IEC 60352-9

Edition 1.0 2024-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Solderless connections –
Part 9: Ultrasonically welded connections – General requirements, test methods and practical guidance

Connexions sans soudure –
Partie 9: Connexions soudées par ultrasons – Exigences générales, méthodes d'essai et guide pratique

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FOREWORD

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IEC 60352-9 has been prepared by subcommittee 48B: Electrical connectors, of IEC technical committee 48: Electrical connectors and mechanical structures for electrical and electronic equipment. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
48B/3080/FDIS	48B/3084/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 60352 series, published under the general title *Solderless connections* , can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
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INTRODUCTION

This part of IEC 60352 covers ultrasonically welded connections and includes requirements, tests and practical guidance information.

Ultrasonic welding is a form of cold friction welding that is becoming increasingly popular in many industries. This type of welding uses ultrasonic vibration to join materials together, creating a bond that is both strong and reliable. Ultrasonic welding has been identified as a process in ISO 4063-41 by the International Organization for Standardization (ISO).

The process of ultrasonic welding relies on high frequency ultrasound waves being used to create frictional heat at the connection point. High temperature is not required for this special method of welding, making it one of the most cost-effective ways to join two materials together.

It also requires fewer steps than traditional methods, meaning it can be completed quickly and with minimal resources.

Ultrasonic welding has been around for decades but only recently has become more widely utilized due to advances in technology and its availability at lower cost. It can be used on many different materials including plastics, rubbers, metals, textiles, and composites. Due to its precision and strong bonds it creates, it has become extremely popular in manufacturing processes such as automotive industry, electronics industry, furniture production and even medical device production.

This document outlines a system of product classification according to the intended use of the end-product. Three general end-product levels, known as class A, B, and C products, are identified. Class A products are for general use and include consumer products, computers, and computer peripherals for applications where the major requirement is function of the assembly. Class B products are dedicated service electronic items providing high performance and extended life. Finally, Class C products are for high performance with zero tolerance for equipment downtime; this includes life support systems and other critical systems. The developer or user of ultrasonically welded connections should determine the class to which their end-product belongs.

This document outlines the test requirements for ultrasonically welded connections deemed to be used in class A, B and C products. Test groups P0-P11 are specified, with additional optional test groups P9 and P12 available if required by the manufacturer and user.

Three test schedules – A (basic), B (intermediate) and C (full) - are provided, based on a specific selection of test groups, each representing the minimum requirements for each correspondingly identified end-product class.

SOLDERLESS CONNECTIONS –

Part 9: Ultrasonically welded connections – General requirements, test methods and practical guidance

1 Scope

This part of IEC 60352 covers ultrasonically welded connections and includes requirements, tests and practical guidance information.

This document covers ultrasonically welded connections made with stranded or flexible wires (class 2, 5 or 6 per IEC 60228) of copper or copper alloy, as well as of aluminium or aluminium alloy.

These welded metal-to-metal connections shall employ wires with cross-sectional area of 0,08 mm^2 to 160 mm^2 and shall not exceed a total cross-sectional area, in case of wire bundle, of 200 mm^2.

For aluminium or aluminium alloy wires, the minimum required cross-sectional area is 2,5 mm^2.

Additionally, information on materials, data from industrial experience and test procedures are included to ensure electrically stable connections under prescribed environmental conditions.

Lastly, this document aims to achieve comparable results when using ultrasonic welding equipment with similar performance and specifications as specified by the termination manufacturer.

NOTE Figures in this document show examples of possible solutions of ultrasonically welded connections of rectangular shape, but solutions are not restricted to the shape displayed.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-581, *International Electrotechnical Vocabulary (IEV) – Part 581 – Electromechanical components for electronic equipment*

IEC 60068-1:2013, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-30, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*