

AWS C6.2/C6.2M:2021
An American National Standard



Specification for Rotary Friction Welding of Metals



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Approved by the
American National Standards Institute
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Specification for **Rotary Friction Welding of Metals**

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Prepared by the
American Welding Society (AWS) C6 Committee on Friction Welding

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This specification provides for the qualification of rotary friction welding machines, procedures, and training of welding operators. Qualification of the welding procedure specification (WPS) includes the material specifications involved, weld joint design, destructive and nondestructive examination requirements, as well as guidelines for different categories of quality assurance. Qualification of welding equipment includes weld parameter control and weld reproducibility. Welding operators require training in the proper operation of rotary friction welding equipment. The requirements for requalification of the WPS and equipment are also given.



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This standard is subject to revision at any time by the AWS C6 Committee on Friction Welding. It must be reviewed every five years, and if not revised, it must be either reaffirmed or withdrawn.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 requested and should be addressed to AWS Headquarters. Such comments will receive careful consideration by the AWS C6 Committee on Friction Welding 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 C6 Committee on Friction Welding 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 NW 36 St, # 130, Miami, FL 33166.

Foreword

This foreword is not part of this standard but is included for informational purposes only.

This *Specification for Rotary Friction Welding* is the second publication of the AWS C6 Committee on Friction Welding. The committee was formed to recognize, codify, develop, and advance the process of friction welding.

The committee's first publication, ANSI/AWS C6.1-89, *Recommended Practices for Friction Welding*, was completed and published in 1989. It was the culmination of a monumental task: assembling and reducing into a concise form the technology and history of friction welding. A second document was then written to provide an explicit specification for friction welding, and is the following document.

The purpose of this specification is to help ensure that the welds resulting from the use of the process meet the service requirements for which they are intended.

This document clearly and accurately describes the essential technical requirements for a rotary friction weld. It specifies the qualification of procedures, methods, and equipment necessary to meet its technical requirements and safe use. This specification is intended to be used when referenced by other specifications or contract documents.

Friction stir welding and linear friction are variants of friction welding. However, these processes have unique process variables, machine controls, tooling, and quality requirements. Both processes have evolved beyond the original scope of this document. As such, these processes have been removed from this document and have been or will be addressed in other AWS documents. The purpose of this document is solely to address rotary friction welding and its close process variants.

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS C6 Committee on Friction Welding, American Welding Society, 8669 NW 36 St, # 130, Miami, FL 33166.

Official interpretations of any of the technical requirements of this standard may only be obtained by sending a request, in writing, to the Managing Director, Technical Services Division, American Welding Society. A formal reply will be issued after it has been reviewed by the appropriate personnel following established procedures.

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1. General Requirements

1.1 Scope. This document specifies the requirements for the manufacture and quality assurance of rotary friction weldments. It also contains requirements for the qualification of welding machines, welding procedures, and training of operators. This specification is directly applicable to inertia and direct-drive variants of rotary friction welding, but may also be used with orbital variants.

1.2 Units of Measurement. 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 shall be used independently.

1.3 Safety. Safety and health issues and concerns are beyond the scope of this standard, and therefore not fully addressed herein. Safety and health information is available from the following sources:

American Welding Society:

(1) ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*

(2) AWS Safety and Health Fact Sheets

(3) Other safety and health information on the AWS website

Material or Equipment Manufacturers:

(1) Safety Data Sheets supplied by materials manufacturers

(2) Operating Manuals supplied by equipment manufacturers

Applicable Regulatory Agencies

Work performed in accordance with this standard may involve the use of materials that have been deemed hazardous, and may involve operations or equipment that may cause injury or death. This standard does not purport to address all safety and health risks that may be encountered. The user of this standard should establish an appropriate safety program to address such risks as well as to meet applicable regulatory requirements. ANSI Z49.1 should be considered when developing the safety program.

2. Normative References

The documents listed below are referenced within this publication and are mandatory to the extent specified herein. For undated references, the latest edition of the referenced standard shall apply. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply.

American Welding Society (AWS) documents:

AWS A2.4, *Standard Symbols for Welding, Brazing, and Nondestructive Examination*;

AWS A3.0M/A3.0, *Standard Welding Terms and Definitions, Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying*;

AWS B1.10M/B1.10, *Guide for the Nondestructive Examination of Welds*;

AWS B2.1/B2.1M, *Specification for Welding Procedure and Performance Qualification*;