



**SLOVENSKI STANDARD**  
**oSIST prEN 15344:2020**  
**01-junij-2020**

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**Polimerni materiali - Reciklirani polimerni materiali - Karakterizacija recikliranega polietilena (PE)**

Plastics - Recycled plastics - Characterisation of Polyethylene (PE) recyclates

Kunststoffe - Kunststoff-Rezyklate - Charakterisierung von Polyethylen (PE)-Rezyklaten

Plastiques - Plastiques recyclés - Caractérisation des recyclats de polyéthylène (PE)

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**ICS:**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
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**DRAFT**  
**prEN 15344**

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ICS 13.030.50; 83.080.20

Will supersede EN 15344:2007

English Version

## Plastics - Recycled plastics - Characterisation of Polyethylene (PE) recyclates

Plastiques - Plastiques recyclés - Caractérisation des  
recyclats de polyéthylène (PE)

Kunststoffe - Kunststoff-Rezyklate - Charakterisierung  
von Polyethylen (PE)-Rezyklaten

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 249.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## European foreword

This document (prEN 15344:2020) has been prepared by Technical Committee CEN/TC 249 “Plastics”, the secretariat of which is held by NBN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 15344:2007.

In comparison with the previous edition, the following technical modifications have been made:

- Clause 4 “Symbols and abbreviations” has been added;
- in Table 1 several changes were introduced: in column “Characteristics” the new line “Presence of polypropylene/ foreign polymers” has been added; column “M/O” was added; key was added to explain M/O: “M/O: The characteristics is mandatory (M) or optional (O)”; in line “Contaminates”, column “Test method” reference to Annex D was added;
- in A.2 “Principle”, a reference for “stable production” is given in the last line;
- in A.3 “Apparatus”, A.3.4 “Method D” was added.

This document is part of a series on Plastics Recycling which is structured as follows:

- EN 15342, *Plastics — Recycled Plastics — Characterization of polystyrene (PS) recyclates*
- EN 15343, *Plastics — Recycled Plastics — Plastics recycling traceability and assessment of conformity and recycled content*
- EN 15344, *Plastics — Recycled plastics — Characterization of Polyethylene (PE) recyclates*
- EN 15345, *Plastics — Recycled Plastics — Characterization of Polypropylene (PP) recyclates*
- EN 15346, *Plastics — Recycled plastics — Characterization of poly(vinyl chloride) (PVC) recyclates*
- EN 15347, *Plastics — Recycled Plastics — Characterization of plastics wastes*
- EN 15348, *Plastics — Recycled plastics — Characterization of poly(ethylene terephthalate) (PET) recyclates*
- CEN/TR 15353, *Plastics — Recycled plastics — Guidelines for the development of standards for recycled plastics*

**prEN 15344:2020 (E)****Introduction**

Recycling plastics waste is one type of material recovery process intended to save resources (virgin raw materials, water, and energy), while minimizing harmful emissions into air, water and soil as well as any impacts on human health. The environmental impact of recycling has to be assessed over the whole life cycle of the recycling system (from the waste generation point to the disposal of final residues). To ensure that recycling constitutes the best environmental option for treating the available waste, some prerequisites should preferably be met:

- recycling scheme being contemplated should generate lower environmental impacts than alternative recovery options;
- existing or potential market outlets should be identified that will secure a sustainable industrial recycling operation;
- collection and sorting schemes should be properly designed to deliver recyclable plastics waste fractions fitting reasonably well with the available recycling technologies and with the (changing) needs of the identified market outlets, preferably at minimum costs to society.

This document has been produced in accordance with the guidance produced by CEN on Environmental Aspects and in accordance with CEN/TR 15353, *Plastics — Recycled plastics — Guidelines for the development of standards for recycled plastics*.

NOTE CEN/TR 15353 considers the general environmental aspects which are specific to the recycling process.

It is often impossible to trace back each individual product at the end user stage and to check whether the product has been used correctly through its life. Consequently, products are out of industrial control for a period of time. It is possible that during this period contamination with other materials may occur that could affect the product's suitability for recycling into the intended application.

## 1 Scope

This document defines a method of specifying delivery conditions for polyethylene (PE) recyclates.

It gives the most important characteristics and associated test methods for assessing PE recyclates intended for use in the production of semi-finished/finished products.

It is intended to support parties involved in the use of recycled PE to agree on specifications for specific and generic applications.

This document is applicable without prejudice to any existing legislation.

This document does not cover the characterization of plastics wastes (see EN 15347).

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12099, *Plastics piping systems — Polyethylene piping materials and components — Determination of volatile content*

EN ISO 179-1, *Plastics — Determination of Charpy impact properties — Part 1: Non-instrumented impact test (ISO 179-1)*

EN ISO 180, *Plastics — Determination of Izod impact strength (ISO 180)*

EN ISO 472, *Plastics — Vocabulary (ISO 472)*

EN ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles (ISO 527-1)*

EN ISO 527-2, *Plastics — Determination of the tensile properties — Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2)*

EN ISO 1043-1, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics (ISO 1043-1)*

EN ISO 1133 (all parts), *Plastics — Determination of the melt mass flow-rate (MFR) and the melt-volume flow rate (MVR) of thermoplastics (ISO 1133)*

EN ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1)*

EN ISO 3451-1, *Plastics — Determination of ash — Part 1: General methods (ISO 3451-1)*

EN ISO 11357-1, *Plastics — Differential scanning calorimetry (DSC) — Part 1: General principles (ISO 11357-1)*

ISO 3534-2, *Statistics — Vocabulary and symbols — Part 2: Applied statistics*

ISO 22498, *Plastics — Vinyl chloride homopolymer and copolymer resins — Particle size determination by mechanical sieving*

CEN/TR 15353, *Plastics — Recycled plastics — Guidelines for the development of standards for recycled plastics*

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### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 472 and CEN/TR 15353 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

### 4 Symbols and abbreviations

For the purposes of this document, the symbols and abbreviations related to recyclates are given in EN ISO 1043-1.

### 5 Characterization of PE recyclates

A single batch is the quantity of PE recyclate that has homogeneous characteristics within the specified tolerances.

The characteristics of PE recyclates, which shall be determined for every batch (see ISO 3534-2) of recyclate, are given in Table 1, and are divided into two types:

- a) required characteristics, needed to define PE recyclates in general, and required for all recyclates;
- b) optional characteristics needed to define PE recyclates according to customer specifications and applications.

NOTE 1 Polyethylene plastics waste originate from different types or grades of PE containing additives to modify characteristics. Polyethylene is generally classified as PE-HD (high density polyethylene), PE-LD (low density polyethylene), PE-LLD (linear low density polyethylene) and others of less common use. The properties and performance of recyclates derived from such wastes can depend on the type or relative proportions of blends of PE, but it is not in the scope of this document to investigate such relations.

These characteristics shall be assessed by using the test methods given in Table 1. Where possible, the supplier should provide information on the original applications.

A certificate of analysis giving the test results for each batch of recyclate shall be provided by the supplier to the purchaser upon request.

To secure the legal use of the recyclate, the supplier shall provide the necessary information about the material composition of the recyclate, as specified by the purchaser.

NOTE 2 In this document, PE (R) is composed of:

- polymeric matrix, consisting of polyethylene (PE content);
- fillers, pigments and additives;
- impurities or contamination in a quantity which do not compromise the workability characteristics of PE (R);
- polymers compatible with the polymeric matrix.



Table 1 — Characterization of PE recyclates

Characteristics	Unit	Tests method	Comments	M/O
Bulk density	kg/m <sup>3</sup>	Annex B	Test may be used for powder or granulates. ASTM D 1895-17 may be used for powder.	M
Colour		Visual inspection		M
Particle size	mm	ISO 22498 <sup>a</sup>	For powder used for rotomoulding (particle size distribution also required). For flakes or regrind, the Annex A of EN 15348:2014 and Annex E of EN 15346:2014 may be used. ASTM D 1921-18 may also be used.	M
Melt mass flow rate (MFR)	g/10 min	EN ISO 1133 (all parts)	190 °C-2,16 kg for density ≤ 0,945 kg/dm <sup>3</sup> 190 °C-5 kg for density > 0,945 kg/dm <sup>3</sup>	M
Shape		Visual inspection	Typical shape are pellets, flakes, regrind, powder and agglomerated	M
Presence of polypropylene/foreign polymers		Usable techniques of infrared spectrometry (FTIR-IR) or DSC <sup>c</sup>	Presence/ not presence	M
Ash content	%	EN ISO 3451-1	With this method, any organic pigments are destroyed	O
Density	kg/m <sup>3</sup>	EN ISO 1183-1	Pycnometer, parties to agree on method A or B	O
Contaminants	Number	Annex A Method A, B, C or D	Parties to agree on which method	O
Filtration level	µm	Mesh size	Only finest filter. Alternatively, dimension of net passage.	O
Izod impact strength or Charpy impact strength	kJ/m <sup>2</sup>	EN ISO 180 EN ISO 179-1	Temperature conditions agreed between the interested parties	O
Residual humidity	%	EN 12099 <sup>b</sup>	Weight loss, 105 °C	O
Tensile stress at yield	MPa	EN ISO 527-1 EN ISO 527-2	Test speed and at the temperature conditions agreed between the interested parties Test specimen 1 A	O

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Characteristics	Unit	Tests method	Comments	M/O
Tensile strain at break	%	EN ISO 527-1 EN ISO 527-2	Test speed and at the temperature conditions agreed between the interested parties Test specimen 1 A	O
Key M/O: The characteristics is mandatory (M) or optional (O)				
<p><sup>a</sup> Although ISO 22498 is specific to PVC, it is considered relevant to PP.</p> <p><sup>b</sup> Although the scope of EN 12099 is limited, it is considered relevant.</p> <p><sup>c</sup> Several differential scanning calorimetry (DSC) methods for the thermal analysis of polymers and polymer blends are specified in EN ISO 11357-1; they can be used for quality assurance purposes, for routine checks of raw materials and finished products or for the determination of comparable data needed for data sheets or databases.</p>				

**6 Quality assurance**

In order that the purchaser of the recyclate may have confidence in the quality of the product, the supplier shall maintain records of the quality control carried out, including incoming materials, processes and finished products.

NOTE 1 A quality management system certified to EN ISO 9001 can be a suitable guarantee of consistent recyclate quality.

The specification and the standard deviation or range of values within and between batches of material shall be agreed between the supplier and the purchaser.

Where a statement of recycled content, or the previous history of the material is requested, documentary evidence shall be provided, where there is no analytical method available to supply such information. These records should be available to the purchaser on request.

Where a recyclate has been produced via a melt process, the supplier may choose to state the level of filtration applied during that process. This will determine the maximum size of any non-melting contaminants present in the recyclate. The statement of filtration level shall include details of the filter. Recyclates which have not passed through a melt process cannot be quantified in the same way, and the supplier may state this.

NOTE 2 EN 15343 describes a qualified recycling process and gives details of traceability and the assessment of recycled content.