

**WATER DISTRIBUTION OR DRAINAGE PIPES****Technical document  
08-01 Traditional**

Heating and/or domestic distribution  
and/or distribution of chilled water –  
PEX pipes

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17/04/2023

*The English version is provided for information. In case of doubt or dispute, the French version only is valid.*

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## MODIFICATION HISTORY

Revision No.	Application date	Modifications
00	16/11/2018	Update to the document layout and reference  Content modifications: Creation of technical document following transition of the products covered by this document to traditional status
01	17/04/2023	<ul style="list-style-type: none"><li>- Part 2 Fields of application</li><li>- §3.2 Test methods</li><li>- §3.3 Specifications</li><li>- Part 5 Marking</li><li>- §7.1. Tests carried out upon admission and extension to CSTB</li></ul>

## Contents

<b>1. STANDARDS.....</b>	<b>4</b>
1.1. Product standards.....	4
1.2. Test standards.....	4
1.3. Associated implementation documents.....	5
<b>2. FIELDS OF APPLICATION .....</b>	<b>6</b>
<b>3. CERTIFIED CHARACTERISTICS AND TEST METHODS.....</b>	<b>8</b>
3.1. Certified and optional characteristics.....	8
3.2. Test methods.....	10
3.3. Specifications.....	13
<b>4. VERIFICATION REGIME .....</b>	<b>14</b>
<b>5. MARKING.....</b>	<b>15</b>
5.1. Pipes.....	15
<b>6. CHECKS PERFORMED BY THE MANUFACTURER.....</b>	<b>16</b>
6.1. For raw materials .....	16
6.2. Pipes.....	16
<b>7. MONITORING ARRANGEMENTS BY CSTB .....</b>	<b>17</b>
7.1. Tests performed for admission and extension at CSTB .....	17
7.2. Tests performed during follow-up at CSTB .....	18
<b>8. SAMPLING FOR TESTS AT CSTB.....</b>	<b>19</b>
8.1. Sampling for admission or extension applications to the CSTB .....	19
8.2. Sampling for follow-up at CSTB .....	19

The requirements and provisions specified in this Technical Document will be updated in the case of new components or products.

## 1. STANDARDS

### 1.1. Product standards

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

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

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

NF 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

NF EN ISO 15875-7: Plastics piping systems for hot and cold water installations - Crosslinked polyethylene (PE-X) - Part 7: Guide for assessment of compliance

### 1.2. Test standards

NF EN ISO 1167-1: Thermoplastics pipes, fittings and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - Part 1: General method

NF EN ISO 1167-2: Thermoplastics pipes, fittings and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - Part 2: Preparation of pipe test pieces

NF EN ISO 1167-3: Thermoplastics pipes, fittings and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - Part 3: Preparation of components

NF EN ISO 2505: Thermoplastics pipes - Longitudinal reversion - Test method and parameters

NF EN ISO 3126: Plastics Piping Systems - Plastics components - Determination of dimensions

NF EN ISO 6259-1: Thermoplastics pipes - Determination of tensile properties - Part 1: General test method

ISO 6259-3: Thermoplastics pipes – Determination of tensile properties – Part 3: Polyolefin pipes

NF EN ISO 11357-1: Plastics - Differential scanning calorimetry (DSC) - Part 1: General principles

NF EN ISO 10147: Pipes and fittings made of crosslinked polyethylene (PE-X) - Estimation of the degree of crosslinking by determination of the gel content

NF EN 728: Plastics piping and ducting systems - Polyolefin pipes and fittings - Determination of oxidation induction time

**NF EN ISO 11357-1: Plastics – Differential scanning calorimetry (DSC) – Part 1: General principles**

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

NF EN ISO 527-1: Plastics - Determination of tensile properties - Part 1: General principles

NF EN ISO 3501: Plastics piping systems – Mechanical joints between fittings and pressure pipes – Test method for resistance to pull-out under constant longitudinal force

NF EN ISO 3503: Plastics piping systems – Mechanical joints between fittings and pressure pipes – Test method for leaktightness under internal pressure of assemblies subjected to bending

NF EN 12293: Plastic piping systems - Thermoplastic pipes and fittings for pressurized hot and cold water installations - Test method for the resistance of assemblies to temperature cycles

NF EN 12294: Plastic piping systems - Systems for installing hot and cold water under pressure - Test method for vacuum tightness

NF EN 12295: Plastic piping systems - Thermoplastic pipes and associated fittings for pressurized hot and cold water installation - Test method for resistance of assemblies to pressure cycles

### 1.3. Associated implementation documents

Implementation must be carried out:

- For class 4 (heated floors): in accordance with DTU 65.14 "Implementation of heated floors with hot water".

- For classes 2 and 5: in accordance with the "Technical Specifications (CPT) for the implementation of pipe systems based on synthetic pipes - Semi-rigid LWC pipes" (CSTB specification 2808\_V2 – November 2011).

## 2. FIELDS OF APPLICATION

This Technical Document covers the applications indicated in the table below. These applications are drawn from the ISO 10508 standard.

Applications classes 2, 4 and 5 comply with the ISO 10508 standard. According to this standard, the reader is reminded that regardless of the application class selected, the system must also comply with conveyance of cold water at 20 °C for 50 years and a service pressure of 10 bar.

PEX tubes shall be from series 5 of dimension class A, as defined in the NF EN ISO 15875 standard, with or without exterior plastic coating(s).

Dimension class C (class 4, underfloor heating only) is authorised.

It also covers the "Chilled water" application class corresponding to air conditioning and cooling systems with a minimum temperature of 5 °C.

Classes	Service conditions	Maximum conditions	Accidental conditions	Typical application
Class 2	70 °C 49 years	80 °C 1 year	95 °C 100 hours	Domestic hot and cold water supply
Class 4	20 °C - 2.5 years and 40 °C - 20 years and 60 °C - 25 years	70 °C 2.5 years	100 °C 100 hours	Low temperature radiators, underfloor heating
Class 5	20 °C - 14 years and 60 °C - 25 years and 80 °C - 10 years	90 °C 1 year	100 °C 100 hours	High temperature radiators

For a system that is not intended for class 2, the marking shall be supplemented by the phrase 'heating only'.

For a system that is intended only for underfloor heating within class 4, the marking shall be supplemented by the phrase 'underfloor heating only'.

The dimension groups are defined in §4.2.1.2. of standard XP CEN ISO/TS 15875-7:

Dimension group	Nominal diameter, dn
1	10 < dn < 63
2	63 ≤ dn < 160

The holder shall produce at least once in each dimension group in a 2-year cycle.

**Contact with potable water**

The pipes, fittings and components (particularly seals) must comply with French regulations currently in force for products designed to come into contact with potable water. In particular, they must have a currently valid ACS certification (or a self-declaration, if applicable). These documents must be presented during audits.



## 3. CERTIFIED CHARACTERISTICS AND TEST METHODS

### 3.1. Certified and optional characteristics

The characteristics listed in the table below will comply with the specifications given in paragraph 3.3.

#### Optional certified characteristics

The certification of the additional DURABILITY and FUNCTIONALITY characteristics "QB D", "QB F" or "QB DF" guarantees the compliance of QB-certified products with the requirements of the CSTB Technical Guide (Specification 3597\_V2). These options are based on a more detailed analysis of the durability and suitability for use of these products by means of the following tests and specifications:

"QB D" option:

- Tensile test on new pipes (durability)
- Tensile test on aged pipes (durability)
- Resistance to oxidation (OIT) (durability)

"QB F" option:

- Experimental heating circuits at 110°C (functionality)

"QB DF" option:

This option is the combination of both options, "QB D" and "QB F"

Certified characteristics	Nature of the component or system
	(2) Pipe PE-X
Dimensional characteristics *	X
Gel content	X
Tensile properties (if QB D option)	X <sup>(1)</sup>
Tensile properties after ageing (if QB D option)	X <sup>(1)</sup>
Resistance to oxidation (if QB D option)	X
Heat shrinkage	X
Thermal stability	X
Resistance to pressure	X
Opacity	X
<b>Suitability for use</b>	
Internal pressure	X
Bending under internal pressure	X
Pull-out	X
Thermal cycle	X
Cyclic pressure	X
Leaktightness under vacuum	X
Experimental heating circuits at 110°C (if QB F option)	X

\*: These characteristics are certified based on verification of the holder's registers and recorded in the audit report.

(1) for PEX pipes without coating.

### 3.2. Test methods

The conditions for verification of the characteristics certified at CSTB are listed in the tables below.

Certified characteristics	PE-X pipe
Dimensional characteristics	NF EN ISO 3126
Gel content	NF EN ISO 10147 (without oxygen barrier) on chip
Tensile properties (if QB D option)	NF EN ISO 6259-1- ISO 6259-3 type 1 or 2 specimen for DN >25 and 1 NF EN ISO 527 BA for DN ≤ 25
Tensile properties after ageing (if QB D option)	NF EN ISO 6259-1- ISO 6259-3 type 1 or 2 specimen for DN >25 and 1 NF EN ISO 527 BA for DN ≤ 25
Resistance to oxidation <sup>(1)</sup> (if QB D option)	NF EN 728 <b>and/or NF EN ISO 11357-1 et -6</b>  200°C 30 min
Heat shrinkage	1 h for th ≤ 8 mm 2 h min if 8 mm < th ≤ 16 mm 4 h if th > 16 mm
	120°C in drying oven
	2 h min if 8 mm < th ≤ 16 mm
Opacity - Transmission	ISO 7686 with use of an integrating sphere
Thermal stability	NF EN ISO 1167 1-2-3 – at 110 °C
Resistance to pressure 1000 h	NF EN ISO 1167 1-2-3 – at 95 °C
	σ = 4.4 MPa
<b>Suitability for use</b>	
Internal pressure	NF EN ISO 1167 1-2-3
Bending under internal pressure	NF EN ISO 3503
Pull-out	NF EN ISO 3501
Thermal cycle	NF EN 12293
Cyclic pressure	NF EN 12295
Leaktightness under vacuum	NF EN 12294
Experimental heating circuits at 110°C (if QB F option)	Experimental circuits are made up of pipes and fittings of different diameters representing the range proposed by the applicant.  For crimp fittings, the full range of proposed tools must be represented.

**(1) The reference test is that carried out in accordance with standard NF EN 728**

## Additions to test methods

### Specific case of polymer pipes with exterior plastic coating

The base pipe must meet the dimensional requirements of the corresponding product standard, and the exterior plastic coating(s) is/are an added element providing the finished product with a greater wall thickness and external diameter than those indicated in the standard.

**Dimension table for pipes in series 5**

Dext x Thickness (mm)	PEX interior pipes (non-coated)		Pipes with exterior plastic coating(s)	
	Dext (mm)	Thickness (mm)	Dext (mm)	Thickness (mm)
<b>12 x 1.1</b>	12 -0 +0.3	1.1 -0 +0.3	12 -0 +0.4	1.1 -0 +0.4
<b>16 x 1.5</b>	16 -0 +0.3	1.5 -0 +0.3	16 -0 +0.4	1.5 -0 +0.4
<b>20 x 1.9</b>	20 -0 +0.3	1.9 -0 +0.3	20 -0 +0.4	1.9 -0 +0.4
<b>25 x 2.3</b>	25 -0 +0.3	2.3 -0 +0.4	25 -0 +0.4	2.3 -0 +0.5
<b>32 x 2.9</b>	32 -0 +0.3	2.9 -0 +0.4	32 -0 +0.4	2.9 -0 +0.5
<b>40 x 3.7</b>	40 -0 +0.4	3.7 -0 +0.5	40 -0 +0.5	3.7 -0 +0.6
<b>50 x 4.6</b>	50 -0 +0.5	4.6 -0 +0.6	50 -0 +0.6	4.6 -0 +0.7
<b>63 x 5.8</b>	63 -0 +0.6	5.8 -0 +0.7	63 -0 +0.7	5.8 -0 +0.8
<b>75 x 6.8</b>	75 -0 +0.7	6.8 -0 +0.8	75 -0 +0.8	6.8 -0 +0.9
<b>90 x 8.2</b>	90 -0 +0.9	8.2 -0 +1.0	90 -0 +1.0	8.2 -0 +1.1
<b>110 x 10.0</b>	110 -0 +1.0	10.0 -0 +1.1	110 -0 +1.1	10.0 -0 +1.2
<b>125 x 11.4</b>	125 -0 +1.2	11.4 -0 +1.2	125 -0 +1.3	11.4 -0 +1.3
<b>140 x 12.7</b>	140 -0 +1.3	12.7 -0 +1.3	140 -0 +1.4	12.7 -0 +1.4
<b>160 x 14.6</b>	160 -0 +1.5	14.6 -0 +1.5	160 -0 +1.6	14.6 -0 +1.6

If the pipe provided includes an exterior plastic coating

<b>Tests</b>	<b>Base pipe (without coating)</b>	<b>Pipe with coating</b>	<b>Comments</b>
NF EN ISO 6259 Determination of tensile properties – Pipes (if QB D option)	X		
OIT Tests relating to resistance to oxidation (if QB D option)		X	
TENSILE Tests relating to resistance to oxidation (if QB D option)	X		
OIT NF EN 728 or NF EN ISO 11357 Determination of oxidation induction time (if QB D option)	X	X	
NF EN ISO 10147 Pipes made of crosslinked polyethylene (PE-X) – Determination of the gel content	X		
NF EN ISO 2505 Determination of longitudinal reversion – Pipes		X	
NF EN ISO 1133 Determination of melt flow rate	X		
NF EN ISO 1167 Determination of resistance to internal pressure	X	X	The tests must be carried out based solely on the thickness of the base pipe
Resistance of assemblies to alternating pressure cycles		X	
NF EN ISO 9080 Long-term hydrostatic strength of pipes by extrapolation	X	X	The tests must be carried out based solely on the thickness of the base pipe
Thermal stability 110°C - 8760 h		X	The tests must be carried out based solely on the thickness of the base pipe
Experimental heating circuit (if QB F option)		X	
NF EN 12293 Resistance of mounted assemblies to temperature cycling		X	

### 3.3. Specifications

Measurements or tests	Test standards	Specifications
		PEX
Dimensional characteristics	EN ISO 3126	<b>Compliant with product standards of the class under consideration</b>
OIT <sup>(1)</sup> (if QB D option)	NF EN 728 and/or NF EN ISO 11357-1et -6	Material specification declared by manufacturer
Tensile properties (if QB D option)	NF EN ISO 6259-1 - ISO 6259-3	Material specification declared by manufacturer
Tensile properties after ageing (thermo-oxidation) (if QB D option)	NF EN ISO 6259-1 - ISO 6259-3	Loss of elongation less than 50% between initial elongation and elongation after 500 h in boiling water, then 100 h in oven at 160°C
Gel content	NF EN ISO 10147	Peroxide: > 70% Silane: > 65% Irradiation: > 60%
Thermal stability	EN ISO 1167	2.5 MPa - 110°C - 8760 h
Heat shrinkage	EN ISO 2505	120°C (air) 1 hour < 3%
Opacity - Transmission	ISO 7686 with use of an integrating sphere	Transmission < 14%
Resistance to internal pressure	EN ISO 1167	95°C - t > 1 h - 95°C - t > 22 h - 95°C - t > 165 h - 95°C - t > 1000 h - } See Sigma in table below

**(1) The reference test is that carried out in accordance with standard NF EN 728**

PRODUCTS/TESTS	PEX Sigma (MPa)
<b>PRODUCT STANDARDS</b>	NF EN ISO 15875-1-7
<b>Pressure</b>	
<b>1000 h - 95°C</b>	4.4
<b>165 h - 95°C</b>	4.6
<b>22 h - 95°C</b>	4.7
<b>1 h - 95°C</b>	4.8
<b>1 h - 20°C</b>	12

<b>PRODUCTS/TESTS</b>	PEX
<b>PRODUCT STANDARDS</b>	NF EN ISO 15875-1-7
<b>Suitability for use</b>	
<b>Internal pressure</b>	Part-5 §4.2
<b>Bending under internal pressure</b>	Part-5 §4.3
<b>Pull-out</b>	Part-5 §4.4
<b>Thermal cycle</b>	Part-5 §4.5
<b>Cyclic pressure</b>	Part-5 §4.6
<b>Leaktightness under vacuum</b>	Part-5 §4.7
Experimental heating circuits at 110°C 1000 h – 4 bar (if QB F option)	Technical guide

## 4. VERIFICATION REGIME

	12 months following admission	After the 12 months following admission
PE-X pipes	Half-yearly	Annual

## 5. MARKING

### 5.1. Pipes

The pipes must be marked indelibly, at least every 2 meters.

This marking must include at least the following elements:

- the number of the standard,
- the QB logo (or in full) or "QB D", "QB F" or "QB DF" if claimed, followed by the last two parts of the certificate number,
- the name of the holder or the distributor (1) (name, acronym or logo, if the acronym or logo is not explicit, this must be filed with CSTB) and the commercial name of the product,
- the identification of the material,
- the nominal diameter and the nominal wall thickness,
- the application classes (for example: 2, 4, 5) completed with their corresponding service pressures (2), (for example: "[Class 2 – 6 bar] [Class 4 – 6 bar] [Class 5 – 6 bar]", if applicable
- the mention "PCRBT" when only class 4 underfloor heating is covered if applicable,
- the statement "NON-DRINKING WATER" when class 2 is not targeted, if applicable
- the manufacturing marks allowing traceability comprising at least:
  - the period of manufacture, at least the month and the year, in numbers or in code,

PCRBT: Low Temperature Cooling Underfloor Heating



## 6. CHECKS PERFORMED BY THE MANUFACTURER

The checks performed by the manufacturer and the measurements of the various characteristics are carried out in accordance with the inspection plan and the operating procedures defined in the reference standards cited in paragraph 1.1 of this technical document no. 08-01 Traditional and at least complying with the frequencies defined in the tables below:

### 6.1. For raw materials

Measurements or tests	Minimum sampling frequency
Supplier analysis certificate	At each delivery
OIT (NF EN 728) (if QB D option)	To be defined by the manufacturer

### 6.2. Pipes

Measurements or tests	Minimum sampling frequency
Dimensions, marking, appearance (EN ISO 3126)	Once every 8 hours per line
Gel content (EN ISO 579)	once per 24 h and per line
Heat shrinkage (EN ISO 2505)	once per week and per line
Tensile strength (NF EN ISO 6259-1-3) (if QB D option)	once per week and per line
Thermo-oxidation (NF EN ISO 6259-1-3) (if QB D option)	once per week and per line
Resistance to internal pressure (EN ISO 1167) 95°C - t > 22 h - or 95°C - t > 165 h - 95°C - t > 1000 h - Sigma given in §3.3.1.	1 specimen per 24 h per machine  1 specimen per week per machine 1 specimen per year per DN

## 7. MONITORING ARRANGEMENTS BY CSTB

### 7.1. Tests performed for admission and extension at CSTB

For the ranges of pipes and fittings covered by the QB 08 certification application, the applicant must provide a type test report according to the EN ISO 15875 series of standards drawn up by an **independent** ISO 17025 accredited laboratory for carrying out the Testing - by an EA Member Accreditation Body. The type tests to be carried out according to the EN ISO 15875 standard are listed in the ISO/TS 15875-7 standard.

The admissibility of test reports is subject to CSTB approval.

#### PIPES

Measurement or test	PEX pipe
Dimensional characteristics	All the types submitted for admission
OIT (if QB D option)	1 test / material
Gel content	1 test / material
Tensile properties (if QB D option)	1 test / material
Tensile properties after ageing (if QB D option)	1 test / material
Resistance to oxidation	1 test / material
Heat shrinkage	3 specimens / 1 DN / dimension group
Opacity - Transmission	1 test / material
Resistance to pressure 1000 h - 95°C	1 DN / dimension group
Resistance to pressure 165 h - 95°C	1 DN / dimension group
Resistance to pressure 22 h - 95°C	1 DN / dimension group
Resistance to pressure, 1 h at 20°C and 95°C	1 DN / dimension group
Thermal stability 8760 h – 110°C	A test report from an organization compliant with §7.1 Or 1 test / material
Verification of the regression curve	1 DN per dimension group 4000 h at 20°, 70°, 95° and 110° C or a test report from an EN ISO 17025 accredited body

SUITABILITY FOR USE	
PRODUCTS/TESTS	PEX pipe
Internal pressure	a test report from an organization in accordance with §7.1
Bending under internal pressure	a test report from an organization in accordance with §7.1
Pull-out	a test report from an organization in accordance with §7.1
Thermal cycle	a test report from an organization in accordance with §7.1
Cyclic pressure	a test report from an organization in accordance with §7.1
Leaktightness under vacuum	a test report from an organization in accordance with §7.1
Experimental heating circuits 110°C 1000 h 6 bar (if QB F option)	1 assembly as defined below*

\* Experimental heating circuits: Experimental circuits are made up of pipes and fittings of different diameters representing the range proposed by the applicant.

*Processing of extensions must comply with ISO/TS 15875-7 §6.2*

## 7.2. Tests performed during follow-up at CSTB

### Tests performed half-yearly

Measurement or test	PEX pipe
Dimensional characteristics	1 DN
OIT (if QB D option)	1 test / material
Gel content	1 test / material
Tensile properties (if QB D option)	1 test / material
Tensile properties after ageing (if QB D option)	1 test / material
Heat shrinkage	1 DN

Resistance to pressure 1000 h	1 DN
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## 8. SAMPLING FOR TESTS AT CSTB

### 8.1. Sampling for admission or extension applications to the CSTB

Collection of samples in cases of admission or extension is left to CSTB's discretion.

### 8.2. Sampling for follow-up at CSTB

<b>PE-X -</b>
<b>Pipes</b>
Coils 10 to 15 m of the same DN x th  Straight rods 10 to 15 1m sections of the same DN x th