Annex E Material Polypropylen (PP-H, PP-B, PP-R, PP-RCT) for the manufacture of pressure pipes and fittings for heating systems, drinking water, sewage, industry

(Edition: 2022-05)

E 1 Testing and certification specifications (also refer to section E 2)

DIN 8077	Polypropylene (PP) pipes - PP-H, PP-B, PP-R, PP-RCT - Dimensions
DIN 8078	Polypropylene (PP) pipes - PP-H, PP-B, PP-R, PP-RCT - General quality requirements and testing
DIN EN ISO 15874-1	Plastics piping systems for hot and cold water installations - Polypropylene (PP) - Part 1: General
DIN CEN ISO/TS 15874-7	Plastics piping systems for hot and cold water installations - Polypropylene (PP) - Part 7: Guidance for the assessment of conformity
DIN EN ISO 15494	Plastics piping systems for industrial applications - Polybutene (PB), polyethylene (PE), polyethylene of raised temperature resistance (PE-RT), crosslinked polyethylene (PE-X), polypropylene (PP) - Metric series for specifications for components and the system
DVGW W 544	Plastic pipes for drinking water - Installation
UBA KTW-BWGL	Evaluation criteria document for plastics and other organic materials in contact with drinking water
UBA	Recommendation – Conformity attestation of product hygiene suitability for drinking water

E 2 General

Annex E of this certification scheme applies to all molding compounds (materials) of the material type Polypropylen (PP-H, PP-B, PP-R, PP-RCT) for the manufacture of pressure pipes and fittings for fields of application: heating systems, drinking water, sewage and industry. The certification scheme includes in association with sections 1 to 8 (main part) all the requirements for the award of the "DINplus" quality mark for materials.

The quality enhancement is summarized in Table E 1.

Compliance with the requirements specified in this certification scheme (BRT, Table E 3) shall be confirmed to the customer by a certificate according to DIN EN 10204 Type 3.1 for each delivery.

Table E 1 Qualitäty Enhansement

Requirements	Annex E	Refer to:
Daily updated publication of the certified materials	+	E 3
Inclusion of the materials in the KRV material list	+	E 3
Certificate according to DIN EN 10204 Type 3.1. for each delivery	+	E 1

E 3 Product groups

The certification is conducted separately for each material designation and production site.

In addition to the initial inspection of each production site and type testing per molding compound and production site, the prerequisite for certification is the conclusion of a surveillance contract between the raw material manufacturer or certificate holder, DIN CERTCO and a testing laboratory recognized by DIN CERTCO. The molding compound manufacturer or certificate holder thus undertakes to carry out regular factory production control (BRT/PVT) and regular audit test (AT) in accordance with Table E 3.

In order to maintain the certificate, an annual surveillance audit per factory site by DIN CERTCO is also required, during which an inspection of production, laboratory, factory production control and quality management takes place.

All materials approved by DIN CERTCO are published daily in the DIN CERTCO certification database at www.dincertco.de. This means that they meet the requirement to be included in the material list of the Plastic Pipe Association at www.krv.de.

Table E 2 Material List

Manufacturer	Production Site		Material Designation	Material type	Colour	…	Application		
							DA	TW	AW
…	…		…	…	…	…	…	…	…

E 4 Material Test

The material tests (TT, BRT/PVT, AT) are summarized in Table E 3. The TT and AT are carried out by test laboratories recognized by DIN CERTCO. For the regular factory production control (BRT / PVT) the material manufacturer or certificate holder is responsible.

Table E 3 Material Test (per molding compound)

	Properties	Requirements according to or based on	Specification/Treshold Value(s)		Testing Standard/Testing Method	Fields of application			Scope of tests			
						DA	TW*	AW	TT	FPC		AT
										BRT	PVT	
Table E 3 Material Test (per molding compound)	**Physical Properties:**											
	Creep internal pressure behavior Classification / MRS-Value (Proof of the long-term hydrostatic strength)	DIN 8078 DIN EN ISO 15874-1	Values and creep internal pressure curves showing the MRS, LPL value	Above the reference characteristic (minimum curve)	DIN EN ISO 9080 or DIN 16887 DIN EN ISO 1167-1 und DIN EN ISO 1167-2 DIN EN ISO 12162	x	x	x	x	/	/	/
	Density		Indication of the minimum value of the basic material (basic density) according to manufacturer´s data	≥ x(1) kg/m³ conditioning at 23 °C ± 2 °C	DIN EN ISO 1183-1 DIN EN ISO 1183-2 DIN EN ISO 1183-3 DIN EN ISO 17855-1	x	x	x	x	1x /batch resp. production campaign / 7 days	/	2x / year / PS
	Loss on Drying (volatile content or moisture content (2))	DVGW W 544	Proportion of volatile components or	< 0,1 %	DIN EN 12099	x	x	x	x	1x / batch / 7 days	/	/
			Humidity content (water)	< 0,03 %	ISO 760 (Karl Fischer Method) resp. DIN EN 12118 / DIN EN ISO 15512							

	Properties	Requirements according to or based on	Specification/Treshold Value(s)		Testing Standard/Testing Method	Fields of application			Scope of tests			
						DA	TW*	AW	TT	FPC		AT
										BRT	PVT	
	Colour	DIN EN ISO 15494	Adherence to the reference value	Uniformly green, beige, grew, other colors permissible, in accordance with RAL	Visually	x	x	x	x	1x / batch / 7 days	/	2x / year / PS
Table E 3 Material Test (per molding compound)	Melt index (Melt Flow Rate MFR)	DVGW W 544 DIN EN ISO 15494	Indication of the MFR range	0,18 - 0,5 g / 10 min at 230 °C / 2,16 kg or 0,28 - 1,1 g / 10 min at 190 °C / 5 kg (nominal MFR-value) (3)	DIN EN ISO 1133-1 resp. DIN EN ISO 1133-2	x	x	x	x	1x / batch / 7 days	/	2x / year / PS
	Thermal Stability (OIT)		Adherence to the manufacturer´s data	> xx min at xxx °C (1)	DIN EN ISO 11357-6	x	x	x	x	1x / batch / 7 days	/	2x / year / PS
	Homogeneity (pigment dispersion and appearance)		Adherence to the reference value	≤ Grade 3 Photomicrographs A1, A2, A3 or B	ISO 18553	x	x	x	x	1x / batch / 7 days	/	2x / year / PS
	Bending creep modulus	DWA A127 Part 10	Adherence to the reference value	$E_{bc,1min}$ ≥ 1250 MPa for PP-B and PP-H resp. ≥ 800 MPa for PP-R and $E_{bc,2000h}$ ≥ 490 MPa for PP-B and PP-H resp. ≥ 320 MPa for PP-R	DIN 16841	x	/	x	x	/	1x / year / PS	/

	Properties	Requirements according to or based on	Specification/Treshold Value(s)		Testing Standard/Testing Method	Fields of application			Scope of tests			
						DA	TW*	AW	TT	FPC		AT
										BRT	PVT	
	Charpy impact strength	DIN EN ISO 15494	Adherence to the reference value	23 °C, notched PP-H ≥ 7 kJ/m² PP-B ≥ 25 kJ/m² PP-R ≥ 25 kJ/m² PP-RCT ≥ 15 kJ/m²	ISO 179 ISO 179/1eA	x	x	x	x	1x /batch resp. Production campaign /	/	2x / year / PS
Table E 3 Material Test (per molding compound)	**Hygienic properties:**											
	Composition requirements	KTW-BWGL section 5.2 and Annex A DVGW W 544	Raw materials shall correspond to the positive lists according to KTW-BWGL Annex A Section A2	Conformity of raw materials with the positive lists according to KTW-BWGL Annex A Section A2	Formulation check according to KTW-BWGL section 6.1	/	x	/	x	/	/	1x / 5 years / PS
		UBA Conformity hygiene section 7.4.1	Test specimens shall be made from the specified raw materials	Agreement of the results of the fingerprint methods	Fingerprint method, e.g. FTIR, TG	/	x	/	x	/	/	1x / Quarter / PS
	Organoleptic testing	KTW-BWGL section 5.3.2 DVGW W 544	No adverse impact on odour	Cold water (method A) TON ≤ 2 Warm water (method B) TON ≤ 8	On granuls, according to KTW-BWGL, section 6.3.1 and DIN EN 1420 (see E 5)	/	x	/	x (method A and B)	1x / batch / 7 days (method A)	/	1x / Quarter / PS (method A) and 1x / year / PS (method B)

	Properties	Requirements according to or based on	Specification/Treshold Value(s)		Testing Standard/Testing Method	Fields of application			Scope of tests			
						DA	TW*	AW	TT	FPC		AT
										BRT	PVT	
	Requirements relating to promoting of microbial growth	KTW-BWGL section 5.6 DVGW W 544	Adherence to the reference value	Growth ≤ (0,05 + 0,02) ml / 800 cm2	On pipes (preferably DN 25 or DN 32), in accordance with DIN EN 16421, method 2	/	x	/	x	/	/	1x / 5 years / PS
	* The same requirements apply to heating systems as to TW with the exception of hygienic properties. (1) According to the manufacturer´s data (2) In arbitration cases, the moisture content requirement applies. (3) The manufacturer of the molding compound shall specify the nominal MFR value. The measured MFR value may deviate by a maximum of ± 20% from the nominal MFR value, whereby the smallest measured MFR value shall not fall below 0.15 g / 10 min at 190 ° C / 5 kg.											

E 5 Method for the evaluation of the organoleptic properties of PP- granulates

Equipment:
thermostatic water bath (with integrated or separate magnetic stirrer)
Erlenmeyer flask with ground glass stopper, 200 ml
(Alternatively other sizes may be used. In that case, the mass of granulate shall be adapted proportionally. A ratio of 1 g granulate / 25 ml nominal volume of flask applies.)
Magnetic stirrer
Magnetic stirring bar

Chemicals:
test water: demineralized (distilled) water, alternatively drinking water without perceptible taste or odour
PP Granulate (materials)

Execution method A (shot-term test):
8 g (+ 1 g) of the PP granulate to be tested are rinsed in demineralized water for max. 1 min using a stainless steel sieve and then placed in the Erlenmeyer flask with inserted magnetic stirrer. The Erlenmeyer flask is filled with demineralized water of 30 °C ± 2 °C (cool water) resp. 70 °C ± 2 °C (warm water) free of air bubbles, sealed and placed in the water bath of a temperature of 30 °C ± 2 °C resp. 70 °C ± 2 °C. The water bath is placed on the magnetic stirrer in such a way that the granules in the Erlenmeyer flask are sufficiently well in uniform contact with the test water. At the same time, a blank test is carried out without PP granules.

After a stirring time of 4 h (± 10 min), the Erlenmeyer flasks are removed from the water bath and cooled down to room temperature (23 ± 2) °C either forcibly or by leaving it standing. The migration water and the zero water are then transferred into TON bottles (e.g. 250 ml wide-neck bottles) and tested for odour. The threshold odour number (TON) of the migration water is determined by comparison with the zero water obtained in the blank test according to DIN EN 1622 (pair test with free choice).

Execution method B (3 x 3 days test)
8 g (+ 1 g) of the PP granules to be tested are placed in the Erlenmeyer flask. The flask is filled with drinking water and left to stand for 24 h (± 1 h) at room temperature without stirring. After 24 h (± 1 h), the granulate from the Erlenmeyer flask is rinsed with drinking water for 2 h (± 5 min) using a top-mounted device. Afterwards, the drinking water is removed from the Erlenmeyer flask, a magnetic stirring bar is inserted and the Erlenmeyer flask is filled with deionized water (cool water) resp. with warm water (60 °C ± 2 °C) free of air bubbles. It is sealed and placed on the magnetic stirring device at room temperature 23 °C ± 2 °C (cool water) resp. in a thermostatic water bath at 60 °C ± 2 °C (warm water) in such a way that the granules in the Erlenmeyer flask are sufficiently well in uniform contact with the test water. At the same time, a blank test without PP granules is carried out.
The contact time is 3 x 72 h (± 1 h). The migration water and zero water of each of the three runs are transferred into TON bottles (e.g. 250 ml wide-neck bottles) and tested for the parameter odour. The threshold odour number (TON) of the migration waters is determined by comparison with the zero water obtained in the blank test according to DIN EN 1622 (pair test with free choice).

Evaluation:
A PP granulate is considered to be faultless if the assessment of the short-term test or of the 3rd migration period of the 3 x 3 days test can be made as TON ≤ 2 (cool water) resp. TON ≤ 8 (warm water)

E 6 Changes and start of validity

The following changes have been made:

Edition 2020-06:
First Edition.

Edition 2020-06 Rev. 01:
Reissue as a separate document.

This annex to the certification scheme “Materials for plastic pipe systems” is valid from 2022-05