



# DRAFT INTERNATIONAL STANDARD ISO/DIS 15874-5

ISO/TC 138/SC 2

Secretariat: SNV

Voting begins on:  
2010-07-29

Voting terminates on:  
2010-12-29

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

## Plastics piping systems for hot and cold water installations — Polypropylene (PP) —

### Part 5: Fitness for purpose of the system

*Systèmes de canalisations en plastique pour les installations d'eau chaude et froide — Polypropylene (PP) —  
Partie 5: Aptitude à l'emploi du système*

[Revision of first edition (ISO 15874-5:2003)]

ICS 23.040.20; 91.140.60

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2493-a7b2-f07ff312/iso-15874-5-2013*

ISO/CEN PARALLEL PROCESSING
<p>This draft has been developed within the European Committee for Standardization (CEN), and processed under the <b>CEN-lead</b> mode of collaboration as defined in the Vienna Agreement.</p> <p>This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.</p> <p>Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.</p>
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## Foreword

ISO 15874-5 was prepared by Technical Committee ISO/TC 138, Plastics pipes and fittings for water supplies, Subcommittee SC 2, and by Technical Committee CEN/TC 155, Plastics piping systems and ducting systems in collaboration.

This second edition cancels and replaces the first edition (ISO 15874-2:2003), wherein clause 4 / subclause 4.2. / Tables 2, 3 and 4 (Values have been adjusted) and Table 5 (The material PP-RCT has been included) and clause 4 / subclause 4.3. / Tables 6, 7 and 8 (Values have been adjusted) have been technically revised.

ISO 15874 consists of the following Parts <sup>1)</sup>, under the general title *Plastics piping systems for hot and cold water installations — Polypropylene (PP)*

- Part 1: *General*
- Part 2: *Pipes*
- Part 3: *Fittings*
- Part 5: *Fitness for purpose of the system (the present standard)*
- Part 7 *Guidance for the assessment of conformity* (intended to be published as CEN ISO/TS 15874-7).

This Part of ISO 15874 includes a Bibliography.

At the date of publication of this standard, System Standards for piping systems of other plastics materials used for the same application are the following:

ISO 15875 *Plastics piping systems for hot and cold water installations — Crosslinked polyethylene (PE X)*

ISO 15876 *Plastics piping systems for hot and cold water installations — Polybutylene (PB)*

ISO 15877 *Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C)*

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

For pipes and fittings which have conformed to the relevant national standard before **[DAV]**, as shown by the manufacturer or by a certification body, the national standard may continue to apply until **[DAV + 24 months]**..

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1) This System Standard does not incorporate Part 4 *Ancillary equipment* or a Part 6: *Guidance for installation*. For ancillary equipment separate standards can apply. Guidance on installation of plastics piping systems made from different materials intended to be used for hot and cold water installations is given by ENV 12108 <sup>[1]</sup>.

## Introduction

The System Standard, of which this is Part 5, specifies the requirements for a piping system and its components when made from polypropylene (PP). The piping system is intended to be used for hot and cold water installations.

In respect of potential adverse effects on the quality of water intended for human consumption, caused by the product covered by ISO 15874;

- no information as to whether the product may be used without restriction;
- existing national regulations concerning the use and/or the characteristics of this product remain in force.

Requirements and test methods for components of the piping system are specified in Part 1, 2 and 3 of this System Standard. Part 7 (ISO/TS) gives guidance for the assessment of conformity.

This Part of ISO 15874 specifies the characteristics of fitness for purpose of the piping systems.

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## 1 Scope

This Part of ISO 15874 specifies the characteristics of the fitness for purpose of polypropylene (PP) piping systems, intended to be used for hot and cold water installations within buildings for the conveyance of water, whether or not intended for human consumption (domestic systems) and for heating systems, under design pressures and temperatures according to the class of application (see Table 1 of ISO 15874-1).

This standard covers a range of service conditions (classes of application) and design pressure classes. For values of  $T_D$ ,  $T_{max}$  and  $T_{mal}$  in excess of those in Table 1 of Part 1 of this standard does not apply.

NOTE It is the responsibility of the purchaser or specifier to make the appropriate selections from these aspects, taking into account their particular requirements and any relevant national regulations and installation practices or codes.

It also specifies the test parameters for the test methods referred to in this standard.

In conjunction with the other Parts of ISO 15874 (see Foreword) it is applicable to PP pipes, fittings, their joints and to joints with components of other plastics and non-plastics materials intended to be used for hot and cold water installations.

## 2 Normative references

This Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 712, *Thermoplastics piping systems — End-load bearing mechanical joints between pressure pipes and fittings — Test method for resistance to pull-out under constant longitudinal force*

EN 713, *Plastics piping systems — Mechanical joints between fittings and polyolefin pressure pipes — Test method for leaktightness under internal pressure of assemblies subjected to bending*

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

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*

ISO 15874-1 *Plastics piping system for hot and cold water installations — Polypropylene (PP) — Part 1: General*

ISO 15874-2, *Plastics piping system for hot and cold water installations — Polypropylene (PP) — Part 2: Pipes*

EN 12293, *Plastics piping systems — Thermoplastics pipes and fittings for hot and cold water — Test method for the resistance of mounted assemblies to temperature cycling*

EN 12294, *Plastics piping systems — Systems for hot and cold water — Test method for leaktightness under vacuum*

EN 12295, *Plastics piping systems — Thermoplastics pipes and associated fittings for hot and cold water — Test method for resistance of joints to pressure cycling*

## 3 Terms and definitions, symbols and abbreviated terms

For the purposes of this standard the terms and definitions, symbols and abbreviated terms given in ISO 15874-1 apply.

## 4 Fitness for purpose of the joints and the piping system

### 4.1 General

When tested in accordance with the applicable test methods as specified in Table 1, using the indicated parameters given in 4.2 to 4.7, as applicable, the joints and the piping system shall have characteristics conforming to the requirements given in the applicable clauses.

For the tests described the fittings shall be connected to the pipe with which they are intended to be used.

Table 1 specifies the tests applicable for each different type of jointing system covered by this standard.

**Table 1 — Joint tests**

Test	Jointing system <sup>a</sup>			Test parameters	Test method
	SW	EF	M		
Internal pressure test	Y	Y	Y	Shall conform to 4.2	ISO 1167-1 and - 4
Bending test	N	N	Y	Shall conform to 4.3	EN 713
Pull-out test	N	N	Y	Shall conform to 4.4	EN 712
Thermal cycling test	Y	Y	Y	Shall conform to 4.5	EN 12293
Pressure cycling test	N	N	Y	Shall conform to 4.6	EN 12295
Vacuum test	N	N	Y	Shall conform to 4.7	EN 12294
<sup>a</sup> SW - Socket welded joint EF - Electrofusion joint M - Mechanical joint Y - denotes test applicable N - denotes test not applicable					

### 4.2 Internal pressure test

When tested in accordance with ISO 1167-1 using the test parameters given in Table 2, 3, 4 or 5 for the relevant classes the joint assemblies shall not leak.

The test pressure,  $p_J$ , for a given time to failure and test temperature shall be determined by the following equation:

$$p_J = p_D \times \frac{\sigma_P}{\sigma_{DP}}$$

where:

- $p_J$  is the hydrostatic test pressure, in bars <sup>2)</sup>, to be applied to the joint assembly during the test period;
- $\sigma_P$  is the hydrostatic stress value, in megapascals, for the pipe material corresponding to time to failure/test temperature points given in Table 2, 3, 4 or 5;
- $\sigma_{DP}$  is the design stress value, in megapascals, for the pipe material as determined for each class and listed in Table 2 of ISO 15874-2;
- $p_D$  is the design pressure of 4 bar or 6 bar or 8 bar or 10 bar, as applicable.

<sup>2)</sup> 1 bar = 10<sup>5</sup> N/m<sup>2</sup> = 0,1 MPa.



Table 2 — Derivation of test pressure  $p_j$  for PP-H

	Application class			
	Class 1	Class 2	Class 4	Class 5
Max. design temperature, $T_{max}$ , in °C	80	80	70	90
Design stress of pipe material, $\sigma_{DP}$ , in MPa	2,88	1,99	3,23	1,82
Test temperature <sup>a</sup> , $T_{test}$ , in °C	95	95	80	95
Test duration, $t$ , in h	1000	1000	1000	1000
Hydrostatic stress of pipe material, $\sigma_p$ , in MPa	3,6	3,6	5,0	3,6
Test pressure, $p_j$ , in bars, for a design pressure, $p_D$ , of:				
4 bar	5,7 <sup>b</sup>	7,2	8,0 <sup>b</sup>	7,8
6 bar	7,5	10,8	9,3	11,8
8 bar	9,9	14,4	12,4	15,7
10 bar	12,4	18,0	15,5	19,6
Number of test pieces	3	3	3	3
<p><sup>a</sup> Generally the highest test temperature is taken to be (<math>T_{max} + 10</math>) °C with an upper limit of 95 °C. However to match existing test facilities the highest test temperature for classes 1 and 2 is also set at 95 °C. The hydrostatic stresses given correspond to the given test temperatures.</p> <p><sup>b</sup> The 20 °C, 10 bar, 50 years, cold water requirement, being higher, determines this value (see clause 4 of ISO 15874-1).</p>				

Table 3 — Derivation of test pressure  $p_j$  for PP-B

	Application class			
	Class 1	Class 2	Class 4	Class 5
Max. design temperature, $T_{max}$ , in °C	80	80	70	90
Design stress of pipe material, $\sigma_{DP}$ , in MPa	1,66	1,19	1,94	1,19
Test temperature <sup>a</sup> , $T_{test}$ , in °C	95	95	80	95
Test duration, $t$ , in h	1000	1000	1000	1000
Hydrostatic stress of pipe material, $\sigma_p$ , in MPa	2,6	2,6	3,7	2,6
Test pressure, $p_j$ , in bars, for a design pressure, $p_D$ , of:				
4 bar	6,4	8,9	7,6	8,9
6 bar	9,5	13,3	11,5	13,3
8 bar	12,7	17,8	15,3	17,8
10 bar	15,9	22,2	19,1	22,2
Number of test pieces	3	3	3	3
<p><sup>a</sup> Generally the highest test temperature is taken to be (<math>T_{max} + 10</math>) °C with an upper limit of 95 °C. However to match existing test facilities the highest test temperature for classes 1 and 2 is also set at 95 °C. The hydrostatic stresses given correspond to the given test temperatures.</p>				