

# Determination of the oxygen permeability

*Plastics piping systems with an oxygen barrier layer*



**Test report No.** LC 21574-2

**Project No.** P000158656

**Date of report** 27-07-2022

**Total number of pages** 5

**Requested by** FITTINGS ESTANDAR S.L.  
Albacete (ES)

**Performed request** Determination of the oxygen permeability of the barrier pipe

**Reference document(s)**

ISO 17455	Plastics piping systems – Determination of the oxygen permeability of the barrier pipe (ISO 17455: 2005 + C1: 2007)
EN ISO 21003-2	Multilayer piping systems for hot and cold water installations inside buildings; Part 2: Pipes (ISO 21003-2: 2008 + A1: 2011)
DIN 4726	Warm water surface heating systems and radiator connecting systems - Plastics piping systems and multilayer piping systems (DIN 4726: 2017)

**Tested product(s)** PE-RT type II/EVOH/PE-RT type II

**Conclusion(s)\*** The products investigated meet the requirements for all tested and evaluated aspects as detailed in this report.

**Kiwa Nederland BV**

*Lab C*

Postbus 137  
7300 AC Apeldoorn  
The Netherlands

Telephone +31 88 998 3393  
E-mail LabC@kiwa.nl  
Internet www.kiwa.com

Authorised by

Mr A.J. Rikers, Coordinator Lab C

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## Overview test results

Characteristic	Test method / Reference standard	Requirement	Measured	Passed*
<b>Pipe or piping system</b>				
Oxygen permeability	ISO 17455	@80 °C: $F_{ox, day} \leq 3,6$ mg O <sub>2</sub> /m <sup>2</sup> ·day (ISO 21003-2)	@80 °C: $F_{ox, day} = 0,45$ mg O <sub>2</sub> /m <sup>2</sup> ·day	Yes
Oxygen permeability	DIN 4726	@80 °C: $F_{ox, day} \leq 3,6$ mg O <sub>2</sub> /m <sup>2</sup> ·day	@80 °C: $F_{ox, day} = 0,45$ mg O <sub>2</sub> /m <sup>2</sup> ·day	Yes

\* The conclusions are not part of the accreditation scope

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## Sample description

### Pipe(s) :

Manufacturer	:	FITTINGS ESTANDAR S.L.
Production location	:	Albacete (ES)
Type of material/construction	:	PE-RT type II/EVOH/PE-RT type II
inner layer	:	PE-RT type II
inner adhesive layer	:	Polymer with maleic anhydrous
barrier layer	:	EVOH
outer adhesive layer	:	Polymer with maleic anhydrous
outer protective layer	:	PE-RT type II
Nominal dimensions	:	16x2,0mm
Marking	:	Fittingsestandar PERT EVOH 16x2,0 PERT Tipo II – C – Oxygen Barrier – Class 1/10 bar – 2/8 bar – 4/8 bar – 5/8 bar – UNE EN ISO 22391 – Made in Spain – Linea 1 – Lo 12/05/22 -1327 – T/OP – Fittingsestandar Fittingsestandar Fittingsestandar Fittingsestandar 050-- -!-
Date of production	:	12-05-2022
Other aspects	:	None

### Appearance

Colour inside/outside	:	Natural/red
Surface	:	Smooth
Defects/damage	:	None
Discolorations	:	None
Remarks	:	None

### Sampling information

Sampled by	:	Not specified
Date of sampling	:	Not specified
Received at Kiwa lab	:	09-06-2022
Registered by	:	Mr R. Boonstoppel

### Assembly

Length of pipe(assembly)	:	(20 ± 0,5) m
Number of fittings in assembly	:	None

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## Oxygen permeability – DIN 4726 pre conditioning

### Test Method

DIN 4726: 2017                      Warm water surface heating systems and radiator connecting systems -  
Plastics piping systems and multilayer piping systems

### Sample preparation, conditioning and apparatus

The sample preparation, conditioning, used measuring devices and test equipment are all in accordance with ISO 17455 and DIN 4726.

### DIN 4726 pre conditioning

#### Bending pre conditioning (1)

Bending diameter                      : 8 x d<sub>n</sub> (applied on 10% of the assembly length)  
Environment                              : Air in air  
Conditioning temperature              : (23 ± 2) °C  
Conditioning time                        : 24 h

#### Water pre conditioning (2)

Environment                              : Water in water  
Water temperature                       : (20 ± 1) °C  
Conditioning time                        : 24 h

#### Drying pre conditioning (3)

Environment                              : Water in air  
Air conditions                             : (23 ± 2 °C, 50 ± 5% humidity)  
Conditioning time                        : 28 days

Date of test                                : 13-06-2022  
Test performed by                        : Mr N. de Wolff and Mr B. Bonekamp

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## Oxygen permeability

### Test Method

ISO 17455: 2005                      Plastics piping systems – Determination of the oxygen permeability of the barrier pipe

### Sample preparation, conditioning and apparatus

The sample preparation, conditioning, used measuring devices and test equipment are all in accordance with ISO 17455.

### Test parameters

Used method (ISO 17455)                      : Dynamic test method (method I)  
 Test temperature                                :  $(80 \pm 0,5)$  °C  
 Conditioning period                             : 1 h ( $e_{min} < 3$  mm)  
 Number of test assemblies                    : 1  
 Length of pipe(assembly)                    :  $(20 \pm 0,5)$  m  
 Number of fittings in assembly              : None  
 Free pipe length of assembly                :  $(20 \pm 0,5)$  m  
 Internal diameter of the pipe                : 12,0 mm  
 External diameter of the pipe                : 16,2 mm  
 Oxygen detection limit                        : 0,1 µg O<sub>2</sub>/l  
 Test run O<sub>2</sub> measuring time                : 1 h + 5 h  
 Date of test                                        : 27-07-2022  
 Test performed by                                : Mr N. de Wolff and Mr B. Bonekamp

### Test results

Test run No.	Oxygen uptake (ppb/h)	Atmospheric pressure (mbar)		(Corrected) Oxygen permeation $F_{Ox, day}$ (mg O <sub>2</sub> /m <sup>2</sup> ·day)
		Initial	End	
3	7,98	1008	1010	0,46
4	7,94	1010	1013	0,45
5	7,66	1014	1015	0,44
Avg. Oxygen permeation (mg O <sub>2</sub> /m <sup>2</sup> ·day)				0,45

### Remarks

None