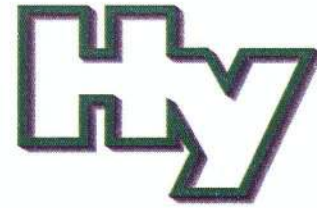


Hygiene-Institut des Ruhrgebiets

Institut für Umwelthygiene und Toxikologie
Direktor: Prof. Dr. rer. nat. L. Dunemann



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Reference-No.: K-220131-12-Ko/st
Contact person: Dr. Andreas Koch

Gelsenkirchen, 21.08.2012

TEST CERTIFICATE according to the KTW-Guideline

Product: Drinking water installation, group 1, pipes made of PP-R Ø 32 x 5,4 mm
(SKZ-Prod.-No.: 4523, DVGW-Cert.-No.: DW-8317BT0232)

Test specimen: pipe samples Ø 32 x 5,4 mm (green with red slat)

Kind of test: Supervision test 2012 (Initial test acc. to the KTW-Guideline: 20.01.2009)

The test specimen meets the requirements according to the test report dated 21.08.2012 Ref.-No.: K-220131-12-Ko/st for the following applications and temperatures, as far as technically suited.

Applications:	cold water (23°C)	warm water (60°C)	hot water (85°C)
Pipes with DN < 80 mm (domestic distribution)	passed	passed	---
Pipes of diameter 80 mm ≤ DN < 300 mm (supply pipes)	passed	passed	---
Pipes of diameter DN ≥ 300 mm (main pipes)	passed	passed	---
Fittings for pipes with DN < 80 mm	passed	passed	---
Fittings for pipes with 80 mm ≤ DN < 300 mm	passed	passed	---
Fittings for pipes with DN ≥ 300 mm	passed	passed	---
Sealings for pipes with DN < 80 mm	passed	passed	---
Sealings for pipes with 80 mm ≤ DN < 300 mm	passed	passed	---
Sealings for pipes with DN ≥ 300 mm	passed	passed	---
Tanks in the domestic installations including repair systems	passed	passed	---
Tanks other than in domestic installations including repair systems	passed	passed	---

If pipes, sealings or fittings and ancillaries do not differ in their material composition and process of manufacture, testing of the smallest diameter of the product range is sufficient.

This test certificate is valid beginning with the date of issue and is ending by 20.01.2014 as far as there are no changes in the formula. After this time it can be extended for further 5 years if demanded.

The Director of the Hygiene-Institute
on behalf of

Dr. rer. nat. Andreas Koch
Head of the Dept. for water
hygienic material testing

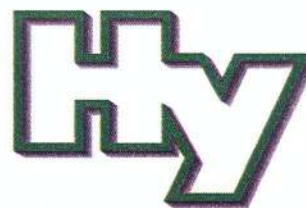


The assessment was based on the assumption that the used starting substances and monomers used to manufacture the product may completely known and no other substances are present in the product. The validity of this document expires in case of modifications in the composition of the product or the processing conditions. The results and evaluations refer to the groups of test items. This document may not be published without our written permission only complete and unchanged or duplicated.



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Reference-No.: K-220131-12-Ko/st
Contact person: Dr. Andreas Koch

Gelsenkirchen, 21.08.2012

TEST REPORT according to the KTW-Guideline

Order of: 11.06.2012 (sampling record SKZ Würzburg, Germany)

Field of application: pipes DN < 80 mm (domestic distribution)
cold water (23°C) and warm water (60°C)

Product: **Drinking water installation, group 1, pipes made of PP-R Ø 32 x 5,4 mm**
(SKZ-Prod.-No.: 4523, DVGW-Cert.-No.: DW-8317BT0232)

Specimen: pipe samples 32 x 5,4 mm (green with red slat)

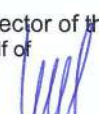
Date of receipt: 15.06.2012

Sampler: by mail (SKZ Würzburg, Germany)

Start of migration test: 14.07.2012

End of test: 14.08.2012

The Director of the Hygiene-Institute
on behalf of


Dr. rer. nat. Andreas Koch
Head of the Dept. for water
hygienic material testing

This test report consists of 3 pages.

The assessment was based on the assumption that the used starting substances and monomers used to manufacture the product may completely known and no other substances are present in the product. The validity of this document expires in case of modifications in the composition of the product or the processing conditions. The results and evaluations refer to the groups of test items. This document may not be published without our written permission only complete and unchanged or duplicated.



TEST RESULTS
cold water test (23°C)

Product: Drinking water installation, group 1
 pipes made of PP-R Ø 32 x 5,4 mm

Formulation: submitted and checked (No. 2980)

S/V-ratio migration test: 32,99 dm² / 1,69 dm³ \pm 19,52 dm⁻¹

S/V-ratio odour/flavour test: 32,99 dm² / 1,69 dm³ \pm 19,52 dm⁻¹

parameter	test steps (each 72 hours)			Requirements for pipes DN < 80 mm
	1 1.-3. day	2 4.-6. day	3 7.-9. day	
colour	colourless	colourless	colourless	n.s.e.
turbidity	clear	clear	clear	n.s.e.
tendency to foam formation	none	none	none	n.s.e.
TON (23°C)	3	2	1-2	< 2
TFN (23°C)	n.e.	n.e.	1-2	< 2
total organic carbon (TOC) mg/dm ² x d	<0,010	<0,010	<0,010	\leq 0,025
parameter with limitations	DWPLL-values are complied (K-172437-09-Ko)			

n.s.e.: no significant effect
 n.e.: not examined

TON threshold odour number
 TFN threshold flavour number

TEST RESULTS
warm water test (60°C)

Product: Drinking water installation, group 1
 pipes made of PP-R Ø 32 x 5,4 mm

Formulation: submitted and checked (No. 2980)

S/V-ratio migration test: 32,99 dm² / 1,69 dm³ \pm 19,52 dm⁻¹

S/V-ratio odour/flavour test: 32,99 dm² / 1,69 dm³ \pm 19,52 dm⁻¹

parameter	test steps (each 24 hours)					Requirements for pipes DN < 80 mm
	1. 24 h	2. 24 h	3. 24 h	6. 24 h	7. 24 h	
colour	colourless	colourless	colourless	colourless	colourless	n.s.e.
turbidity	clear	clear	clear	clear	clear	n.s.e.
tendency to foam formation	none	none	none	none	none	n.s.e.
TON (23°C)	7	6	5	5	2	≤ 4
TFN (23°C)	n.e.	n.e.	n.e.	n.e.	2	≤ 4
total organic carbon (TOC) mg/dm ² x d	0,054	0,060	0,050	0,035	0,025	$\leq 0,025$
parameter with limitations	DWPLL-values are complied (K-172437-09-Ko)					

n.s.e.: no significant effect
 n.e.: not examined

TON threshold odour number
 TFN threshold flavour number