AWS G1.2M/G1.2:1999 (R2010)
An American National Standard

Specification for Standardized Ultrasonic Welding Test Specimen for Thermoplastics

American Welding Society

Approved American National Standard
ANSI

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Specification for Standardized Ultrasonic Welding Test Specimen for Thermoplastics

1st Edition

Prepared by the
American Welding Society (AWS) G1 Committee on Joining of Plastics and Composites

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This specification outlines the requirements for the ultrasonic welding test sample for thermoplastics and its welding and testing. In order to minimize variations, the geometry for the standard test sample is defined in detailed figures including tolerances on critical dimensions that may affect its weldability.

This specification can be used for but not be limited to the following investigations:

Thermoplastic Ultrasonic Weldability Studies;
Thermoplastic Ultrasonic Welding Optimizations; and
Scientific Studies on the Ultrasonic Welding of Thermoplastics.

Data collection of welding variables is divided into three levels. Level three data recording requires the highest precision of data collection and, consequently, is the most time intensive. Level two data recording requires moderate data collection for more practical investigations. Level one data recording is the least stringent. These three levels are included in order to recognize the varying levels of precision required within the plastic welding community.

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Foreword

This foreword is not part of AWS G1.2M/G1.2:1999 (R2010), *Specification for Standardized Ultrasonic Welding Test Specimen for Thermoplastics*, but is included for informational purposes only.

This specification, dealing with ultrasonic welding, was developed by the American Welding Society (AWS) G1 Committee on Joining of Plastics and Composites in response to a plastics industry demand for a reference document. This document provides a uniform procedure and sample profile to be used in rating the relative weldability of thermoplastic and composite materials. This specification was first published in 1999, and subsequently reaffirmed in 2010.

The AWS Committee on Joining Plastics and Composites was formed in 1989 by industry and academic experts interested in providing process information and test standards for rating the weldability of plastic and composite materials. A supplemental publication, AWS G1.1, Guide to the Ultrasonic Welding of Thermoplastics, is pending. AWS G1.1 provides more general information regarding the ultrasonic welding process, equipment, troubleshooting, and generic discussion on thermoplastic materials. Documents covering vibrational welding and the qualification of hot gas and extrusion welding personnel are planned for the future.

As new applications are developed and more experience is gathered, it is anticipated that changes in this standard will be required. Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS G1 Committee on Joining of Plastics and Composites, American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

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Table of Contents

Page No.

Personnel (Reaffirmation) v
Personnel (Original) vii
Foreword ix
List of Tables xii
List of Figures xii

1. Scope 1
2. Referenced Documents 1
3. Definitions 1
4. Safety 2
5. Geometry of the Standard Sample and Preparation 2
   5.1 Geometry Types 2
   5.2 Mold Design 2
   5.3 Molded Sample Specification 3
   5.4 Energy Director Butt Joint 3
   5.5 Double Shear Joint 3
   5.6 Reference Sample 3
6. Welding 3
   6.1 Horns 3
   6.2 Fixture 4
   6.3 Welding Parameters 4
7. Data Recording 4
   7.1 Level 1 Data Recording 8
   7.2 Level 2 Data Recording 8
   7.3 Level 3 Data Recording 9
8. Testing Procedures 13
   8.1 Data Recording 13
   8.2 Data Reporting 13
   8.3 Nominal Stress Calculation 14

Annex A (Informative)—Sample Tracking—Molding and Welding Sheet 17
Annex B (Informative)—Sample Ultrasonic Welding with Energy Director Butt Joint Data Sheet 19
Annex C (Informative)—Sample Ultrasonic Welding with Double Shear Joint Data Sheet 21
Annex D (Informative)—Guidelines for the Preparation of Technical Inquiries 23

List of Tables

Table		Page No.
1	Levels of Data Recording	12

List of Figures

Figure		Page No.
1	Standard Sample Geometry—Energy Director Butt Joint	3
2	Standard Sample Geometry—Double Shear Joint	4
3	Standard Sample Geometry—Mating Beam	5
4	Standard Sample Geometry—Reference Sample	5
5	Energy Director Butt Joint Welding	6
6	Double Shear Joint Welding	6
7(a)	20 kHz Horn/Sonotrode	7
7(b)	40 kHz Horn/Sonotrode	7
8(a)	Weld Fixture Assembly	8
8(b)	Weld Fixture Mounting Plate	9
8(c)	Weld Fixture Adjustable Side Support	10
8(d)	Weld Fixture Adjustable End Support	10
8(e)	Weld Fixture Fixed Support	11
9(a)	Pull Test Fixture Assembly	13
9(b)	Pull Test Fixture Mount	14
9(c)	Pull Test Fixture Jaws	15

Specification for Standardized Ultrasonic Welding Test Specimen for Thermoplastics

1. Scope

1.1 This specification outlines the requirements for a standard ultrasonic welding test sample for thermoplastics and its welding and testing.

1.2 As used in this specification, the word ***shall*** denotes a requirement; the word ***should*** denotes a guideline or recommendation; and the word ***may*** denotes a choice.

1.3 This standard makes use of both the International System of Units (SI) and U.S. Customary Units. The measurements are not exact equivalents; therefore each system must be used independently of the other without combining in any way. The standard with the designation G1.2M:1999 uses SI Units. The standard with the designation G1.2:1999 uses U.S. Customary Units. The latter are shown in appropriate columns in tables and figures, and within parentheses ( ) when used in the text.

2. Referenced Documents

AWS G1.1 *Guide to the Ultrasonic Assembly of Thermoplastics*

3. Definitions

actuator. The unit that houses the converter, booster, and horn assembly in a rigid mounting allowing it to move up and down either mechanically or pneumatically to apply a predetermined pressure on the workpiece.

amplitude. The peak to peak displacement of the horn at its work face as expressed in μm or in.

booster. A one-half wavelength long resonant metal section mounted between the converter and horn, it may have a change in cross-sectional area between the input and output surfaces. It usually mechanically increases or decreases the amplitude of the system, or acts as a coupling bar.

conditioned. Any condition other than dry-as-molded (i.e., moistened, aged, annealed, etc.).

converter. An electro-mechanical device which transforms electrical energy to mechanical energy.

coupling bar. A booster with unity gain, i.e., does not change the amplitude (1:1 Gain Ratio).

displacement. The total collapse of the part during the welding process, expressed in mm or in.

down speed. The rate of travel of the actuator from the home position to the part. Expressed in mm/s or in./s.

dry-as-molded. The moisture condition of the test sample as it is ejected from the mold.

energy. In welding, energy required to melt the plastic equals the power delivered multiplied by the time power is applied. Measured in watt seconds or joules.

energy director butt joint. A joint that contains a triangular-shaped projection of plastic material at the joint interface of a plastic part that concentrates the ultrasonic energy against a flat surface (see Figure 5).

far field welding. Configuration where the joint surface plane is typically more than 6 mm (0.25 in.) from the plane of horn contact with the workpiece.

fixture. A device for locating and supporting the workpiece in position for assembly.

flash. Material displaced from the joint area as a result of welding.

frequency. The number of complete oscillations per second, or cycles produced by the converter, booster, and horn. Expressed in Hertz (Hz) or kilohertz (kHz).