This is a preview of "AWS G2.4/G2.4M:2007". Click here to purchase the full version from the ANSI store.

AWS G2.4/G2.4M:2007
An American National Standard

Guide for the Fusion Welding of Titanium and Titanium Alloys

American Welding Society

Approved American National Standard
ANSI

This is a preview of "AWS G2.4/G2.4M:2007". Click here to purchase the full version from the ANSI store.

AWS G2.4/G2.4M:2007
An American National Standard

Approved by the
American National Standards Institute
September 20, 2006

Guide for the Fusion Welding of Titanium and Titanium Alloys

1st Edition

Prepared by the
American Welding Society (AWS) G2 Committee on Joining Metals and Alloys

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

The standard *Guide for the Fusion Welding of Titanium and Titanium Alloys* provides instructional guidance for the welding of titanium and titanium alloys. This guide explains processes, equipment, materials, workshop practices, joint preparation, welding technique, tests, and the repair of defects.

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

This is a preview of "AWS G2.4/G2.4M:2007". Click here to purchase the full version from the ANSI store.

Table of Contents

This is a preview of "AWS G2.4/G2.4M:2007". Click here to purchase the full version from the ANSI store.

This is a preview of "AWS G2.4/G2.4M:2007". Click here to purchase the full version from the ANSI store.

List of Tables

List of Figures

This is a preview of "AWS G2.4/G2.4M:2007". Click here to purchase the full version from the ANSI store.

Guide for the Fusion Welding of Titanium and Titanium Alloys

1. Scope

This guide provides information on welding processes and procedures that are recommended for use in titanium fabrication. The document presents detailed and up-to-date technical information on the best practices to allow first-time users of titanium as well as established fabricators to join titanium parts into high quality components.

This standard makes use of both the U.S. Customary Units and the International System of Units (SI). The latter are shown within brackets [ ] or in appropriate columns in tables and figures. The measurements may not be exact equivalents; therefore, each system must be used independently of the other without combining in any way. The standard with the designation G2.4:2007 uses U.S. Customary Units. The standard with the designation G2.4M:2007 uses SI Units.

Safety and health issues and concerns are beyond the scope of this standard and therefore are not fully addressed herein. 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.

2. Normative References

The following standards contain provisions which, through reference in this text, constitute mandatory provisions of this AWS standard. For undated references, the latest edition of the referenced standard shall apply. For dated references, subsequent amendments to, or revision of, any of these publications do not apply. (See Annexes C and D for complete lists of standards and specifications for titanium fabrication.)

AWS Documents:[1]

1. AWS A3.0, *Standard Welding Terms and Definitions*;

2. AWS A5.12/A5.12M, *Specification for Tungsten and Tungsten Alloy Electrodes for Arc Welding and Cutting*;

3. AWS A5.16/A5.16M:2004, *Specification for Titanium and Titanium Alloy Welding Electrodes and Rods*;

4. AWS A5.32/A5.32M, *Specification for Welding Shielding Gases*; and

Other Documents:

5. ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*.[2]

3. Terms and Definitions

For the purposes of this document**,** the following terms and definitions apply:

alpha grades or alloys. The alpha (α) grades or alloys are generally weldable and nonheat treatable. They are materials with relatively large amounts of alpha stabilizers and low concentrations of beta (β) stabilizers. They are sometimes referred to as having predominately an alpha phase. They have medium strength, good notch toughness, and good resistance to creep at elevated temperatures. Silicon is sometimes added to enhance creep strength. A common alpha alloy is commercially pure (CP) titanium.

allotrope. An allotrope is a structurally different form of an element such as graphite and diamond which are allotropes of carbon. As can be seen with the example of carbon allotropes, certain physical properties can vary dramatically from allotrope to allotrope. Alpha and beta allotropes of titanium have very different properties. Alpha and beta allotropes are also referred to as phases.

alpha phase. The low-temperature allotrope of titanium with a hexagonal close-packed (HCP) crystal structure. The alpha phase promotes increased weldability and higher creep strength. Interestingly, the interstitial alloying elements of the alpha stabilizing type are

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

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