SLOVENSKI STANDARD
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Cevi za daljinsko ogrevanje - Izolirani gibki cevni sistemi - 1. del: Klasifikacija, splošne zahteve in preskusne metode

District heating pipes - Pre-insulated flexible pipe systems - Part 1: Classification, general requirements and test methods

Fernwärmerohre - Werkmäßig gedämmte flexible Rohrsysteme - Teil 1: Klassifikation, allgemeine Anforderungen und Prüfungen

Tuyaux de chauffage urbain - Systèmes de tuyaux flexibles préisolés - Partie 1 : Classification, exigences générales et méthodes d'essai

Ta slovenski standard je istoveten z: **prEN 15632-1**

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District heating pipes - Pre-insulated flexible pipe systems - Part 1: Classification, general requirements and test methods

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Fernwärmerohre - Werkmäßig gedämmte flexible Rohrsysteme - Teil 1: Klassifikation, allgemeine Anforderungen und Prüfungen

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European foreword

This document (prEN 15632-1:2020) 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 15632-1:2009+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 15632-1:2009+A1:2014 the following changes have been made:

a) improved description of the bending test in 5.2 and 6.2;

b) improved description of the thermal insulation in 5.4;

c) improved description of the compressive creep test in 6.3;

d) improved calculation of the thermal conductivity in Annex A, A.6;

e) improved calculation of the radial thermal resistance in Annex B;

f) completely revised "guideline for testing" in the informative Annex C.

Introduction

Flexible pipe systems in district heating networks are of common technical usage. In order to ensure quality including product-related service life, to ensure safety in use, economical energy usage and to facilitate comparability in the market, CEN/TC 107 decided to set up standards for these products.

1 Scope

This document provides classification, general requirements and test methods for flexible, factory made, buried district heating pipe systems.

This document is intended to be used in conjunction with part 2, 3 or 4, as applicable.

Depending on the pipe assembly (see Table 4), this document is valid for maximum media temperature of 95 °C (part 2 and 3) and maximum media temperature of 120 °C (for part 4) and design pressures of 0,6 MPa to 2,5 MPa.

The pipe systems are designed for a service life of at least 30 years. For pipe systems with plastic service pipes, the respective temperature profiles are defined in EN 15632-2 and EN 15632-3.

NOTE For the transport of other liquids, for example potable water, additional requirements can be applicable.

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 pipe systems for directly buried hot water networks — Factory made pipe assembly of steel service pipe, polyurethane thermal insulation and outer casing of polyethylene*

EN 1605, *Thermal insulating products for building applications — Determination of deformation under specified compressive load and temperature conditions*

EN 1606, *Thermal insulating products for building applications — Determination of compressive creep*

EN 12085, *Thermal insulating products for building applications — Determination of linear dimensions of test specimens*

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

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

EN 60811-4-1:2004, *Electric and optical fibre cables — Test methods for non-metallic materials — Part 406: Miscellaneous tests — Resistance to environmental stress cracking of polyethylene and polypropylene compounds (IEC 60811-406-1:2012)*

EN ISO 845, *Cellular plastics and rubbers — Determination of apparent density (ISO 845:2006)*

EN ISO 3127, *Thermoplastics pipes — Determination of resistance to external blows — Round-the-clock method (ISO 3127)*

EN ISO 9967, *Thermoplastics pipes — Determination of creep ratio (ISO 9967)*

EN ISO 9969, *Thermoplastics pipes — Determination of ring stiffness (ISO 9969)*

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 16871, *Plastics piping and ducting systems — Plastics pipes and fittings — Method for exposure to direct (natural) weathering (ISO 16871)*

EN ISO 23993, *Thermal insulation products for building equipment and industrial installations — Determination of design thermal conductivity (ISO 23993)*

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

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

3 Terms and definitions and symbols

3.1 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

3.2 Symbols, indices and abbreviations

For the purposes of this document, the following symbols in Table 1, indices in Table 2 and abbreviations in Table 3 apply.

Table 1 — Symbols

Symbol	Description	Unit
A	projected area of the service pipe (length * width)	mm^2
d_1	inner diameter of the service pipe	mm
D	actual diameter of casing, measured with measuring tape	mm
De	deviation of service pipe	%
D_{min}	minimum casing diameter, measured with calliper	mm
D_{max}	maximal casing diameter, measured with calliper	mm
$d_{1,p}$	inner diameter of the service pipe at the peak of a corrugation	mm
$d_{1,t}$	inner diameter of the service pipe at the trough of a corrugation	mm
d_2	outer diameter of the service pipe	mm
$d_{2,p}$	outer diameter of the service pipe at the peak of a corrugation	mm
$d_{2,t}$	outer diameter of the service pipe at the trough of a corrugation	mm
d_3	inner diameter of the casing	mm

Symbol	Description	Unit
$d_{3,p}$	inner diameter of the casing at the peak of a corrugation	mm
$d_{3,t}$	inner diameter of the casing at the trough of a corrugation	mm
d_4	outer diameter of the casing	mm
$d_{4,p}$	outer diameter of the casing at the peak of a corrugation	mm
$d_{4,t}$	outer diameter of the casing at the trough of a corrugation	mm
F	force	N
f_a	ageing factor	/
f_{cor}	corrective factor for differences between calculated and measured thermal conductivities or is the correction factor for existing open splits, thermal bridges or change of the factor for shape caused by influence of lying in the ground and the relevant factors set up by EN ISO 23993.	/
F_{exp}	force resulting from heat expansion	N
f_m	moisture factor	/
F_{weight}	is the force resulting from weight in N	N
g	acceleration due to gravity	m/s^2
L	length of the test specimen	m
M	mass of the service pipe including the water inside	kg
O	Ovality	%
P_{exp}	area related load on the thermal insulation resulting from heat expansion of the service pipe	MPa
P_{test}	area related test load	MPa
P_{weight}	area related load on the cross section of the test specimen of the thermal insulation material	MPa
q	heat flow rate	W/m
q_f	radial heat flow rate for buried single pipe system in the flow pipe	W/m
q_{f+r}	radial heat flow rate for buried single pipe system in the flow and return pipe	W/m
q_r	radial heat flow rate for buried single pipe system in the return pipe	W/m
q_{TPS}	radial heat flow rate for buried twin pipe system	W/m
Q	heat flow	W
r	bending radius in the axis of the pipe	mm

Symbol	Description	Unit
R	radial thermal resistance	m·K/W
R_0	thermal resistance from earth surface to ambient air	m^2·K/W
R_{design}	design value for the radial resistance	m·K/W
R_f	radial thermal resistance of the flow pipe	m·K/W
R_r	radial thermal resistance of the return pipe	m·K/W
R_{soil}	radial thermal resistance of the soil	m·K/W
R_{TPS}	radial thermal resistance of a twin pipe system	m·K/W
s	thickness	mm
S_i	thickness of thermal insulation, mean value of 4 measurements at 3,6,9 and 12 o'clock position at test specimen end	mm
S_iB	maximum thickness of the thermal insulation	mm
s_{STB}	thickness of test specimen after load testing and temperature testing	mm
τ_{ax}	axial shear stress	MPa
t	thickness of the casing	mm
U	coefficient of heat loss	W/(m·K)
U_f	coefficient of heat loss for buried single pipe system in the flow pipe	W/(m·K)
U_r	coefficient of heat loss for buried single pipe system in the return pipe	W/(m·K)
U_{TPS}	coefficient of heat loss in a twin pipe system	W/(m·K)
Z	depth of laying distance from the centre line of the pipe to the surface	m
Z	is the soil coverage above the centre line of the pipe	m
Z_c	is a corrected value for the soil coverage	m
Z_{cor}	corrected minimum value for thermal transmittance on the surface of the earth	m
λ_{50}	thermal conductivity of the thermal insulation at 50 °C	W/(m·K)
λ_C	thermal conductivity of the casing	W/(m·K)
λ_{design}	calculation value of the thermal conductivity of the thermal insulation material	W/(m·K)
λ_I	thermal conductivity of the thermal insulation	W/(m·K)
λ_{soil}	thermal conductivity of the soil	W/(m·K)
λ_S	thermal conductivity of the service pipe	W/(m·K)

Symbol	Description	Unit
λ_{steel}	thermal conductivity of steel	W/(m·K)
$\lambda_{TPS,\vartheta av}$	thermal conductivity of a twin pipe system at any average temperature	W/(m·K)
ϑ_1	temperature at the inner diameter of the service pipe	K
$\vartheta_{1,f}$	temperature at the inner diameter of the service flow pipe	K
$\vartheta_{1,r}$	temperature at the inner diameter of the service return pipe	K
ϑ_2	temperature at the outer diameter of the service pipe	K
ϑ_3	temperature at the inner diameter of the casing	K
ϑ_4	temperature at the outer diameter of the casing	K
ϑ_{amb}	ambient temperature	K
ϑ_f	flow temperature	K
$\vartheta_{i,mean}$	mean temperature of the thermal insulation	K
ϑ_r	return temperature	K
Σ	Compression of the thermal insulation	%