



SLOVENSKI STANDARD
SIST EN ISO 16812:2004
01-maj-2004

Petroleum and natural gas industries - Shell-and-tube heat exchangers (ISO 16812:2002)

Petroleum and natural gas industries - Shell-and-tube heat exchangers (ISO 16812:2002)

Erdöl- und Erdgasindustrie - Röhrenkesselwärmetauscher (ISO 16812:2002)

Industries du pétrole et du gaz naturel - Echangeurs de chaleur a faisceaux (ISO 16812:2002)

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Ta slovenski standard je istoveten z: EN ISO 16812:2003

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ICS:

71.120.30	Prenosniki toplote	Heat exchangers
75.180.20	Predelovalna oprema	Processing equipment

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EUROPEAN STANDARD

EN ISO 16812

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2003

ICS 27.060.30; 75.180.20

English version

Petroleum and natural gas industries - Shell-and-tube heat exchangers (ISO 16812:2002)

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This European Standard was approved by CEN on 3 November 2003.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

EN ISO 16812:2003 (E)**Foreword**

The text of ISO 16812:2002 has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum and natural gas industries" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 16812:2003 by Technical Committee CEN/TC 12 "Materials, equipment and offshore structures for petroleum and natural gas industries" the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2004, and conflicting national standards shall be withdrawn at the latest by May 2004.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

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INTERNATIONAL
STANDARD

ISO
16812

First edition
2002-07-01

**Petroleum and natural gas industries —
Shell-and-tube heat exchangers**

Industries du pétrole et du gaz naturel — Échangeurs de chaleur à faisceaux

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Reference number
ISO 16812:2002(E)

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Printed in Switzerland

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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16812 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum and natural gas industries*, Subcommittee SC 6, *Processing equipment and systems*.

Annexes A, B, C and D of this International Standard are for information only.

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ISO 16812:2002(E)**Introduction**

This International Standard is based on API Standard 660, sixth edition, February 2001.

Users of this International Standard should be aware that further or differing requirements may be needed for individual applications. This International Standard is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the vendor should identify any variations from this International Standard and provide details.

In International Standards, the SI system of units is used. Where practical in this International Standard, US Customary units are included in brackets for information.

A bullet (●) at the beginning of a clause or subclause indicates that either a decision is required or further information is to be provided by the purchaser. This information should be indicated on data sheets or stated in the enquiry or purchase order (see examples in annex A). Decisions should be indicated on a check list (see example in annex B). Annex C contains an example of a checklist which can be used to indicate the responsibilities of the various parties.

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Petroleum and natural gas industries — Shell-and-tube heat exchangers

1 Scope

This International Standard specifies requirements and gives recommendations for the mechanical design, material selection, fabrication, inspection, testing and preparation for shipment of shell-and-tube heat exchangers for the petroleum and natural gas industries.

This International Standard is applicable to the following types of shell-and-tube heat exchangers: heaters, condensers, coolers and reboilers.

This International Standard is not applicable to vacuum-operated steam surface condensers and feed-water heaters.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ASME B 16.5¹⁾, *Pipe flanges and flanged fittings: NPS ½ through NPS 24*

ASME B 16.11, *Forged steel fittings, socket-welding and threaded*

ASME B 1.20.1, *Pipe threads, general purpose (inch)*

NACE MR0175²⁾, *Sulfide stress cracking resistant metallic materials for oilfield equipment*

TEMA³⁾, Eighth edition, *Standards of the Tubular Exchanger Manufacturers Association*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1

heat exchanger unit

one or more heat exchangers for a specified service that may include alternative operating conditions

1) ASME International, 3 Park Avenue, New York, NY 10016-5990, USA.

2) NACE International, P.O. Box 218340, Houston, TX 77218-8340, USA.

3) Tubular Exchanger Manufacturers Association, 25 North Broadway, Tarrytown, NY 10591, USA.

ISO 16812:2002(E)**3.2****item number**

purchaser's identification number for a heat exchanger unit

3.3**effective surface**

outside surface area of the tubes that contributes to heat transfer

3.4**nubbin**

projection on the flange gasket surface, positioned at the centre of the gasket, used to concentrate the bolt load on the gasket

3.5**pressure design code**

recognized pressure vessel standard specified or agreed by the purchaser

EXAMPLE ASME Boiler and Pressure Vessel Code, Section VIII.

3.6**seal-welded**

welded to improve leak tightness of tube-to-tubesheet joints

3.7**strength-welded**

welded so that the design strength is equal to, or greater than, the maximum allowable axial tube strength of tube-to-tubesheet joints

3.8**category A welded joint**

longitudinal welded joint within the main shell, communicating chambers, nozzles or transitions in diameter; or any welded joint within a sphere or within a formed or flat head, or circumferential welded joint connecting hemispherical heads to main shells, to transitions in diameters or to communicating chambers

3.9**category B welded joint**

circumferential welded joint within the main shell, communicating chambers, nozzles, or transitions in diameter including joints between the transitions and a cylinder at either the large or small end; or circumferential welded joint connecting formed heads, other than hemispherical to main shells, to transitions in diameter, to nozzles or to communicating chambers

3.10**communicating chamber**

heat exchanger appurtenance which intersects the shell or heads of the heat exchanger and forms an integral part of the pressure-containing envelope

EXAMPLE Sump.

3.11**full-penetration weld**

butt joint attained by double-welding or by other means which provides the same quality of deposited weld metal on the inside and outside surfaces to meet the requirements of the pressure design code

4 General

- **4.1** The pressure design code shall be specified or agreed by the purchaser. Pressure components shall comply with the pressure design code and the supplemental requirements given in this International Standard.

- 4.2** Heat exchanger construction shall conform to TEMA Standards, Class R, unless another TEMA class is specified.
- **4.3** The vendor shall comply with the applicable local regulations specified by the purchaser.
- 4.4** If specified by the purchaser or required by local regulations, the vendor shall register each exchanger with the appropriate Boiler and Pressure Vessel Inspection Authority.
- 4.5** Annex D includes some recommended mechanical and design details for information.

5 Proposals

5.1 Purchaser's responsibilities

The purchaser's enquiry shall include specification sheets, a checklist if required, and other applicable information outlined in this International Standard (for example, in the formats given in annex A, annex B and annex C). All necessary data for the design of a heat exchanger unit shall be provided.

5.2 Vendor's responsibilities

5.2.1 The vendor's proposal shall include, for each heat exchanger unit, completed specification sheets such as those given in annex A or, if a specification sheet is included in the enquiry, a statement indicating complete compliance with that specification sheet.

5.2.2 Designs that are not fully defined by the nomenclature in TEMA Standards, Section 1, shall be accompanied by sketches that are sufficient to describe the details of construction.

5.2.3 If distributor belts are provided, the vendor shall define the type of construction proposed.

5.2.4 The vendor shall determine the need for, and if required, include expansion joints based on all conditions supplied by the purchaser. The vendor shall state the type of construction proposed.

5.2.5 The proposal shall include a detailed description of all exceptions to the requirements of the purchaser's enquiry.

5.2.6 Unless otherwise specified, the vendor shall supply the complete heat exchanger unit including:

- a) bolts, nuts and gaskets for the interconnecting nozzles of directly flanged stacked heat exchangers;
- b) shims and bolting for interconnecting supports of heat exchangers.

5.2.7 Unless otherwise specified, the vendor shall provide a separate quotation for the following items:

- a) a test component consisting of a test ring and gland, in accordance with TEMA Standard, Figure E-4.13-2 or equivalent, for each heat exchanger or group of similar heat exchangers with floating heads;
- b) one spare set of gaskets per heat exchanger unit.

6 Drawings and other required data

6.1 Outline drawings

6.1.1 The vendor shall submit, for review by the purchaser, outline drawings for each heat exchanger unit. The drawings shall include the following information: