

Specification for Carbon and Low- Alloy Steel Flux Cored Electrodes for Flux Cored Arc Welding and Metal Cored Electrodes for Gas Metal Arc Welding



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Specification for Carbon and Low-Alloy Steel Flux Cored Electrodes for Flux Cored Arc Welding and Metal Cored Electrodes for Gas Metal Arc Welding

2nd Edition

Supersedes AWS A5.36/A5.36M:2012

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 carbon and low-alloy steel flux cored electrodes for flux cored arc welding and metal cored electrodes for gas metal arc welding. The requirements include chemical composition and mechanical properties of the weld metal and certain usability characteristics. Optional, supplemental designators are also included for diffusible hydrogen and to indicate conformance to special mechanical property requirements when the weld metal is deposited using low heat input, fast cooling rate and high heat input, slow cooling rate procedures. Additional requirements are included or referenced for standard sizes, marking, manufacturing, and packaging. A guide is appended to the specification as a source of information concerning the classification system employed and the intended use of carbon and low-alloy steel flux cored and metal cored electrodes.

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 included for informational purposes only.

It is not part of AWS A5.36/A5.36M:2016, *Specification for Carbon and Low-Alloy Steel Flux Cored Electrodes for Flux Cored Arc Welding and Metal Cored Electrodes for Gas Metal Arc Welding*

This specification is the second edition that combines the two specifications previously issued by the American Welding Society for the classification of carbon and low-alloy steel flux cored electrodes (AWS A5.20/A5.20M, *Specification for Carbon Steel Electrodes for Flux Cored Arc Welding*, and AWS A5.29/A5.29M, *Specification for Low-Alloy Steel Electrodes for Flux Cored Arc Welding*). In addition, this specification includes provisions for the classification of carbon and low-alloy steel metal cored electrodes. Heretofore, carbon steel metal cored electrodes were classified under AWS A5.18/A5.18M, *Specification for Carbon Steel Electrodes and Rods for Gas Shielded Arc Welding*, and low-alloy steel metal cored electrodes were classified under A5.28/A5.28M, *Specification for Low-Alloy Steel Electrodes and Rods for Gas Shielded Arc Welding*. The user should be advised that the requirements for low-alloy metal cored electrodes classified under this specification may vary somewhat from those prescribed in AWS A5.28/A5.28M.

This document uses both U.S. Customary Units and the International System of Units (SI) throughout. 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, AWS A1.1, *Metric Practice Guide for the Welding Industry*, and ISO 544, *Welding Consumables—Technical Delivery Conditions for Filler Materials and Fluxes—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 AWS A5.36/A5.36M specification utilizes a new, “open classification system” introduced in this document for the classification of carbon and low-alloy steel flux cored and metal cored electrodes. This new classification system facilitates the introduction of new products designed to meet the ever changing requirements of today’s market. The open classification system uses designators to indicate electrode type (Usability Designator), welding position capability, tensile strength, notch toughness, shielding gas (with more options and new designations), condition of heat treatment, if any, and weld deposit composition. The change to an open classification system was made to allow for the classification of flux cored and metal cored electrodes with classification options which (1) better define the performance capabilities of the advanced electrode designs that have been developed, and (2) reflect the application requirements of today’s marketplace. In addition, the provision was made in this document for the classification of metal cored electrodes (usability Designator T15) and two new electrode types (Usability Designators T16 and T17) for the classification of metal cored and flux cored electrodes designed for use with AC power sources with or without modified waveforms. The EXXT-2X classification was discontinued in the 2012 edition. Electrodes previously classified as EXXT-2X can now be classified under the new open classification system without requiring a unique “2” Usability Designator. The EXXT-13 electrode classification was discontinued in the 2012 edition due to lack of commercial significance.

The AWS A5.36/A5.36M specification does not preclude the continued classification of carbon and low-alloy steel flux cored electrodes or carbon and low-alloy steel metal cored electrodes to AWS A5.20/A5.20M, AWS A5.29/A5.29M, AWS A5.18/A5.18M, or AWS A5.28/A5.28M, as applicable. It is recognized that many electrodes classified to the fixed requirements of these documents have gained wide acceptance for single and multiple pass applications. A number of the more widely used electrodes falling into this category have been retained in AWS A5.36/A5.36M with their existing designations and classification requirements. A listing of these electrode classifications with their requirements is given in Table A.1 in the Normative Annex A.

Additional changes to note are: (1) the Mn and Ni requirements for the K11 alloy type have been modified, (2) two new alloy types have been added, the K12 for high strength circumferential pipe welding and the K13 which is similar to the K2 alloy type but modified to allow for lower Mn content, (3) the heat input requirements for the “D” optional, supplemental designator for seismic applications have been changed to the requirements as specified in AWS A5.20/A5.20M:2005, (4) a protocol was introduced to allow the manufacturer to indicate conformance to impact requirements which are supplemental to and different from those used for electrode classification under this specification, (5) supplemental designators were provided to indicate more restrictive requirements for the Mn + Ni content of the B91 and B92 chromium-molybdenum weld deposits, and (6) a restriction was established prohibiting the use of the optional, supplemental diffusible hydrogen designator for self-shielded electrodes which produce weld deposits with greater than 1.3% aluminum content (Refer to A2.5 in Annex A).

Additionally, the format of this document has been modified for better clarity. The following items now appear in a Normative Annex: (1) a table listing existing electrode classifications having fixed requirements which are retained in this document, (2) optional, supplemental designators with their requirements, and (3) other special tests not required for classification.

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.

Document Development

This is the first revision of AWS A5.36/A5.36M specification that was issued initially in 2012. The history of the AWS A5.20 and AWS A5.29 specifications appear below:

AWS A5.20-69 ANSI W3.20-1973	<i>Specifications for Mild Steel Electrodes for Flux Cored Arc Welding</i>
ANSI/AWS A5.20-79	<i>Specification for Carbon Steel Electrodes for Flux Cored Arc Welding</i>
ANSI/AWS A5.20-95	<i>Specification for Carbon Steel Electrodes for Flux Cored Arc Welding</i>
AWS A5.20/A5.20M:2005	<i>Specification for Carbon Steel Electrodes for Flux Cored Arc Welding</i>
ANSI/AWS A5.29-80	<i>Specification for Low-Alloy Steel Electrodes for Flux Cored Arc Welding</i>
ANSI/AWS A5.29:1998	<i>Specification for Low-Alloy Steel Electrodes for Flux Cored Arc Welding</i>
AWS A5.29/A5.29M:2005	<i>Specification for Low-Alloy Steel Electrodes for Flux Cored Arc Welding</i>
AWS A5.36/A5.36M:2012	<i>Specification for Carbon and Low-Alloy Steel Flux Cored Electrodes for Flux Cored Arc Welding and Metal Cored Electrodes for Gas Metal Arc Welding</i>

Comments and suggestions for the improvement of this specification are welcome. They should be sent to the Secretary, Committee on Filler Metals and Allied Materials, American Welding Society, 8669 NW 36 St # 130, Miami, FL 33166.