriate fee is paid to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, tel: (978) 750-8400; Internet: <www.copyright.com>.

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 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 is entrusted to appropriately qualified and competent personnel.

This standard may be superseded by new editions. This standard may also be corrected through publication of amendments or errata or supplemented by publication of addenda. Information on the latest editions of AWS standards including amendments, errata, and addenda is posted on the AWS web page (www.aws.org). Users should ensure that they have the latest edition, amendments, errata, and addenda.

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.

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

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, 8669 Doral Blvd., Suite 130, Doral, FL 33166 (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, 8669 Doral Blvd., Suite 130, Doral, FL 33166.

Personnel

AWS A5 Committee on Filler Metals and Allied Materials

H. D. Wehr, Chair	<i>Arcos Industries, LLC</i>
J. J. DeLoach Jr., 1st Vice Chair	<i>Naval Surface Warfare Center</i>
R. D. Fuchs, 2nd Vice Chair	<i>Böhler Welding Group USA, Incorporated</i>
R. K. Gupta, Secretary	<i>American Welding Society</i>
T. Anderson	<i>ITW Welding North America</i>
J. M. Blackburn	<i>Naval Sea Systems Command</i>
J. C. Bundy	<i>Hobart Brothers Company</i>
J. L. Caron	<i>Haynes International, Incorporated</i>
D. D. Crockett	<i>Consultant</i>
R. V. Decker	<i>Weldstar</i>
D. A. DelSignore	<i>Consultant</i>
H. W. Ebert	<i>Consulting Welding Engineer</i>
D. M. Fedor	<i>The Lincoln Electric Company</i>
J. G. Feldstein	<i>Foster Wheeler North America</i>
S. E. Ferree	<i>ESAB Welding and Cutting Products</i>
D. A. Fink	<i>The Lincoln Electric Company</i>
G. L. Franke	<i>Naval Surface Warfare Center</i>
R. M. Henson	<i>J. W. Harris Company, Incorporated</i>
S. D. Kiser	<i>Special Metals</i>
P. J. Konkol	<i>Concurrent Technologies Corporation</i>
D. J. Kotecki	<i>Damian Kotecki Welding Consultants</i>
L. G. Kvidahl	<i>Northrop Grumman Ship Systems</i>
A. Y. Lau	<i>Canadian Welding Bureau</i>
J. S. Lee	<i>Chevron</i>
T. Melfi	<i>The Lincoln Electric Company</i>
K. M. Merlo	<i>EWI</i>
M. T. Merlo	<i>RevWires LLC</i>
B. Mosier	<i>Polymet Corporation</i>
A. K. Mukherjee	<i>Siemens Power Generation, Incorporated</i>
T. C. Myers	<i>Oceaneering Intervention Engineering</i>
C. L. Null	<i>Consultant</i>
B. A. Pletcher	<i>CB&I, Incorporated</i>
K. C. Pruden	<i>Hydril Company</i>
K. Roossinck	<i>Northrop Grumman Ship Systems</i>
P. K. Salvesen	<i>Det Norske Veritas (DNV)</i>
K. Sampath	<i>Consultant</i>
W. S. Severance	<i>ESAB Welding and Cutting Products</i>
M. F. Sinfield	<i>Naval Surface Warfare Center</i>
M. J. Sullivan	<i>NASSCO—National Steel and Shipbuilding</i>
R. C. Sutherlin	<i>ATI Wah Chang</i>
R. A. Swain	<i>Euroweld, Limited</i>
K. P. Thornberry	<i>Care Medical, Incorporated</i>
M. D. Tumuluru	<i>U.S. Steel Corporation</i>
J. Zhang	<i>Indalco Alloys Incorporated of Lincoln Electric</i>

Advisors to the AWS A5 Committee on Filler Metal and Allied Materials

R. L. Bateman	<i>Soldaduras West Arco Limitada</i>
J. E. Beckham	<i>Chrysler LLC</i>
M. L. Caruso	<i>Special Metals</i>
R. A. Daemen	<i>Consultant</i>
B. S. Dauble	<i>Carpenter Technology Corporation</i>
T. A. Davenport	<i>PRL Industries</i>
J. DeVito	<i>Consultant</i>
C. E. Fuerstenau	<i>Lucas-Milhaupt Incorporated</i>
J. P. Hunt	<i>Special Metals</i>
S. Imaoka	<i>Kobe Steel Limited</i>
S. J. Knostman	<i>Hobart Brothers</i>
W. A. Marttila	<i>WAMcom Consulting LLC</i>
R. Menon	<i>Stoody Company</i>
M. P. Parekh	<i>Consultant</i>
J. W. Price	<i>DMI Industries</i>
M. A. Quintana	<i>The Lincoln Electric Company</i>
E. S. Surian	<i>National University of Lomas de Zamora</i>
H. J. White	<i>Consultant</i>

AWS A5C Subcommittee on Aluminum-Alloy Filler Metals

T. Anderson, Chair	<i>ITW Welding North America</i>
R. K. Gupta, Secretary	<i>American Welding Society</i>
B. E. Anderson	<i>MAXAL International, Incorporated</i>
B. C. Boehringer	<i>The Lincoln Electric Company</i>
S. A. Collins	<i>Maine Maritime Academy</i>
W. D. England	<i>Ferris State University</i>
R. M. Henson	<i>Harris Products Group</i>
J. S. Lee	<i>Chevron</i>
S. E. Pollard	<i>Machinist, Incorporated</i>
W. J. Sperko	<i>Sperko Engineering Services</i>
L. T. Vernam	<i>AlcoTec Wire Corporation</i>
D. A. Wright	<i>Zephyr Products, Incorporated</i>

Advisors to the AWS A5C Subcommittee on Aluminum-Alloy Filler Metals

B. J. Farkas	<i>MAXAL International, Incorporated</i>
V. van der Mee	<i>Lincoln Electric Europe bv</i>
G. J. White	<i>MAXAL International, Incorporated</i>
J. Zhang	<i>Indalco Alloys, Incorporated of Lincoln Electric</i>

Table of Contents

	Page No.
<i>Personnel</i>	v
<i>Foreword</i>	vii
<i>List of Tables</i>	x
<i>List of Figures</i>	x
1. Scope	1
2. Normative references	1
3. Classification	2
4. Acceptance	2
5. Certification	2
6. Rounding-off procedure	2
7. Summary of tests	5
8. Retest	5
9. Weld test assemblies	5
10. Chemical analysis	10
11. Radiographic test	10
12. Bead-on-plate test	10
13. Method of manufacture	11
14. Standard sizes	11
15. Finish and uniformity	12
16. Standard package forms	12
17. Winding requirements	12
18. Filler metal identification	12
19. Packaging	15
20. Marking of packages	15
21. Symbols and requirements	15
22. Mechanical properties of the weld metal	15
National Annexes	
Annex A (Informative)—Guide to Welding Consumables—Wire Electrodes, Wires and Rods for Welding of Aluminum and Aluminum-Alloys—Classification	17
Annex B (Informative)—Guidelines for the Preparation of Technical Inquiries	27
Annex C (Informative)—List of Deviations from ISO 18273:2004	29
AWS Filler Metal Specifications by Material and Welding Process	31
AWS Filler Metal Specifications and Related Documents	33

List of Tables

Table	Page No.
1 Symbol for the Chemical Composition of Solid Wires and Rods	3
2 Required Tests	6
3 Base Metal for Test Assemblies	9
4 Standard Sizes.....	14
5 Typical Sizes of Flattened Rods	14
6 Standard Packages, Dimensions, and Weights	15
A.1 Guide to the Choice of Filler Metal for General Purpose Welding	23
A.2 Discontinued Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods	25

List of Figures

Figure	Page No.
1 Groove Weld Test Assembly for Radiographic Test.....	8
2A Radiographic Acceptance Standards for 3/16 in [5 mm] and 1/4 in [6.4 mm] Thick Test Assemblies—Overhead Welding Position.....	11
2B Radiographic Acceptance Standards for 3/8 in [10 mm] Thick Test Assemblies—Overhead Welding Position.....	12
3 Radiographic Acceptance Standard for Test Assemblies—Flat Position Welding	13

Welding consumables — Wire electrodes, wires and rods for welding of aluminum and aluminum-alloys — Classification

1 Scope

1.1 This standard specifies requirements for classification of solid wires and rods for fusion welding of aluminum and aluminum alloys. The classification of the solid wires and rods is based on their chemical composition.

1.2 *Safety and health issues and concerns are beyond the scope of this standard and are therefore not fully addressed herein. Some safety and health information can be found in informative annex Clauses A6 and A12. 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 weld metal properties. The specification A5.10 uses U.S. Customary Units. The specification with the designation A5.10M 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 the sizing of electrodes or packaging or both under specification A5.10 or A5.10M.*

2 Normative references

This standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

2.1 *The following AWS standards¹ are referenced in the mandatory clauses of this document:*

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

AWS A3.0M/A3.0, Standard Welding Terms and Definitions

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

AWS A5.02/A5.02M:2007, Filler Metal Standard Sizes, Packaging, and Physical Attributes

2.2 *The following ANSI standard is referenced in the mandatory clauses of this document:*

ANSI Z49.1, Safety in Welding, Cutting, and Allied Processes²

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

² This ANSI standard is published by the American Welding Society, 8669 Doral Blvd., Suite 130, Doral, FL 33166.