

# SLOVENSKI STANDARD

## SIST EN 448:2004

01-oktober-2004

Nadomešča:  
SIST EN 448:2000

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**Cevi za daljinsko ogrevanje – Izolirani vezani cevni sistemi za podzemeljska toplovodna omrežja – Sestav fittingov 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 - Verbund-Formstücke, bestehend aus Stahl-Mediumrohr, Polyurethan-Wärmedämmung und Außenmantel aus Polyethylen

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

**Ta slovenski standard je istoveten z: EN 448:2003**

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

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
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**EN 448**

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**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**

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

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This European Standard was approved by CEN on 28 November 2002.

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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**

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**EN 448:2003 (E)****Foreword**

This document (EN 448:2003) 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 2003, and conflicting national standards shall be withdrawn at the latest by August 2003.

This document supersedes EN 448:1994.

Annexes A and B are informative.

This document includes a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound 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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## Introduction

The first edition of EN 448 was approved in 1994. The main areas of the revision are:

- the title has been amended by "District heating pipes";
- the term "underground" has been changed to "directly buried";
- the mentioning in the foreword of the production method "injected (poured)" has been deleted;
- service pipes with nominal diameters from DN 700 up to and including DN 1200 have been added and the requirements have been amended accordingly;
- casings with nominal outside diameters from 900 mm up to and including 1 400 mm have been added and the requirements have been amended accordingly;
- the minimum straight length of the casing at the ends of fittings has been changed to 200 mm;
- the requirements for polyethylene welding have been changed;
- annex B has been rewritten;
- the former annex C has been omitted.

This specification is part of the standards for bonded systems using polyurethane foam thermal insulation applied to bond to a steel service pipe and a polyethylene casing.

For information on the minimum expected thermal life with operation at various temperatures with respect to PUR foam performance see EN 253:2003, annex B.

The other standards from TC 107 are:

EN 253:2003, *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 488:2003, *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 489:2003, *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 13941:2003, *Design and installation of preinsulated bonded pipe systems for district heating.*

NOTE The following draft in connection with the above mentioned is under development:

prEN 14416, *District heating pipes – Preinsulated bonded pipe systems for directly buried hot water networks – Surveillance systems.*

**EN 448:2003 (E)****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 standard covers the following fittings: bends, T-pieces, reducers and anchors.

This standard applies only to insulated fitting assemblies for continuous operation with hot water at various temperatures in accordance with clause 1 of EN 253:2003.

Guidelines for quality inspection are given in annex A of this standard.

Procedures for PE-welding are given in annex B of this standard.

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

**2 Normative references**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 253:2003, *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, *Approval testing of welders - Fusion welding - Part 1: Steels.*

EN 288-1:1992, *Specification and qualification of welding procedures for metallic materials - Part 1: General rules for fusion welding.*

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 10216-2, *Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 2: Non-alloy and alloy steel tubes with specified elevated temperature properties.*

EN 10217-2, *Welded steel tubes for pressure purposes - Technical delivery conditions - Part 2: Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties.*

EN 10217-5, *Welded steel tubes for pressure purposes - Technical delivery conditions - Part 5: Submerged arc welded non-alloy and alloy steel tubes with specified elevated temperature properties.*

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

EN 25817:1992, *Arc-welded joints in steel - Guidance on quality levels for imperfections (ISO 5817:1992).*

ISO 1106-3, *Recommended practice for radiographic examination of fusion welded joints - Part 3: Fusion welded circumferential joints in steel pipes of up to 50 mm wall thickness.*

ISO 3419:1981, *Non-alloy and alloy steel butt welding fittings.*

ISO 6761, *Steel tubes - Preparation of ends of tubes and fittings for welding.*



### 3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 253:2003 together with the following apply.

#### 3.1

##### **cold formed bend**

manufactured by cold bending of steel pipes

#### 3.2

##### **butt welding bend**

manufactured either by hot bending of steel pipes or by hot forming of steel plates which are subsequently welded together

#### 3.3

##### **bending angle, $\alpha$**

deviation in direction of the steel pipe centre lines

#### 3.4

##### **forged T-piece**

manufactured by hot forming of either steel pipes or steel plates which are subsequently welded together

#### 3.5

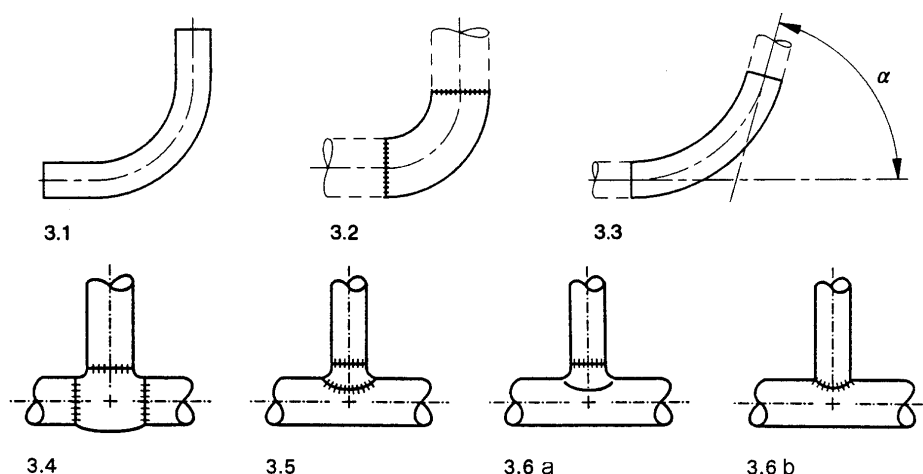
##### **welding saddle**

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

#### 3.6

##### **welded T-piece**

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



#### Key

- 3.1 Cold formed bend
- 3.2 Butt welding bend
- 3.3 Bending angle,  $\alpha$
- 3.4 Forged T-piece

- 3.5 T-piece with welding saddle
- 3.6a T-piece with drawn collar
- 3.6b Directly welded T-piece

Figure 1 — Examples

**EN 448:2003 (E)****3.7****reducer**

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

**3.8****anchor**

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

**4 Requirements****4.1 Steel parts****4.1.1 Quality**

The material shall be in accordance with 4.2.1 of EN 253:2003.

**4.1.2 Wall thickness and diameter**

The minimum nominal wall thickness of pipes and butt welding fittings 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 Table 1 of EN 253:2003. The tolerances on the outside diameter of the pipe ends shall be in accordance with Table 2 of EN 253:2003.

Subject to design considerations other wall thicknesses than those given in Table 1 of EN 253:2003 may be used, but in no case shall these be less than the minima indicated in Table 1 of EN 253:2003.

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**4.1.3 Bends****4.1.3.1 Butt welding bends**

The dimensions shall be in accordance with 6.1.2 of ISO 3419:1981 with the exception that the bend radius shall be  $\geq 1,5$  times the outer diameter. See also prEN 13941.

**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 positioned in a 45° angle to the bending plane.

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 Table 1 of EN 253:2003).

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

The formula for the calculation of the ovality is:

$$o = \frac{D_{s \max} - D_{s \min}}{D_s} \times 100$$

where

$D_{s \max}$  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 Tolerances of bending angles

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

**Table 1 — Deviations from nominal bending angle**

Nominal diameter of service pipe	Deviation
≤ DN 200	± 2,0°
> DN 200	± 1,0°

#### 4.1.4 T-pieces

##### 4.1.4.1 Forged T-pieces

The wall thicknesses  $T$  and  $T_1$  - see Figure 4 of ISO 3419:1981 - shall be at least the same as those for the straight pipes (see Table 1 of EN 253:2003). All other dimensions shall be in accordance with 6.1.4 of ISO 3419:1981.

##### 4.1.4.2 Welding saddles

Welding saddles shall be of the type which shall be welded into the wall of the main pipe.

The wall thicknesses of the welding saddles shall be at least the same as the wall thicknesses of the main pipes and the branch pipes which shall be welded to the saddles.

##### 4.1.4.3 Welded T-pieces

Welded T-pieces shall be manufactured either by using welding saddles or by drawing a collar on which the branch pipe is welded or by welding the branch pipe directly to the main pipe. The wall thickness of the collar shall be at least the same as that for the branch pipe (see Table 1 of EN 253:2003).

The collar shall be drawn opposite the welding seam in the main pipe.

##### 4.1.4.4 Tolerances of angles between branch pipes and main pipes

The branch pipes shall be perpendicular to the main pipes within a tolerance of ± 2,0°.

#### 4.1.5 Reducers

Reducers shall be in accordance with 6.1.3 of ISO 3419:1981, except for the wall thicknesses  $T$  and  $T_1$  - see Figure 3 of ISO 3419:1981 - which shall be at least the same as for the straight pipes (see Table 1 of EN 253:2003) to be welded to the fittings.

#### 4.1.6 Anchors

The wall thickness of the pipe shall be at least the same as for the straight pipe (see Table 1 of EN 253:2003).

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## 4.1.7 Fusion welding of steel fittings

## 4.1.7.1 Filler material

Filler material shall after welding have mechanical characteristics comparable with the parent metal.

## 4.1.7.2 Welding process

All types of fusion welding are acceptable but arc welding with covered electrodes and gas-shielded metal-arc welding are preferred. The welding process shall be specified in accordance with clause 4 of EN 288-1:1992 and approved in accordance with 5.1.1 of EN 288-1:1992.

The method of approval may be chosen by the manufacturer.

Fittings of diameter  $\geq 300$  mm shall be welded in more than one pass.

## 4.1.7.3 Preparation for welding

Pipe ends shall be prepared in accordance with the welding procedure used. When using covered electrodes or gas-shielded metal-arc welding, pipe ends and fittings shall be prepared in accordance with ISO 6761 and Figure 2.

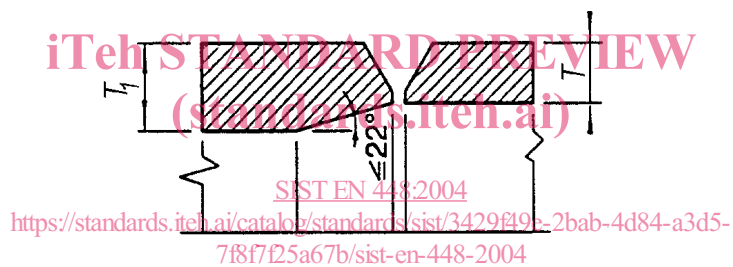


Figure 2 — Adaptation of inside diameter

The difference between average diameter of the 2 pipe or fittings ends to be welded together shall not exceed a value of 0,66 times pipe wall thickness; if the pipes and fittings have different wall thicknesses, a value of 0,66 times  $T$  in accordance with Figure 2 applies.

When manufacturing T-pieces with the branch pipe welded directly to the main pipe, preparations shall comply with Figure 3.