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## Brazing — Qualification test of brazers and brazing operators

*Brasage fort — Essais de qualification des braseurs et des opérateurs braseurs en brasage fort*

ICS: 25.160.01

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# Contents

	Page
Foreword .....	v
Introduction .....	vi
<b>1 Scope .....</b>	<b>1</b>
<b>2 Normative references .....</b>	<b>1</b>
<b>3 Terms and definitions .....</b>	<b>2</b>
<b>4 Symbols, definitions and reference numbers .....</b>	<b>4</b>
4.1 General .....	4
4.2 Symbols .....	4
<b>5 Essential variables and range of qualification .....</b>	<b>4</b>
5.1 General .....	4
5.2 Brazing process .....	4
5.3 Brazer qualification .....	5
5.3.1 Product type .....	5
5.3.2 Type of joint .....	5
5.3.3 Parent material group(s) .....	5
5.3.4 Filler metals and brazing filler application .....	6
5.3.5 Dimensions .....	6
5.3.6 Filler metal flow direction .....	6
5.4 Brazing operator qualification .....	7
5.4.1 Type of equipment .....	7
5.4.2 Filler metals and brazing filler application .....	7
<b>6 Examination and testing .....</b>	<b>7</b>
6.1 Supervision .....	7
6.2 Brazing conditions .....	7
6.3 Test piece .....	8
6.4 Assessment of work pieces .....	8
6.5 Extent of testing .....	8
6.6 Visual testing .....	8
6.7 Non-destructive testing .....	8
6.8 Destructive testing .....	8
6.9 Additional examination and testing .....	8
<b>7 Acceptance requirements for test pieces .....</b>	<b>9</b>
<b>8 Re-tests .....</b>	<b>9</b>
<b>9 Period of validity .....</b>	<b>9</b>
9.1 Initial qualification .....	9
9.2 Prolongation .....	10
<b>10 Certificate .....</b>	<b>10</b>
<b>11 Designation .....</b>	<b>10</b>
<b>Annex A (informative) Quality requirements for brazing .....</b>	<b>12</b>
<b>Annex B (informative) Brazer qualification test certificate .....</b>	<b>13</b>
<b>Annex C (informative) Brazing operator qualification test certificate .....</b>	<b>15</b>
<b>Annex D (informative) Other non-essential variables .....</b>	<b>16</b>
<b>Annex E (normative) Material grouping system .....</b>	<b>17</b>
<b>Annex F (informative) Examples of test pieces .....</b>	<b>19</b>
<b>Annex ZA (informative) Relationship between this European Standard and the essential requirements of EU Directive 2014/68/EU (PED) aimed to be covered .....</b>	<b>22</b>

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## 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](http://www.iso.org/directives)).

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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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 44, *Welding and allied processes* Subcommittee SC 11, *Qualification requirements for welding and allied processes personnel*.

This second edition cancels and replaces the first edition (ISO 13585:2012), which has been technically revised.

— To be completed closer to publication

Any feedback, question or request for official interpretation related to any aspect of this document should be directed to the Secretariat of ISO/TC 44/SC 11 via your national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html). Official interpretations, where they exist, are available from this page: <https://committee.iso.org/sites/tc44/home/interpretation.html>.

## Introduction

The purpose of this document is to provide a general set of rules for qualification of brazers and brazing operators, independent of product or application.

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# Brazing — Qualification test of brazers and brazing operators

## 1 Scope

This document specifies requirements for qualification testing of brazers and brazing operators for metallic materials.

This document applies to the following brazing processes in accordance with ISO 857-2 and ISO 4063 with local and global heating:

- 911 Infrared brazing
- 912 Flame brazing, torch brazing
- 913 Laser beam brazing
- 914 Electron beam brazing
- 916 Induction brazing
- 918 Resistance brazing
- 919 Diffusion brazing
- 921 Furnace brazing
- 922 Vacuum brazing
- 923 Dip-bath brazing
- 924 Salt-bath brazing
- 925 Flux bath brazing
- 926 Immersion brazing
- 972 Arc weld brazing

This document is not applicable to personnel operating brazing equipment who do not have any direct influence on the quality of the brazed joint for example, personnel performing exclusively loading/unloading the brazing unit or just initiating the brazing cycle in automatic brazing.

NOTE 1 [Annex A](#) gives guidelines on general quality requirements for brazing.

NOTE 2 This document does not apply to brazing for aerospace applications covered by ISO 11745.

The principles of this document may be applied to brazing of other materials.

## 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 857-2:2005, *Welding and allied processes — Vocabulary — Part 2: Soldering and brazing processes and related terms*

ISO 4063, *Welding and allied processes — Nomenclature of processes and reference numbers*

ISO 17672, *Brazing — Filler metals*

ISO 18279, *Brazing — Imperfections in brazed joints*

ISO/TR 25901-1:2016, *Welding and allied processes — Vocabulary — Part 1: General terms*

ISO/DIS 17779, *Brazing — Qualification of brazing procedures*

EN 12797, *Brazing — Destructive tests of brazed joints*

EN 12799, *Brazing — Non-destructive examination of brazed joints*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 857-2:2005, ISO/TR 25901-1:2016 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

##### **brazer**

person who holds and manipulates the device for heating the brazing area by hand

Note 1 to entry: the brazer verifies compliance with the pBPS or BPS prior to and during brazing.

#### 3.2

##### **brazing operator**

person who controls or adjusts brazing parameters for mechanized brazing or sets up brazing parameters for automatic brazing

Note 1 to entry: the brazing operator verifies compliance with the pBPS or BPS prior to and during the brazing cycle.

#### 3.3

##### **automatic brazing**

brazing in which all operations are performed without brazing operator intervention during the process

Note 1 to entry: Manual adjustment of brazing variables by the brazing operator during brazing is not possible.

#### 3.4

##### **mechanized brazing**

brazing where the required brazing conditions are maintained by mechanical or electronic means but may be manually varied during the process

#### 3.5

##### **manual brazing**

brazing where the required brazing conditions are maintained by hand

#### 3.6

##### **brazing**

joining process using filler metal with a liquidus temperature above 450 °C

[SOURCE: ISO 857-2:2005, 3.1.2.]



**3.7****brazing procedure specification****BPS**

document that has been qualified and provides the required variables of the brazing procedure to ensure repeatability during production brazing

**3.8****preliminary brazing procedure specification****pBPS**

document containing the required variables of the brazing procedure which is not yet qualified

**3.9****manufacturer**

workshop or site (or both) which is (are) under the same technical and quality management

**3.10****examiner**

person appointed to verify compliance with the applicable standard

Note 1 to entry: In certain cases, an external independent examiner can be required.

[SOURCE: ISO/TR 25901-1:2016, 2.5.29]

**3.11****examining body**

organization appointed to verify compliance with the applicable standard

Note 1 to entry: In certain cases, an external independent examining body can be required.

[SOURCE: ISO/TR 25901-1:2016, 2.5.30]

**3.12****filler metal(s)**

added metal required for brazed joints

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Note 1 to entry: Filler metal can be in the form of wire, inserts, powder, pastes, foil etc.

**3.13****flux**

non-metallic material which, when molten, promotes wetting by removing existing oxide or other detrimental films from the surfaces to be joined and prevents their re-formation during the joining operation

[SOURCE: ISO 857-2:2005, 3.2.2]

**3.14****test piece**

brazed assembly which is used for testing purposes

Note 1 to entry: Adapted from ISO/TR 25901-1:2016, 2.2.1.5.

**3.15****test specimen**

part or portion cut from the test piece in order to perform a specified destructive test

[SOURCE: ISO/TR 25901-1:2016, 2.2.1.6]

## 4 Symbols, definitions and reference numbers

### 4.1 General

Where the full wording is not used, the symbols in 4.2 and brazing process reference numbers in Clause 1 shall be used when completing the qualification test certificate (see Annexes B and C).

### 4.2 Symbols

*t* material thickness of the work piece

*L* overlap length

*D* outside pipe diameter

## 5 Essential variables and range of qualification

### 5.1 General

The qualification of brazers, (see 5.3) and brazing operators, (see 5.4) is based on essential variables in accordance with Table 1. For each essential variable, a range of qualification is defined and brazing outside that range of qualification requires a new qualification test.

Table 1 — Essential variables for brazer and brazing operator qualification

Essential variable	Brazer	Brazing Operator
brazing process	X	X
product type	X	X
type of joint	X	-
parent material group(s)	X	-
brazing filler metal type	X	-
brazing filler application	X	X
dimension (material thickness, outside pipe diameter and overlap length)	X	-
filler metal flow direction	X	-
type of equipment	-	X

NOTE There can be other variables that the manufacturer deems to be essential in certain applications, e.g. constraint on access for the torch, purging gas, etc. which need separate qualification (see Annex D).

The brazer or brazing operator who undertakes the brazing procedure test satisfactorily in accordance with this document is qualified according to the relevant national/international standard being applied, provided that the relevant testing requirements of that standard are met.

### 5.2 Brazing process

Each qualification test qualifies only one brazing process (see Clause 1). A change of brazing process requires a new qualification test.

When applicable the furnace atmosphere is limited to the same type of atmosphere, e.g. reducing or inert, carburizing or decarburizing, and hydrogen or disassociated ammonia as used in the test.

For brazing processes where fuel gases apply the qualification is limited to the same type of fuel gas and flame as used in the test.

### 5.3 Brazer qualification

#### 5.3.1 Product type

The brazing of one product type qualifies for other product types in accordance with [Table 2](#).

**Table 2 — Range of qualification for product type**

Product type for test piece	Range of qualification
Plate	Plate
Pipe	Pipe and Plate

#### 5.3.2 Type of joint

Range of qualification for type of joint is given by [Table 3](#).

**Table 3 — Range of qualification for type of joint**

Type of joint in test piece	Range of qualification
Butt joint	Butt joint
Lap joint	Lap joint
T joint	T joint

#### 5.3.3 Parent material group(s)

In order to minimize the number of brazer qualification tests, parent materials are assigned to M-number groupings (see [Annex E](#)).

The parent material used in the brazer qualification test qualifies the brazer for brazing of all other parent materials within the same M-number grouping – see [Table 4](#).

Parent materials that do not appear in [Annex E](#), require separate qualification and only qualify that material.

**Table 4 — Range of qualification for parent material**

Test piece material (see <a href="#">Annex E</a> )	Range of qualification <sup>a) b)</sup>
100, 110, 120, 170	100, 110, 120, 170
130, 140, 150, 160, 180	130, 140, 150, 160, 180
200, 210, 220	200, 210, 220
300, 310, 320, 330, 340, 350, 360	300, 310, 320, 330, 340, 350, 360
400, 410, 420, 430	400, 410, 420, 430
500	500
600	600
700	700
800	800

<sup>a)</sup> For a test piece material used for brazer qualification, the brazer is qualified to braze all materials and all combinations of materials given in the same row.

<sup>b)</sup> When test piece material from two rows are used for brazer qualification, the brazer is qualified to braze all material combinations in each row and combinations between those rows.