SLOVENSKI STANDARD
SIST EN 15632-1:2009

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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 method

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

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

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23.040.01	Deli cevovodov in cevovodi na splošno	Pipeline components and pipelines in general
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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 15632-1:2009) 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of an identical text or by endorsement, at the latest by July 2009, and conflicting national standards shall be withdrawn at the latest by July 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document is one of a series of standards which form several parts of EN 15632, *District heating pipes — Pre-insulated 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.*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

Flexible pipe systems in district heating networks are of common technical usage. In order to assure quality including product-related lifetime, to assure 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 European Standard provides classification, general requirements and test methods for flexible, pre-insulated, directly buried district heating pipe systems.

It is intended to be used in conjunction with parts 2, 3, 4, and 5.

Depending on the pipe assembly (see Table 4), this European Standard is valid for maximum operating temperatures of 95 °C to 140 °C and operating pressures of 6 bar to 25 bar.

The pipe systems are designed for a lifetime of 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 may be applicable.

2 Normative references

The following referenced documents are indispensable for the application 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 253:2008, *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 489, *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 728, *Plastics piping and ducting systems — Polyolefin pipes and fittings — Determination of oxidation induction time*

EN 744, *Plastics piping and ducting systems — Thermoplastics pipes — Test method for resistance to external blows by the round-the-clock-method*

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 12667, *Thermal performance of building materials and products — Determination of thermal resistance by means of guarded hot plate and heat flow meter methods — Products of high and medium thermal resistance*

EN 13941, *Design and installation of preinsulated bonded pipe systems for district heating*

EN 14419:2003, *District heating pipes — Pre-insulated bonded pipe systems for directly buried hot water networks — Surveillance systems*

EN 60811-4-1:2004, *Insulating and sheathing of electric and optical cables — Common test methods — Part 4-1: Methods specific to polyethylene and polypropylene compounds - Resistance to environmental stress cracking - Measurement of the melt flow index - Carbon black and/or mineral filler content measurement in*

polyethylene by direct combustion - Measurement of carbon black content by thermogravimetric analysis (TGA) – Assessment of carbon black dispersion in polyethylene using a microscope (IEC 60811-4-1:2004)

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

EN ISO 9967, *Thermoplastics pipes — Determination of creep ratio (ISO 9967:2007)*

EN ISO 9969, *Thermoplastics pipes — Determination of ring stiffness (ISO 9969:2007)*

EN ISO 16871, *Plastics piping and ducting systems — Plastics pipes and fittings — Method for exposure to direct (natural) weathering (ISO 16871:2003)*

EN ISO 23993, *Thermal insulation products for building equipment and industrial installations — Determination of design thermal conductivity (ISO 23993:2008)*

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 253:2008, EN 14419:2003 and the following apply.

3.1
lifetime
time during which the flexible pipe system operates without failure at the designated operating temperature

3.2
continuous operating temperature
temperature of the heat medium for which the system has been designed to operate continuously

NOTE See Table 4

3.3
maximum operating temperature
exceptionally high operating temperature occurring for short periods only

3.4
operating pressure
pressure at which the hot water network is designed to operate continuously

3.5
service pipe
medium carrying pipe which is in contact with warm water

3.6
outer casing
separately applied outer layer of the pipe assembly, protecting the construction during installation and protecting the construction against external influences (after installation)

3.7
insulation layer
layer which provides the designated thermal characteristics of the pipe assembly

3.8
pipe assembly
assembled product, consisting of at least one service pipe, insulating material and casing

3.9
pipe system
pipe assembly, plus service pipe fittings, casing joints, and other components like surveillance elements

3.10
single pipe system
SPS
pipe system with one service pipe

3.11
twin pipe system
TPS
pipe system with two service pipes

3.12
bonded system
service pipe, insulating material and casing which are bonded by the insulating material

3.13
non bonded system
service pipe, insulating material and casing which are not bonded by the insulating material

3.14
casing joint assembly
casing joint
assembled product, consisting of at least insulating material and casing, designed to protect and thermally insulate a service pipe joint

3.15
ageing factor
f_a
factor without a dimension which expresses the ageing of the insulating layer in relation to the expected lifetime

3.16
moisture factor
f_m
factor without a dimension for the influence of moisture on the insulating layer in relation to the expected lifetime

NOTE The term 'moisture' as it is used here is not identical with the term 'moisture' as it is used in EN 14419.

3.17
ovality
difference between the maximum and minimum diameter at a cross section expressed as a percentage of the minimum diameter

Table 1 — Symbols, definitions and dimensions

Symbol	Description	Unit
A	projected area of the service pipe	m^2
d_1	inner diameter of the service pipe	m
$d_{1,c}$	inner diameter of the service pipe at the crest of a corrugation	m
$d_{1,t}$	inner diameter of the service pipe at the trough of a corrugation	m
d_2	outer diameter of the service pipe	m
$d_{2,c}$	outer diameter of the service pipe at the crest of a corrugation	m
$d_{2,t}$	outer diameter of the service pipe at the trough of a corrugation	m
d_3	inner diameter of the casing	m
$d_{3,c}$	inner diameter of the casing at the crest of a corrugation	m
$d_{3,t}$	inner diameter of the casing at the trough of a corrugation	m
d_4	outer diameter of the casing	m
$d_{4,c}$	outer diameter of the casing at the crest of a corrugation	m
$d_{4,t}$	outer diameter of the casing at the trough of a corrugation	m
F	force	N
f_a	ageing factor	/
f_{cor}	corrective factor for differences between calculated and measured thermal conductivities	/
F_{exp}	force resulting from heat expansion	N
f_m	moisture factor	/
F_{weight}	weight force	N
g	acceleration due to gravity	m/s^2
H	earth covering	m
L	length of the test	m
M	mass of the pipe inclusively the water inside	kg
P_{exp}	area related load on the insulation resulting from heat expansion of the service pipe	Pa
P_{test}	test load	Pa
P_{weight}	area related load on the cross section of the test specimen of the insulation material	Pa
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
r	bending radius in the axis of the pipe	m
R	radial thermal resistance	mK/W
$R_{,\vartheta av}$	radial thermal resistance of a twin pipe system at any average temperature	mK/W
R_0	thermal transmittance factor from earth surface to ambient air	m^2K/W
R_{decl}	declared value of radial thermal resistance	mK/W
$R_{decl,\vartheta av}$	declared value of thermal resistance at average temperature	mK/W
R_{design}	design value for the radial resistance	mK/W
R_f	radial thermal resistance of the flow pipe	mK/W
R_r	radial thermal resistance of the return pipe	mK/W
R_s	radial thermal resistance of the soil	mK/W
R_{TPS}	radial thermal resistance of a twin pipe system	mK/W
$R_{TPS,\vartheta av}$	radial thermal resistance of a twin pipe system at any average temperature	mK/W
s	thickness	mm
SDR	ratio of nominal outer diameter and nominal wall thickness	/

Table 2 — Symbols, definitions and dimensions *(continued)*

s_{min}	minimum wall thickness	mm
s_{STB}	thickness of test piece after load testing and temperature testing	mm
τ_{ax}	shear stress	N/m^2
U	coefficient of heat loss	W/(mK)
U_f	coefficient of heat loss for buried single pipe system	W/(mK)
U_r	coefficient of heat loss for buried single pipe system in the return pipe	W/(mK)
U_{TPS}	coefficient of heat loss in a twin pipe system	W/(mK)
Z	depth of laying distance from the center line of the pipe to the surface	m
Z_{cor}	corrected minimum value for thermal transmittance on the surface of the earth	m
$\lambda_{\vartheta av}$	thermal conductivity of a pipe system at any average temperature	W/(mK)
λ_C	thermal conductivity of the casing	W/(mK)
λ_{decl}	declared thermal conductivity of a pipe system	W/(mK)
$\lambda_{decl,\vartheta av}$	declared value of thermal conductivity at average temperature	W/(mK)
λ_{design}	calculation value of the thermal conductivity of the insulation material	W/(mK)
λ_I	thermal conductivity of the insulation	W/(mK)
λ_s	thermal conductivity of the soil	W/(mK)
λ_S	thermal conductivity of the service pipe	W/(mK)
$\lambda_{TPS,\vartheta av}$	thermal conductivity of a twin pipe system at any average temperature	W/(mK)
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_4	temperature at the outer diameter of the casing	K
ϑ_{amb}	ambient temperature	K
ϑ_{av}	average temperature	K
ϑ_f	flow temperature	K
ϑ_r	return temperature	K
ϑ_s	temperature of the soil	K
Σ	compression	mm