



**SLOVENSKI STANDARD**  
**SIST EN 15348:2008**  
**01-februar-2008**

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**Polimerni materiali - Reciklirani polimerni materiali - Karakterizacija recikliranega polietilen-tereftalata (PET)**

Plastics - Recycled plastics - Characterization of poly(ethylene terephthalate) (PET) recyclates

Kunststoffe - Kunststoff-Rezyklate - Charakterisierung von Polyethylenterephthalat (PET) Rezyklaten

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Plastiques - Plastiques recyclés - Caractérisation des recyclats de poly(téréphthalate d'éthylène) (PET)

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**ICS:**

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ICS 13.030.50; 83.080.20

English Version

## Plastics - Recycled plastics - Characterization of poly(ethylene terephthalate) (PET) recyclates

Plastiques - Plastiques recyclés - Caractérisation des recyclats de poly(éthylène téréphtalate) (PET)

Kunststoffe - Kunststoff-Rezyklate - Charakterisierung von Polyethylenterephthalat (PET)-Rezyklaten

This European Standard was approved by CEN on 25 October 2007.

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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 Management Centre has the same status as the official versions.

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COMITÉ EUROPÉEN DE NORMALISATION  
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## Foreword

This document (EN 15348:2007) 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of an identical text or by endorsement, at the latest by June 2008, and conflicting national standards shall be withdrawn at the latest by June 2008.

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

This standard is one part of a series of CEN publications 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 — Characterisation of Polyethylene (PE) recyclates
- EN 15345 Plastics — Recycled Plastics — Characterisation of Polypropylene (PP) recyclates
- EN 15346 Plastics — Recycled plastics — Characterisation of poly(vinyl chloride) (PVC) recyclates
- EN 15347 Plastics — Recycled Plastics — Characterisation of plastics waste
- 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 organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

## Introduction

Recycling of plastics waste is one type of material recovery process intended to save resources (virgin raw materials, water, and energy), while minimising 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 standard 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.

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## 1 Scope

This European Standard gives guidelines for the characterisation of poly(ethylene terephthalate) (PET) recyclates.

It gives the most important characteristics and associated test methods for assessing PET recyclates intended to be used for the production of semi-finished/finished products. It is intended for use by the supplier and purchaser of such materials, to assist them in agreeing on specifications.

This standard is applicable without prejudice to any existing legislation.

## 2 Normative references

The following referenced documents are indispensable for the application 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 ISO 472:2001, *Plastics — vocabulary (ISO 472:1999)*

ISO 565, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*

ISO 1628-5, *Plastics — Determination of the viscosity of polymers in dilute solution using capillary viscometers - Part 5: Thermoplastic polyesters (TP) homopolymers and copolymers*

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

CEN/TR 15353:2007, *Plastics — Recycled plastics — Guidelines for the development of standards for recycled plastics*

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## 3 Terms, definitions and abbreviations terms

For the purposes of this European Standard, the terms and definitions given in EN ISO 472:2001 and those prepared in CEN/TR 15353:2007 apply.

### 3.1

#### **Sieve retention**

The percentage, in mass, of the recycled test sample retained on a sieve at the end of the test

### 3.2

#### **Container retention**

percentage of recycled matter retained in the container at the bottom of a stack of sieves, or under a simple sieve, at the end of the testing method compared to the mass of the sample

### 3.3

#### **Average particulate dimension**

Single value of size, representing the dominant mass size for the whole test sample

## 4 Characterisation of PET recyclates

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

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



- Required characteristics needed to characterise PET recyclates in general and required for all recyclates.
- Optional characteristics needed to characterise PET recyclates according to customer specifications and applications.

These characteristics shall be assessed by using the test methods given in Table 1 and detailed below. A Certificate of Analysis, providing 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 recyclates, as specified by the purchaser.

**SAFETY PRECAUTIONS — WARNING:** It is most important for safety reasons that personal protective clothing is used when applying solvents to the test specimen. The use of solvents in regard to application of this standard may be further controlled under National and/or regional legislation.

Table 1 - Characterization of PET recyclates

Characteristics	Unit	Test Method	Comments
<b>Required</b>			
Shape		Visual	Flakes, pellets
Maximum particle size determination	mm		Given by the size of the screen of the grinder
Fine particle content	%	Annex A	Screening method
Colour		Visual	
Determination Melt Mass-Flow Rate (MFR)			Annex B To be agreed
Water content	%	Annex C	
PVC content	mg/Kg	Annex D	
Polyolefin content	%	Annex D	
Other residual content <sup>a</sup>	mg/Kg	Annex D	
<b>Optional</b>			
Intrinsic Viscosity (I.V.)	dl/g	ISO 1628-5	
Alkalinity	pH	Annex E	Only for flakes
Filterability	100 bar/h/cm <sup>2</sup>	Annex F	
Colour	L,a,b	Colourimeter	Injection molded disks from Flakes, pellets
NOTE Other tests may be carried out by agreement between the purchaser and the supplier and results reported.			

## 5 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 may 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 upon 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 that 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 provides details of traceability and the assessment of recycled content.

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## Annex A (normative)

### Method for the determination of size and distribution of PET-R flakes by sieving

#### A.1 Scope

This procedure specifies a method for determining the dimensional distribution (size) of PET-R flakes by measuring the quantities retained in a range of sieves having meshes of various sizes.

The results can be expressed in terms of quantity retained on the various sieves or as the mean particulate dimension for the whole sample tested (That which has the greatest frequency).

#### A.2 Principles

A determined sample is filtered through a single sieve, or stack of sieves of various mesh opening sizes, helped by mechanical or manual vibrations. When several sieves are selected to form a stack, the sieves are assembled in ascending order of the mesh opening sizes so that the largest mesh opening is at the top.

#### A.3 Apparatus

##### A.3.1 Weighing scale:

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With a precision of + or – 0,1 g.

##### A.3.2 Sieve:

The nominal diameter of 200 mm, in accordance with ISO 565 supplemented by a lid and by a receiving container. Sieves are made of ring wire.

The sieves used have the following square mesh opening sizes of: 1 mm; 2 mm; 3,15 mm; 4 mm; 6,30 mm; 8 mm and 12,5 mm.

##### A.3.3 Mechanical sieve shaker

#### A.4 Procedure

**A.4.1** Examine the sieve, or the sieves, for the damage to the mesh or any deformation of the matrix of the meshes. Replace all defective meshes.

**A.4.2** Weigh the sieve, or each individual sieve, with a margin of 0,1 g.

**A.4.3** Weigh the container to the nearest 0,1 g.

**A.4.4** Assemble the sieve, or the sieves, and the container, one on top of the other. By assembling a stack of sieves, you ensure that they are gathered in the ascending order of the mesh opening sizes so that the largest opening is at the top.