

SLOVENSKI STANDARD
oSIST prEN 253:2018
01-junij-2018

Cevi za daljinsko ogrevanje - Poviti enocevni sistemi za neposredno vkopana vročevodna omrežja - Tovarniško izdelan cevni sestav iz jeklene delovne cevi, obdane s poliuretansko toplotno izolacijo in zaščitnim plaščem iz polietilena

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

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

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

Ta slovenski standard je istoveten z: prEN 253

ICS:

23.040.07	Cevovodi za daljinsko ogrevanje in njihovi deli	Pipeline and its parts for district heat
23.040.10	Železne in jeklene cevi	Iron and steel pipes
91.140.65	Oprema za ogrevanje vode	Water heating equipment

oSIST prEN 253:2018

en,fr,de

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 253

April 2018

ICS 23.040.07; 23.040.10

Will supersede EN 253:2009+A2:2015

English Version

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

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SIST EN 253:2020

<https://standards.iteh.ai/catalog/standards/sist/586568a2-ad39-4891-98e3-e34ec4118523/sist-en-253-2020>

European foreword

This document (prEN 253:2018) has been prepared by Technical Committee CEN/TC 107 “Prefabricated district heating and district cooling pipe systems”, the secretariat of which is held by DS.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 253:2009+A2:2015.

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SIST EN 253:2020

<https://standards.iteh.ai/catalog/standards/sist/586568a2-ad39-4891-98e3-e34ec4118523/sist-en-253-2020>

Introduction

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

The other standards from CEN/TC 107 covering this subject are:

- EN 448, 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;
- EN 488, District heating pipes – Bonded single pipe systems for directly buried hot water networks – Factory made steel valve assembly for steel service pipes, polyurethane thermal insulation and a casing of polyethylene;
- prEN 489-1:2017, District heating pipes – Bonded single and twin pipe systems for directly buried hot water networks – Casing joint assemblies and thermal insulation for hot water networks in accordance with EN 13941-1;
- prEN 13941-1:2016, District heating pipes – Design and installation of thermal insulated bonded single and twin pipe systems for directly buried hot water networks – Part 1: Design;
- prEN 13941-2:2016, 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 directly buried hot water networks – Surveillance systems;
- EN 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 pipe, polyurethane thermal insulation and one casing of polyethylene;
- EN 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.

1 Scope

This European Standard specifies requirements and test methods for straight lengths of factory made thermally insulated bonded single pipe assemblies for hot water networks in accordance with prEN 13941-1:2016, comprising a steel service pipe, rigid polyurethane foam insulation and a casing of polyethylene.

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

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 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 10220, *Seamless and welded steel tubes — Dimensions and masses per unit length*

prEN 13941-1:2016, *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 14419, *District heating pipes — Preinsulated bonded pipe systems for directly buried hot water networks — Surveillance systems*

prEN 17248:2018, *District heating and district cooling pipe systems — Terms and definitions*

EN ISO 845, *Cellular plastics and rubbers — Determination of apparent density (ISO 845)*

EN ISO 1133 (all parts), *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics (ISO 1133)*

EN ISO 2505, *Thermoplastics pipes — Longitudinal reversion — Test method and parameters (ISO 2505)*

EN ISO 3126, *Plastics piping systems — Plastics components — Determination of dimensions (ISO 3126)*

EN ISO 4590, *Rigid cellular plastics — Determination of the volume percentage of open cells and of closed cells (ISO 4590)*

EN ISO 6259-1, *Thermoplastics pipes — Determination of tensile properties — Part 1: General test method (ISO 6259-1)*

EN ISO 8497:1996, *Thermal insulation — Determination of steady-state thermal transmission properties of thermal insulation for circular pipes (ISO 8497:1994)*

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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 9080, *Plastics piping and ducting systems — Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation (ISO 9080)*

EN ISO 11357-6, *Plastics — Differential scanning calorimetry (DSC) — Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT) (ISO 11357-6)*

EN ISO 12162, *Thermoplastics materials for pipes and fittings for pressure applications — Classification, designation and design coefficient (ISO 12162)*

ISO 844, *Rigid cellular plastics — Determination of compression properties*

ISO 3127:1994, *Thermoplastics pipes — Determination of resistance to external blows — Round-the-clock method*

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

ISO 6964, *Polyolefin pipes and fittings — Determination of carbon black content by calcination and pyrolysis — Test method and basic specification*

ISO 11414:2009, *Plastics pipes and fittings — Preparation of polyethylene (PE) pipe/pipe or pipe/fitting test piece assemblies by butt fusion*

ISO 13953, *Polyethylene (PE) pipes and fittings — Determination of the tensile strength and failure mode of test pieces from a butt-fused joint*

ISO 16770, *Plastics — Determination of environmental stress cracking (ESC) of polyethylene — Full notch creep test (FNCT)*

ISO 18553, *Method for the assessment of the degree of pigment or carbon black dispersion in polyolefin pipes, fittings and compounds*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 17248:2018 apply.

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

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

4 Requirements

4.1 General

Unless otherwise specified, the requirements shall be valid for each single measurement.

For information on suitable guidelines for inspection of factory made pipes, see Annex C.

4.2 Steel service pipe

4.2.1 Specification

Steel grades are specified in prEN 13941-1:2016.

All steel pipes and components used for manufacturing of pipe assemblies under the scope of this standard 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 pipe assemblies, this request shall be given whilst placing the order with the manufacturer of the pipe assemblies.

NOTE Any later request for provision of such documentation can be too late and can possibly not be met by the manufacturer, since the manufacturer has to organize the assignment of 3.1 certificates to pipes and part of pipes before starting the production.

A length of pipe shall not include a circular weld.

4.2.2 Diameter

The diameter shall be in accordance with Table 1 which is derived from EN 10220.

The tolerances on the outside diameter, D_S , of the steel service pipe at the pipe ends, shall be in accordance with EN 10216-2, EN 10217-2 or EN 10217-5. Diameter measurements shall be made using a circumferential tape. The diameter shall be calculated as the actual circumference divided by π . Outside diameter, D_S , 168,3 and smaller may be measured using a slide calliper.

The out-of-roundness shall be determined in accordance with EN 10216-2, EN 10217-2 or EN 10217-5.

4.2.3 Wall thickness

The wall thicknesses, t , and masses shall be in accordance with EN 10220 with a minimum as indicated in Table 1.

Table 1 — Steel service pipe dimensions

Nominal diameter DN	Outside diameter d_S mm	Wall thickness t mm
15	21,3	2,0
20	26,9	2,0
25	33,7	2,3
32	42,4	2,6
40	48,3	2,6
50	60,3	2,9
65	76,1	2,9
80	88,9	3,2
100	114,3	3,6
125	139,7	3,6
150	168,3	4,0

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Nominal diameter DN	Outside diameter d_s mm	Wall thickness t mm
200	219,1	4,5
250	273,0	5,0
300	323,9	5,6
350	355,6	5,6
400	406,4	6,3
450	457,0	6,3
500	508,0	6,3
600	610,0	7,1
700	711,0	8,0
800	813,0	8,8
900	914,0	10,0
1 000	1 016,0	11,0
1 200	1 219,0	12,5

4.2.4 Surface condition

In order to ensure proper bonding between the steel service pipe and the thermal insulation, the following procedure shall be followed:

Prior to thermal insulation, the outer surface of the pipe shall be cleaned so that it is free from rust, mill scale, oil, grease, dust, paint, moisture and other contaminants.

Before cleaning the pipe, the outer surface of the pipe shall comply with rust grade A, B or C according to EN ISO 8501-1, without pitting.

4.3 Casing

4.3.1 Material properties

4.3.1.1 Material composition

The casing material shall be black coloured PE virgin or rework material containing only those anti-oxidants, UV-stabilizers and carbon black necessary for the manufacture and end use of pipes. The black coloured PE material to be extruded shall be classified at least a PE 80 material in accordance with EN ISO 12162.

NOTE The required carbon black content ensures UV stability for the service life.

The casing may be a separately manufactured pipe or be applied directly onto the insulation by extrusion.

The casing material shall be black coloured PE virgin or rework material containing only those anti-oxidants, UV-stabilizers and carbon black necessary for the manufacture and use of pipe assemblies to this specification. The black coloured PE material to be extruded shall be tested in accordance with EN ISO 9080 and classified at least a PE 80 material in accordance with EN ISO 12162.

The carbon black content shall, when tested in accordance with ISO 6964, be $(2,5 \pm 0,5)$ % by mass.

The carbon black shall be finely dispersed in the material. When tested in accordance with 5.2.3, the following requirements shall be met:

Carbon black agglomerates and particles shall be grade ≤ 3

Dispersion appearance rating not worse than A1, A2 or A3 in ISO 6964.

4.3.1.2 Melt mass-flow rate

The melt mass-flow rate (MFR), in g/10 min, of black PE materials used for the manufacturing of casings shall lie within $0,2 < \text{MFR} \leq 10$ g/10 min determined in accordance with EN ISO 1133, condition 5 kg, 190 °C.

Black coloured PE materials conforming to 4.3.1.1, which do not differ more than 0,5 g/10 min in MFR shall be considered fusible to each other.

Casings made of PE materials outside this MFR range of 0,5 g/10 min may be fusion welded provided that the pipe manufacturer has demonstrated fusion compatibility by preparing a but fusion joint using the parameters as specified in Annex A of ISO 11414:2009. The requirement of fusion compatibility is a ductile failure mode of the joint when tested at 23 °C in accordance with ISO 13953.

4.3.1.3 Thermal stability

The thermal stability is determined by oxygen induction time (OIT) of the black coloured PE material and shall be at least 20 min when tested at 210 °C according to EN ISO 11357-6.

4.3.1.4 Use of rework material

Only clean, not degraded, rework material, generated from the manufacturer's own production of pipes, shall be used.

4.3.2 Casing properties

4.3.2.1 Nominal outside diameter

The nominal outside diameter of the casing should be selected from Table 2.

The actual outside diameter shall be measured in accordance with EN ISO 3126.

4.3.2.2 Wall thickness

The wall thickness of one single PE layer of the casing shall be in accordance with Table 2.

The actual wall thickness shall be measured in accordance with EN ISO 3126.

Table 2 — Casing dimensions

Nominal outside diameter	Minimum wall thickness
D_C	e_{\min}
mm	mm
75	3,0
90	3,0
110	3,0
125	3,0
140	3,0
160	3,0
180	3,0