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

*Soudage — Exigences de qualité relatives au traitement thermique
associé au soudage et aux techniques connexes*

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ISO 17663:2009

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 17663 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 10, *Unification of requirements in the field of metal welding*.

This first edition cancels and replaces ISO/TR 17663:2001, which has been technically revised.

Requests for official interpretations of any aspect of this International Standard should be directed to the Secretariat of ISO/TC 44/SC 10 via your national standards body. A listing of these bodies can be found at <http://www.iso.org>.

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Welding — Quality requirements for heat treatment in connection with welding and allied processes

1 Scope

This International Standard provides quality requirements for heat treatment in air or controlled atmospheres carried out in workshops and on site in connection with welding and forming. It applies mainly to ferritic steels, but can be used for other materials, as appropriate.

This International Standard provides guidance for manufacturers that perform heat treatment or produce heat-treated products or components. This International Standard can also be used as a basis for assessing the manufacturer in respect to its heat treatment capability.

The fulfilment of a requirement can be waived where justification can be provided that a specific requirement is not applicable to a specific process. This International Standard is intended to be a flexible framework to provide

- specific requirements for heat treatment by manufacturer in order to have a quality system in accordance with ISO 9001;
- specific requirements for heat treatment in specifications which require the manufacturer to have a quality system other than ISO 9001;
- specific guidance for a manufacturer developing a quality control system for heat treatment;
- specific guidance for post weld heat treatment for manufacturers adopting ISO 3834-2 or ISO 3834-3;
- detailed requirements for specifications, regulations or product standards that require control of heat treatment activities.

2 Normative references

The following referenced documents are indispensable for the application 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 13916, *Welding — Guidance on the measurement of preheating temperature, interpass temperature and preheat maintenance temperature*

IEC 60584-2, *Thermocouples — Part 2: Tolerances*

EN 10052, *Vocabulary of heat treatment terms for ferrous products*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13916 and EN 10052 and the following apply.

3.1

manufacturer

person or organization responsible for heat treatment of products or components

3.2

loading temperature

temperature of the furnace at the stage when the product or component is put into the furnace

3.3

holding temperature

temperature at which the product or component is kept in order to achieve the specified properties

NOTE 1 The holding temperature depends on the type of heat treatment, type of material and material thickness.

NOTE 2 Normally, the holding temperature is expressed as a temperature range.

3.4

holding time

time the product or component is kept at the holding temperature

NOTE 1 The holding time starts when the temperature at all measuring points has reached the minimum value of the range of the holding temperature and stops when one of the measuring points falls below that temperature.

NOTE 2 The holding time depends on the type of heat treatment, material and material thickness.

3.5

unloading temperature

temperature of the product or component when it is taken out of a furnace or when the heat source is removed or switched off in any other heat treatment, e.g. local heat treatment

3.6

section temperature range

temperature range with a specified linear distance that may vary between two adjacent measuring points

4 Review of requirements and technical review

4.1 General

The manufacturer shall review the contractual requirements and any other requirements together with any technical data. This is to ensure that all information necessary to carry out the heat treatment operations is available prior to the commencement of the work. The manufacturer shall affirm its capability to meet all requirements and ensure adequate planning of all quality-related activities.

The review of requirements is carried out by the manufacturer to verify that the work content is within its capability to perform, that sufficient resources are available to achieve delivery schedules and that documentation is clear and unambiguous. The manufacturer shall ensure that essential variations between the contract and previous quotation are identified.

4.2 Review of requirements

Aspects for consideration shall include the following:

- a) product standard used, together with any supplementary requirements;
- b) statutory and regulatory requirements;
- c) any additional requirement determined by the manufacturer;
- d) capability of the manufacturer to meet the prescribed requirements.

4.3 Technical review

It shall be ensured that all necessary information has been supplied by the purchaser. Aspects for consideration shall include the following:

- a) application standard being used and appropriate drawings;
- b) location and accessibility of the product or component being heat treated;
- c) type of marking of the product or component being heat treated;
- d) heat-treatment specifications (appropriate heat treatment values) and inspection procedures for heat treatment;
- e) connection between heat-treatment specifications and welding and/or forming-procedure specifications;
- f) methods of heat treatment, e.g. which products or components are being treated in a furnace and which products or components are being subjected to local heat treatment;
- g) competence of personnel;
- h) suitability of equipment;
- i) heat-treatment documentation;
- j) control and inspection arrangements;
- k) quality requirements for the subcontractor;
- l) handling of non-conformances of heat treatment;
- m) means of temperature measurement and recording;
- n) quality requirements and testing of heat treatment, if any;
- o) schedule/sequence of heat treatment;
- p) availability of sufficient energy;
- q) other special agreements, e.g. supporting of the product or component.

5 Subcontracting

Any subcontractor shall work under the orders and responsibility of the manufacturer and shall fully comply with the relevant requirements of this International Standard. The manufacturer shall ensure that the subcontractor can comply with the quality requirements of the specification.

Information that the manufacturer provides to the subcontractor shall include all relevant data from the technical review (see 4.3).

The manufacturer who orders heat treatment shall supply all relevant specifications and requirements concerning these works to the subcontractor. The subcontractor shall provide records and documentation of his work as specified by the manufacturer.

6 Personnel

The manufacturer shall appoint a sufficient number of competent personnel for the planning, performing and supervising of the heat-treatment work according to specified requirements.

The competence of personnel who carry out the heat treatment shall be confirmed by the manufacturer.

The personnel shall be trained and be able to read, understand and implement heat-treatment instructions, e.g. programming the regulation, installation of thermocouples, control of measuring line.

7 Inspection and testing

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7.1 General

The manufacturer shall have at his disposal a sufficient number of competent personnel for planning and performing, inspection, testing and assessing of the heat-treatment activities according to specified requirements.

7.2 Non-destructive testing

Non-destructive testing shall be carried out at the stage of heat treatment specified in the application standard.

7.3 Destructive testing

Destructive testing after heat treatment may be carried out if

- a) it is required by the application standard or contract;
- b) the manufacturer decides to verify the properties for the product or component.

The destructive testing may be carried out on separate test pieces if they are of the same material as the product and were subjected to the same production and heat treatment sequences.

8 Equipment for heat treatment

8.1 Production and testing equipment

The following equipment shall be available, when necessary:

- a) furnace and/or heating equipment;
- b) programmer for the heating process;
- c) equipment for measuring and recording the temperature;
- d) cooling equipment;
- e) lifting and transport devices;
- f) personnel protective equipment and other safety equipment.

8.2 Description of facilities

For an evaluation of workshop capacity and capability, the manufacturer and/or subcontractor shall maintain a list of essential equipment used for heat treatment. This list shall identify items of major equipment, for example

- a) furnace dimensions, maximum load and temperature range, in degrees Celsius;
- b) heat treatment equipment and its capacity;
- c) programmers and their capacity;
- d) temperature-measurement equipment and its capacity, method of measurement, area of reading, accuracy, number of measuring channels and recording devices;
- e) thermocouple type and tolerance class, in accordance with IEC 60584-2 and method of attachment;
- f) cooling devices, e.g. quenching tank, fan, compressed air;
- g) other equipment required for heat treatment and its inspection.

8.3 Suitability of equipment

Equipment shall be adequate for the application concerned.

8.4 Verification of heat treatment equipment

8.4.1 General

All devices used for adjusting, measuring and recording the temperature shall be suitably validated at specified intervals by calibrated measuring instruments.

8.4.2 Measurement of the uniformity of furnace temperature

The uniformity of the furnace temperature shall be verified by regularly performed measurements of the temperature.