Kiwa report LC 21574-1

Determination of the oxygen permeability

Plastics piping systems with an oxygen barrier layer

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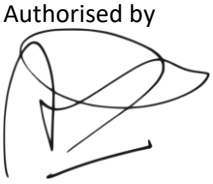
Requested by	FITTINGS ESTANDAR S.L. Albacete (ES)	
Performed request	Determination of the oxygen permeability of the barrier pipe	
Reference document(s)	ISO 17455	Plastics piping systems – Determination of the oxygen permeability of the barrier pipe (ISO 17455: 2005 + C1: 2007)
	EN ISO 21003-2	Multilayer 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.	

Authorised by



Mr A.J. Rikers, Coordinator Lab C

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Overview test results

Characteristic	Test method / Reference standard	Requirement	Measured	Passed*
Pipe or piping system				
Oxygen permeability	ISO 17455	@40 °C: $F_{ox,\ day} \leq 0{,}32$ mg $O_2/m^2 \cdot day$ (ISO 21003-2)	@40 °C: $F_{ox,\ day} < 0{,}03$ mg $O_2/m^2 \cdot day$	Yes
Oxygen permeability	DIN 4726	@40 °C: $F_{ox,\ day} \leq 0{,}32$ mg $O_2/m^2 \cdot day$	@40 °C: $F_{ox,\ day} < 0{,}03$ mg $O_2/m^2 \cdot day$	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	:	16×2,0mm
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 -1329 – T/OP – Fittingsestandar Fittingsestandar Fittingsestandar Fittingsestandar 010-- ¬!¬
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

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_n (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

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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	:	(40 ± 0,5) °C
Conditioning period	:	1 h (e_{min} < 3 mm)
Number of test assemblies	:	1
Length of pipe(assembly)	:	(20 ± 0,5) m
Number of fittings in assembly	:	None
Free pipe length of assembly	:	(20 ± 0,5) m
Internal diameter of the pipe	:	12,1 mm
External diameter of the pipe	:	16,2 mm
Oxygen detection limit	:	0,1 µg O_2/l
Test run O_2 measuring time	:	1 h + 5 h
Date of test	:	20-07-2022
Test performed by	:	Mr N. de Wolff and Mr B. Bonekamp

Test results

Test run No.	Oxygen uptake (ppb/h)	Atmospheric pressure (mbar) Initial	Atmospheric pressure (mbar) End	(Corrected) Oxygen permeation $F_{ox,\,day}$ (mg O_2/m²·day)
4	1,41	1015	1014	0,08
5	0,03	1014	1013	< 0,01
6	< 0,01	1011	1010	< 0,01
Avg. Oxygen permeation (mg O_2/m²·day)				< 0,03

Remarks

In case of an (average) oxygen uptake smaller than the detection limit of 0,01 mg O_2/m²·day the tested system shall be considered as non-permeable for oxygen. Oxygen permeability results smaller than 0,10 mg O_2/m²·day are not subjected to the statistical requirement of an absolute 5% repeatability.