



SLOVENSKI STANDARD SIST EN ISO 13705:2004

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Petroleum and natural gas industries - Fired heaters for general refinery service (ISO 13705:2001)

Petroleum and natural gas industries - Fired heaters for general refinery service (ISO 13705:2001)

Erdöl- und Erdgasindustrie - Befeuerte Erhitzer für den allgemeinen Einsatz in Raffinerien (ISO 13705:2001)

Industries du pétrole et du gaz naturel - Réchauffeurs à bruleurs pour usage général dans les raffineries (ISO 13705:2001)

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EUROPEAN STANDARD
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Petroleum and natural gas industries - Fired heaters for general refinery service (ISO 13705:2001)

Industries du pétrole et du gaz naturel - Réchauffeurs à brûleurs pour usage général dans les raffineries (ISO 13705:2001)

Erdöl- und Erdgasindustrie - Befeuerte Erhitzer für den allgemeinen Einsatz in Raffinerien (ISO 13705:2002)

This European Standard was approved by CEN on 15 December 2001.

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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 13705:2001 (E)

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Foreword

This document (EN ISO 13705:2001) has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum and natural gas industries" in collaboration with 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of an identical text or by endorsement, at the latest by June 2002, and conflicting national standards shall be withdrawn at the latest by June 2002.

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, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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2001-12-15

**Petroleum and natural gas industries —
Fired heaters for general refinery service**

*Industries du pétrole et du gaz naturel — Réchauffeurs à brûleurs pour
usage général dans les raffineries*

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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.

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.

International Standard ISO 13705 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 D and E form a normative part of this International Standard. Annexes A, B, C, F, G and H are for information only.

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ISO 13705:2001(E)**Introduction**

This International Standard is based on API standard 560, second edition, September 1995.

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 (see examples in annex A) or stated in the enquiry or purchase order. Decisions should be indicated on a check list (see example in annex B).

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Petroleum and natural gas industries — Fired heaters for general refinery service

1 Scope

This International Standard specifies requirements and gives recommendations for the design, materials, fabrication, inspection, testing, preparation for shipment, and erection of fired heaters, air preheaters, fans and burners for general refinery service.

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.

ISO 8501-1, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings*

ISO 13704, *Petroleum and natural gas industries — Calculation of heater-tube thickness in petroleum refineries*

EN 10025¹⁾, *Hot rolled products of non-alloy structural steels — Technical delivery conditions*

AFBMA Standard 9²⁾, *Load ratings and fatigue life for ball bearings*

AMCA 99-2404-78³⁾, *Drive arrangements for centrifugal fans*

AMCA 201, *Fans and systems*

AMCA 210, *Laboratory methods of testing fans for aerodynamic performance rating*

ASME B17.1⁴⁾, *Keys and keyseats*

ASME B31.3, *Process piping*

ASME Boiler and pressure vessel code, Section VIII, *Rules for construction of pressure vessels*

ASTM A 36⁵⁾, *Standard specification for carbon structural steel*

1) European Committee for Standardization (CEN), Rue de Stassart 36, B-1050 Brussels, Belgium.

2) Anti-Friction Bearing Manufacturers Association, 1200 19th Street NW, Suite 300, Washington, DC 20036-2412, USA.

3) Air Movement and Control Association, 30 West University Drive, Arlington Heights, IL 60004, USA.

4) American Society of Mechanical Engineers, 3 Park Avenue, New York, NY 10017, USA.

5) American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA.

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ASTM A 105, *Standard specification for carbon steel forgings for piping applications*

ASTM A 123, *Standard specification for zinc (hot-dip galvanized) coatings on iron and steel products*

ASTM A 143, *Standard practice for safeguarding against embrittlement of hot-dip galvanized structural steel products and procedure for detecting embrittlement*

ASTM A 153, *Standard specification for zinc coating (hot-dip) on iron and steel hardware*

ASTM A 161, *Standard specification for seamless low-carbon and carbon-molybdenum steel still tubes for refinery service*

ASTM A 181, *Standard specification for carbon steel forgings, for general-purpose piping*

ASTM A 182, *Standard specification for forged or rolled alloy-steel pipe flanges, forged fittings, and valves and parts for high-temperature service*

ASTM A 192, *Standard specification for seamless carbon steel boiler tubes for high-pressure service*

ASTM A 193, *Standard specification for alloy-steel and stainless steel bolting materials for high-temperature service*

ASTM A 194, *Standard specification for carbon and alloy steel nuts for bolts for high-pressure or high-temperature service, or both*

ASTM A 209, *Standard specification for seamless carbon-molybdenum alloy-steel boiler and superheater tubes*

ASTM A 210, *Standard specification for seamless medium-carbon steel boiler and superheater tubes*

ASTM A 213, *Standard specification for seamless ferritic and austenitic alloy-steel boiler, superheater and heat-exchanger tubes*

ASTM A 216, *Standard specification for steel castings, carbon, suitable for fusion welding, for high-temperature service*

ASTM A 217, *Standard specification for steel castings, martensitic stainless and alloy, for pressure-containing parts, suitable for high-temperature service*

ASTM A 234, *Standard specification for piping fittings of wrought carbon steel and alloy steel for moderate and high temperature service*

ASTM A 240, *Standard specification for heat-resisting chromium and chromium-nickel stainless steel plate, sheet, and strip for pressure vessels*

ASTM A 242, *Standard specification for high-strength low-alloy structural steel*

ASTM A 283, *Standard specification for low and intermediate tensile strength carbon steel plates*

ASTM A 297, *Standard specification for steel castings, iron-chromium and iron-chromium-nickel, heat resistant, for general application*

ASTM A 307, *Standard specification for carbon steel bolts and studs, 60 000 psi tensile strength*

ASTM A 320, *Standard specification for alloy steel bolting materials for low-temperature service*

ASTM A 325, *Standard specification for structural bolts, steel, heat treated, 120/105 ksi minimum tensile strength*

ASTM A 351, *Standard specification for castings, austenitic, austenitic-ferritic (duplex), for pressure-containing parts*

ASTM A 384, *Standard practice for safeguarding against warpage and distortion during hot-dip galvanizing of steel assemblies*

- ASTM A 385, *Standard practice for providing high-quality zinc coatings (hot-dip)*
- ASTM A 387, *Standard specification for pressure vessel plates, alloy steel, chromium-molybdenum*
- ASTM A 403, *Standard specification for wrought austenitic stainless steel piping fittings*
- ASTM A 447, *Standard specification for steel castings, chromium-nickel-iron alloy (25-12 class), for high-temperature service*
- ASTM A 560, *Standard specification for castings, chromium-nickel alloy*
- ASTM A 572, *Standard specification for high-strength, low alloy columbium-vanadium structural steel*
- ASTM A 608, *Standard specification for centrifugally cast iron-chromium-nickel high-alloy tubing for pressure application at high temperatures*
- ASTM B 366, *Standard specification for factory-made wrought nickel and nickel alloy fittings*
- ASTM B 407, *Standard specification for nickel-iron-chromium alloy seamless pipe and tube*
- ASTM B 564, *Standard specification for nickel alloy forgings*
- ASTM B 633, *Standard specification for electrodeposited coatings of zinc on iron and steel*
- ASTM C 27, *Standard classification of fireclay and high-alumina refractory brick*
- ASTM C 155, *Standard classification of insulating firebrick*
- ASTM C 332, *Standard specification for lightweight aggregates for insulating concrete*
- ASTM C 401, *Standard classification of alumina and alumina-silicate castable refractories*
- ASTM C 612, *Standard specification for mineral fiber block and board thermal insulation*
- AWS⁶⁾ D1.1, *Structural welding code — Steel*
- AWS D14.6-96, *Specification for welding of rotating elements of equipment*
- MSS SP-55⁷⁾, *Quality standard for steel castings for valves, flanges and fittings, and other piping components — Visual method*
- NFPA 70⁸⁾, *National electrical code*

3 Terms and definitions

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

NOTE Terms and definitions related to centrifugal fans are given in annex E.

3.1

air heater

air preheater

heat transfer apparatus through which combustion air is passed and heated by a medium of higher temperature, such as the combustion products, steam or other fluid

6) American Welding Society, 550 NW Le Jeune Road, Miami, FL 33126, USA.

7) Manufacturers Standardization Society, 127 Park Street NE, Vienna, VA 22180, USA.

8) National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-9101, USA.

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3.2

**anchor
tieback**

metallic or refractory device that holds the refractory or insulation in place

3.3

arch

flat or sloped portion of the heater radiant section opposite the floor

3.4

atomizer

device used to reduce liquid fuel to a fine mist

3.5

backup layer

refractory layer behind the hot face layer

3.6

balanced draught heater

heater which uses forced-draught fans to supply combustion air and uses induced fans to remove flue gases

3.7

breeching

heater section where flue gases are collected after the last convection coil for transmission to the stack or the outlet ductwork

3.8

**bridgewall
gravity wall**

wall which separates two adjacent heater zones

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3.9

bridgewall temperature

temperature of flue gas leaving the radiant section

3.10

burner

device which introduces fuel and air into a heater at the desired velocities, turbulence and concentration to establish and maintain proper ignition and combustion

NOTE Burners are classified by the type of fuel fired, such as oil, gas, or a combination of gas and oil, which may be designated as "dual fuel" or "combination".

3.11

butterfly damper

single-blade damper which pivots about its centre

3.12

casing

metal plate used to enclose the fired heater

3.13

castable

insulating concrete poured or gunned in place to form a rigid refractory shape or structure

3.14

ceramic fibre

fibrous refractory insulation composed primarily of silica and alumina

NOTE Applicable forms include blanket, board, module, rigidized blanket, and vacuum-formed shapes.

3.15**convection section**

portion of the heater in which the heat is transferred to the tubes primarily by convection

3.16**corbel**

projection from the refractory surface generally used to prevent flue gas bypassing the tubes of the convection section if they are on a staggered pitch

3.17**corrosion allowance**

additional material thickness added to allow for material loss due to corrosion

3.18**corrosion rate**

rate of reduction in the material thickness due to chemical attack from the process fluid or flue gas or both

NOTE Corrosion rate is expressed in millimetres per year (mils per year).

3.19**crossover**

interconnecting piping between any two heater-coil sections

3.20**damper**

device for introducing a variable resistance in order to regulate the flow of flue gas or air

3.21**direct air preheater**

heat exchanger which transfers heat directly between the flue gas and the combustion air

NOTE A regenerative air preheater uses heated rotating elements and a recuperative design uses stationary tubes, plates, or cast iron elements to separate the two heating media.

3.22**draught**

negative pressure (vacuum) of the air and/or flue gas measured at any point in the heater

3.23**draught loss**

pressure drop (including buoyancy effect) through duct conduits or across tubes and equipment in air and flue gas systems

3.24**duct**

conduit for air or flue gas flow

3.25**fuel efficiency**

total heat absorbed divided by the total input of heat derived from the combustion of fuel only (lower heating value basis)

NOTE This definition excludes sensible heat of the fuels and applies to the net amount of heat exported from the unit.

3.26**thermal efficiency**

total heat absorbed divided by the total input of heat derived from the combustion of fuel (h_L) plus sensible heats from air, fuel and any atomizing medium