

INTERNATIONAL STANDARD

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Welded steel tubes for pressure purposes — Technical delivery conditions —

Part 2:

Electric resistance and induction welded
unalloyed and alloyed steel tubes with
specified elevated temperature properties

*Tubes en acier soudés pour service sous pression — Conditions
techniques de livraison —*

*Partie 2: Tubes soudés par résistance électrique et par induction en aciers
non alliés et alliés avec caractéristiques spécifiées à température élevée*



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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.

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.

International Standard ISO 9330-2 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 19, *Technical delivery conditions for steel tubes for pressure purposes*.

It constitutes a partial revision of ISO 2604-3:1975.

ISO 9330 consists of the following parts, under the general title *Welded steel tubes for pressure purposes — Technical delivery conditions*:

- *Part 1: Unalloyed steel tubes with specified room temperature properties*
- *Part 2: Electric resistance and induction welded unalloyed and alloyed steel tubes with specified elevated temperature properties (Partial revision of ISO 2604-3:1975)*
- *Part 3: Electric resistance and induction welded unalloyed and alloyed steel tubes with specified low temperature properties (Partial revision of ISO 2604-3:1975)*
- *Part 4: Submerged arc-welded unalloyed and alloyed steel tubes with specified elevated temperature properties (Partial revision of ISO 2604-6:1978)*
- *Part 5: Submerged arc-welded unalloyed and alloyed steel tubes with specified low temperature properties (Partial revision of ISO 2604-6:1978)*
- *Part 6: Longitudinally welded austenitic stainless steel tubes*

Annex A of this part of ISO 9330 is for information only.

Welded steel tubes for pressure purposes — Technical delivery conditions —

Part 2:

Electric resistance and induction welded unalloyed and alloyed steel tubes with specified elevated temperature properties

1 Scope

1.1 This part of ISO 9330 specifies the technical delivery conditions for electric resistance and induction welded tubes of circular cross-section having wall thickness up to and including 16 mm, made of unalloyed and alloyed steels with specified elevated temperature properties.

These tubes are intended for pressure purposes, in cases when the material is also subjected to elevated temperatures, e.g. for the construction of steam generating equipment and for interconnecting pipework.

The requirements of appropriate international application standards and relevant national legal regulations shall be taken into account by the user. For boilers and pressure vessels, ISO/R 831 and ISO 5730 are available.

The following parts of ISO 9330 are now available or are being prepared:

- *Part 1: Unalloyed steel tubes with specified room temperature properties* (partial revision of ISO 2604-3:1975 and of ISO 2604-6:1978).
- *Part 3: Electric resistance and induction welded unalloyed and alloyed steel tubes with specified*

low temperature properties (partial revision of ISO 2604-3:1975).

- *Part 4: Submerged arc-welded unalloyed and alloyed steel tubes with specified elevated temperature properties* (partial revision of ISO 2604-6:1978).
- *Part 5: Submerged arc-welded unalloyed and alloyed steel tubes with specified low temperature properties* (partial revision of ISO 2604-6:1978).
- *Part 6: Longitudinally welded austenitic stainless steel tubes* (revision of ISO 2604-5:1978).

NOTE 1 The English words "tube" and "pipe" are synonymous.

1.2 See ISO 404 for general technical delivery requirements.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 9330. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 9330 are encouraged to investigate the possibility of applying the most recent editions of the

standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 377-1:1989, *Selection and preparation of samples and test pieces of wrought steels — Part 1: Samples and test pieces for mechanical test.*

ISO 377-2:1989, *Selection and preparation of samples and test pieces of wrought steels — Part 2: Samples for the determination of the chemical composition.*

ISO 404:1992, *Steel and steel products — General technical delivery requirements.*

ISO 783:1989, *Metallic materials — Tensile testing at elevated temperature.*

ISO/R 831:1968, *Rules for construction of stationary boilers.*

ISO 1129:1980, *Steel tubes for boilers, superheaters and heat exchangers — Dimensions, tolerances and conventional masses per unit length.*

ISO 2566-1:1984, *Steel — Conversion of elongation values — Part 1: Carbon and low alloy steels.*

ISO 3205:1976, *Preferred test temperatures.*

ISO 3545-1:1989, *Steel tubes and fittings — Symbols for use in specifications — Part 1: Tubes and tubular accessories with circular cross-section.*

ISO 4200:1991, *Plain end steel tubes, welded and seamless — General tables of dimensions and masses per unit length.*

ISO/TR 4949:1989, *Steel names based on letter symbols.*

ISO 5252:1991, *Steel tubes — Tolerance systems.*

ISO 5730:1992, *Stationary shell boilers of welded construction (other than water-tube boilers).*

ISO 6761:1981, *Steel tubes — Preparation of ends of tubes and fittings for welding.*

ISO 6892:1984, *Metallic materials — Tensile testing.*

ISO 7438:1985, *Metallic materials — Bend test.*

ISO 8492:1986, *Metallic materials — Tube — Flattening test.*

ISO 8493:1986, *Metallic materials — Tube — Drift expanding test.*

ISO 8495:1986, *Metallic materials — Tube — Ring expanding test.*

ISO 8496:1986, *Metallic materials — Tube — Ring tensile test.*

ISO 9302:1994, *Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes — Electromagnetic testing for verification of hydraulic leak-tightness.*

ISO 9303:1989, *Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes — Full peripheral ultrasonic testing for the detection of longitudinal imperfections.*

ISO 9764:1989, *Electric resistance and induction welded steel tubes for pressure purposes — Ultrasonic testing of the weld seam for the detection of longitudinal imperfections.*

ISO/TR 9769:1981, *Steel and iron — Review of available methods of analysis.*

ISO 10332:1994, *Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes — Ultrasonic testing for the verification of hydraulic leak-tightness.*

ISO 10474:1991, *Steel and steel products — Inspection documents.*

3 Symbols and denominations

3.1 Fundamental symbols

D = specified outside diameter

D_i = specified inside diameter

T = specified wall thickness

3.2 Symbols for tolerances

See ISO 5252.

3.3 Symbols for tests

3.3.1 Tensile test

See ISO 6892.

3.3.2 Flattening test

H = distance between platens

3.3.3 Hydraulic test

PE = test pressure

S = stress which occurs in the metal during the test

4 Information to be supplied by the purchaser

4.1 Mandatory information

The purchaser shall state on his enquiry and order the following information:

- the denomination "tube";
- whether tubes are to be supplied hot-finished or cold-finished (see 5.3);
- reference to the relevant dimensional standard;
- dimensions (outside diameter × wall thickness) in millimetres (see 7.1);
- length (see 7.2);
- tolerances, if exact lengths greater than 12 m are ordered (see 7.3.3);
- reference to this part of ISO 9330;
- steel grade (see table 2);
- test category for unalloyed steels (see 9.2).

4.2 Optional information

Enquiries and orders for tubes in accordance with this part of ISO 9330 shall be supplemented, if it is deemed necessary by the purchaser, with the indication of one or more of the following optional requirements, which shall be the subject of special agreements:

- steelmaking process (see 5.1);
- delivery condition (see 5.4);
- special straightness requirements (see 7.3.5);

- bevelled ends (see 8.2);
- product chemical analysis (see 9.3 and 9.10.1)
- tensile testing of weld for tubes over 219 mm but with an outside diameter less than 508 mm (see 9.4.1.3);
- determination of proof stress at elevated temperature, $R_{p0,2}$ (see 9.4.2);
- leak-tightness test (see 9.5);
- specific marking (see 10.3);
- protective coating (see clause 11);
- type of inspection and testing and corresponding document (see 9.1 and clause 12).

4.3 Example of an order

Example of an order for a welded tube conforming to the dimensional standard ISO 4200, with an outside diameter of 168,3 mm, a wall thickness of 4 mm and a standard length (random length) of 4 m to 8 m, made of steel grade PH 23 with specified elevated temperature properties to be submitted to specific inspection and testing to test category I involving the issuing of an inspection certificate 3.1.B according to ISO 10474:

Tube ISO 4200 - 168,3 × 4 - 4 to 8 - ISO 9330-2 - PH23 - I - 3.1.B

5 Manufacturing process

5.1 Steelmaking process

If requested, the purchaser shall be informed of the steelmaking process used.

Steels may be cast in ingots or may be strand cast. When steels of different grades are sequentially strand cast, identification of the resultant transitional material is required. The producer shall remove the transitional material by an established procedure that efficiently separates the grades.