AWS A5.36/A5.36M:2012
An American National Standard

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

American Welding Society®

Approved American National Standard
ANSI

**AWS A5.36/A5.36M:2012**
**An American National Standard**

**Approved by the**
**American National Standards Institute**
**December 20, 2011**

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

**1st Edition**

**Supersedes AWS A5.20/A5.20M:2005 and AWS A5.29/A5.29M: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 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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**550 N.W. LeJeune Road, Miami, FL 33126**

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# Foreword

This foreword is not part of AWS A5.36/A5.36M:2012, *Specification for Carbon and Low-Alloy Steel Flux Cored Electrodes for Flux Cored Arc Welding and Metal Cored Electrodes for Gas Metal Arc Welding*, but is included for informational purposes only.

This specification 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 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 new AWS A5.36/A5.36M specification utilizes two classification systems. The first of these is a "fixed classification system" which has been carried over to this specification from AWS A5.20/A5.20M or AWS A5.18/A5.18M, as applicable, for the classification of those carbon steel flux cored electrodes or carbon steel metal cored electrodes which, with the specific mechanical properties specified for them in AWS A5.20/A5.20M or AWS A5.18/A5.18M, have gained wide acceptance for single and multiple pass applications. The classification designations and requirements for these specific electrodes are unchanged from those previously specified in AWS A5.20/A5.20M or AWS A5.18/A5.18M. A listing of these electrodes with their requirements is given in Table 1.

This AWS A5.36/A5.36M specification also utilizes a new, "open classification system" which is introduced in this document for the classification of carbon and low-alloy steel flux cored and metal cored electrodes. The open classification system uses designators to indicate electrode type (Usability Designator), welding position capability, tensile strength, impact strength, 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 is being 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 has been 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 has been discontinued. 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 has been discontinued due to lack of commercial significance. For a complete listing of the affected existing electrode classifications and the corresponding equivalent classifications using the open classification system under AWS A5.36/A5.36M, refer to A9 in Annex A.

Two additional changes to note are (1) the fillet weld test, previously required under AWS A5.20/A5.20M and AWS A5.29/A5.29M (and also detailed in ISO 15792-3) is not a required test under AWS A5.36/A5.36M, and (2) the preheat

and interpass temperature requirements for the "D" optional, supplemental designator have been modified for better agreement with AWS D1.8/D1.8M, *Structural Welding Code—Seismic Supplement*."

The A5.20/A5.20M:2005 specification being replaced is the fourth revision of the joint ASTM/AWS A5.20 document first issued in 1969. The A5.29/A5.29M:2005 specification being replaced is the third revision of AWS A5.29 that was introduced in 1980. The historical progressions of these two documents appear below:

**Historical Background**

| | |
|---|---|
| AWS A5.20-69<br>ANSI W3.20-1973 | *Specifications for Mild Steel Electrodes for Flux Cored Arc Welding* |
| ANSI/AWS A5.20-79 | *Specification for Carbon Steel Electrodes for Flux Cored Arc Welding* |
| ANSI/AWS A5.20-95 | *Specification for Carbon Steel Electrodes for Flux Cored Arc Welding* |
| AWS A5.20/A5.20M:2005 | *Specification for Carbon Steel Electrodes for Flux Cored Arc Welding* |
| ANSI/AWS A5.29-80 | *Specification for Low-Alloy Steel Electrodes for Flux Cored Are Welding* |
| ANSI/AWS A5.29: 1998 | *Specification for Low-Alloy Steel Electrodes for Flux Cored Arc Welding* |
| AWS A5.29/A5.29M:2005 | *Specification for Low-Alloy Steel Electrodes for Flux Cored 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.

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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

## 1. Scope

**1.1** This specification prescribes requirements for the classification of carbon and low-alloy steel flux cored electrodes for flux cored arc welding (FCAW), either with or without shielding gas, and carbon and low-alloy steel metal cored electrodes for gas metal arc welding (GMAW). This new specification replaces both 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*. It also includes provisions for the classification of carbon and low-alloy steel metal cored electrodes which previously had been classified according to AWS A5.18/A5.18M, *Specification for Carbon Steel Electrodes and Rods for Gas Shielded Arc Welding*, or AWS A5.28/A5.28M, *Specification for Low-Alloy Steel Electrodes and Rods for Gas Shielded Arc Welding*, as applicable. Iron is the only element of the undiluted weld metal deposited by the electrodes classified under this specification whose content exceeds 10.5%.

**1.2** Safety issues and concerns are addressed in this standard, although health issues and concerns are beyond the scope of this standard. Some safety and health information can be found in nonmandatory Annex A, Clauses A5 and A10. Safety and health information is available from other sources, including, but not limited to, ANSI Z49.1[1] 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 with the designation A5.36 uses U.S. Customary Units. The specification A5.36M uses the International System of Units (SI). 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 the A5.36 and A5.36M specifications.

## 2. Normative References

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 editions of the documents shown below. For undated references, the latest edition of the standard referred to applies.

**2.1** The following AWS standards[2] are referenced in the mandatory sections of this document:

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

(2) AWS A3.0M/A3.0, *Standard Welding Terms and Definitions*

[1] ANSI Z49.1 is published by the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.
[2] AWS standards are published by the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.