



SLOVENSKI STANDARD
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**Cevi za daljinsko ogrevanje - Tovarniško izdelani gibki cevni sistemi - 2. del:
Vezani cevni sistemi iz polimernih materialov - Zahteve in preskusne metode**

District heating pipes - Factory made flexible pipe systems - Part 2: Bonded system with plastic service pipes; requirements and test methods

Fernwärmerohre - Werkmäßig gedämmte flexible Rohrsysteme - Teil 2:
Verbundrohrsysteme mit Mediumrohren aus Kunststoff; Anforderungen und Prüfungen

Tuyaux de chauffage urbain - Système de tuyaux flexibles pré-isolés - Partie 2 : Système bloqué avec tubes de service en plastique ; exigences et méthodes d'essai

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23.040.07	Cevovodi za daljinsko ogrevanje in njihovi deli	Pipeline and its parts for district heat
91.140.10	Sistemi centralnega ogrevanja	Central heating systems

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English Version

District heating pipes - Factory made flexible pipe systems - Part 2: Bonded system with plastic service pipes; requirements and test methods

Tuyaux de chauffage urbain - Système de tuyaux flexibles pré-isolés - Partie 2 : Système bloqué avec tubes de service en plastique ; exigences et méthodes d'essai

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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.

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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European foreword

This document (prEN 15632-2:2020) 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 15632-2:2010+A1:2014.

This document is one of a series of standards which form several parts of EN 15632, *District heating pipes — Factory made flexible pipe systems*:

Part 1: *Classification, general requirements and test methods*;

Part 2: *Bonded system with plastic service pipes; requirements and test methods*;

Part 3: *Non bonded system with plastic service pipes; requirements and test methods*;

Part 4: *Bonded system with metal service pipes; requirements and test methods*.

In comparison to EN 15632-2:2010+A1:2014 the following changes have been made:

- a) revised temperature profile in Clause 4 with explicitly stated (unchanged) safety factors;
- b) introduction of an alternative option of thermal stability testing at 115 °C in 5.2;
- c) improved specification of a service pipe according to EN ISO 21003 in 5.2;
- d) completely revised informative Annex A “Application of Miner’s rule”;
- e) completely revised “guideline for testing” in the informative Annex B.

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Introduction

Pre-insulated flexible bonded pipe systems with plastic service pipes are used in district and local heating networks.

This part of the series of standards for the various types of flexible pipe systems is intended to be used in connection with EN 15632-1 which specifies the basic design criteria for flexible district heating pipes.

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1 Scope

This document provides requirements and test methods for flexible, factory made, buried heating pipe systems with plastics service pipes and bonding between the layers of the pipe assemblies.

It shall be used in conjunction with part 1.

This document is valid for maximum operating temperatures of 95 °C and maximum operating design pressures up to 1,0 MPa for a design service life of at least 30 years.

This document does not cover surveillance systems.

In conjunction with the other parts of EN 15632, this document is applicable to pipes, fittings, their joints and to joints with components made of non-plastics materials intended to be used for district heating installations.

NOTE For higher temperatures or for the transport of other fluids, for example potable water, additional requirements and testing is needed. Such requirements are not specified in this document.

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 485-2, *Aluminium and aluminium alloys — Sheet, strip and plate — Part 2: Mechanical properties*

EN 573-3, *Aluminium and aluminium alloys — Chemical composition and form of wrought products — Part 3: Chemical composition and form of products*

EN 15632-1, *District heating pipes — Factory made flexible pipe systems — Part 1: Classification, general requirements and test methods*

EN ISO 15875-1, *Plastics piping systems for hot and cold water installations — Crosslinked polyethylene (PE-X) — Part 1: General (ISO 15875-1)*

EN ISO 15875-2, *Plastics piping systems for hot and cold water installations — Crosslinked polyethylene (PE-X) — Part 2: Pipes (ISO 15875-2)*

EN ISO 15875-3, *Plastics piping systems for hot and cold water installations — Crosslinked polyethylene (PE-X) — Part 3: Fittings (ISO 15875-3)*

EN ISO 15875-5, *Plastics piping systems for hot and cold water installations — Crosslinked polyethylene (PE-X) — Part 5: Fitness for purpose of the system (ISO 15875-5)*

EN ISO 15876-1, *Plastics piping systems for hot and cold water installations — Polybutylene (PB) — Part 1: General (ISO 15876-1)*

EN ISO 15876-2, *Plastics piping systems for hot and cold water installations — Polybutylene (PB) — Part 2: Pipes (ISO 15876-2)*

EN ISO 15876-3, *Plastics piping systems for hot and cold water installations — Polybutylene (PB) — Part 3: Fittings (ISO 15876-3)*

EN ISO 15876-5, *Plastics piping systems for hot and cold water installations — Polybutylene (PB) — Part 5: Fitness for purpose of the system (ISO 15876-5)*

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EN ISO 21003-2, *Multilayer piping systems for hot and cold water installations inside buildings — Part 2: Pipes (ISO 21003-2)*

EN ISO 22391 (series), *Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT)*

ISO 17455, *Plastics piping systems — Multilayer pipes — Determination of the oxygen permeability of the barrier pipe*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 17248 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 <https://www.iso.org/obp>

4 Classification**4.1 Operating temperatures and service life**

Pipe systems according to this document are designed for a service life of at least 30 years when operated with the following temperature profile DH (Table 1):

Table 1 — Temperature profile DH

	Temperatures	Duration
Operating Temperature (T_{op})	80 °C	29 Years
Maximum operating temperature (T_{max})	90 °C	7 760 h
	95 °C	1 000 h
Malfunction temperature (T_{mal})	100 °C	100 h

NOTE The temperature profile DH of this document exceeds the requirements especially the thermal load of other plastic piping system standards for conveyed medium water by far. This document requires a thermal stability test at 110 °C of 15 000 h (see 5.2.1) in comparison to a thermal stability test at 110 °C of 8 760 h for hot drinking water applications inside of buildings.

Other temperature/time profiles can be applied in accordance with ISO 13760 (Miner's Rule). Further information is given in Annex A.

The maximum operating temperature shall not exceed 95 °C.

4.2 Design pressures

Pipe systems according to this document are designed for continuous operating pressures of 0,6 MPa, 0,8 MPa or 1,0 MPa.

Table 2 defines the maximum SDR ratios of the service pipe required to withstand the operating pressures.

Table 2 — SDR ratios required for different design pressures

	Design Pressure		
Service pipe	0,6 MPa	0,8 MPa	1,0 MPa
PE-X	SDR 11	SDR 9	SDR 7,4
PB-H	SDR 13,6	SDR 11	SDR 9
Multilayer M-pipes	Wall thicknesses shall be calculated according to the methods defined in EN ISO 21003-2		

NOTE 1 The SDR ratios in Table 2 are based on the reference lines given in EN ISO 15875-1 and EN ISO 15876-1, respectively.

The following minimum safety factors for design stress shall be applied (Table 3):

Table 3 — Safety factors for design stress

Temperature	Safety factor	Temperature range
Operating Temperature (T_{op})	1,5	≤ 80 °C
Maximum operating temperature (T_{max})	1,3	> 80 °C to ≤ 95 °C
Malfunction temperature (T_{mal})	1,0	> 95 °C to ≤ 100 °C

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NOTE 2 These safety factors are identical with the overall service (design) coefficients given in EN ISO 15875-2, EN ISO 15876-2 and EN ISO 21003-2, respectively.

5 Requirements

5.1 General requirements

In addition to the general requirements defined in EN 15632-1 the following product specific requirements shall apply.

5.2 Service pipes, fittings and their connections

5.2.1 Quality of service pipes, fittings and their connections

Service pipes, fittings and their connections shall comply with:

- EN ISO 15875-1, EN ISO 15875-2, EN ISO 15875-3, EN ISO 15875-5, for service pipes made of crosslinked polyethylene (PE-X).

The EN ISO 15875 standards series consisting of part 1, 2 3 and 5 is a piping system standard.

The documents shall only be used in conjunction with all the other parts of EN ISO 15875. The EN ISO 15875-1 is of general importance. Pipes conforming to EN ISO 15875-2 are intended to be joined with fittings conforming to EN ISO 15875-3, whereby the connection conforms to the requirements of EN ISO 15875-5.

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NOTE 1 The test results obtained from a specific piping system test according EN ISO 15875-5 cannot be transferred to other combinations of pipes and fittings.

All requirements of the pipe and fitting according to EN ISO 15875-2 and EN ISO 15875-3 especially the degree of cross-linking shall be met before leaving the production site.

- Deviating from EN ISO 15875-2, the thermal stability test on service pipes shall be carried out as follows:
 - pipes shall not fail when tested at 110 °C at a hoop stress of 2,4 N/mm² for 15 000 h;
 - alternatively, pipes shall not fail when tested at 115 °C at a hoop stress of 2,1 N/mm² for 8 760 h;
 - in case of dispute, the result of the thermal stability test at 110 °C applies.
- Deviating from EN ISO 15875-5, the thermal cycling test on service pipes and fittings shall be carried out with test parameters specified in 6.2.
- EN ISO 15876-1, EN ISO 15876-2, EN ISO 15876-3, EN ISO 15876-5, for service pipes made of polybutylene (PB-H).

The EN ISO 15876 standards series consisting of part 1, 2 3 and 5 is a piping system standard.

The documents shall only be used in conjunction with all the other parts of EN ISO 15876. The EN ISO 15876-1 is of general importance. Pipes conforming to EN ISO 15876-2 are intended to be joined with fittings conforming to EN ISO 15876-3, whereby the connection conforms to the requirements of EN ISO 15876-5.

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NOTE 2 The test results obtained from a specific piping system test according EN ISO 15876-5 cannot be transferred to other combinations of pipes and fittings.

All requirements of the pipes and fittings according to EN ISO 15876-2, EN ISO 15876-3 shall be met before leaving the production site.

- Deviating from EN ISO 15876-2, the thermal stability test on service pipes shall be carried out as follows:
 - pipes shall not fail when tested at 110 °C at a hoop stress of 2,2 N/mm² for 15 000 h;
 - alternatively, pipes shall not fail when tested at 115 °C at a hoop stress of 1,6 N/mm² for 8 760 h;
 - in case of dispute, the result of the thermal stability test at 110 °C applies.
- Deviating from EN ISO 15876-5, the thermal cycling test on service pipes and fittings shall be carried out with test parameters specified in 6.2.
- EN ISO 21003-1, EN ISO 21003-2, EN ISO 21003-3, EN ISO 21003-5 for multilayer M-pipes.

The EN ISO 21003 standards series consisting of part 1, 2 3 and 5 is a piping system standard.

The documents shall only be used in conjunction with all the other parts of EN ISO 21003. The EN ISO 21003-1 is of general importance. Pipes conforming to EN ISO 21003-2 are intended to be

joined with fittings conforming to EN ISO 21003-3, whereby the connection conforms to the requirements of EN ISO 21003-5.

NOTE 3 The test results obtained from a specific piping system test according EN ISO 21003-5 cannot be transferred to other combinations of pipes and fittings.

All requirements of the pipes and fittings according to EN ISO 21003-2, EN ISO 21003-3 shall be met before leaving the production site.

- Deviating from EN ISO 21003-2, the following shall apply:
 - the service pipe construction shall be a multilayer M-pipe comprising of an inner polymeric layer, inner adhesive layer, metal layer, outer adhesive layer and an outer polymeric layer;
 - the inner polymeric layer is made of polybutylene according to EN ISO 15876, PE-X according to EN ISO 15875 or PE-RT Type 2 according to EN ISO 22391;
 - the metal layer is made of aluminium with defined composition according to EN 573-3 and with defined mechanical performance according to EN 485-2;
 - the thermal stability test for multilayer M-pipes according EN ISO 21003-2 has to be met when tested at 110 °C for 15 000 h;
 - the thermal stability test of the inner layer material of the multilayer M-pipe is optionally possible by testing the complete multilayer M-pipe at 110 °C for 15 000 h. The test pressure applied shall be the σ_{LPL} value of the multilayer M-pipe at 110 °C and 15 000 h. No failure shall occur;
 - alternatively, the thermal stability testing for multilayer M-pipes according EN ISO 21003-2 at 115 °C is possible. In case of dispute, the result of the thermal stability test at 110 °C applies.
- Deviating from EN ISO 21003-5, the thermal cycling test on service pipes and fittings shall be carried out with test parameters specified in 6.2.

5.2.2 Oxygen tightness of service pipes

The oxygen diffusion of service pipes shall not exceed 1,8 mg/m²d at 80 °C when tested according to ISO 17455.

Multilayer M-pipes which consist of a homogeneously closed and longitudinally welded or seamless metal layer with a layer thickness $\geq 100 \mu\text{m}$ in the pipe construction are considered to be oxygen-tight. A separate test of oxygen permeability is not necessary for these types of pipes.

NOTE The criterion of the layer thickness is due to the welding technology. However, it is generally known - also from industries as food and medical packaging - that metal barriers as aluminium laminates with thicknesses of the aluminium down to 9 μm works as diffusion barriers.

5.3 Axial shear strength of pipe assemblies

The axial shear strength between the service pipe and the thermal insulation shall be at least 0,09 MPa for plastics pipes and 0,12 MPa for multilayer M pipes, when tested in accordance with 6.3. The test result shall be determined as an average of three measurements.