

SLOVENSKI STANDARD
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SIST EN 15344:2008

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:

13.030.50	Recikliranje	Recycling
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EUROPEAN STANDARD

EN 15344

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

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

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

This European Standard was approved by CEN on 12 April 2021.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

<https://standards.iteh.ai/catalog/standards/sist/fa6aff7-a086-4857-bb4d-6954353c9a05/sist-en-15344-2021>



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 15344:2021) has been prepared by Technical Committee CEN/TC 249 “Plastics”, the secretariat of which is held by NBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2021, and conflicting national standards shall be withdrawn at the latest by November 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes 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 have been introduced: in column “Characteristics” the new line “Presence of polypropylene/ foreign polymers” has been added; column “M/O” has been added; key has been added to explain M/O: “M/O: The characteristics is mandatory (M) or optional (O)”; in line “Contaminates”, column “Test method” reference to method D has been 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” has been 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*.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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Introduction

Recycling plastics waste, by mechanical recycling, 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 polyethylene (PE) recyclates obtained by mechanical recycling 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 15343, *Plastics — Recycled Plastics — Plastics recycling traceability and assessment of conformity and recycled content*

EN ISO 60, *Plastics — Determination of apparent density of material that can be poured from a specified funnel (ISO 60)*

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 tensile properties — Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2)*

EN ISO 527-3, *Plastics — Determination of tensile properties — Part 3: Test conditions for films and sheets (ISO 527-3)*

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 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)*

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EN ISO 7765-1, *Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 1: Staircase methods (ISO 7765-1)*

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

ISO 11357-3, *Plastics — Differential scanning calorimetry (DSC) — Part 3: Determination of temperature and enthalpy of melting and crystallization*

ISO 13468-1, *Plastics — Determination of the total luminous transmittance of transparent materials — Part 1: Single-beam instrument*

ISO 18314-1, *Analytical colorimetry — Part 1: Practical colour measurement*

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*

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 <https://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.

PE (REC) (see EN ISO 1043-1) 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.

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 Polyethylene plastics waste originates 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.

Table 1 — Characterization of PE recyclates

Characteristics	Unit	Tests method	Comments	M/O
Bulk density	kg/m ³	Annex B or EN ISO 60	Test may be used for powder or granulates. ASTM D 1895 may be used for powder. Any alternative method may be used upon common approval with the customer through a specification	0
Colour		Visual inspection ISO 18314-1		0
Transparency	%	ISO 13468-1	Test may be carried out on a sheet with a thickness of 200 µm, made by compression of granules. Any alternative method may be used upon common approval with the customer through a specification	0
Particle size	mm	ISO 22498 ^a	For powder used for rotomoulding (particle size distribution also required). For flakes or regrind, EN 15348:2014, Annex A and EN 15346:2014, Annex E may be used. ASTM D 1921 may also be used.	0

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Characteristics	Unit	Tests method	Comments	M/O
Melt mass flow rate (MFR)	g/10 min	EN ISO 1133 (all parts)		M
Shape		Visual inspection	Typical shape are pellets, flakes, regrind, powder and agglomerates	M
LDPE content	%	ISO 11357-3		M
Presence of polypropylene/ foreign polymers		Usable techniques of infrared spectrometry (FTIR-IR) or DSC ^c	Presence/ no presence	O
Ash content	%	EN ISO 3451-1	With this method, any organic pigments are destroyed	O
Density	kg/m ³	EN ISO 1183-1	Pycnometer, parties to agree on method A or B	M
Contaminants	number	Annex A Method A, B, C or D	Parties to agree on which method	O
Filtration level	µm	mesh size	Indicate the opening of the finest filter. Alternatively, dimension of net passage.	M
Izod impact strength or Charpy impact strength or Drop Dart impact		EN ISO 180 EN ISO 179-1 EN ISO 7765-1	Temperature conditions agreed between the interested parties Any alternative method may be used upon common approval with the customer through a specification	O
Residual humidity	%	EN 12099 ^b	Weight loss, 105 °C Any alternative method may be used upon common approval with the customer through a specification	O
Tensile stress at yield	MPa	EN ISO 527-1 EN ISO 527-2 EN ISO 527-3	Test speed and temperature conditions agreed between the interested parties Test specimen 1 A	O
Tensile strain at break	%	EN ISO 527-1 EN ISO 527-2 EN ISO 527-3	Test speed and temperature conditions agreed between the interested parties Test specimen 1 A	O
Key M/O: The characteristic is mandatory (M) or optional (O)				