
Industrija za predelavo nafte in zemeljskega plina - Z indukcijo upognjena cevna kolena, fitingi in prirobnice za transportne cevovodne sisteme - 2. del: Fitingi (ISO 15590-2:2003, spremenjen)

Petroleum and natural gas industries - Induction bends, fittings and flanges for pipeline transportation systems - Part 2: Fittings (ISO 15590-2:2003 modified)

Erdöl- und Erdgasindustrie - Induktivbiegungen, Formstücke und Flansche für Transportleitungssysteme - Teil 2: Fittings (ISO 15590-2:2003 modifiziert)

Industries du pétrole et du gaz naturel - Coudes d'induction, raccords et brides pour systèmes de transport par conduites - Partie 2 : Raccords (ISO 15590-2:2003 modifiée)

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EUROPEAN STANDARD
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**Petroleum and natural gas industries - Induction bends, fittings
and flanges for pipeline transportation systems - Part 2: Fittings
(ISO 15590-2:2003 modified)**

Industries du pétrole et du gaz naturel - Coudes d'induction,
raccords et brides pour systèmes de transport par
conduites - Partie 2 : Raccords (ISO 15590-2:2003
modifiée)

Erdöl- und Erdgasindustrie - Im Induktionsverfahren
hergestellte Rohrbögen, Fittings und Flansche für
Rohrleitungstransportsysteme -Teil 2: Fittings (ISO 15590-
2:2003 modifiziert)

This European Standard was approved by CEN on 30 September 2004.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



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Explanatory Note

ISO 15590-2:2003, developed within ISO/TC 67 SC 2, has been taken over as a European Standard EN 14870-2 (ISO 15590-2:2003 modified).

The scope of ISO/TC 67/SC 2 is pipeline transportation systems for the petroleum and natural gas industries without exclusions. However in CEN, the scopes of CEN/TC 12 and CEN/TC 234 overlapped until 1995. This scope overlap caused problems for the parallel procedure for the above-mentioned items. The conflict in scope was resolved when both the CEN/Technical Committees and the CEN/BT took the following resolution:

Resolution BT 38/1995:

Subject: Revised scope of CEN/TC 12

“BT endorses the conclusions of the coordination meeting between CEN/TC 12 “Materials, equipment and offshore structures for petroleum and natural gas industries” and CEN/TC 234 “Gas supply” and modifies the CEN/TC 12 scope, to read:

“Standardization of the materials, equipment and offshore structures used in drilling, production, refining and the transport by pipelines of petroleum and natural gas, excluding on-land supply systems used by the gas supply industry and those aspects of offshore structures covered by IMO requirement (ISO/TC 8).

The standardization is to be achieved wherever possible by the adoption of ISO Standards.”

Resulting from Resolution BT 38/1995, “**gas supply on land**” has been excluded from the scope of ISO 15590-2:2003 for the European adoption by CEN/TC 12.

Equivalence with European Standards is provided in Annex ZA.

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EN 14870-2:2004 (E)**Foreword**

The text of ISO 15590-2:2003 has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries" of the International Organization for Standardization (ISO) and has been taken over as EN 14870-2:2004 by Technical Committee CEN/TC 12 "Materials, equipment and offshore structures for petroleum, petrochemical 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 2005, and conflicting national standards shall be withdrawn at the latest by June 2005.

This document includes a Bibliography.

International Standard ISO 15590-2 was prepared by Technical Committee ISO/TC 67, Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries, Subcommittee SC2, Pipeline transportation systems.

EN 14870 consists of the following parts, under the general title *Petroleum and natural gas industries — Induction bends, fittings and flanges for pipeline transportation systems*:

— *Part 1: Induction bends (ISO 15590-1:2001 modified)*

— *Part 2: Fittings (ISO 15590-2:2003 modified)*

The following part is under preparation:

— *Part 3: Flanges*

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

Introduction

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

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EN 14870-2:2004 (E)**1 Scope**

This document specifies the technical delivery conditions for unalloyed or low-alloy steel seamless and welded pipeline fittings for use in pipeline transportation systems for the petroleum and natural gas industries as defined in EN 14161.

This document is applicable to welding-end fittings such as elbows, caps, tees, single or multiple extruded headers, reducers, and transition sections made from seamless and welded pipe of unalloyed or low-alloy steels.

This document specifies three classes of fitting corresponding to increasing quality requirements in accordance with the technical delivery conditions of ISO 3183 for pipe as indicated in Table 1.

Table 1 — Fitting class and corresponding pipe standard

Fitting class	Corresponding pipe standard
Class A	ISO 3183-1
Class B	ISO 3183-2
Class C	ISO 3183-3

This document is not applicable to the selection of the fitting class.

This document is not applicable to the materials for, or the attachment of, factory-welded extensions.

On-land supply systems used by the gas supply industry are excluded from the scope of this document.

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.

EN 287-1, *Qualification test of welders — Fusion welding — Part 1: Steels*.

EN 14161, *Petroleum and natural gas industries - Pipeline transportation systems (ISO 13623:2000 modified)*.

EN ISO 377:1997, *Steel and steel products - Location and preparation of samples and test pieces for mechanical testing (ISO 377:1997)*.

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

EN ISO 6507-1, *Metallic materials - Vickers hardness test - Part 1: Test method (ISO 6507-1:1997)*.

EN ISO 7438, *Metallic materials - Bend test (ISO 7438:1985)*.

EN ISO 15156-2:2003, *Petroleum, petrochemical and natural gas industries - Materials for use in H₂S-containing environments in oil and gas production - Part 2: Cracking-resistant carbon and low alloy steels, and the use of cast irons (ISO 15156-2:2003)*.

EN ISO 15614-1, *Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys (ISO 15614-1:2004)*.

ISO 148, *Steel — Charpy impact test (V-notch)*.

ISO 148-2, *Metallic materials — Charpy pendulum impact test — Part 2: Verification of test machines*.

ISO 148-3, *Metallic materials — Charpy pendulum impact test — Part 3: Preparation and characterization of Charpy V reference test pieces for verification of test machines.*

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

ISO 3183-1, *Petroleum and natural gas industries — Steel pipe for pipelines — Technical delivery conditions — Part 1: Pipes of requirement class A.*

ISO 3183-2, *Petroleum and natural gas industries — Steel pipe for pipelines — Technical delivery conditions — Part 2: Pipes of requirement class B.*

ISO 3183-3, *Petroleum and natural gas industries — Steel pipe for pipelines — Technical delivery conditions — Part 3: Pipes of requirement class C.*

ISO 3834-2, *Quality requirements for welding — Fusion welding of metallic materials — Part 2: Comprehensive quality requirements.*

ISO 4885:1996, *Ferrous products — Heat treatments — Vocabulary.*

ISO 6892, *Metallic materials — Tensile testing at ambient temperature.*

ISO/TR 7705:1991, *Guidelines for specifying Charpy V-notch impact prescriptions in steel specifications.*

ISO 9712, *Non-destructive testing — Qualification and certification of personnel.*

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

ISO 11496, *Seamless and welded steel tubes for pressure purposes — Ultrasonic testing of tube ends for the detection of laminar imperfections.*

ISO 12095, *Seamless and welded steel tubes for pressure purposes — Liquid penetrant testing.*

ISO 12096, *Submerged arc-welded steel tubes for pressure purposes — Radiographic testing of the weld seam for the detection of imperfections.*

ISO 13664, *Seamless and welded steel tubes for pressure purposes — Magnetic particle inspection of the tube ends for the detection of laminar imperfections.*

ASME¹⁾ B16.9, *Factory-made wrought butt welding fittings.*

ASME B31.8, *Gas transmission and distribution piping systems.*

ASME IX, *Boiler and pressure vessel code, Section IX — Welding and brazing procedures, welders, brazers, and welding and brazing operators.*

ASTM²⁾ E 112, *Standard test methods for determining average grain size.*

ASTM E 709, *Standard guide for magnetic particle examination.*

MSS³⁾ SP-75, *Specification for high test wrought butt welding fittings.*

1) American Society of Mechanical Engineers, 345 East 47th Street, NY 10017-2392, USA.

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

3) Manufacturers Standardization Society of the Valve & Fittings Industry, 127 Park Street, N.E., Vienna, Virginia 22180, USA.

EN 14870-2:2004 (E)**3 Terms and definitions**

For the purposes of this document, the terms and definitions given in ISO 4885:1996 and the following apply.

3.1**by agreement**

agreed between manufacturer and purchaser

[EN 14870-1:2004]

3.2**extrados**

outer curved section of the elbow

NOTE Adapted from EN 14870-1:2004.

3.3**heat, noun**

batch of steel prepared in one steel-making process

NOTE Adapted from EN 14870-1:2004.

3.4**intrados**

inner curved section of the elbow

NOTE Adapted from EN 14870-1:2004.

3.5**manufacturing procedure specification****MPS**

document which specifies the process control parameters and the acceptance criteria to be applied for all manufacturing, inspection and testing activities performed during fitting manufacture

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3.6**tangent**

straight section at the ends of the fitting

NOTE Adapted from EN 14870-1:2004.

3.7**test unit**

fitting or test piece of the same designation, starting material wall thickness, heat, manufacturing procedure specification, and heat treatment condition

4 Symbols and abbreviated terms

A_o	original cross-sectional area of the parallel length of a tensile test specimen
D	outside diameter
D_p	specified outside diameter of matching pipe
D_n	minor outside diameter of a conical reducer or reducing tee at any point, n , under consideration, measured perpendicular to the longitudinal axis
E	factor used to calculate t_i (see A.1)

f	factor used to calculate proof test pressure (see Table B.1)
P_{cm}	crack measurement parameter (see Table 4)
p	design pressure
p_p	numerical value of the computed proof pressure
R_m	tensile strength
$R_{m, red}$	allowable tensile strength of a reducer
$R_{t0,5}$	yield strength for 0,5 % total elongation
R_{smys}	specified minimum yield strength
$T_{d, min}$	minimum design temperature specified by the purchaser
t	nominal wall thickness
t_D	wall thickness of thicker component for joints of unequal thickness (see Figure 1)
t_i	minimum wall thickness required in the intrados
t_p	nominal wall thickness of matching pipe
t_n	specified wall thickness of reducers and reducing tees at diameter D_n
α	included angle of a conical reducer
ρ_0	radius of curvature of the external contoured portion of the outlet of a tee
CE	carbon equivalent (see Table 4)
CTOD	crack tip opening displacement
DN	nominal size
HIC	hydrogen-induced cracking
MT	magnetic particle testing
NDT	non-destructive testing
PT	liquid penetrant testing
RT	radiographic testing
SMYS	specified minimum yield strength
SSC	sulfide stress-cracking
UT	ultrasonic testing

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EN 14870-2:2004 (E)**5 Designation**

Designation of fittings shall take the form:

EN 14870-2 YY xxx-Z,

where

- YY is a textual description of the type of fitting, corresponding to one of the following: EL for elbow, TE for tee, CA for cap, CR for concentric reducer, ER for eccentric reducer and NR for conical reducer, preceded by the size designation (e.g. "DN 600 EL" is a DN 600 elbow);
- xxx is the specified minimum yield strength requirement in MPa;
- Z is the suffix A or B or C, to identify the fitting class for use in non-sour service, or the suffix CS to identify class C fittings for use in sour-service conditions.

6 Pressure rating and design**6.1 General**

The capability of the fitting to withstand internal pressure shall equal or exceed that of the matching pipe. The verification of the capability shall be made by calculation and/or proof testing. The calculations shall be made in accordance with Annex A. The proof test procedure shall be as defined in Annex B. Additional requirements on strength design verifications, such as resistance to internal pressure under special load cases in accordance with EN 14161, shall be indicated at the time of enquiry or order.

The design calculations and/or results of proof testing shall be available for review at the manufacturer's facility.

If the SMYS of the fitting material is less than that of the matching pipe, the minimum thickness of the fitting end shall be increased such that the product of its thickness times its SMYS shall at least equal the product of the specified wall thickness and the SMYS of the matching pipe, in accordance with MSS SP-75.

6.2 Tees and headers

Outlet branches in tees and headers manufactured from seam-welded pipe shall be positioned diametrically opposite the longitudinal weld. When this positioning is not possible, the location shall be decided by agreement.

The design and welding for the attachment of guide bars of barred tees shall be decided by agreement prior to manufacture of the tee.

6.3 Extruded outlet headers

Extruded outlet headers shall be designed to comply with ASME B31.8.