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Specification and qualification of welding procedures for metallic materials — Qualification based on tested welding consumables

Descriptif et qualification d'un mode opératoire de soudage pour les matériaux métalliques — Qualification basée sur des produits consommables soumis à essais

Reference number
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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).

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 Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 10, *Quality management in the field of welding*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 121, *Welding and allied processes*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 15610:2003), which has been technically revised.

The main changes are as follows:

— process numbers have been updated in accordance with ISO 4063:2009;

— normative references have been updated;

— text has been editorially revised.

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. Official interpretations of ISO/TC 44 documents, where they exist, are available from this page: https://committee.iso.org/sites/tc44/home/interpretation.html.

Introduction

This document is a part of a group of standards dealing with specification and qualification of welding procedures, details of which are given in ISO 15607:2019, Annex A.

In ISO 15607, one of the methods for the qualification of welding procedures is based on tested welding consumable usage data.

Specification and qualification of welding procedures for metallic materials — Qualification based on tested welding consumables

1 Scope

This document specifies how a welding procedure can be qualified by using tested welding consumable data. It expands on the requirements given in ISO 15607.

In addition, it gives the range of qualification.

This document is applicable to the welding processes according to Table 1.

Table 1 — Applicable welding processes

Process number according to ISO 4063:2009	Welding process
111	Manual metal arc welding (metal arc welding with covered electrode)
114	Self-shielded tubular cored arc welding
121	Submerged arc welding with solid wire electrode
131	MIG welding with solid wire electrode
132	MIG welding with flux-cored electrode
133	MIG welding with metal cored electrode
135	MAG welding with solid wire electrode
136	MAG welding with flux cored electrode
138	MAG welding with metal cored electrode
141	TIG welding with solid filler material (wire/rod)
15	Plasma arc welding
311	Oxyacetylene welding

Application of this document is limited to parent material groups 1.1, 8.1, 21, 22.1 and 22.2 in accordance with ISO/TR 15608, which produce acceptable microstructures and properties in the heat-affected zone which do not deteriorate significantly in service.

This document is limited to:

— parent material thicknesses $t \leq 40$ mm (groups 1.1 and 8.1) and $t \leq 20$ mm (groups 21, 22.1 and 22.2);

— fillet welds with throat thickness $a \geq 1$ mm.

This document is not applicable when any of the following is specified for the welded joint:

a) hardness;

b) impact properties;

c) preheating;

d) controlled heat input;

e) interpass temperature;

f) post-weld heat treatment.

The use of this document can also be restricted by an application standard, specification or other documents.

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/TR 15608, *Welding — Guidelines for a metallic materials grouping system*

ISO 15609-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 1: Arc welding*

ISO 15609-2, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 2: Gas welding*

ISO 25901 (all parts), *Welding and allied processes — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in the ISO 25901 series and the following apply.

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

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

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

3.1
qualification
development of a welding procedure qualification record (WPQR), preliminary welding procedure specification (pWPS) and welding procedure specification (WPS) from published welding consumable usage data

3.2
tested welding consumable
consumable or consumable combination tested in accordance with the appropriate welding consumable classification standard

4 Limits of the application of this document

4.1 Limits related to the welded joint

4.1.1 Parent material

Parent material groups shall be limited to those in accordance with ISO/TR 15608 as given in Table 2.

Table 2 — ISO/TR 15608 parent material groups

Steel	Aluminium and its alloys
1.1	21
8.1	22.1
	22.2

Joints between group 22.1 and group 22.2 are allowed. Otherwise, joints between the different parent material groups given in Table 2 shall not be permitted.

4.1.2 Parent material thickness, *t*

For material groups 1.1 and 8.1, parent material thickness, *t*, shall not exceed 40 mm.

For material groups 21, 22.1 and 22.2, parent material thickness, *t*, shall not exceed 20 mm.

4.1.3 Fillet weld throat thickness, *a*

Fillet weld throat thicknesses, *a*, shall not be less than 1 mm.

4.2 Limits common to all welding processes

4.2.1 Multiple-process welding procedures

Multiple-process welding procedures shall be permitted providing:

a) tested consumables are used throughout the weld; and

b) the range of qualification for each welding consumable is available.

4.2.2 Welding positions

The welding position(s) shall be restricted to the position(s) defined in the welding consumable manufacturers' published usage data.

4.2.3 Welding consumables

Qualification of the welding procedure specification (WPS) shall be restricted to the manufacturer and trade name of the welding consumables selected.

4.2.4 Type of current

The type of current and polarity shall be limited to those defined in the welding consumable manufacturers' published usage data.

4.3 Limits specific for the welding process

4.3.1 Processes 131, 132, 133, 135, 136 and 138

The shielding gas (weld face and/or root) shall be restricted to those defined in the welding consumable manufacturers' published usage data.

Qualification of the WPS shall be restricted to single-wire welding.

4.3.2 Processes 141 and 15

The shielding gas (weld face and/or root) shall be restricted to those defined in the welding consumable manufacturers' published usage data.

4.3.3 Process 121

The parameters shall be limited to those defined in the welding consumable manufacturers' published usage data.

Qualification of the WPS shall be restricted to single-wire welding.

5 Preliminary welding procedure specification (pWPS)

The qualification of a welding procedure based on tested welding consumables shall be based on a preliminary welding procedure specification (pWPS) in accordance with ISO 15609-1 or ISO 15609-2. The pWPS shall specify the range for all the relevant parameters.

6 Qualification of the pWPS

The essential items for the qualification are:

a) parent material(s) specifications;

b) welding conditions (as specified in published usage data for the tested welding consumables);

c) a pWPS in accordance with ISO 15609-1 or ISO 15609-2 suitable for the application;

d) the date and signature of the examiner or examining body on the welding procedure qualification record (WPQR) so the WPS can be used in production;

e) the name of the company using the WPS.

7 Welding procedure qualification record (WPQR)

For the purposes of this document, the WPQR is a statement of the results of assessing the published welding consumable usage data within the limits of Clause 4. The WPQR shall include copies of the published welding consumable usage data.

An example format for the WPQR is given in Annex A.

The relevant items listed for the pWPS in accordance with ISO 15609-1 or ISO 15609-2 shall be included.

If the pWPS is consistent with the published welding consumable usage data, the WPQR shall be signed and dated by the examiner or examining body.

The WPQR remains valid so long as the welding conditions remain in accordance with the published welding consumable usage data.

Annex A
(informative)

Example of a WPQR form

Qualification in accordance with ISO 15610
(see scope for limitations)

Manufacturer's WPQR no.:

Manufacturer:

Address:

	Range of qualification
Welding process:	
Parent material group(s) and sub-group(s):	
Parent material thickness (mm):	
Throat thickness (mm):	
Filler material designation:	
Filler material make:	
Shielding gas/flux designation:	
Backing gas designation:	
Welding positions:	

Range for welding parameters in table below

Filler material size (mm)	**Range of current A**	**Range of voltage U**	**Type of welding current and polarity**

We confirm that the statements in this record are verified in accordance with the published welding consumable usage data (see attached) and ISO 15610.

.....	.....	.....
Location	Date of issue	Examiner or examining body Name, date and signature