

SLOVENSKI STANDARD

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Cevi za daljinsko ogrevanje - Poviti enocevni sistemi za neposredno vkopana vročevodna omrežja - Tovarniško izdelana armatura iz jeklenih delovnih cevi, obdanih s poliuretansko toplotno izolacijo in zaščitnim plaščem iz polietilena

District heating pipes - Bonded single pipe systems for directly buried hot water networks
- Factory made fitting assemblies of steel service pipes, polyurethane thermal insulation and a casing of polyethylene

Fernwärmrohre - Einrohr-Verbundsysteme für direkt erdverlegte Fernwärmenetze - Werkmäßig gefertigte Formstückbaueinheiten, bestehend aus Stahl-Mediumrohren, einer Wärmedämmung aus Polyurethan und einer Ummantelung aus Polyethylen

Tuyaux de chauffage urbain - Systèmes bloqués monotube pour les réseaux enterrés d'eau chaude pour des réseaux d'eau chaude enterrés directement - Assemblages de raccords manufacturés pour tubes de service en acier, isolation thermique en polyuréthane et tube de protection en polyéthylène

Ta slovenski standard je istoveten z: prEN 448

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District heating pipes - Bonded single pipe systems for directly buried hot water networks - Factory made fitting assemblies of steel service pipes, polyurethane thermal insulation and a casing of polyethylene

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 107.

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COMITÉ EUROPÉEN DE NORMALISATION
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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (prEN 448:2023) has been prepared by Technical Committee CEN/TC 107 “Prefabricated district heating and district cooling pipe system”, the secretariat of which is held by DS.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 448:2019.

The main changes compared to the previous edition are listed below:

- two more ultrasonic testing methods for testing of welds are added to Table 4;
- alignment with the structure of EN 253;
- according to 4.1.3.3, the requirements for hot-formed bends are to be agreed between purchaser and supplier;
- according to 4.1.3.3, the requirements for hot-formed bends are to be agreed between purchaser and supplier;
- anchors are no longer included;
- single use compensators and caps are no longer included, they are covered by EN 13941-1;
- for steel welding, requirements for the welding contractor and welding consumables are specified in 4.1.6.1 and 4.1.6.3;
- requirements for steel weld preparation are omitted;
- requirements for distance between parallel weld seams are specified in 4.1.6.5.2;
- preparation of set-on branch with steel plate for reinforcement has been added in 4.1.6.5.3;
- requirement for imperfections of weld seams in 4.1.6.6.1 has been adapted to EN 13941-2;
- non-destructive testing (NDT) of weld seams in 4.1.6.6.2 is adapted to EN 13941-2;
- test methods for leak testing of steel weld seams have been clarified in 5.3;
- requirements for visual inspection of PE weld seams in 5.4.1 have been revised and explanatory figures have been added;
- requirements for marking of fitting assemblies have been added in 6.5;
- recommendations for qualifications of PE welders have been added to B.1.

Introduction

prEN 448 has been aligned with prEN 488-1 and other relevant European Standards.

Other standards from CEN/TC 107 are:

- EN 253, *District heating pipes - Bonded single pipe systems for directly buried hot water networks - Factory made pipe assembly of steel service pipe, polyurethane thermal insulation and a casing of polyethylene*
- prEN 488-1, *District heating pipes — Bonded single pipe systems for directly buried hot water networks — Part 1: Factory made steel valve assembly for steel service pipes, polyurethane thermal insulation and a casing of polyethylene;*
- prEN 488-2, *District heating and district cooling pipes - Bonded pipe systems for directly buried hot and cold water networks - Part 2: Factory made steel valve assembly for draining and venting, polyurethane thermal insulation and a casing of polyethylene*
- EN 489-1, *District heating pipes - Bonded single and twin pipe systems for buried hot water networks - Part 1: Joint casing assemblies and thermal insulation for hot water networks in accordance with EN 13941-1*
- EN 13941-1, *District heating pipes - Design and installation of thermal insulated bonded single and twin pipe systems for directly buried hot water networks - Part 1: Design*
- EN 13941-2, *District heating pipes - Design and installation of thermal insulated bonded single and twin pipe systems for directly buried hot water networks - Part 2: Installation*
- EN 14419, *District heating pipes - Bonded single and twin pipe systems for buried hot water networks - Surveillance systems*
- EN 15632 (all parts), *District heating pipes - Factory made flexible pipe systems*
- prEN 15698-1, *District heating pipes - Bonded twin pipe systems for directly buried hot water networks - Part 1: Factory made twin pipe assembly of steel service pipes, polyurethane thermal insulation and one casing of polyethylene*
- prEN 15698-2, *District heating pipes - Bonded twin pipe systems for directly buried hot water networks - Part 2: Factory made fitting and valve assemblies of steel service pipes, polyurethane thermal insulation and one casing of polyethylene*
- EN 17248, *District heating and district cooling pipe systems - Terms and definitions*
- EN 17414 (all parts), *District cooling pipes - Factory made flexible pipe systems*
- EN 17415 (all parts), *District cooling pipes - Bonded single pipe systems for directly buried cold water networks*
- EN 17878 (all parts), *District heating pipes - Factory made flexible pipe systems with a lower temperature profile*

Waste management and recycling of materials is dealt with in Annex C.

1 Scope

This document specifies requirements and test methods for factory made thermally insulated bonded fitting assemblies for hot water networks in accordance with EN 13941-1, comprising a steel service pipe, in most cases a steel fitting, polyurethane (PUR) foam thermal insulation and a casing of polyethylene.

The fitting assembly can also include the following additional elements: measuring wires, spacers and diffusion barriers.

This document covers the following fitting assemblies: bend, tee and reducer.

This document applies to fitting assemblies with a minimum design pressure of 1,6 MPa.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *District heating pipes - Bonded single pipe systems for directly buried hot water networks - Factory made pipe assembly of steel service pipe, polyurethane thermal insulation and a casing of polyethylene*

EN 10204, *Metallic products - Types of inspection documents*

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

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

EN 13018, *Non-destructive testing - Visual testing - General principles*

EN 13941-1, *District heating pipes - Design and installation of thermal insulated bonded single and twin pipe systems for directly buried hot water networks - Part 1: Design*

EN 13941-2, *District heating pipes - Design and installation of thermal insulated bonded single and twin pipe systems for directly buried hot water networks - Part 2: Installation*

EN 14419, *District heating pipes - Bonded single and twin pipe systems for buried hot water networks - Surveillance systems*

EN 17248, *District heating and district cooling pipe systems - Terms and definitions*

EN ISO 3452-1, *Non-destructive testing - Penetrant testing - Part 1: General principles (ISO 3452-1)*

EN ISO 3834-3, *Quality requirements for fusion welding of metallic materials - Part 3: Standard quality requirements (ISO 3834-3)*

EN ISO 5579, *Non-destructive testing - Radiographic testing of metallic materials using film and X- or gamma rays - Basic rules (ISO 5579)*

EN ISO 5817, *Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections (ISO 5817)*

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)*

EN ISO 9606-1, *Qualification testing of welders - Fusion welding - Part 1: Steels (ISO 9606-1)*

EN ISO 9934-1, *Non-destructive testing - Magnetic particle testing - Part 1: General principles (ISO 9934-1)*

EN ISO 10675-1, *Non-destructive testing of welds - Acceptance levels for radiographic testing - Part 1: Steel, nickel, titanium and their alloys (ISO 10675-1)*

EN ISO 11666, *Non-destructive testing of welds - Ultrasonic testing - Acceptance levels (ISO 11666)*

EN ISO 14732, *Welding personnel - Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials (ISO 14732)*

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

EN ISO 16810, *Non-destructive testing - Ultrasonic testing - General principles (ISO 16810)*

EN ISO 17636-1, *Non-destructive testing of welds - Radiographic testing - Part 1: X- and gamma-ray techniques with film (ISO 17636-1)*

EN ISO 17636-2, *Non-destructive testing of welds - Radiographic testing - Part 2: X- and gamma-ray techniques with digital detectors (ISO 17636-2)*

EN ISO 17637, *Non-destructive testing of welds - Visual testing of fusion-welded joints (ISO 17637)*

EN ISO 17638, *Non-destructive testing of welds - Magnetic particle testing (ISO 17638)*

EN ISO 17640, *Non-destructive testing of welds - Ultrasonic testing - Techniques, testing levels, and assessment (ISO 17640)*

EN ISO 23277, *Non-destructive testing of welds - Penetrant testing - Acceptance levels (ISO 23277)*

EN ISO 23278, *Non-destructive testing of welds - Magnetic particle testing - Acceptance levels (ISO 23278)*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in EN 17248 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

4 Requirements

4.1 Steel parts

4.1.1 Specification

Steel grades are specified in EN 13941-1.

All steel service pipes and steel fittings used for manufacturing of fitting assemblies under the scope of this document shall as a minimum be delivered to the manufacturer with an inspection certificate 3.1 according to EN 10204. The inspection certificate shall on request be passed on to the customer.

In case a material related inspection certificate 3.1 according to EN 10204 is required by the client who orders the fitting assemblies, this request shall be given whilst placing the order with the manufacturer of the fitting assemblies.

NOTE 1 Any later request for provision of such documentation could be too late and possibly can't be met by the manufacturer, since the start of the production is depending on organizing the assignment of 3.1 certificates to the steel valves and parts of the steel service pipes beforehand.

NOTE 2 For cold-formed bends, the material according to EN 10204 apply to the values of the chemical composition, but not to the values of the mechanical properties.

4.1.2 Wall thickness and diameter

According to the scope of this document, all steel components shall be designed for a minimum of 1,6 MPa.

If the fitting assemblies are used in situations with design pressures higher than 1,6 MPa, extra calculations will be necessary.

The nominal diameter and the minimum nominal wall thickness of all steel components shall prior to processing be at least the same as for the service pipes regarding EN 253.

At the end of the fitting assembly, the outside diameter, the tolerances on the diameter of the pipe ends and the wall thickness shall be the same as for the service pipes in accordance with EN 253.

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

All components shall be designed in accordance with EN 13941-1, for the actions and stresses that normally occur during the service life of the fitting assembly (or of the component).

4.1.3 Bends

4.1.3.1 Butt welding bends

The manufacturing process and dimensions shall be in accordance with EN 10253-2 with the exception that the bend radius shall be $\geq 1,5$ times the outer diameter.

4.1.3.2 Cold formed bends

Cold formed bends shall be produced from seamless pipe or longitudinal welded pipes.

After bending, the minimum wall thickness of the bent pipe shall be not less than 85 % of the wall thickness of the straight service pipe, see EN 253.

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

The formula for the calculation of the ovality is:

$$O = \frac{D_{s,\max} - D_{s,\min}}{D_s} \cdot 100 \quad (1)$$

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

Hot-formed bends shall be delivered by agreement between purchaser and supplier. If nothing else is agreed, the same requirements apply as in 4.1.3.2.

4.1.3.4 Tolerances of bending angles for cold- and hot-formed bends

The deviation from the nominal bending angle for cold- and hot-formed bends shall not exceed the tolerances given in Table 1.

Table 1 — Deviations from nominal bending angle for cold- and hot-formed bends

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

4.1.4 T-pieces

4.1.4.1 T-pieces produced by hot deformation process

T-pieces shall be produced by hot deformation processes according to EN 10253-2.

The wall thickness t and t_1 , see EN 10253-2, shall be at least the same as those for the straight pipes, see EN 253. All other dimensions shall be in accordance with EN 10253-2.

4.1.4.2 T-piece as set-on branch

T-pieces as set-on branch shall be manufactured by welding the branch pipe directly to the main pipe, without or with compensating (reinforcement) plates according to EN 13941-1 requirements, see Figure 2 and Figure 3. The branch pipes shall be perpendicular to the main pipes within a tolerance of ± 2,0°.

4.1.4.3 T-piece by drawing a collar

T-pieces by drawing a collar shall be manufactured by hot drawing a collar on which the branch pipe is welded. The wall thickness of the collar shall be at least the same as that for the branch pipe, see EN 253. The collar shall be drawn opposite the welding seam in the main pipe.

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T-pieces manufactured by drawing a collar shall be free from external and internal surface defects that can be detected by visual testing.

The internal and external surface finish of the fittings shall be typical of the manufacturing process and, where applicable, the heat treatment employed. Normally the finish and surface condition shall be such, that any surface imperfections requiring dressing shall be identified.

4.1.5 Reducers

Reducers shall be in accordance with EN 10253-2, except for the wall thicknesses T and T_1 , see EN 10253-2, which shall be at least the same as for the straight pipes, see EN 253, to be welded to the fittings.

4.1.6 Welding of steel parts**4.1.6.1 Qualification of the manufacturer**

The manufacturer of the valve assemblies shall fulfil the quality requirements according to EN ISO 3834-3.

4.1.6.2 Qualification of the welder

Welders for manual welding shall be qualified in accordance with EN ISO 9606-1.

Welders for with mechanised welding equipment shall be qualified in accordance with EN ISO 14732.

4.1.6.3 Welding process and welding procedure

Any type of welding process is permitted as long as it is demonstrated that the welded joint has comparable mechanical and technological properties to the base material.

The welding process shall be specified and approved in accordance with EN ISO 15607. The method of approval may be chosen by the manufacturer.

All weld seams shall be completely welded through.

4.1.6.4 Welding consumables

Welding consumables shall be of such a quality that the weld seams have mechanical characteristics at least equivalent with the parent metal and shall fit with the welding procedure and welding conditions.

4.1.6.5 Performance of welding work**4.1.6.5.1 Joint edge preparation and different wall thickness**

For joints between steel parts of different wall thickness Figure 1 shall apply.

For the different values of the possible misalignment and difference in wall thickness Table 2 shall apply.