Plastics piping systems for hot and cold water installations Polypropylene(PP) -Part 7: Guidance for the assessment of conformity

Introduction

This series specifies the requirements for a piping system 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 EN ISO 15874:

--- This Technical Specification provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;

---It should be noted that, while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

Requirements and test methods for material and components are specified in Part 1 to Part 3 of EN ISO 15874.Characteristics for fitness for purpose (mainly for joints) are covered in Part 5.

This Technical Specification gives guidance for the assessment of conformity of materials, components, joints and assemblies and it is intended to be used by certification bodies, inspection bodies, testing laboratories and manufacturers.

1 Scope

This Technical Specification gives guidance for the assessment of conformity to be included in the manufacturer's quality plan as part of his quality system.

This Technical Specification includes:

a) requirements for materials, components, joints and assemblies given in the applicable Part(s) of EN ISO 15874:2003;

b) requirements for the manufacturer's quality system;

C) definitions and procedures to be applied if third party certification is involved.

In conjunction with the other parts of EN ISO 15874:2003 (see Foreword), this Technical Specification is applicable to 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 appropriate to the class of application (see Table 1 of EN ISO 15874-1:2003).

2 Normative references

This Technical Specification 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 Technical Specification only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN ISO 15874-1:2003, Plastics piping systems for hot and cold water installations -- Polypropylene (PP) --Part 1: General

EN ISO 15874-2:2003, Plastics piping systems for hot and cold water installations -- Polypropylene (PP) --Part 2: Pipes

EN ISO 15874-3:2003, Plastics piping systems for hot and cold water installations -- Polypropylene (PP) --Part 3: Fittings

EN ISO 15874-5:2003, Plastics piping systems for hot and cold water installations -- Polypropylene (PP) --Part 5: Fitness for purpose of the system

ISO 2859-1:1999, Sampling procedures for inspection by attributes -- Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection

ISO 3951: 1989, Sampling procedures and charts for inspection by variables for percent nonconforming

3 Definitions, symbols and abbreviations

For the purposes of this Technical Specification, the definitions, symbols and abbreviations given in Part 1 and Part 3 of EN ISO 15874:2003 apply, together with the following.

3.1 Definitions

3.1.1**certification body**

impartial body, governmental or non-governmental, possessing the necessary competence and responsibility to carry out certification of conformity according to given rules of procedure and management.

3.1.2 inspection body

impartial organization or company, approved by a certification body as possessing the necessary competence to verify and/or to carry out initial type testing, audit testing and inspection of the manufacturer's factory production control in accordance with the relevant European Standard

3.1.3 testing laboratory

laboratory which measures, tests, calibrates or

otherwise determines the characteristics of the performance of materials and products

3.1,4 quality system

organizational structure, responsibilities, procedures, processes and resources for implementing quality management (see EN ISO 9000:2000[5])

3.1.5 quality plan

document setting out the specific quality practices, resources and sequence of activities relevant to a particular product or range of products

3.1,6 type testing (TT)

testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard

3.1.7 preliminary type testing (PTT)

type testing carried out by or on behalf of the manufacturer

3.1.8 initial type testing (ITT)

type testing carried out by or on behalf of a certification body for certification purposes

3.1.9 batch release test (BRT)

test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released

3.1.10 process verification test (PVT)

test performed by the manufacturer on materials, components, joints or assemblies at specific intervals to confirm that the process continues to be capable of producing components conforming to the requirements given in the relevant standard

3.1.11 audit test (AT)

test performed by or on behalf of a certification body to confirm that the material, component, joint or assembly continues to conform to the requirements given in the relevant standard and to provide information to assess the effectiveness of the quality system

3.1.12 indirect test (IT)

test performed by the manufacturer, different from that specified for that particular characteristic, having verified its correlation with the specified test

3.1.13 witness testing (WT)

testing accepted by a certification body for initial type testing and/or audit testing, which is carried out by or on behalf of the manufacturer and supervised by a representative of the certification body, qualified in testing.

3.1.14 material or compound batch

clearly identifiable quantity of a particular material or compound

3.1.15 production batch

clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound conforming to the same specification

3.1.16 lot

clearly identifiable sub-division of a batch for inspection purposes

3.1.17 sample

one or more units of product drawn from a batch or lot, selected at random without regard to their quality

3.1.18 acceptable quality level (AQL)

when a continuous series of lots or batches is considered, the quality level which for the purpose of sampling inspection is the limit of a satisfactory process average [see ISO 2859-1:1999 and ISO 3951:1989]

3.1.19 inspection level

relationship between the lot or batch size and the sample size [see ISO 2859-1:1999]

3.1.20 group

collection of similar components from which samples are selected for testing purposes

AQL en : acceptable quality level
fr : niveau de qualite acceptable
de : annehmbare Qualitatsgrenzlage

AT: en : audit test
fr : essai d'audit
de : Uberwachungsprufung

BRT en : batch release test
fr : essai de liberation de campagne de fabrication
de : Freigabeprufung einer Charge

IT en: indirect test
fr:essai indirect
de:indirekte prufung

ITT en:initial type testing
fr:essai de type initial
de:Erst-Typprufung

PTT en:preliminary type testing
fr : essai de type preliminaire
de : vorausgehende Typprufung

PVT en: process verification test
fr:essai de verfication du procede de fabrication
de: Prozebuberprufung

TT: en: type test
fr: essai de type
de: Typprufung

WT: en: witness testing
fr: essai temoin
de:Prufung unter Aufsicht

4. Requirements

4.1 General

4.1.1 Materials, components, joints and assemblies shall conform to the requirements given in Part 1 to Part 3 and Part 5 of EN ISO 15874:2003, as applicable.

4.1.2 Components and/or assemblies shall be produced by the manufacturer under a quality system which includes a quality plan.

4.2 Testing and inspection

4.2.1 Grouping

For the purposes of this Technical Specification the following groups apply.

4.2.1.1 Pressure groups

A group of design pressures, from which one individual design pressure, P_D, shall be selected for testing purposes. Two pressure groups shall be designated as given in Table 1.

Table 1 -- Pressure groups

Pressure group	Design pressure, P_d bar
1	4; 6
2	8; 10

4.2.1.2 Size groups

A group of nominal diameters of pipes and fittings, from which one individual nominal diameter, d_n, shall be selected for testing purposes.

Two size groups shall be designated as given in Table 2.

Table 2 -- Size groups

Size group	Nominal diameter, d_n
1	$10 \leqslant d_n \leqslant 63$
2	$63 < d_n < 160$

4.2.1.3 Fitting groups

A group of fittings having a similar design, from which one individual fitting shall be selected for testing purposes. Four fitting groups shall be designated as given in Table 3.

Table 3-- Fitting groups

Fitting group	Type of fitting
1	Bends
2	Elbows, tees
3	Reducers, couplers, end caps
4	Unions, flange adaptors, adaptor pieces and/or their plastics parts

4.2.2 Type testing (TT)

4.2.2.1 General

Type tests shall demonstrate that the products conform to all requirements for the characteristics given in Table 5 to Table 7, as applicable.

In addition, relevant type tests shall be carried out whenever there is a change in design, in material and/or in the production method, other than routine in-process adjustments, and/or to extensions of the product range.

For the purposes of defining a change of material, Table 4 applies. The characteristics and the values for X (see Table 4) shall be specified by the manufacturer in his quality plan.

If any characteristic is changed or any level exceeds the band, this variation in formulation constitutes a change in material and the relevant characteristics given in column M1 or column M2 of Table 5 and Table 6, as applicable,shall be retested. A change in the supplier of a material or stabilizer does not necessarily constitute a change in material or compound. If third party certification is involved, retesting shall be agreed between certification body and manufacturer.

Table 4-- Conditions for change of material

Type of material change	**Characteristics, value X and band**

(http://www.advance-tech.cn)

- Change of polymer (M1)	- Change of supplier; - Change of polymerization; - Change of chemical properties of comonomers
- Change of additive package (e.g. pigments, antioxidants) (M2)	- Amount greater than X+ 30 % of individual additive; - Chemical properties or nature of additive

For the purposes of defining a change in design, the following characteristics are relevant:

dimensions;
geometry of the component;
jointing system.

In the quality plan of the manufacturer the geometry, dimensions and the applied tolerances at least according and in addition to the requirements given in the relevant Part(s) of EN ISO 15874:2003 shall be specified.

If one or more of these characteristics exceed the defined specifications, the relevant characteristics given in Table 5 to Table 7, as applicable, shall be retested. If third party certification is involved, retesting shall be agreed between certification body and manufacturer.

Table 5 -- Characteristics of pipes that require type testing (TT)

Characteristic	Reference to Part, clause and table of EN ISO 15874:2003	Initial/changes/extension [a]				Sampling procedure
		1	M1	M2	E	
Influence on water intended for human consumption	Part 1-5.2	+	+	+	-	According to national regulations
Hydrostatic stress properties of material [b]	Part 2-4.2	+	+	+[C]	-	One evaluation per material
Appearance	Part 2-5.1	+	+	+	+	One test piece pre d_n and pressure group
Opacity	Part 2-5.2	+	+	+	-	One test piece with the smallest wall thickness produced
Dimensions	Part 2- Table 4 to Table 8	+	+	+	+	One test piece per d_n and pressure group
Resistance to internal pressure	Part2 – Table 9	+	+	+	+	Three test pieces on one d_n per size group
Longitudinal reversion	Part2 – Table10	+	+	+	+	Three test pieces on one d_n per size group
Melt mass-flow rate MFR	Part2 – Table 10	+	+	+	+	One test piece on one d_n per size group
Thermal stability	Part2 – Table 10	+	+	+	-	One test piece per material
Impact resistance	Part2 – Table 10	+	+	+	+	One test on one e_n per size group
Marking	Part2 – Clause 10	+	-	-	+	One test piece per d_n and pressure group

a I : initial type test in case of new system;
M1 : change of polymer;
M2 : change of additive package;
E : extension of the product range;
+ : test to be carried out.

b If the material supplier has evaluated the hydrostatic stress properties specified in EN ISO 15874-2:2003, the manufacturer of pipes only has to check conformity with the reference curves for the expected hydro-static strength given in Figure 1,2 or3 of EN ISO 15874-2:2003 by testing three test pieces at two different stress levels at 95 ~C. The lowest stress level shall give failure times of approximately 2500 h. All failure points shall be on or above the relevant reference curve of Figure 1,2 or 3 of EN ISO 15874-2:2003.

C In order to check the effect of a change of additive package (M2) on the hydrostatic stress properties specified in EN ISO 15874-2:2003,three test pieces must be tested at two different stress levels at 95^0C.The lowest stress level shall give failure times of approximately 2500 h. All failure points shall be on or above the relevant reference curve of Figure 1,2 or 3 of EN ISO 15874-2:2003 for the appropriate material.

Table -- Characteristics of pipes that require type testing (TT)

(http://www.advance-tech.cn)

Characteristic	Reference to Part, clause and table of EN ISO 15874:2003	Initial/changes/extension [a]					Sampling procedure
		1	D	M1	M2	E	
Influence on water intended for human consumption	Part 1-5.2	+	-	+	+	-	According to national regulations
Hydrostatic stress properties of material [b]	Part 3-4.1	+	-	+	+[C]	-	One evaluation per material
Thermal stability	Part3 – 4.12.2	+	-	+	+	-	One test piece per material
Appearance	Part 3-5.1	+	-	+	+	+	One test piece pre d_n and fitting group
Opacity	Part 3-5.2	+	-	+	+	-	One test piece with the smallest wall thickness produced
Dimensions	Part 3- Clause 6	+	+	+	+	+	One test piece per d_n and fitting group
Resistance to internal pressure	Part 3- Clause7	+	+	+	+	+	One test piece per size group and fitting group for the relevant design pressure and appropriate class of application
Melt mass-flow rate MFR	Part3 – 8	+	-	+	+	+	One test piece on one d_n per size group and fitting group
Marking	Part3 – Clause 11	+	-	-	-	+	One test piece per d_n and fitting group

a I : initial type test in case of new system;
D :change in design
M1 : change of polymer;
M2 : change of additive package;
E : extension of the product range;
+ : test to be carried out.

b If the material supplier has evaluated the hydrostatic stress properties specified in EN ISO 15874-2:2003, the manufacturer of fittings only has to check conformity with the reference curves for the expected hydrostatic strength given in Figure 1,2 or3 of EN ISO 15874-2:2003 by testing three test pieces at two different stress levels at 95^0C. The lowest stress level shall give failure times of approximately 2500 h. All failure points shall be on or above the relevant reference curve of Figure 1,2 or 3 of EN ISO 15874-2:2003.

C In order to check the effect of a change of additive package (M2) on the hydrostatic stress properties specified in EN ISO 15874-2:2003,three test pieces must be tested at two different stress levels at 95^0C.The lowest stress level shall give failure times of approximately 2500 h. All failure points shall be on or above the relevant reference curve of Figure 1,2 or 3 of EN ISO 15874-2:2003 for the appropriate material.

D Only if the fitting material is different from the pipe material.

(http://www.advance-tech.cn)

Table 7 m Characteristics of fitness for purpose of the system that require type testing (TT)

Characteristic	Reference to Part, clause and table of EN ISO 15874:2003	Initial/changes/es[a]			Sampling procedure
		I	D	E	
Resistance to internal pressure	Part 5 - 4.2	+	+	+	One evaluation per size group and jointing system for the relevant design
Leaktightness under internal pressure and	Part 5 - 4.3	+	+	+	One evaluation per size group and jointing system for the relevant design
Resistance to pull-out	Part 5 - 4.4	+	+	+	One evaluation for the smallest and largest d_n per size group and jointing system for the relevant design
Resistance to thermal	Part 5 - 4.5	+	+	+	One evaluation per d_n and jointing system for the relevant design
Resistance to pressure cycling	Part 5 - 4.6	+	+	+	One evaluation per size group and jointing system for the relevant design
Leaktightness under vacuum	Part 5 - 4.7	+	+	+	One evaluation per size group and jointing system per pressure group

a I : initial type test in case of new system;
D : change in design;
E : extension of the product range;
\+ : test to be carried out.

4.2.2.2 Preliminary type testing (PTT)

The manufacturer shall demonstrate that the products conform to all requirements of the characteristics given in Table 5 to Table 7, as applicable.

4.2.2.3 Initial type testing (ITT)

If third party certification is involved, the certification body shall assess the conformity of a product to all requirements for the characteristics given in Table 5 to Table 7, as applicable.

The assessment shall be performed by validation or testing, using the sampling procedure given in Table 5 to Table 7, as applicable and grouping according to 4.2.1, in an approved testing laboratory or by witness testing.

Preliminary test data including long-term characteristics, supplied by the manufacturer and traceable to material and process, validated by the certification body shall be taken into account for initial type testing.

4.2.3 Batch release tests (BRT)

Those characteristics specified in Part 2 and Part 3 of EN ISO 15874:2003 and listed in Table 8 shall be batch release tested with the minimum sampling frequency given in Table 8. Alternatively the manufacturer may use the sampling procedures detailed in either ISO 2859-1:1999 with an inspection level S-2 or ISO 3951:1989 with an inspection level S-3, as appropriate. In any case an AQL not greater than 6,5 % shall be used.

(http://www.advance-tech.cn)

Table 8-- Characteristics and minimum sampling frequencies for BRT

Characteristic	Reference to Part, clause and table of EN ISO 15874:2003	Minimum sampling frequency	Retest procedure
Pipes			
Appearance	Part 2 - 5.1	One test piece per 8 h per machine	A or B
Outside diameter	Part 2 - 6.2.1, Table 4 to Table 7	One test piece per 8 h per machine	A
Wall thickness	Part 2 - 6.2.2, Table 4 to Table 8	One test piece per 8 h per machine	A
Resistance to internal pressure	Part 2 - Table 9	One test piece per 24 h per machine	A or B
Or			
Resistance to internal	Part 2 - Table 9	One test piece per week per machine	
Longitudinal reversion	Part 2 - Table 10	One test piece per week per machine	A or B
Impact resistance	Part 2 - Table 10	One test per week per machine	B
Marking	Part 2 - Clause 10	One test piece per 8 h per machine	A or B
Fittings			
Appearance	Part 3 - 5.1	One test piece per 8 h per cavity	A or B
Geometrical characteristics (but only those dimensions which vary by the	Part 3 - Clause 6	One test piece per 8 h per cavity	A
Resistance to internal pressure	Part 3 - Clause 7	One test piece per week per machine	A or B
Marking	Part 3 - Clause 11	One test piece per 8 h per cavity	A or B
[a] In case of dispute testing at 95 ^{0}C and 165 h shall be done.			

The manufacturer shall specify a batch or lot in his quality plan.
A batch or lot shall only be released for supply when all the relevant tests and inspections have been carried out at least once at the specified frequencies and the requirements have been conformed to.
If a product fails in respect of any characteristic given in Table 8, the batch or lot shall be rejected or the retest procedure shall be performed for the characteristic on which the product failed.
The retest procedure shall conform to Table 8 and shall be either Procedure A or Procedure B, as follows:

Procedure A:
Find the last product, which conforms to the requirements as specified in Part2 and Part3 of EN ISO 15874:2003, as applicable. Release all products produced before that point and reject the products produced after that point;

Procedure B:
Use a sampling procedure in accordance with ISO 2859-1:1999 or ISO 3951:1989, as applicable, based on a maximum AQL of 4 % and a minimum inspection level S-3.

If the retest requirements are conformed to, release the batch or lot. If they are not conformed to, reject the batch or lot.
Procedures for dealing with rejected products shall be detailed in the manufacturer's quality plan

4.2.4 Process verification tests (PVT)
Those characteristics specified in Part 2 and Part 3 of EN ISO 15874:2003 and listed in Table 9 shall be process verification tested with the minimum sampling frequency given in Table 9.

Table 9 -- Characteristics and minimum sampling frequencies for PVT

Characteristic	Reference to Part, clause and table of EN ISO 15874:2003	Minimum sampling frequency
Pipes		
Resistance to internal pressure (95^0C,1000h)	Part 2- part 9	One test piece per year per dn and en
Fittings		
Resistance to internal pressure	Part 3- clause 9	One test piece per year per size group and fitting group

If a product does not conform to the requirements in respect of any characteristic given in Table 9, the retest procedure detailed in the manufacturer's quality plan shall be performed. If third party certification is involved, the certification body shall be informed.

If the retest procedure does not confirm conformity of the product to the requirements, then the process shall be investigated and corrected in accordance with the procedures given in the manufacturer's quality plan.

4.2.5 Audit tests (AT)
If third party certification is involved, those characteristics specified in Part 2 and Part 3 of EN ISO 15874:2003 and listed in Table 10 are intended to be audit tested with the minimum sampling frequency given in Table 10.

Table 10 -- Characteristics and minimum sampling frequencies for AT

Characteristic	Reference to Part,clause and table of EN ISO 15874:2003	Minimum sampling frequency
Pipes		
Appearance	Part 2 - 5.1	Three test pieces per year per size group
Dimensions	Part 2 - Table 4 to Table 8	Three test pieces per year per size group

Resistance to internal pressure (95 ^{0}C, 1000 h)	Part 2 - Table 9	Three test pieces per year per size group
Longitudinal reversion	Part 2 - Table 10	Three test pieces per year per size group
Impact resistance	Part 2 - Table 10	One test per year per size group
Marking	Part 2 - Clause 10	Three test pieces per year per size group
Fittings		
Appearance	Part 3 - 5.1	Three fittings per year per size group and fitting group
Dimensions	Part 3 - Clause 6	Three fittings per year per size group and fitting group
Resistance to internal pressure (95 ~C, 1000 h)	Part 3 - Clause 7	Three fittings per year per size group and fitting group
Marking	Part 3 - Clause 11	Three fittings per year per size group and fitting group

Certification bodies may accept process verification tests (PVT) as audit tests (AT) if witnessed by them or by their agencies.

4.2.6 Indirect tests (IT)

Generally testing shall be performed according to the test methods referred to in Part 1 to Part 3 and Part 5 of EN ISO 15874:2003.

Indirect testing may be used for BRT and PVT characteristics as given in Table 8 and Table 9, respectively. Indirect testing shall not be applied to TT and AT.

The indirect test method used and the correlation or safe relationship of the indirect testing to the specified testing shall be documented in the manufacturer's quality plan. The continuing validity of the indirect testing shall be checked at regular intervals.

In case of dispute the BRT or PVT- as specified in Table 8 and Table 9, as applicable, shall be used.

If third party certification is involved, the IT shall be acceptable to the certification body.

4.2.7 Inspection records and test records

Unless otherwise specified all records shall be maintained for a minimum of ten years.