# Annex C Stripe material Polyethylene (PE 80, PE 100, PE 100-RC) for the manufacture of pressure pipes for gas, drinking water, sewage and industrial applications

(Edition: 2020-06)

## C 1 Testing and certification specifications (see refer to section C 2)

| | |
|---|---|
| DIN 8074 | Polyethylene (PE) pipes – PE 80, PE 100 – Dimensions |
| DIN 8075 | Polyethylene (PE) pipes – PE 80, PE 100 – General quality specifications |
| DIN EN 1555-1 | Plastics piping systems for the supply of gaseous fuels – Polyethylene (PE) – Part 1: General |
| DIN CEN/TS 1555-7 | Plastics piping systems for the supply of gaseous fuels – Polyethylene (PE) – Part 7: Guidance for assessment of conformity |
| DIN EN 12201-1 | Plastic piping systems for water supply, and for drainage and sewerage under pressure – Polyethylene (PE) – Part 1: General |
| DIN CEN/TS 12201-7 | Plastics piping systems for water supply, and for drainage and sewerage under pressure – Polyethylene (PE) – Part 7: Guid ance 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 |
| ISO 4427-1 | Plastics piping systems for water supply and for drainage and sewerage under pressure – Polyethylene (PE) – Part 1: General |
| ISO 4437-1 | Plastics piping systems for the supply of gaseous fuels – Polyethylene (PE) – Part 1: General |
| DVGW GW 335-A2 | Plastics piping systems for gas and water distribution – Requirements and tests – Part A2: PE 80 and PE 100 pipes |
| DVGW GW 335-B2 | Plastics piping systems for gas and water distribution – Specifications and tests – Part B 2: PE 80 and PE 100 fittings |
| UBA KTW-BWGL | Evaluation basis for plastics and other organic materials in contact with drinking water |
| UBA | Recommendation - Assessment of conformity of the drinking water hygiene suitability of products |
| PAS 1031:2004-09 | Material Polyethylene (PE) for the manufacture of pressure pipes and fittings – Requirements and tests |
| PAS 1075:2009-04 | Pipes made from Polyethilene for alternative installation techniques – Dimensions, technical requirements and testing |

## C 2 General

Annex C of this certification scheme applies to all molding compounds (stripe materials) of the material type polyethylene (PE 80, PE 100 and PE 100-RC) for the manufacture of pressure pipes and fittings for gas, drinking water, waste water and industrial applications. 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 C 1.

Compliance with the requirements specified in this certification scheme (BRT, Table C 4) shall be confirmed to the customer by a certificate according to DIN EN 10204 Type 3.1 for each delivery.

**Table C 1 Quality Enhancement**

| Requirements | Annex A | DIN 8074 | DIN 8075 | DIN EN 1555 | DIN EN 12201 | DVGW GW 335-A2 | See section |
|---|---|---|---|---|---|---|---|
| Daily updated publication of the certified materials | + | / | / | / | / | / | C 3 |
| Materials are listed in the KRV material list | + | / | / | / | / | / | C 3 |
| Certificate according to DIN EN 10204 type 3.1 for each delivery | + | / | / | / | / | x | C 1 |

The stripes shall meet the requirements of DVGW GW 335-A2 (see Table C 4).

**Table C 2 Number, width and depth of the stripes**

| Outer diameter in mm | Minimum number of stripes | Minimum width in mm | Maximum depth in mm (with wall thickness s in mm, but not more than 3,0 mm) |
|---|---|---|---|
| < 32 | 3 | 1 | 20 % of s |
| 32 to 63 | 3 | 2 | 20 % of s |
| 75 to 160 | 4 | 4 | 15 % of s |
| 180 to 400 | 4 | 9 | 15 % of s |
| ≥ 450 | 6 | 12 | 10 % of s |

## C 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 monitoring 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 C 4.

In order to maintain the certificate, an annual monitoring 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.tuv.com. This means that they meet the requirement to be included in the material list of the Plastic Pipe Association at www.krv.de.

**Table C 3 Material List**

| Manufacturer | Production Site | Material Designation | Material type | Colour | Weathering Verification 7 GJ/m² | Proven Rapid Crack Propagation (RCP) S4- or FS-test | | | | Application | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Application also for pipes ≥ 32 mm wall thickness | | | Application for pipes up to ... mm wall thickness | | | | |
| | | | | | | DA | TW | AW | G | DA | G | TW | AW |
| … | … | … | … | … | … | … | … | … | … | … | ….. | … | … |

## C 4 Material test (Stripe material)

The material tests (TT, BRT/PVT, AT) are summarized in Table C 4. 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 C 4 Material tests (per molding compound)**

| | Properties | Requirements according to or based on | Specification/Reference Value(s) | | Testing Standard/Testing Method | Field of application | | | | Scope of tests | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | TW | G | AW | DA | TT | FPC | | AT |
| | | | | | | | | | | | BRT | PVT | |
| Table C 4 Material tests (per molding compound) | **Physical properties:** | | | | | | | | | | | | |
| | Creep internal pressure behavior Classification / MRS-Value (Proof of the long-term hydrostatic strength) | DIN EN 1555-1<br>DIN EN 12201-1<br>ISO 15494 | Must correspond to the same base material of the pipe material | PE 80: > 1.000 h at 80 °C / 4 MPa<br>PE 100: > 1.000 h at 80 °C / 5 MPa | DIN EN ISO 1167-1<br>and<br>DIN EN ISO 1167-2 | x | x | x | x | x | / | / | / |
| | Density | DIN EN 1555-1<br>DIN EN 12201-1<br>ISO 15494 | Indication of the minimum value of the basic material (basic density) | ≥ 930 kg/m³<br>Conditioning at 23 °C ± 2 °C | DIN EN ISO 1183-1<br>DIN EN ISO 1183-2<br>DIN EN ISO 1183-3<br>DIN EN ISO 17855-1 | x | x | x | x | x | x | / | / |
| | Trockenverlust (flüchtige Bestandteile oder Feuchtegehalt (1)) | DIN EN 1555-1<br>DIN EN 12201-1<br>ISO 15494 | Proportion of vola-tile components | ≤ 350 mg/kg | DIN EN 12099 | x | x | x | x | x | x | / | / |
| | | | Humidity content (water) | < 0,03 %<br>bzw.<br>≤ 300 mg/kg | ISO 760 (Karl Fischer Methode)<br>bzw.<br>DIN EN 12118 /<br>DIN EN ISO 15512 | | | | | | | | |
| | Colour | DIN EN 1555-1<br>DIN EN 12201-1<br>ISO 15494 | Adherance to the reference value | Uniform black, light blue, royal blue, yellow, orange yellow, brown or green, similar to RAL | visually | x | x | x | x | x | x | / | / |

| | Properties | Requirements according to or based on | Specification/Reference Value(s) | | Testing Standard/Testing Method | Field of application | | | | Scope of tests | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | TW | G | AW | DA | TT | FPC BRT | FPC PVT | AT |
| Table C 4 Material tests (per molding compound) | Melt index (MFR) | DIN EN 1555-1<br>DIN EN 12201-1<br>ISO 15494 | Indication of MFR range | 0,15 to 1,40 g / 10 min at 190 °C / 5 kg (nominal MFR value) (2) | DIN EN ISO 1133-1 resp. DIN EN ISO 1133-2 | x | x | x | x | x | x | / | 2x / year/PS |
| | Weldability for materials (3) | DIN EN 1555-1<br>DIN EN 12201-1<br>ISO 15494 | Proof of weldability by creep tensile tests | Rupture outside the joining plane | DVS Guideline 2203-4 | x | x | x | x | x | / | / | / |
| | Thermal stability (OIT) | DIN EN 1555-1<br>DIN EN 12201-1<br>ISO 15494 | Adherance to the reference value | > 30 min at 200 °C<br>or<br>> 20 min at 210 °C<br>or<br>> 10 min at 220 °C<br>with15 ± 2 mg (4)<br>respectively | DIN EN 11357-6 | x | x | x | x | x | x | / | 2x / year/PS |
| | Homogenity (Carbon black resp. pigment dispersion and appearance) | DIN EN 1555-1<br>DIN EN 12201-1<br>ISO 15494 | Adherance to the reference value | ≤ Degree 3<br>Bild A1, A2, A3 or B | ISO 18553 | x | x | x | x | x | x | / | 2x / year/PS |
| | **Hygienic properties:** | | | | | | | | | | | | |
| | Composition requirements | KTW-BWGL Section 5.2 and Annex A | Raw materials must comply with the positive lists according to KTW-BWGL Annex A Section A2 | Conformity of raw materials with the positive lists ac-cording to KTW-BWGL Annex A Section A2 | Formulation check according to KTW-BWGL section 6.1 | x | / | / | x (5) | x | / | / | 1x / 5 years/PS |
| | | UBA Conformity Hygiene section 7.4.1 | Test specimens must be prepared from the specified raw materials | Consistency of results of fingerprint methods | Fingerprint method, e.g. FTIR, TG | x | / | / | x (5) | x | / | / | 1x / half-yearly/PS |

| | Properties | Requirements according to or based on | Specification/Reference Value(s) | | Testing Standard/Testing Method | Field of application | | | | Scope of tests | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | TW | G | AW | DA | TT | FPC BRT | FPC PVT | AT |
| | Organoleptic properties | PAS 1031 KTW-BWGL section 5.6 DVGW GW335-A2 | No detrimental change in odour | TON ≤ 4 | Based on KTW-BWGL section 6.3.1 and DIN EN 1420 (see A5) | x | / | / | x (5) | x | x | / | 1x / half-yearly/PS |
| | (1) In arbitration cases, the moisture content requirement applies.<br>(2) The manufacturer of the molding materials must 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 must not fall below 0.15 g / 10 min at 190 ° C / 5 kg.<br>(3) Only to be carried out for materials with a nominal MFR value outside the range 0.15 to 1.40 g / 10 min at 190 ° C / 5 kg.<br>(4) The test may be carried out at 220 °C provided that there is a reliable correlation. In cases of arbitration the requirement at 200 °C applies.<br>(5) Proof only if application TW is also provided. | | | | | | | | | | | | |

## C 5 Method for evaluation of the organoleptic properties of PE granulate (raw material)

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 smell
PE-Granulate

Execution: Short-term test within the batch release test (BRT) and audit test (AT)
8 g (+ 1 g) of the PE granulate to be tested are rinsed in demineralised 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 free of air bubbles, sealed and placed in the water bath of a temperature of 30 °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 PE 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).

3 x 3 days test within the type testing (TT)
8 g (+ 1 g) of the PE 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 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 free of air bubbles. It is sealed and placed on the magnetic stirring device at room temperature 23 °C ± 2 ° 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 PE 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 PE 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.

## C 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 2020-06-30.