INTERNATIONAL STANDARD

ISO 22688

First edition
2020-04

Brazing — Quality requirements for brazing of metallic materials

Brasage fort — Exigences de qualité en brasage fort des matériaux métalliques

Reference number
ISO 22688:2020(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by IIW, the *International Institute of Welding*, jointly with Commission XVII, *Brazing, soldering and diffusion bonding*, and Commission XVIII, *Quality management in welding and allied processes*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Brazing processes are widely used to manufacture many products from simple to complex. In some companies, brazing is the key fabrication process. Examples include several industry fields, such as automotive, aerospace, heat exchangers, refrigeration, air-conditioning, turbomachinery and other items.

These processes exert a profound influence on the cost of manufacture and quality of the product. It is important, therefore, to ensure that these processes are carried out in the most effective way and that appropriate control is exercised over all aspects of the operation.

This document is similar in scope and purpose to the ISO 3834 series and has been adapted for brazing quality management systems. This document can be a useful tool when a quality management system (e.g. ISO 9001) is applied by manufacturers.

Specification of quality requirements for brazing processes is important because the quality of these processes cannot be readily verified. Therefore, they are considered to be special processes as noted by ISO 9000.

Quality cannot be inspected into a product, it needs to be built in. Even the most extensive and sophisticated non-destructive testing does not improve the as-produced quality of the product. The use of non-destructive testing processes such as radiography, fluorescent penetrants and ultrasonics helps in rendering a decision as to the quality of the brazed joint.

For products to be free from serious problems in production and in service, it is necessary to provide controls, from the design phase, through material selection, into manufacture and subsequent inspection. For example, poor design can create serious and costly difficulties in the workshop, on site, or in service. Incorrect material selection can result in problems, such as failure of brazed joints.

To ensure sound and effective manufacturing, management needs to understand and appreciate the sources of potential trouble and to implement appropriate procedures for their control.

This document identifies measures that are applicable for different situations. Typically, they can be applied in the following circumstances:

— in contractual situations: specification of brazing quality requirements;

— by manufacturers: establishment and maintenance of brazing quality requirements;

— by committees drafting manufacturing codes or application standards: specification of brazing quality requirements;

— by organizations assessing brazing quality performance (e.g. third parties, customers or manufacturers).

This document may be adopted in full or partially by the manufacturer depending on the assembly concerned. This document provides a flexible framework for the control of brazing in the following applications.

— Case 1: To provide specific requirements for specifications which require the manufacturer to have a quality management system (e.g. ISO 9001).

— Case 2: To provide specific guidance for a manufacturer developing a quality management system for brazing.

— Case 3: To provide detailed requirements for specifications, regulations or product standards that require control of brazing activities.

This document can be used by internal and external organizations, including certification bodies, to assess the manufacturer's ability to meet customer, regulatory or the manufacturer's own requirements.

A similar series of documents, the ISO 3834 series, was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 10, *Quality management in the field of welding*.

Brazing — Quality requirements for brazing of metallic materials

1 Scope

This document defines two levels of quality requirements and selection criteria for brazing of metallic materials. It applies to manufacturing, both in workshops and at installation sites.

NOTE 1 This document is applicable to brazing industry quality management systems, similar in scope and purpose to the ISO 3834 series. This document provides complete sets of quality requirements for process control related to all listed brazing processes (for each process separately or in combination as specified) and lists the documents with which it is necessary to conform to these requirements. The requirements in this standard may be adopted for other brazing processes, with or without adjustments, under the responsibility of the manufacturer.

NOTE 2 These requirements can be used on their own by a manufacturer or in conjunction with a quality management system (e.g. ISO 9001).

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.

ISO 857-2, *Welding and allied processes — Vocabulary — Part 2: Soldering and brazing processes and related terms*

ISO 9000, *Quality management systems — Fundamentals and vocabulary*

ISO 9712, *Non-destructive testing — Qualification and certification of NDT personnel*

ISO 11745, *Brazing for aerospace applications — Qualification test for brazers and brazing operators — Brazing of metallic components*

ISO 13585, *Brazing — Qualification test of brazers and brazing operators*

ISO 17662, *Welding — Calibration, verification and validation of equipment used for welding, including ancillary activities*

ISO 17663, *Welding — Quality requirements for heat treatment in connection with welding and allied processes*

ISO 18279, *Brazing — Imperfections in brazed joints*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 857-2 and ISO 9000 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
application standard
standard applicable to a specific sector or type of product

EXAMPLE Standards specific to pressure vessels, process piping, structural fabrication or storage tanks.

Note 1 to entry: Application standards can be based on generic standards, in whole or partly, but provide additional, fewer or different requirements.

3.2
brazing coordination personnel
person or group of persons who coordinate manufacturing operations for all brazing and brazing-related activities

Note 1 to entry: Different personnel may be appointed by the *manufacturer* (3.5) for different brazing and related tasks.

3.3
brazing operator
person who controls or adjusts any brazing parameter for mechanized brazing or automatic brazing

3.4
competent personnel
personnel with the demonstrated ability to apply knowledge and skills to achieve the intended results

Note 1 to entry: A qualification test may be required for specific tasks and responsibilities.

3.5
manufacturer
organization responsible for brazing production

3.6
specification
requirements for products specified by customers or by the *manufacturer* (3.5) in anticipation of customer requirements or other documents

Note 1 to entry: The requirements for products and in some cases associated processes can be contained in, for example, technical specifications, product standards, process standards, contractual agreements or other documents.

3.7
sub-contractor
supplier of products, services and/or activities to the *manufacturer* (3.5) in a contractual situation

[SOURCE: ISO 3834-1:2005, 3.5]

4 General

This document specifies quality requirements suitable for the following listed brazing processes:

a) brazing with local heating, including:

- infrared brazing;
- flame brazing (torch brazing, USA);
- laser beam brazing;
- electron beam brazing;
- induction brazing;

- resistance brazing;
- diffusion brazing; and

b) brazing with global heating, including:

- furnace brazing;
- vacuum brazing;
- dip-bath brazing;
- salt-bath brazing;
- flux-bath brazing;
- immersion brazing
- diffusion brazing; and

c) weld brazing (braze welding, USA), including:

- gas weld brazing (gas braze welding, USA);
- arc weld brazing (arc braze welding, USA);
- gas metal arc weld brazing (gas metal arc braze welding, USA);
- gas tungsten arc weld brazing (gas tungsten arc braze welding, USA);
- plasma arc weld brazing (plasma arc braze welding, USA);
- laser weld brazing (laser braze welding, USA);
- electron beam weld brazing (electron beam braze welding, USA).

NOTE Controlled Atmosphere Brazing (CAB) is considered furnace brazing.

The requirements contained within this document may be adopted for other brazing processes.

These requirements relate only to those aspects of the quality of the products that can be influenced by the brazing process, without being assigned to any specific product group.

Therefore, this document provides a method to demonstrate the capability of a manufacturer to produce products of the specified quality.

These requirements:

a) are independent of the type of assembly manufactured;

b) define quality requirements for brazing in workshops and/or at installation sites;

c) provide guidance for describing a manufacturer's capability to produce assemblies to meet specified requirements;

d) provide a basis for assessing a manufacturer’s brazing capability.

These requirements are appropriate when demonstration of a manufacturer's capability to produce brazed assemblies, fulfilling specified quality requirements, is specified in one or more of the following:

- a specification;
- a product standard;
- contracts or other documents.

5 Selection of the appropriate level of quality requirements

The selection of the comprehensive quality requirements (see Clause 6) or the elementary quality requirements (see Clause 7) shall consider the product standard, specification, contract or other documents.

To fulfil the comprehensive quality requirements, the manufacturer is required to comply with the requirements of the relevant documents cited in Clause 6. To fulfil the elementary quality requirements, the manufacturer is required to comply with the requirements of the relevant documents cited in Clause 7.

The requirements of this document can be applied in a variety of situations. The manufacturer shall also consider the comprehensive quality requirements, or the elementary quality requirements, based on the following criteria related to products:

— the extent and significance of safety-critical products;

— the extent and significance of product performance;

— the complexity of manufacture;

— the range of products manufactured;

— the range of different materials used;

— the extent to which metallurgical problems, such as erosion, liquation, overaging, resolutionizing, etc., can affect product performance;

— the extent to which manufacturing imperfections (e.g. misalignment, distortion or brazed joint imperfections such as macroporosity, lack of braze coverage, lack of bonding, etc.) can affect product performance.

NOTE 1 Because these requirements can be used in a variety of situations and for different applications, definitive rules on the level of quality requirements to be adopted in individual circumstances are not given in this clause.

A manufacturer that demonstrates compliance with the comprehensive quality requirements is considered to have established compliance with the elementary quality requirements without further demonstration.

NOTE 2 Table A.1 lists criteria that assists in the selection of the appropriate quality level, using Clauses 6 and 7 of these requirements.

6 Comprehensive quality requirements

6.1 General

This clause defines comprehensive quality requirements for brazing, both in workshops and at installation sites.

In certain situations, where particular operations such as heat treatment are not undertaken, the requirements related to that operation detailed in this clause may be selectively amended or deleted.

Otherwise, the requirements contained within this clause shall be adopted in full.