SLOVENSKI STANDARD
SIST EN 448:2009

01-maj-2009

Nadomešča:
SIST EN 448:2004

Cevi za daljinsko ogrevanje - Izolirani vezani cevni sistemi za podzemeljska toplovodna omrežja - Sestav fitingov jeklenih cevi, poliuretanske toplotne izolacije in zunanjega polietilenskega plašča

District heating pipes - Preinsulated bonded pipe systems for directly buried hot water networks - Fitting assemblies of steel service pipes, polyurethane thermal insulation and outer casing of polyethylene

Fernwärmerohre - Werkmäßig gedämmte Verbundmantelrohrsysteme für direkt erdverlegte Fernwärmenetze - Verbundformstücke, bestehend aus Stahl-Mediumrohr, Polyurethan-Wärmedämmung und Außenmantel aus Polyethylen

Tuyaux de chauffage urbain - Systèmes bloqués de tuyaux préisolés pour des réseaux d'eau chaude enterrés directement - Raccords préisolés pour tubes de service en acier, isolation thermique en polyuréthane et tube de protection en polyéthylène

Ta slovenski standard je istoveten z: **EN 448:2009**

ICS:

23.040.10	Železne in jeklene cevi	Iron and steel pipes
23.040.40	Kovinski fitingi	Metal fittings
91.140.65	Oprema za ogrevanje vode	Water heating equipment

SIST EN 448:2009 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

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EN 448

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ICS 23.040.40

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English Version

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Foreword

This document (EN 448:2009) has been prepared by Technical Committee CEN/TC 107 “Prefabricated district heating pipe systems”, the secretariat of which is held by DS.

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of an identical text or by endorsement, at the latest by August 2009, and conflicting national standards shall be withdrawn at the latest by August 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 448:2003.

The main changes from EN 448:2003 have been listed in the informative Annex C.

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

Introduction

The first edition of EN 448 was approved in 1994. A completely revised standard was published in 2003. The main areas of the current revision have been listed in Annex C.

The main reason for drafting the EN 448:2009 is the aligning with EN 13941 and with other relevant recent European standards.

For information on the minimum expected thermal life with operation at various temperatures with respect to PUR foam performance see EN 253:2009, Annex B.

The other standards from TC 107 are:

EN 253, *District heating pipes – Preinsulated bonded pipe systems for directly buried hot water networks – Pipe assembly of steel service pipe, polyurethane thermal insulation and outer casing of polyethylene;*

EN 488, *District heating pipes – Preinsulated bonded pipe systems for directly buried hot water networks – Steel valve assembly for steel service pipes, polyurethane thermal insulation and outer casing of polyethylene;*

EN 489, *District heating pipes – Preinsulated bonded pipe systems for directly buried hot water networks – Joint assembly for steel service pipes, polyurethane thermal insulation and outer casing of polyethylene;*

EN 13941, *Design and installation of preinsulated bonded pipe systems for district heating;*

EN 14419, *District heating pipes – Preinsulated bonded pipe systems for directly buried hot water networks – Surveillance systems;*

EN 15632 *(all parts), District heating pipes – Pre-insulated flexible pipe systems;*

EN 15698-1*, District heating pipes – Preinsulated bonded twin pipe systems for directly buried hot water networks – Part 1: Twin pipe assembly of steel service pipe, polyurethane thermal insulation and outer casing of polyethylene.*

1 Scope

This European Standard specifies requirements and test methods for fittings of prefabricated thermally insulated pipe-in-pipe assemblies comprising a steel service fitting from DN 20 to DN 1200, rigid polyurethane foam insulation and an outer casing of polyethylene for use in directly buried hot water networks with preinsulated pipe assemblies in accordance with EN 253.

This European Standard covers the following fittings: bends, T-pieces, reducers, single use compensators and anchors.

This European Standard applies only to insulated fitting assemblies and single use compensators for continuous operation with hot water at various temperatures in accordance with EN 253:2009, Clause 1.

This European Standard applies to fitting assemblies with a minimum design pressure of 16 bar (overpressure) complying with EN 13941.

Guidelines for quality inspection are given in Annex A of this European Standard.

Procedures for PE-welding are given in Annex B of this European Standard.

NOTE This European Standard does not include rules for calculation of loads and stresses.

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 253:2009,, *District heating pipes - Preinsulated bonded pipe systems for directly buried hot water networks - Pipe assembly of steel service pipe, polyurethane thermal insulation and outer casing of polyethylene*

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

EN 489:2009, *District heating pipes – Preinsulated bonded pipe systems for directly buried hot water networks – Joint assembly for steel service pipes, polyurethane thermal insulation and outer casing of polyethylene*

EN 571-1, *Non destructive testing – Penetrant testing – Part 1: General principles*

EN 1289, *Non-destructive examination of welds - Penetrant testing of welds – Acceptance levels*

EN 1290, *Non-destructive examination of welds – Magnetic particle examination of welds*

EN 1291, *Non-destructive examination of welds – Magnetic particle testing of welds – Acceptance levels*

EN 1418, *Welding personnel – Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials*

EN 1435, *Non-destructive examination of welds – Radiographic examination of welded joints*

EN 10253-2:2007 *Butt-welding pipe fittings – Part 2: Non alloy and ferritic alloy steels with specific inspection requirements*

EN 12517-1, *Non-destructive testing of welds – Part 1: Evaluation of welded joints in steel, nickel, titanium and their alloys by radiography – Acceptance levels*

EN 12814-1, *Testing of welded joints of thermoplastics semi-finished products – Part 1: Bend test*

EN 13941, *Design and installation of preinsulated bonded pipe systems for district heating*

EN 14419:2009, *District heating pipes – Preinsulated bonded pipe systems for directly buried hot water networks – Surveillance systems*

EN 14870-1, *Petroleum and natural gas industries - Induction bends, fittings and flanges for pipeline transportation systems – Part 1: Induction bends (ISO 15590-1:2001 modified)*

EN ISO 5817, *Welding – Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) – Quality levels for imperfections (ISO 5817:2003, corrected version:2005, including Technical Corrigendum 1:2006)*

EN 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 8501-1:2007)*

EN ISO 9692-1:2003, *Welding and allied processes - Recommendations for joint preparation - Part 1: Manual metal-arc welding, gas-shielded metal-arc welding, gas welding, TIG welding and beam welding of steels (ISO 9692-1:2003)*

EN ISO 15607, *Specification and qualification of welding procedures for metallic materials – General rules (ISO 15607:2003)*

ISO 17636, *Non-destructive testing of welds - Radiographic testing of fusion-welded joints*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 253:2009 and the following apply.

3.1
anchor
steel construction used to transfer the axial load from the steel service pipe through the insulation and the casing to a fixed point

3.2
bending angle α
deviation in direction of the steel pipe centre lines

3.3
butt welded bend
bend manufactured either by hot bending of steel pipe or by hot forming of steel plates which are subsequently welded together

3.4
cold formed bend
bend manufactured by cold bending of steel pipe

3.5
dish or end cap
not pre-insulated butt welded fitting to be welded on the end of a pipe or pipe element

3.6
fitting
pipe element

3.7
forged T-piece
T-piece manufactured by hot forming of either steel pipes or steel plates which are subsequently welded together

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hot formed bend
bend manufactured by heating pipe during bending

3.9
induction bend
bend manufactured by induction bending

3.10
induction bending
continuous bending process which utilizes induction heating to create a narrow, circumferential, heated band around the material being bent

3.11
nominal size, DN
numerical metric designation of size is common to components in piping systems of any one size

3.12
pipe element
reducer, tee, factory-made elbow and bend, flange, cap, welding stub, mechanical joint

3.13
reducer
butt welding fitting to be welded between two steel pipes of different diameters

3.14
single use compensators
single use compensators with one-off expansion has facilities of absorbing expansion in the pipe system when it is heated up first time

NOTE By locking the expansion facility (by welding) future expansions in the pipe system will be absorbed as tensile and compressive stresses. Single use compensators are not pre-insulated.

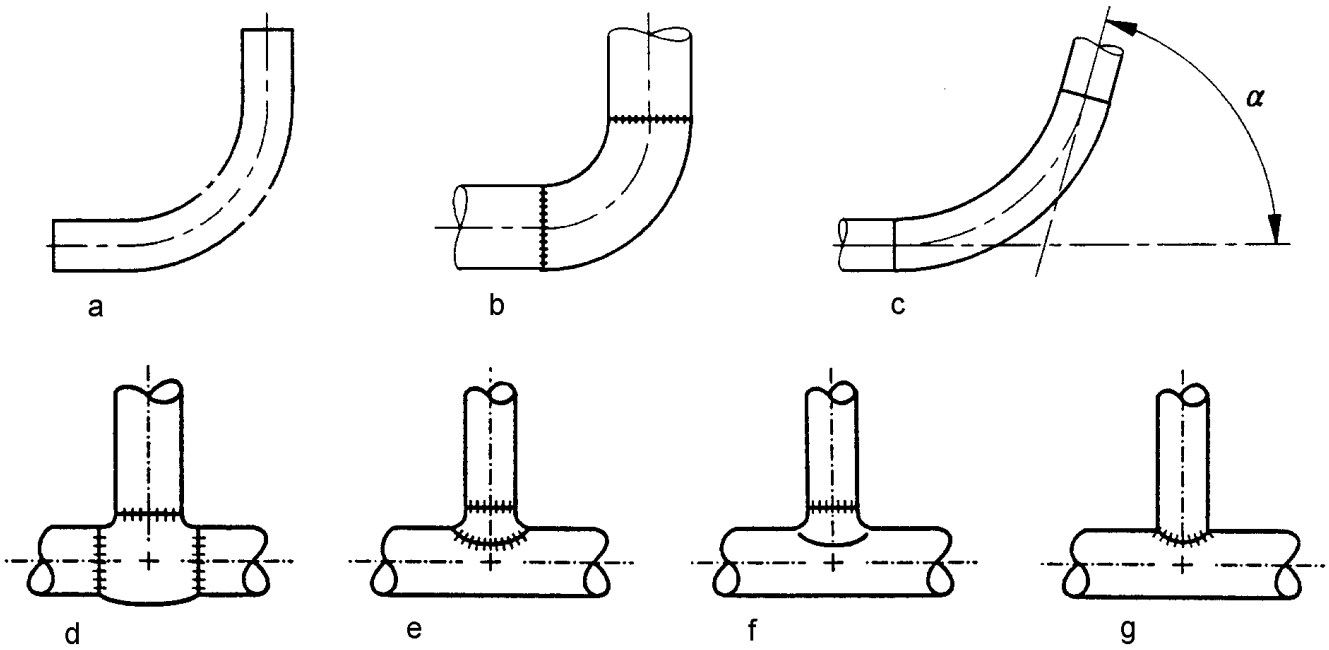
3.15
surveillance system

system that consists of measuring sections and measuring instruments for surveillance of pipe systems according to EN 14419

3.16
welded T-piece
butt welding fitting manufactured by welding together pieces of steel pipes with or without the use of a welding saddle or a drawn collar on the main pipe

3.17
welding saddle
butt welding fitting to be welded into the main pipe for the welded connection between the main pipe and the branch pipe in a T-piece

NOTE For examples of fittings see Figure 1.



Key

a	Cold or hot formed bends	e	T-piece with welding saddle
b	Butt welding bend or elbows	f	T-piece with drawn collar
c	Bending angle, α	g	Directly welded T-piece
d	Forged T-piece		

Figure 1 — Examples

4 Requirements

4.1 Steel parts

4.1.1 Quality

The quality of pipe material used for the assembly of fittings shall be in accordance with EN 253:2009, Table 1. The quality of butt welding pipe fittings shall be in accordance with EN 10253-2.

NOTE 1 Steel material P235GH, referred to in EN 253, is most similar to the material, P235GH and P235TR2, referred to in EN 10253-2.

NOTE 2 For Sweden a deviating situation is applicable for EN 253:2009, Table 1 (see the A-deviation in EN 253:2009, Annex G).

4.1.2 Wall thickness and diameter

According to the scope of this European Standard all components shall be designed for a minimum of 16 bar.

NOTE if the fitting assemblies have to be used in situations with pressures higher than 16 bar, extra calculations will be necessary.

The minimum nominal wall thickness of all components shall prior to processing be at least the same as for the straight pipes.

The nominal diameter, the outside diameter and the minimum nominal wall thickness shall be the same as for the straight pipes in accordance with EN 253:2009, Table 2. The tolerances on the outside diameter of the pipe ends shall be in accordance with EN 253:2009 Table 3.

Subject to design considerations other wall thicknesses than those given in EN 253:2009, Table 2 may be used, but in no case shall these be less than the minima indicated in EN 253:2009, Table 2.

All components shall be designed in accordance with EN 13941, for the actions and stresses that normally occur during a system's entire service life.

4.1.3 Bends

4.1.3.1 Butt welding bends

The dimensions shall be in accordance with EN 10253-2 with the exception that the bend radius shall be ≥ 1,5 times the outer diameter.

4.1.3.2 Cold formed bends

Cold formed bends shall be produced from seamless pipe or longitudinal welded pipes. At cold formed bends made of longitudinal welded pipes the weld bead shall be welded to factor V=1 (calculation stress = 100%).

After bending, the minimum wall thickness of the bent pipe shall be not less than 85 % of the nominal wall thickness of the straight pipe (see EN 253:2009, Table 2).

The maximum ovality in the bent area shall not exceed 6 %.

The formula for the calculation of the ovality is:

$$o = \frac{(D_{s\,max} - D_{s\,min})}{D_s} \times 100 \qquad (1)$$

where:

o is the ovality, in %

$D_{s\,max}$ is the maximum outside diameter;

$D_{s\,min}$ is the minimum outside diameter in the same cross section in the bended area;

D_s is the specified outside diameter.

There shall be no folding in the bent area. Waves can be accepted, when the maximum height between trough and crest of the wave does not exceed 25 % of the nominal wall thickness of the bent pipe.

4.1.3.3 Hot-formed bends

For hot-formed bends manufactured from straight pipes by means of inductive heating (induction bends), no heat treatment is necessary as far as this method is applied with unalloyed or low-alloyed steel with [Mo] < 0.65 %. Hot-formed bends shall be supplied in conformity with EN 14870-1.

If for the bending other heating methods are applied, heat treatment following the bending of the pipes is required.

NOTE 1 If a hot-formed bend has to be made from line pipe, this should be specified to the pipe manufacturer at the time of ordering so that they can take this into account when selecting the (chemical) composition of the pipe material and the welding filler material.

NOTE 2 It is recommended to determine per batch, diameter, wall thickness and bend radius, through mechanical testing, that the bends comply with the applicable material specifications. It is customary that a representative bend or an (additional) section of a bend of adequate length be manufactured during the production process and that 10 % of the bends be tested.

4.1.3.4 Tolerances of bending angles

The deviation from the nominal bending angle shall not exceed the tolerances given in Table 1.