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### Disclaimer

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## List of abbreviations

<i>AMD</i>	<i>Amendment</i>
<i>AWI</i>	<i>Approved Work Item</i>
<i>CD</i>	<i>Committee Draft</i>
<i>CEN</i>	<i>European Committee for Standardization</i>
<i>CENELEC</i>	<i>European Committee for Standardization in the Electrical Field</i>
<i>CWA</i>	<i>CEN-CENELEC Workshop Agreement</i>
<i>DIS</i>	<i>Draft International Standard</i>
<i>EN</i>	<i>European Standard</i>
<i>EOTA</i>	<i>European Organization for Technical Assessment</i>
<i>ESO</i>	<i>European Standardization Organization</i>
<i>ETAG</i>	<i>European Technical Approval Guideline</i>
<i>ETSI</i>	<i>European Telecommunications Standards Institute</i>
<i>EU</i>	<i>European Union</i>
<i>FDIS</i>	<i>Final Draft International Standard</i>
<i>hEN</i>	<i>Harmonised European Standard</i>
<i>IEC</i>	<i>International Electrotechnical Commission</i>
<i>ISO</i>	<i>International Organization for Standardization; International Standard</i>
<i>LCA</i>	<i>Life Cycle assessment</i>
<i>NMC</i>	<i>National Mirror Committee</i>
<i>NSB</i>	<i>National Standardization Body</i>
<i>NWIP</i>	<i>New Work Item Proposal</i>
<i>PWI</i>	<i>Preliminary Work Item</i>
<i>SC</i>	<i>Subcommittee</i>
<i>TC</i>	<i>Technical Committee</i>
<i>TR</i>	<i>Technical Report</i>
<i>TS</i>	<i>Technical Specification</i>
<i>UNE</i>	<i>Spanish Association For Standardization</i>
<i>WD</i>	<i>Working Draft</i>
<i>WG</i>	<i>Working Group</i>
<i>WI</i>	<i>Work Item</i>
<i>WP</i>	<i>Work Package</i>
<i>WS</i>	<i>Workshop</i>

## 0 Executive summary

Standardization activities in upPE-T aims to increase the impact of the project in the European industry. In fact, the transfer of upPE-T outcomes to standards that are widely recognized by the industry and that are developed in a system external to the Consortium will ease the market uptake of these results and their impact beyond the duration of the project. Additionally, the standardization system is an excellent dissemination channel towards the stakeholders represented in the standardization committees.

This document has been developed in the framework of Task 7.4 “Standardization contribution” and in particular, Activity 7.4.2 “Contribution to the ongoing and future standardization developments” and collects the strategy actions for the contribution to standardization of upPE-T project, as well as the results obtained until the moment of the publication of this deliverable.

The Spanish Association for Standardization (UNE), as National Standardization Body (NSB), member of CEN-CENELEC and of ISO-IEC, is member of upPE-T to provide support regarding the standardization tasks included in the project (WP7 “Exploitation, dissemination, business plan & IPR Management”).



## 1 Introduction

The main objective of the standardization activities in upPE-T is to facilitate the market acceptance of the results, by transferring these outcomes and findings to new standards. Standards have a wide recognition in the market as main technical codes, especially among industry, customers and public administrations, which many times use them to specify technical requirements or expected levels of performance.

The inclusion of project outcomes in new standards, external to the consortium, that can be easily used by the European or international industry and public administrations, is useful to increase the footprint left by the project, complementing the role of scientific publications and other dissemination and communication activities.

With this aim, task T7.4 'Standardization activities' was included in the upPE-T planning from the beginning of the project. As a first step, this task consisted of carrying out a study on the existing standards of interest for the development of the different work packages, together with the identification of standardization technical bodies developing related activities. That study was reported in deliverables D7.11 and D7.12 "Standardization contribution", produced in M6 and M12, respectively.

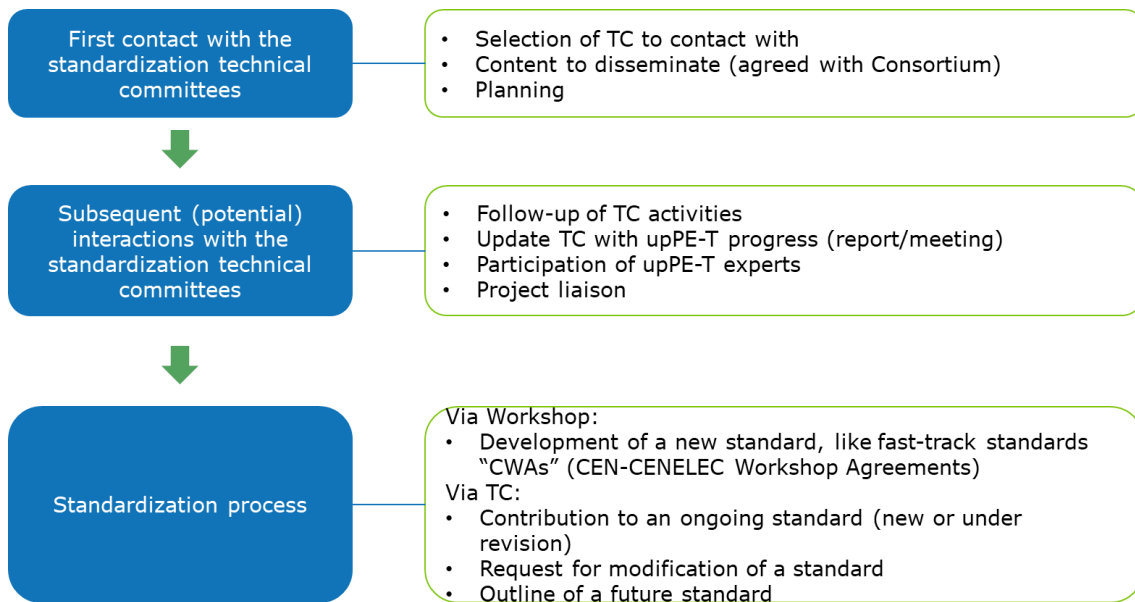
The present deliverable is also part of Task 7.4 "Standardization activities" and is based on the conclusions of previous deliverables D7.11 and D7.12, which revealed the need to introduce several actions to interact with the standardization system for disseminating the project findings, as well as to contribute to ongoing standards under development or future standards.

This deliverable aims to record the actions to be performed and the results obtained or expected during the three stages in which the contribution to the standardization process is divided, which will be presented in the next clause.

## 2 Strategy

The contribution to standardization of upPE-T is based on the interaction with the relevant Standardization Technical Committees (TC) and on the initiation of a standardization process. The strategy comprises the actions represented in Figure 1, which are explained below with further detail.

**Figure 1: Strategy for the contribution to standardization of upPE-T**



### 2.1 First contact with the standardization technical committees

The objective of this first contact is to raise awareness about upPE-T among the relevant standardization committees and to ease subsequent communications.

Different categories of stakeholders at European/international level are present in these committees, so the standardization system is used as a targeted dissemination channel.

Feedback is asked to gather any view, opinion or advise about the project and the standardization possibilities or needs. Additionally, these first contacts are expected to be useful to determine the best path towards the initiation of a standardization process.

### 2.2 Subsequent interaction with the standardization technical committees

Different relationships can be established with the relevant CEN/CENELEC, ISO/IEC technical committees. Two factors determine the more suitable interactions:

- the impact/relevance of the standardization work of the standardization committees.
- the feasibility of initiating a standardization process within a standardization committee (versus initiating the standardization process within a standardization workshop).

The ways of interaction of the project with the standardization committees include:

1. **Follow-up of the activity of the relevant standardization committees.**

This allows to detect the initiation of standardization works that can be relevant for upPE-T and the progress of significant existing standards under-development. This is achievable through a periodical monitoring of the standardization activity resulting in updates of D7.11, which offered a first analysis of the standardization technical committees and standards that are relevant for the project.

2. **Further contact with the standardization committees to update the progress of upPE-T.** This is achievable by delivering reports, attending relevant technical committees' meetings or taking advantage of joint events. On the one hand, this action contributes to further dissemination of the project and can guide the initiation of the standardization process; on the other hand, this further contact is mandatory towards the standardization committees directly covering (if that were the case) the subject that will be promoted by upPE-T to undergo a standardization process.

3. **Participation of one or more upPE-T partners in the standardization technical committees.** Standardization is an open activity, and all interested parties may participate in the technical committees through the designation of their National Standardization Body (NSB). This option allows a more in-depth monitoring of the activity of a standardization committee and is valuable if the standardization process is to be initiated within the standardization committee.

4. **Establishment of a formal liaison of upPE-T with the standardization committees.** It is recommended only when the work of the standardization committee is closely linked with the main goals of the project and a direct technical contribution from the project is expected. The figure of project liaison is recognized in CEN/CENELEC but it is not very effective in ISO/IEC.

The objectives of the interaction with the relevant standardization committees are:

- Facilitate the subsequent contribution to standardization allowing the related standardization committees an advance knowledge of upPE-T and to comment about the standardization possibilities.
- Disseminate the results and objectives of the project using the network of the standardization community, and
- Gather any feedback that may come from the standardization community regarding the development of the project.

### 2.3 Standardization process

UpPE-T aims to effectively contribute to the development of new standards based on the results of the project.

Different options to contribute to standardization shall be analyzed according to the specific conditions of each project, considering the kind of the results expected, time availability, intellectual property protection strategy, etc., and the standardization context (the existence of closely related standards and position of the standardization committees):

1. **Development of a new standard within a standardization workshop.** A standardization workshop is a group of entities with a common interest in developing a standard about a specific issue. It is the equivalent to the standardization committee, but the number of participants is typically smaller and the working procedures are faster and more flexible. A standardization workshop is created when there is a need for developing a precise standard in an innovative field that is not covered by the existing standardization committees, or when these committees are not interested in developing such standard (e.g. it does not fit in their work programme). If the subject is close to the field covered by a standardization committee, they shall be informed and consent to the standardization workshop to be launched.

Considering that the standardization workshop option is interesting for upPE-T mainly in the European environment, the standardization workshop will be named hereinafter as CEN Workshop or CENELEC Workshop. The standard produced by a CEN/CENELEC Workshop is called CEN Workshop Agreement or CENELEC Workshop Agreement, typically named as CWA. The nature and timeline for the development

of CWAs is very suitable in the framework of the Research & Innovation (R&I) projects.

2. **Standardization within a standardization committee.** It may be interesting or necessary for upPE-T results to go through the standardization process within a standardization committee. The possible scenarios are:
  - i. **Develop a new standard within a standardization committee.** When there is a result of upPE-T to be promoted to a standard in a field covered by a standardization committee and such a committee decides to include this development in its work programme. The resulting standard would have the support of the standardization committee, but the work shall be adapted to the internal timeline of such standardization committee and could go beyond the timeframe of the project.
  - ii. **Contribute to an on-going standard.** As a consequence of the monitoring of the standardization landscape, it may be found that upPE-T results are covered by an on-going standard but that these results do not fit in the current draft of the standard. Gaps in standards may be found both in standards that are being developed from a new initiative, and standards already published that are going under a review process towards a new version.
  - iii. **Request the modification of a standard that is not under development or review.** The gap may also be found in published standards that are not under any work within the standardization committee. In this case, a fully justified modification request can be submitted to the standardization committee.
  - iv. **Outline of a future standard.** Only when there is not a clear view on a full roadmap for the contribution to standardization (like lack of agreement within the Consortium or lack of the expected results).

### 3 Implementation

The actions and approach to be taken for the implementation of each of the steps of the strategy described in clause 2 are detailed below.

#### 3.1 First contact with the standardization technical committees

To undertake this action, the relevance of the standardization committees identified at earlier stages was considered.

It has been noticed that, among the topics indicated in D7.11, upPE-T will bring innovation to the following ones:

- Plastics
- Biodegradable plastics
- Recycled plastics
- Thermoplastics
- Plastic packaging
- Food & drink packaging
- Life Cycle Assessment
- Packaging and environment

Table 1 includes the topics and standardization committees proposed for creating contacts with the objectives described in 2.1:

**Table 1: Identification of standardization committees to be contacted**

<b>Standardization technical committee</b>	<b>Relevant topics</b>
CEN/TC 249 Plastics	Plastics, biodegradable plastics, recycled plastics, thermoplastics, plastic packaging
CEN/TC 261 Packaging	Plastic packaging, food & drink packaging, packaging and environment
CEN/TC 261/SC 4 Packaging and Environment	Plastic packaging, food & drink packaging, Life Cycle Assessment, packaging and environment
ISO/TC 61 Plastics	Plastics, biodegradable plastics, recycled plastics, thermoplastics, plastic packaging
ISO/TC 122 Packaging	Plastic packaging, food & drink packaging
ISO/TC 122/SC 4 Packaging and the environment	Plastic packaging, Life Cycle Assessment, packaging and environment

ISO/TC 61/SC 14 Environmental aspects	Recycled plastics, Life Cycle Assessment, packaging and environment
ISO/TC 207 Environmental management	Recycled plastics, Life Cycle Assessment, packaging and environment

Relevant outcomes of upPE-T project are expected to be obtained in different innovation areas, like:

- PE and PET enzymatic depolymerisation
- Conditioning of alkanes, TPA, EG to produce PHBV
- PHBV production
- PHBV formulation and compounding
- PHBV transformation into food packaging

For the rest of the topics identified in D7.11 (e.g. polyethylene, polyethylene terephthalate, migration test methods), their consideration is expected to be useful in terms of compatibility of the developments of upPE-T.

First contacts with technical standardization bodies were carried out in the period M17-M20.

The contacts were addressed to the Secretary/Convenor of each selected standardization committee and subcommittee.

The text for the communication includes:

- Brief introduction of the project.
- Explanation of the aim of the standardization activities in the project. Presentation of UNE as part of the standardization community and as the project partner leading these activities
- The link of the work developed in upPE-T with the relevant standardization committee highlighting specific project objectives and relevant standards.
- Link to the upPE-T webpage.

The general text can be consulted in Annex A. In addition, a brief document was attached to the communication summarizing the most important data of the project. This document was circulated and agreed by the consortium.

The support of the coordinator and upPE-T partners is needed to summarize the relevant progress and validate the information to disseminate avoiding any confidential content.

### 3.2 Subsequent interaction with the standardization technical committees

The implementation of the actions aiming at creating follow-up interactions with the standardization technical committees starts with the monitoring of the work of the standardization committees identified in D7.11.

This surveillance also includes the analysis of European standardization workshops. The monitoring of the relevant standardization activity is a continuous activity during the duration of upPE-T.

The standardization committees included in Table 1 will be updated with the relevant progress in upPE-T. This will be done by updating the report/information provided in the first contacts and, at the same time, keeping open the possibility of having face to face interactions (e.g. attending a meeting of the standardization committee, if feasible).

The programming of these updates depends on the reactions to the first contacts and on when the relevant outcomes of upPE-T are delivered.

At the same time, if an opportunity for a face-to-face interaction arises, it would be done when feasible. In that case, the implication of the Coordinator/Partners will be needed to explain the technical details.

In general, the communication has been extended to the committee members through the respective secretaries, inviting them to send any feedback or comments that they considered relevant for their activity.

Following this communication, some of the most relevant observations are highlighted below:

- As a result of contacting ISO/TC 61/SC 14 "Environmental aspects", it has been pointed out that, although the status of the project doesn't seem to be very concrete in terms of standardization, in case a new work item proposal was initiated, this could be of interest for ISO/TC 61/SC 14/WG 5 "Mechanical and chemical recycling".
- For their part, the ISO/TC 122/SC 4 "Packaging and the environment" has expressed its willingness to discuss how to facilitate the standardization process within the ISO/TC 122/SC 4 in case the project points to one or more standardization needs related to their scope. The consortium is also invited to update them on progress or to share information with the subcommittee, including the possibility to arrange a conversation if preferred.

In the following months it is expected to continue the interaction with these technical bodies. Further engagement with the standardization committees (i.e. the participation of members of upPE-T in these committees and the consideration of a project liaison) will be



determined according to the outcomes of the described communications and the approach of the standardization process illustrated in 2.3.

### 3.3 Standardization process

Based on the identification of standardizable results, the standardization landscape at the moment (result of the interaction with the standardization committees and the monitoring of their standardization works) and the progress of the project, the most suitable roadmap among the options described in 2.3 will be selected and conducted.

A dedicated standardization session to work on the identification of the standardizable results and the election of the roadmap could be appropriate as a good opportunity to present and evaluate the different options available and to clarify any doubt regarding the standardization process. This session could take place during a physical project meeting or on-line. A tentative date for this standardization session is M30.

The standardization process is considered very valuable for the market uptake of the results of upPE-T and for the impact of the project beyond the financing period. The decisions taken, the actions performed, and the results obtained will be properly registered in D7.15.

### 3.4 Summary of the implementation

The summary of the tentative dates and the responsible for the actions is included in Table 2:

**Table 2: Summary of the actions in the strategy towards a contribution to standardization**

Action	Responsible	Month
First contacts with the standardization committees in Table 1	UNE (content agreed by consortium)	M17-M20
Updates on the standardization landscape	UNE	Continuous but formally at: M12 M24
Provision of updated report/information to the	UNE (content provided by Coordinator)	M24

standardization committees identified in Table 1		M36 Whenever it is demanded
Face to face interaction with the relevant standardization committees	UNE and Coordinator/Partners	When relevant
Standardization session	UNE	M30
Standardization process	UNE and Coordinator/Partners	M30-M48

## 4 Additional actions

### 4.1 Information on the progress of the standardisation work through the interaction with technical bodies

The benefits obtained from the participation of one or more upPE-T partners in standardization technical bodies were explained in subclause 2.2.

Regarding the upPE-T project, there is a partner member who participates as an expert in different working groups of standardization committees.

The following is a compilation of the relevant developments provided by Ines Fritz (BOKU) in relation to issues of relevance to the project. The most relevant drafts that are being worked on are:

- In CEN/TC 261/SC 4/WG 2 “Degradability and organic recovery of packaging and packaging materials” as drafting body:
  - Work on the revision of EN 13432:2000 on packaging for organic recovery.
  - FprEN 17428, on the determination of the degree of disintegration in home compost. This under development standard was in a first voting stage (Formal Vote) that resulted in no agreement and is currently delayed since there is honest concern about the methods.
  - Work on the revision of EN 17427:2022 on home compostable carrier bags, which is dependent on FprEN 17428 “Packaging - Determination of the degree of disintegration under simulated home composting conditions”. There are doubts about the benefit of composting carrier bags (shopping bags) at home.
- In CEN/TC 249/WG 9 “Bio-based and biodegradable plastics”:
  - FprCEN/TR 17910 “Biodegradable plastics - Status of standardization and new prospects”. This technical report is in Formal Vote stage. It is one of the most interesting and impactful technical reports since years as it summarises methods, limits and terminology about biodegradable products and provides not only definitions but extended explanations for non-scientists.

Ines Fritz also is a corresponding member in ISO/TC 61/WG 14 “Environmental aspects”, in which significant work is done for marine biodegradability determination and for analysis of plastic residues (microplastic) in several media, such as surface water, groundwater and soil.

#### 4.2 Workshop “Standardization in plastics and in circular economy”

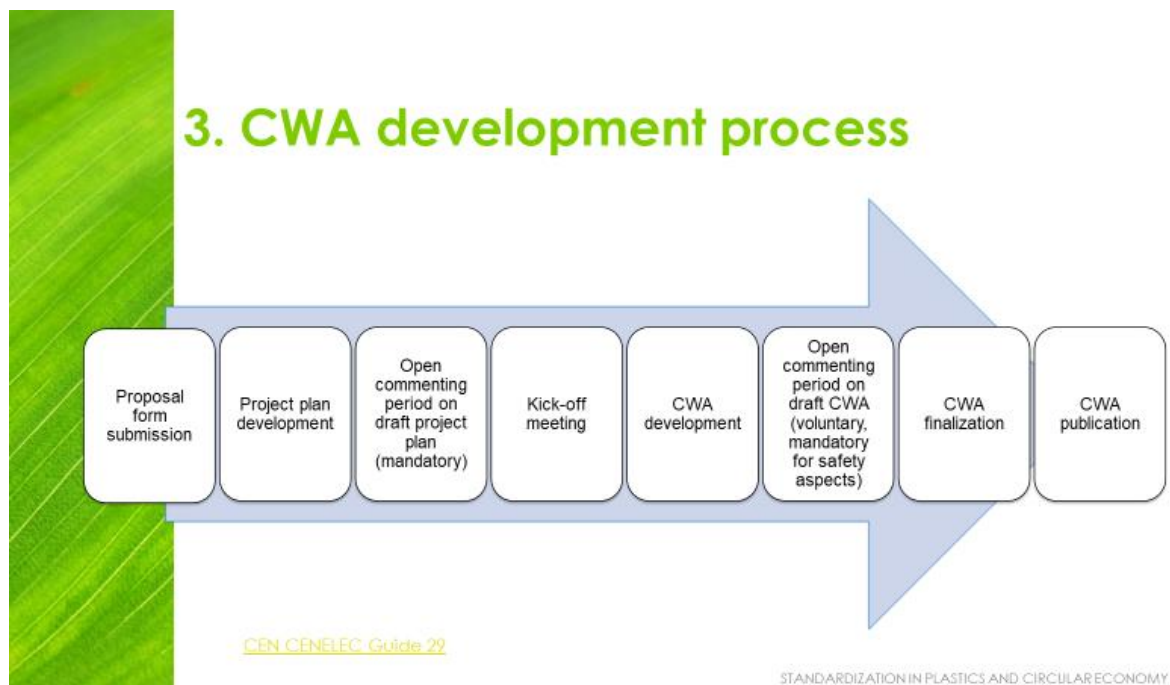
UpPE-T has participated in the joint workshop "Standardization in plastics and in circular economy", together with two sister projects [PRESERVE](#) and [UPLIFT](#), which was held in April 2022.

The three projects, related to bio-based packaging, are EU-funded projects under the European Union’s Horizon 2020 Research and Innovation Programme. These projects are all working to upcycle food and drinks packaging through different technologies such as biological depolymerisation, enzymatic technologies and enzymes compounding.

The aim of the event was to build a high-level meeting point for stakeholders across Europe to show how standardization can support valorising research and innovation (R&I) results.


During the mentioned workshop, the concept of CEN-CENELEC Workshop Agreements (CWAs) was presented, including the CWA development process (see Figure 2).

**Figure 2: CWA development process [Workshop “Standardization in plastics and in circular economy”]**



Conclusions are compiled in Figure 3.

**Figure 3: Conclusions [Workshop “Standardization in plastics and in circular economy”]**



## 4. Conclusions

- **A CWA is:**
  - ✓ A CEN/CENELEC deliverable
  - ✓ Developed and agreed by the participants in a temporary working group (Workshop)
  - ✓ Designed to meet an immediate need (includes innovation)
- **Reasons to develop a CWA:**
  - ✓ It can be quickly developed
  - ✓ Possibility to use already “done documents” as a basis
  - ✓ It can be used as a fast track to future standardization activities (CEN standard in the future)
  - ✓ It gives more visibility to the project within industry and standardization system

**The development of a CWA is probably the best formula to contribute to standardization within the framework of R&I Projects**

### 4.3 Updated list of standards related to upPE-T project

Table 3 contains a list of new standards related to plastic materials and properties that are considered as relevant for upPE-T project since the delivery of D7.12. The complete list of standards related to plastic materials and properties is contained in Table B.1.

**Table 3: New standards related to plastic materials and properties for upPE-T project**

Reference	Document title
ISO/DIS 5677	Testing and characterization of mechanically recycled Polypropylene (PP) and Polyethylene (PE) for intended use in different plastics processing techniques
EN 17679:2022	Plastics - Plastic films - Determination of tear resistance using a trapezoidal test specimen with incision
ISO 1133-1:2022	Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 1: Standard method
ISO 11357-7:2022	Plastics — Differential scanning calorimetry (DSC) — Part 7: Determination of crystallization kinetics
ISO 11358-1:2022	Plastics — Thermogravimetry (TG) of polymers — Part 1:

	General principles
ISO 11359-2:2021	Plastics — Thermomechanical analysis (TMA) — Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature
ISO 11403-2:2022	Plastics — Acquisition and presentation of comparable multipoint data — Part 2: Thermal and processing properties
ISO 14782:2021	Plastics — Determination of haze for transparent materials
ISO 15527:2022	Plastics — Compression-moulded sheets of polyethylene (PE-UHMW, PE-HD) — Requirements and test methods
ISO 22007-2:2022	Plastics — Determination of thermal conductivity and thermal diffusivity — Part 2: Transient plane heat source (hot disc) method
ISO 3146:2022	Plastics — Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods
ISO 3915:2022	Plastics — Measurement of resistivity of conductive plastics
ISO 4765:2022	Chemically-induced ultra-weak photon emission (UPE) — Measurement as an analysis method of degradation of polymeric material
ISO 489:2022	Plastics — Determination of refractive index
ISO 5623:2022	Plastics — Joining of thermoplastic moulded components — Specification for quality levels for imperfections
ISO 6721-12:2022	Plastics — Determination of dynamic mechanical properties — Part 12: Compressive vibration — Non-resonance method
ISO 7765-2:2022	Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 2: Instrumented puncture test
ISO 871:2022	Plastics — Determination of ignition temperature using a hot-air furnace
ISO 8985:2022	Plastics — Ethylene/vinyl acetate copolymer (EVAC) thermoplastics — Determination of vinyl acetate content

Table 4 contains a list of new standards related to packaging and use of plastics that are considered as relevant for upPE-T project since the delivery of D7.12. The complete list of standards related to packaging and use of plastics is contained in Table B.2.

**Table 4: New standards related to packaging and use of plastics for upPE-T project**

Reference	Document title
EN 1186-2:2022	Materials and articles in contact with foodstuffs - Plastics - Part 2: Test methods for overall migration in vegetable oils
EN 1186-3:2022	Materials and articles in contact with foodstuffs - Plastics - Part 3: Test methods for overall migration in evaporable simulants
EN 13045:2022	Packaging - Flexible cylindrical plastic tubes - Dimensions and tolerances
EN 16592:2022	Packaging - Rigid plastic containers - PET finish 29/25 (12,6)
EN 17665:2022	Packaging - Test methods and requirements to demonstrate that plastic caps and lids remain attached to beverage containers
FprEN 17427:2021	Packaging — Requirements and test scheme for carrier bags suitable for treatment in well-managed home composting installations
FprEN 17428	Packaging - Determination of the degree of disintegration under simulated home composting conditions
FprCEN/TR 17910	Biodegradable plastics - Status of standardization and new prospects

Table 5 contains a list of new standards related to environment management and life cycle assessment that are considered as relevant for upPE-T project since the delivery of D7.12. The complete list of standards related to environment management and life cycle assessment is contained in Table B.3.

**Table 5: New standards related to environment management and life cycle assessment for upPE-T project**

Reference	Document title
EN 15942:2021	Sustainability of construction works - Environmental product declarations - Communication format business-to-business
EN 17615:2022	Plastics - Environmental Aspects - Vocabulary
ISO 21931-1:2022	Sustainability in buildings and civil engineering works — Framework for methods of assessment of the environmental, social and economic performance of construction works as a basis for sustainability assessment — Part 1: Buildings

ISO/WD 4924	Eco-design principle, requirement and guideline for express packaging
ISO/WD TR 18607	Packaging—Packaging and the environment — Guidebook for environment conscious designing of packaging based on ISO 18600 series of standards



## Annex A: Communication with the standardization technical committees

### A.1 First contact letter

Dear Mr, Ms XXX

I'm addressing you on behalf of the H2020 project upPE-T, whose aim is to become an innovative alternative to the habitual recycling techniques of PE and PET food and drink packaging wastes, involving sustainable strategies, through enzymatic engineering for PE and PET depolymerization. PE and PET waste streams are expected to be turned into raw material to produce biodegradable bioplastics by means of enzymatic degradation and microbial assimilation.

The objectives of the project include simplifying the downstream bioplastic recovery process from cell biomass using an efficient and green extraction approach without the use of toxic solvents.

As part of this project, under the responsibility of UNE (Spanish Standardization Body) representing CEN/CENELEC in upPE-T specific standardization activities are included to:

- Ensure compatibility with existing technologies by the identification of relevant existing standards
- Maximize dissemination to proper stakeholders by addressing the relevant standardization technical committees and
- Contribute with the findings and knowledge generated during the project to the development of standardization in the field

[Special mention to the technical committee contacted]

The objective of this contact is, on the one hand, to raise awareness on the project to this TC and gather feedback on any suggestion, question, or comment. On the other hand, it is intended that in the second half of the project it contributes to standardization from selected project results. Depending on several factors such as the nature of these results and the standardization landscape at that moment, this contribution to standardization may be oriented towards the generation of new pre-standards (Workshop Agreements) or to participation at TC level.

Please, find attached a brief summary containing the most relevant information about upPE-T (further detail in [webpage](#)). Feel free to circulate this information to your TC members or to anyone you consider potentially interested in the objectives and results of the project. Now the project is 1/3 progressed and we would be very grateful if you could give us feedback regarding the interest of this project for the activity of the TC. Additionally, any suggestion, question or comment related to the project would be very useful.

If you find that additional information would be welcome, as well as other kinds of contact (a dedicated telco, attending a TC, SC or WG meeting to explain the project, etc.) we would be pleased to address it.

I would appreciate it if you could provide at least initial feedback by the end of April.

Thank you in advance for your attention and looking forward for your reply.

## A.2 Brief summary



H2020-NMBP-TR-IND-2020-twostage  
RIA  
GRANT AGREEMENT: 953214



### PROJECT OVERVIEW

The upPE-T project aims upcycling recalcitrant oil-based plastics by bioconversion into biodegradable bioplastic for food and drink packaging production.

Plastic packaging, which makes up nearly 60% of the total plastic waste in Europe, is highly problematic from a waste management- and environmental- point of view due to their durability and resistance to degradation. Polyethylene (PE) and Polyethylene terephthalate (PET) are the leading plastic use in food and drink packaging (43% PE and 19% PET). The sustainable management of this plastic waste has become a very challenging problem for global society.

upPE-T includes sustainable strategies as an alternative for plastic chemical degradation, improving PE and PET depolymerization through enzymatic engineering to positively impact food and drink packaging recycling rate and achieving the European Union expected impact.

PE and PET waste streams are expected to be turned into raw material to produce biodegradable bioplastics by means of enzymatic degradation and microbial assimilation. In addition, the objectives of the project include simplifying the downstream bioplastic recovery process from cell biomass using an efficient and green extraction approach without the use of toxic solvents.

Finally, together with customers and food and drink brand owners, bio-based end-packaging will be demonstrated and validated to ensure fast market deployment.

Additionally, in order to ensure 100% of PE and PET recyclability, plastic rejections not optimal for microbial bioconversion into bioplastics will be valorized by their use in building applications instead of being sent to incineration or landfilling.

upPE-T will be an important part of the actions for compliance with the European Strategy for Plastics in a Circular Economy.



## OBJECTIVES

- Objective 1: Demonstrate the technical feasibility of enzymatic technologies to degrade PET and PE wastes.
- Objective 2: Demonstrate the technical feasibility of the biotechnological production of a range of PHBV biodegradable biopolymers by using the products resulting from PET and PE enzymatic degradation.
- Objective 3: Develop PHBV based compound grades with the required processability and performance for flexible, rigid and semirigid food and drink packaging.
- Objective 4: Ensure the sustainability of upPET from an environmental, economic and social point of view, while increasing European citizens' awareness of food and beverage packaging recycling and the concept of upcycling and developing new standards and certification systems to ensure market acceptance and use of the developed solutions.

## OVERALL METHODOLOGY



## PARTNERS

1. ASOCIACION EMPRESARIAL DE INVESTIGACION CENTRO TECNOLOGICO DEL CALZADO Y DEL PLASTICO DE LA REGION DE MURCIA (CETEC)
2. ENZYMICALS AG (ENZYMICALS AG)
3. DRUSTVO SA OGRANICENOM ODGOVORNOSCU ECO Plastics Beograd CUKARICA (Eco Plastics)
4. ASOCIACION PARA LA PROMOCION, INVESTIGACION, DESARROLLO E INNOVACION TECNOLOGICA DE LA INDUSTRIA DEL CALZADO Y CONEXAS DE LA RIOJA (CTCR APIDIT)
5. UNIVERSITAET FUER BODENKULTUR WIEN (BOKU)
6. TAMPEREEN KORKEAKOULUSAATIO SR (TAU) TAMPEREEN KORKEAKOULUSAATIO SR (TAU)
7. LAPPEENRANNAN-LAHDEN TEKNILLINEN YLIOPISTO LUT (LUT University),
8. TECNOALIMENTI S.C.P.A. (TCA)
9. INSTITUT ZA RAZVOJ I INOVACIJE - IRI (IRI)
10. DIGIOTOUCH OU (Digiotouch)
11. UNIONE NAZIONALE CONSUMATORI UMBRIA (UNC)
12. DIMOS NEAS SMYRNI (MoNS)
13. DURUKAN SEKERLEME SANAYI VE TICARETANONIM SIRKETI (CONFECTIONERY)
14. ASOCIACION ESPANOLA DE NORMALIZACION (UNE)
15. CETEC BIOTECHNOLOGY SL (CETBIO)
16. UNIVERSIDAD DE ALICANTE (UA)
17. BIO-MI DRUSTVO S OGRANICENOM ODGOVORNOSCU ZA PROIZVODNJU, ISTRAZIVANJEI RAZVOJ (BIO-MI)
18. VILLANI SPA (VILL)
19. MOSES PRODUCTOS SL (MOSES)
20. UNIVERSITAET GREIFSWALD (UG)

## Annex B: Complete list of standards related to upPE-T

**Table B.1: Standards related to plastic materials and properties for upPE-T project**

Reference	Document title
prEN 15347	Plastics - Recycled plastics - Characterisation of sorted plastics wastes
prEN 15348	Plastics - Recycled plastics - Characterization of poly(ethylene terephthalate) (PET) recyclates
ISO/DIS 22526-4	Plastics — Carbon and environmental footprint of biobased plastics — Part 4: Environmental (total) footprint (Life Cycle Assessment)
ISO/DIS 5677	Testing and characterization of mechanically recycled Polypropylene (PP) and Polyethylene (PE) for intended use in different plastics processing techniques
CEN/TR 15351:2006	Plastics - Guide for vocabulary in the field of degradable and biodegradable polymers and plastic items
CEN/TR 15353:2007	Plastics - Recycled plastics - Guidelines for the development of standards for recycled plastics
CEN/TR 17219:2018	Plastics - Biodegradable thermoplastic mulch films for use in agriculture and horticulture - Guide for the quantification of alteration of films
CEN/TS 16010:2020	Plastics - Recycled plastics - Sampling procedures for testing plastics waste and recyclates
CEN/TS 16011:2013	Plastics - Recycled plastics - Sample preparation
CEN/TS 16861:2015	Plastics - Recycled plastics - Determination of selected marker compounds in food grade recycled polyethylene terephthalate (PET)
CEN/TS 16892:2015	Plastics - Welding of thermoplastics - Specification of welding procedures
CEN/TS 17627:2021	Plastics - Recycled plastics - Determination of solid contaminants content
EN 12943:1999	Filler materials for thermoplastics - Scope, designation, requirements, tests
EN 13206:2017+A1:2020	Plastics - Thermoplastic covering films for use in agriculture and horticulture
EN 13207:2018	Plastics - Thermoplastic silage films and tubes for use in agriculture

EN 13655:2018	Plastics - Thermoplastic mulch films recoverable after use, for use in agriculture and horticulture
EN 13705:2004	Welding of thermoplastics - Machines and equipment for hot gas welding (including extrusion welding)
EN 14728:2019	Imperfections in thermoplastic welds - Classification
EN 14995:2006	Plastics - Evaluation of compostability - Test scheme and specifications
EN 15343:2007	Plastics - Recycled Plastics - Plastics recycling traceability and assessment of conformity and recycled content
EN 15344:2021	Plastics - Recycled plastics - Characterization of Polyethylene (PE) recyclates
EN 15347:2007	Plastics - Recycled Plastics - Characterisation of plastics wastes
EN 15348:2014	Plastics - Recycled plastics - Characterization of poly(ethylene terephthalate) (PET) recyclates
EN 15860:2018	Plastics - Thermoplastic semi-finished products for machining - Requirements and test methods
EN 16472:2014	Plastics - Method for artificial accelerated photoaging using medium pressure mercury vapour lamps
EN 16795:2015	Plastics - Method for estimating heat build up of flat surfaces by simulated solar radiation
EN 17033:2018	Plastics - Biodegradable mulch films for use in agriculture and horticulture - Requirements and test methods
EN 17417:2020	Determination of the ultimate biodegradation of plastics materials in an aqueous system under anoxic (denitrifying) conditions - Method by measurement of pressure increase
EN 17679:2022	Plastics - Plastic films - Determination of tear resistance using a trapezoidal test specimen with incision
ISO 10093:2020	Plastics — Fire tests — Standard ignition sources
ISO 10350-1:2017	Plastics — Acquisition and presentation of comparable single-point data — Part 1: Moulding materials
ISO 1043-1:2011	Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics
ISO 1043-1:2011/Amd 1:2016	Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics — Amendment 1: New symbol ST for syndiotactic



ISO 1043-2:2011	Plastics — Symbols and abbreviated terms — Part 2: Fillers and reinforcing materials
ISO 1043-3:2016	Plastics — Symbols and abbreviated terms — Part 3: Plasticizers
ISO 1043-4:2021	Plastics — Symbols and abbreviated terms — Part 4: Flame retardants
ISO 10640:2011	Plastics — Methodology for assessing polymer photoageing by FTIR and UV/visible spectroscopy
ISO 10840:2008	Plastics — Guidance for the use of standard fire tests
ISO 10927:2018	Plastics — Determination of the molecular mass and molecular mass distribution of polymer species by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF-MS)
ISO 11248:1993	Plastics — Thermosetting moulding materials — Evaluation of short-term performance at elevated temperatures
ISO 1133-1:2022	Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 1: Standard method
ISO 1133-2:2011	Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 2: Method for materials sensitive to time-temperature history and/or moisture
ISO 11357-1:2016	Plastics — Differential scanning calorimetry (DSC) — Part 1: General principles
ISO 11357-2:2020	Plastics — Differential scanning calorimetry (DSC) — Part 2: Determination of glass transition temperature and step height
ISO 11357-3:2018	Plastics — Differential scanning calorimetry (DSC) — Part 3: Determination of temperature and enthalpy of melting and crystallization
ISO 11357-4:2021	Plastics — Differential scanning calorimetry (DSC) — Part 4: Determination of specific heat capacity
ISO 11357-5:2013	Plastics — Differential scanning calorimetry (DSC) — Part 5: Determination of characteristic reaction-curve temperatures and times, enthalpy of reaction and degree of conversion
ISO 11357-6:2018	Plastics — Differential scanning calorimetry (DSC) — Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)
ISO 11357-7:2022	Plastics — Differential scanning calorimetry (DSC) — Part 7: Determination of crystallization kinetics

ISO 11357-8:2021	Plastics — Differential scanning calorimetry (DSC) — Part 8: Determination of thermal conductivity
ISO 11358-1:2022	Plastics — Thermogravimetry (TG) of polymers — Part 1: General principles
ISO 11358-2:2021	Plastics — Thermogravimetry (TG) of polymers — Part 2: Determination of activation energy
ISO 11358-3:2021	Plastics — Thermogravimetry (TG) of polymers — Part 3: Determination of the activation energy using the Ozawa-Friedman plot and analysis of the reaction kinetics
ISO 11359-1:2014	Plastics — Thermomechanical analysis (TMA) — Part 1: General principles
ISO 11359-2:2021	Plastics — Thermomechanical analysis (TMA) — Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature
ISO 11359-3:2019	Plastics — Thermomechanical analysis (TMA) — Part 3: Determination of penetration temperature
ISO 11403-1:2021	Plastics — Acquisition and presentation of comparable multipoint data — Part 1: Mechanical properties
ISO 11403-2:2022	Plastics — Acquisition and presentation of comparable multipoint data — Part 2: Thermal and processing properties
ISO 11403-3:2021	Plastics — Acquisition and presentation of comparable multipoint data — Part 3: Environmental influences on properties
ISO 11443:2021	Plastics — Determination of the fluidity of plastics using capillary and slit-die rheometers
ISO 11469:2016	Plastics — Generic identification and marking of plastics products
ISO 11501:1995	Plastics — Film and sheeting — Determination of dimensional change on heating
ISO 11502:2018	Plastics — Film and sheeting — Determination of blocking resistance
ISO 1183-1:2019	Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method
ISO 1183-2:2019	Plastics — Methods for determining the density of non-cellular plastics — Part 2: Density gradient column method
ISO 1183-3:1999	Plastics — Methods for determining the density of non-cellular plastics — Part 3: Gas pycnometer method



ISO 11907-1:2019	Plastics — Smoke generation — Determination of the corrosivity of fire effluents — Part 1: General concepts and applicability
ISO 11907-4:1998	Plastics — Smoke generation — Determination of the corrosivity of fire effluents — Part 4: Dynamic decomposition method using a conical radiant heater
ISO 12058-1:2018	Plastics — Determination of viscosity using a falling-ball viscometer — Part 1: Inclined-tube method
ISO 1209-1:2007	Rigid cellular plastics — Determination of flexural properties — Part 1: Basic bending test
ISO 1209-2:2007	Rigid cellular plastics — Determination of flexural properties — Part 2: Determination of flexural strength and apparent flexural modulus of elasticity
ISO 12418-1:2012	Plastics — Post-consumer poly(ethylene terephthalate) (PET) bottle recyclates — Part 1: Designation system and basis for specifications
ISO 12418-2:2012	Plastics — Post-consumer poly(ethylene terephthalate) (PET) bottle recyclates — Part 2: Preparation of test specimens and determination of properties
ISO 12992:2017	Plastics — Vertical flame spread determination for film and sheet
ISO 13468-1:2019	Plastics — Determination of the total luminous transmittance of transparent materials — Part 1: Single-beam instrument
ISO 13468-2:2021	Plastics — Determination of the total luminous transmittance of transparent materials — Part 2: Double-beam instrument
ISO 13586:2018	Plastics — Determination of fracture toughness (GIC and KIC) — Linear elastic fracture mechanics (LEFM) approach
ISO 13636:2012	Plastics — Film and sheeting — Non-oriented poly(ethylene terephthalate) (PET) sheets
ISO 13802:2015	Plastics — Verification of pendulum impact-testing machines — Charpy, Izod and tensile impact-testing
ISO 13927:2015	Plastics — Simple heat release test using a conical radiant heater and a thermopile detector
ISO 14616:1997	Plastics — Heat shrinkable films of polyethylene, ethylene copolymers and their mixtures — Determination of shrinkage stress and contraction stress
ISO 14632:2021	Extruded sheets of polyethylene (PE-HD) — Requirements and test methods

ISO 14782:1999/Cor 1:2005	Plastics — Determination of haze for transparent materials — Technical Corrigendum 1
ISO 14782:2021	Plastics — Determination of haze for transparent materials
ISO 15015:2011	Plastics — Extruded sheets of impact-modified acrylonitrile-styrene copolymers (ABS, AEPDS and ASA) — Requirements and test methods
ISO 15033:2018	Plastics — Determination of caprolactam and its cyclic and linear oligomers by HPLC
ISO 15038:1999	Plastics — Organic-perester crosslinking agents for unsaturated-polyester thermosetting materials — Determination of active-oxygen content
ISO 15040:1999	Composites — Prepregs — Determination of gel time
ISO 15105-1:2007	Plastics — Film and sheeting — Determination of gas-transmission rate — Part 1: Differential-pressure methods
ISO 15105-2:2003	Plastics — Film and sheeting — Determination of gas-transmission rate — Part 2: Equal-pressure method
ISO 15106-1:2003	Plastics — Film and sheeting — Determination of water vapour transmission rate — Part 1: Humidity detection sensor method
ISO 15106-2:2003	Plastics — Film and sheeting — Determination of water vapour transmission rate — Part 2: Infrared detection sensor method
ISO 15106-3:2003	Plastics — Film and sheeting — Determination of water vapour transmission rate — Part 3: Electrolytic detection sensor method
ISO 15106-4:2008	Plastics — Film and sheeting — Determination of water vapour transmission rate — Part 4: Gas-chromatographic detection sensor method
ISO 15106-5:2015	Plastics — Film and sheeting — Determination of water vapour transmission rate — Part 5: Pressure sensor method
ISO 15106-6:2015	Plastics — Film and sheeting — Determination of water vapour transmission rate — Part 6: Atmospheric pressure ionization mass spectrometer method
ISO 15106-7:2015	Plastics — Film and sheeting — Determination of water vapour transmission rate — Part 7: Calcium corrosion method
ISO 15314:2018	Plastics — Methods for marine exposure
ISO 15373:2001	Plastics — Polymer dispersions — Determination of free formaldehyde
ISO 15512:2019	Plastics — Determination of water content

ISO 15527:2022	Plastics — Compression-moulded sheets of polyethylene (PE-UHMW, PE-HD) — Requirements and test methods
ISO 15791-1:2014	Plastics — Development and use of intermediate-scale fire tests for plastics products — Part 1: General guidance
ISO 15850:2014	Plastics — Determination of tension-tension fatigue crack propagation — Linear elastic fracture mechanics (LEFM) approach
ISO 15988:2003	Plastics — Film and sheeting — Biaxially oriented poly(ethylene terephthalate) (PET) films
ISO 15989:2004	Plastics — Film and sheeting — Measurement of water-contact angle of corona-treated films
ISO 15989:2004/Cor 1:2007	Plastics — Film and sheeting — Measurement of water-contact angle of corona-treated films — Technical Corrigendum 1
ISO 16012:2015	Plastics — Determination of linear dimensions of test specimens
ISO 16014-1:2019	Plastics — Determination of average molecular weight and molecular weight distribution of polymers using size-exclusion chromatography — Part 1: General principles
ISO 16014-2:2019	Plastics — Determination of average molecular weight and molecular weight distribution of polymers using size-exclusion chromatography — Part 2: Universal calibration method
ISO 16014-3:2019	Plastics — Determination of average molecular weight and molecular weight distribution of polymers using size-exclusion chromatography — Part 3: Low-temperature method
ISO 16014-4:2019	Plastics — Determination of average molecular weight and molecular weight distribution of polymers using size-exclusion chromatography — Part 4: High-temperature method
ISO 16014-5:2019	Plastics — Determination of average molecular weight and molecular weight distribution of polymers using size-exclusion chromatography — Part 5: Light-scattering method
ISO 1628-1:2021	Plastics — Determination of the viscosity of polymers in dilute solution using capillary viscometers — Part 1: General principles
ISO 1628-3:2010	Plastics — Determination of the viscosity of polymers in dilute solution using capillary viscometers — Part 3: Polyethylenes and polypropylenes
ISO 1663:2007	Rigid cellular plastics — Determination of water vapour transmission properties
ISO 16770:2019	Plastics — Determination of environmental stress cracking

	(ESC) of polyethylene — Full-notch creep test (FNCT)
ISO 16790:2021	Plastics — Determination of drawing characteristics of thermoplastics in the molten state
ISO 16869:2008	Plastics — Assessment of the effectiveness of fungistatic compounds in plastics formulations
ISO 171:1980	Plastics — Determination of bulk factor of moulding materials
ISO 17221:2014	Plastics — Determination of image clarity (degree of sharpness of reflected or transmitted image)
ISO 17223:2014	Plastics — Determination of yellowness index and change in yellowness index
ISO 17281:2018	Plastics — Determination of fracture toughness (GIC and KIC) at moderately high loading rates (1 m/s)
ISO 17282:2004	Plastics — Guide to the acquisition and presentation of design data
ISO 175:2010	Plastics — Methods of test for the determination of the effects of immersion in liquid chemicals
ISO 17541:2014	Plastics — Quantitative evaluation of scratch-induced damage and scratch visibility
ISO 176:2005	Plastics — Determination of loss of plasticizers — Activated carbon method
ISO 177:2016	Plastics — Determination of migration of plasticizers
ISO 17744:2004	Plastics — Determination of specific volume as a function of temperature and pressure (pvT diagram) — Piston apparatus method
ISO 178:2019	Plastics — Determination of flexural properties
ISO 17855-1:2014	Plastics — Polyethylene (PE) moulding and extrusion materials — Part 1: Designation system and basis for specifications
ISO 17855-2:2016	Plastics — Polyethylene (PE) moulding and extrusion materials — Part 2: Preparation of test specimens and determination of properties
ISO 179-1:2010	Plastics — Determination of Charpy impact properties — Part 1: Non-instrumented impact test
ISO 179-2:2020	Plastics — Determination of Charpy impact properties — Part 2: Instrumented impact test
ISO 180:2019	Plastics — Determination of Izod impact strength

ISO 18263-1:2015	Plastics — Mixtures of polypropylene (PP) and polyethylene (PE) recyclate derived from PP and PE used for flexible and rigid consumer packaging — Part 1: Designation system and basis for specification
ISO 18263-2:2015	Plastics — Mixtures of polypropylene (PP) and polyethylene (PE) recyclate derived from PP and PE used for flexible and rigid consumer packaging — Part 2: Preparation of test specimens and determination of properties
ISO 18872:2007	Plastics — Determination of tensile properties at high strain rates
ISO 19095-1:2015	Plastics — Evaluation of the adhesion interface performance in plastic-metal assemblies — Part 1: Guidelines for the approach
ISO 19095-2:2015	Plastics — Evaluation of the adhesion interface performance in plastic-metal assemblies — Part 2: Test specimens
ISO 19095-3:2015	Plastics — Evaluation of the adhesion interface performance in plastic-metal assemblies — Part 3: Test methods
ISO 19095-4:2015	Plastics — Evaluation of the adhesion interface performance in plastic-metal assemblies — Part 4: Environmental conditions for durability
ISO 1922:2018	Rigid cellular plastics — Determination of shear properties
ISO 1923:1981	Cellular plastics and rubbers — Determination of linear dimensions
ISO 19252:2008	Plastics — Determination of scratch properties
ISO 1926:2009	Rigid cellular plastics — Determination of tensile properties
ISO 19929:2017	Plastics — Determination of average molecular mass and mixture ratio of poly(ethylene glycol) and its derivatives by MALDI-TOF-MS
ISO 19935-1:2018	Plastics — Temperature modulated DSC — Part 1: General principles
ISO 19935-2:2020	Plastics — Temperature modulated DSC — Part 2: Measurement of specific heat capacity cp
ISO 20329:2020	Plastics — Determination of abrasive wear by reciprocating linear sliding motion
ISO 2039-1:2001	Plastics — Determination of hardness — Part 1: Ball indentation method
ISO 2039-2:1987	Plastics — Determination of hardness — Part 2: Rockwell hardness

ISO 20457:2018	Plastics moulded parts — Tolerances and acceptance conditions
ISO 20753:2018	Plastics — Test specimens
ISO 20965:2021	Plastics — Determination of the transient extensional viscosity of polymer melts
ISO 2115:1996	Plastics — Polymer dispersions — Determination of white point temperature and minimum film-forming temperature
ISO 21304-1:2019	Plastics — Ultra-high-molecular-weight polyethylene (PE-UHMW) moulding and extrusion materials — Part 1: Designation system and basis for specifications
ISO 21304-2:2021	Plastics — Ultra-high-molecular-weight polyethylene (PE-UHMW) moulding and extrusion materials — Part 2: Preparation of test specimens and determination of properties
ISO 21367:2007	Plastics — Reaction to fire — Test method for flame spread and combustion product release from vertically oriented specimens
ISO 21475:2019	Plastics — Methods of exposure to determine the wavelength dependent degradation using spectrally dispersed radiation
ISO 21509:2006	Plastics and ebonite — Verification of Shore durometers
ISO 21702:2019	Measurement of antiviral activity on plastics and other non-porous surfaces
ISO 22007-1:2017	Plastics — Determination of thermal conductivity and thermal diffusivity — Part 1: General principles
ISO 22007-2:2022	Plastics — Determination of thermal conductivity and thermal diffusivity — Part 2: Transient plane heat source (hot disc) method
ISO 22007-3:2008	Plastics — Determination of thermal conductivity and thermal diffusivity — Part 3: Temperature wave analysis method
ISO 22007-4:2017	Plastics — Determination of thermal conductivity and thermal diffusivity — Part 4: Laser flash method
ISO 22007-6:2014	Plastics — Determination of thermal conductivity and thermal diffusivity — Part 6: Comparative method for low thermal conductivities using a temperature-modulation technique
ISO 22088-1:2006	Plastics — Determination of resistance to environmental stress cracking (ESC) — Part 1: General guidance
ISO 22088-2:2006	Plastics — Determination of resistance to environmental stress cracking (ESC) — Part 2: Constant tensile load method

ISO 22088-3:2006	Plastics — Determination of resistance to environmental stress cracking (ESC) — Part 3: Bent strip method
ISO 22088-4:2006	Plastics — Determination of resistance to environmental stress cracking (ESC) — Part 4: Ball or pin impression method
ISO 22088-5:2006	Plastics — Determination of resistance to environmental stress cracking (ESC) — Part 5: Constant tensile deformation method
ISO 22088-6:2006	Plastics — Determination of resistance to environmental stress cracking (ESC) — Part 6: Slow strain rate method
ISO 22196:2011	Measurement of antibacterial activity on plastics and other non-porous surfaces
ISO 23512:2021	Plastics — Joining of thermoplastic moulded components — Specification of variables for thermal joining processes
ISO 23559:2011	Plastics — Film and sheeting — Guidance on the testing of thermoplastic films
ISO 23706:2020	Plastics — Determination of apparent activation energies of property changes in standard weathering test methods
ISO 23741:2021	Plastics — Determination of spray water delivery during spray cycles when using a xenon arc weathering test apparatus
ISO 23976:2021	Plastics — Fast differential scanning calorimetry (FSC) — Chip calorimetry
ISO 24047:2021	Plastics — Polyethylene (PE) and polypropylene (PP) thermoplastics — Determination of metal content by ICP-OES
ISO 25337:2010	Plastics — Production quality control — Statistical method for using single measurements
ISO 2577:2007	Plastics — Thermosetting moulding materials — Determination of shrinkage
ISO 2578:1993	Plastics — Determination of time-temperature limits after prolonged exposure to heat
ISO 26723:2020	Plastics — Determination of total luminous transmittance and reflectance
ISO 2818:2018	Plastics — Preparation of test specimens by machining
ISO 291:2008	Plastics — Standard atmospheres for conditioning and testing
ISO 29221:2014	Plastics — Determination of mode I plane-strain crack-arrest toughness
ISO 293:2004	Plastics — Compression moulding of test specimens of thermoplastic materials

ISO 295:2004	Plastics — Compression moulding of test specimens of thermosetting materials
ISO 29664:2010	Plastics — Artificial weathering including acidic deposition
ISO 306:2013	Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST)
ISO 3146:2022	Plastics — Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods
ISO 3167:2014	Plastics — Multipurpose test specimens
ISO 3343:2010	Reinforcement yarns — Determination of twist balance index
ISO 3344:1997	Reinforcement products — Determination of moisture content
ISO 3374:2000	Reinforcement products — Mats and fabrics — Determination of mass per unit area
ISO 3451-1:2019	Plastics — Determination of ash — Part 1: General methods
ISO 3671:1976	Plastics — Aminoplastic moulding materials — Determination of volatile matter
ISO 3915:2022	Plastics — Measurement of resistivity of conductive plastics
ISO 4576:1996	Plastics — Polymer dispersions — Determination of sieve residue (gross particle and coagulum content)
ISO 458-1:1985	Plastics — Determination of stiffness in torsion of flexible materials — Part 1: General method
ISO 458-2:1985	Plastics — Determination of stiffness in torsion of flexible materials — Part 2: Application to plasticized compounds of homopolymers and copolymers of vinyl chloride
ISO 4582:2017	Plastics — Determination of changes in colour and variations in properties after exposure to glass-filtered solar radiation, natural weathering or laboratory radiation sources
ISO 4589-1:2017	Plastics — Determination of burning behaviour by oxygen index — Part 1: General requirements
ISO 4589-2:2017	Plastics — Determination of burning behaviour by oxygen index — Part 2: Ambient-temperature test
ISO 4589-3:2017	Plastics — Determination of burning behaviour by oxygen index — Part 3: Elevated-temperature test
ISO 4589-4:2021	Plastics — Determination of burning behaviour by oxygen index — Part 4: High gas velocity test



ISO 4590:2016	Rigid cellular plastics — Determination of the volume percentage of open cells and of closed cells
ISO 4591:1992	Plastics — Film and sheeting — Determination of average thickness of a sample, and average thickness and yield of a roll, by gravimetric techniques (gravimetric thickness)
ISO 4592:1992	Plastics — Film and sheeting — Determination of length and width
ISO 4593:1993	Plastics — Film and sheeting — Determination of thickness by mechanical scanning
ISO 4602:2010	Reinforcements — Woven fabrics — Determination of number of yarns per unit length of warp and weft
ISO 4604:2011	Reinforcement fabrics — Determination of conventional flexural stiffness — Fixed-angle flexometer method
ISO 4611:2010	Plastics — Determination of the effects of exposure to damp heat, water spray and salt mist
ISO 472:2013	Plastics — Vocabulary
ISO 472:2013/Amd 1:2018	Plastics — Vocabulary — Amendment 1: Additional items
ISO 4765:2022	Chemically-induced ultra-weak photon emission (UPE) — Measurement as an analysis method of degradation of polymeric material
ISO 483:2005	Plastics — Small enclosures for conditioning and testing using aqueous solutions to maintain the humidity at a constant value
ISO 489:2022	Plastics — Determination of refractive index
ISO 4892-1:2016	Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance
ISO 4892-2:2013	Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps
ISO 4892-2:2013/Amd 1:2021	Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps — Amendment 1: Classification of daylight filters
ISO 4892-3:2016	Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps
ISO 4892-4:2013	Plastics — Methods of exposure to laboratory light sources — Part 4: Open-flame carbon-arc lamps
ISO 527-1:2019	Plastics — Determination of tensile properties — Part 1:

	General principles
ISO 527-2:2012	Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics
ISO 527-3:2018	Plastics — Determination of tensile properties — Part 3: Test conditions for films and sheets
ISO 5623:2022	Plastics — Joining of thermoplastic moulded components — Specification for quality levels for imperfections
ISO 5659-2:2017	Plastics — Smoke generation — Part 2: Determination of optical density by a single-chamber test
ISO 60:1977	Plastics — Determination of apparent density of material that can be poured from a specified funnel
ISO 604:2002	Plastics — Determination of compressive properties
ISO 61:1976	Plastics — Determination of apparent density of moulding material that cannot be poured from a specified funnel
ISO 6186:1998	Plastics — Determination of pourability
ISO 6187:2001	Rigid cellular plastics — Determination of friability
ISO 62:2008	Plastics — Determination of water absorption
ISO 6383-1:2015	Plastics — Film and sheeting — Determination of tear resistance — Part 1: Trouser tear method
ISO 6383-2:1983	Plastics — Film and sheeting — Determination of tear resistance — Part 2: Elmendorf method
ISO 6427:2013	Plastics — Determination of matter extractable by organic solvents (conventional methods)
ISO 6601:2002	Plastics — Friction and wear by sliding — Identification of test parameters
ISO 6603-1:2000	Plastics — Determination of puncture impact behaviour of rigid plastics — Part 1: Non-instrumented impact testing
ISO 6603-2:2000	Plastics — Determination of puncture impact behaviour of rigid plastics — Part 2: Instrumented impact testing
ISO 6721-1:2019	Plastics — Determination of dynamic mechanical properties — Part 1: General principles
ISO 6721-10:2015	Plastics — Determination of dynamic mechanical properties — Part 10: Complex shear viscosity using a parallel-plate oscillatory rheometer
ISO 6721-11:2019	Plastics — Determination of dynamic mechanical properties —

	Part 11: Glass transition temperature
ISO 6721-12:2022	Plastics — Determination of dynamic mechanical properties — Part 12: Compressive vibration — Non-resonance method
ISO 6721-2:2019	Plastics — Determination of dynamic mechanical properties — Part 2: Torsion-pendulum method
ISO 6721-3:2021	Plastics — Determination of dynamic mechanical properties — Part 3: Flexural vibration — Resonance-curve method
ISO 6721-4:2019	Plastics — Determination of dynamic mechanical properties — Part 4: Tensile vibration — Non-resonance method
ISO 6721-5:2019	Plastics — Determination of dynamic mechanical properties — Part 5: Flexural vibration — Non-resonance method
ISO 6721-6:2019	Plastics — Determination of dynamic mechanical properties — Part 6: Shear vibration — Non-resonance method
ISO 6721-7:2019	Plastics — Determination of dynamic mechanical properties — Part 7: Torsional vibration — Non-resonance method
ISO 6721-8:2019	Plastics — Determination of dynamic mechanical properties — Part 8: Longitudinal and shear vibration — Wave-propagation method
ISO 6721-9:2019	Plastics — Determination of dynamic mechanical properties — Part 9: Tensile vibration — Sonic-pulse propagation method
ISO 7214:2012	Cellular plastics — Polyethylene — Methods of test
ISO 75-1:2020	Plastics — Determination of temperature of deflection under load — Part 1: General test method
ISO 75-2:2013	Plastics — Determination of temperature of deflection under load — Part 2: Plastics and ebonite
ISO 75-3:2004	Plastics — Determination of temperature of deflection under load — Part 3: High-strength thermosetting laminates and long-fibre-reinforced plastics
ISO 7616:1986	Cellular plastics, rigid — Determination of compressive creep under specified load and temperature conditions
ISO 7765-1:1988	Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 1: Staircase methods
ISO 7765-2:2022	Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 2: Instrumented puncture test
ISO 7808:1992	Plastics — Thermosetting moulding materials — Determination

	of transfer flow
ISO 7850:1986	Cellular plastics, rigid — Determination of compressive creep
ISO 8256:2004	Plastics — Determination of tensile-impact strength
ISO 8295:1995	Plastics — Film and sheeting — Determination of the coefficients of friction
ISO 8296:2003	Plastics — Film and sheeting — Determination of wetting tension
ISO 844:2021	Rigid cellular plastics — Determination of compression properties
ISO 845:2006	Cellular plastics and rubbers — Determination of apparent density
ISO 846:2019	Plastics — Evaluation of the action of microorganisms
ISO 8570:1991	Plastics — Film and sheeting - Determination of cold-crack temperature
ISO 8604:1988	Plastics — Prepregs — Definitions of terms and symbols for designations
ISO 8660:2002	Plastics — Determination of permanganate absorption number of caprolactam — Spectrometric method
ISO 868:2003	Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)
ISO 871:2022	Plastics — Determination of ignition temperature using a hot-air furnace
ISO 877-1:2009	Plastics — Methods of exposure to solar radiation — Part 1: General guidance
ISO 877-2:2009	Plastics — Methods of exposure to solar radiation — Part 2: Direct weathering and exposure behind window glass
ISO 877-3:2018	Plastics — Methods of exposure to solar radiation — Part 3: Intensified weathering using concentrated solar radiation
ISO 8985:2022	Plastics — Ethylene/vinyl acetate copolymer (EVAC) thermoplastics — Determination of vinyl acetate content
ISO 899-1:2017	Plastics — Determination of creep behaviour — Part 1: Tensile creep
ISO 899-2:2003	Plastics — Determination of creep behaviour — Part 2: Flexural creep by three-point loading
ISO 899-2:2003/Amd	Plastics — Determination of creep behaviour — Part 2:

1:2015	Flexural creep by three-point loading — Amendment 1
ISO 9054:1990	Cellular plastics, rigid — Test methods for self-skinned, high-density materials
ISO 9113:2019	Plastics — Polypropylene (PP) and propylene-copolymer thermoplastics — Determination of isotactic index
ISO 9352:2012	Plastics — Determination of resistance to wear by abrasive wheels
ISO 9370:2017	Plastics — Instrumental determination of radiant exposure in weathering tests — General guidance and basic test method
ISO 9702:1996	Plastics — Amine epoxide hardeners — Determination of primary, secondary and tertiary amine group nitrogen content
ISO 974:2000	Plastics — Determination of the brittleness temperature by impact
ISO 9772:2020	Cellular plastics — Determination of horizontal burning characteristics of small specimens subjected to a small flame
ISO 9773:1998	Plastics — Determination of burning behaviour of thin flexible vertical specimens in contact with a small-flame ignition source
ISO 9773:1998/Amd 1:2003	Plastics — Determination of burning behaviour of thin flexible vertical specimens in contact with a small-flame ignition source — Amendment 1: Specimens
ISO 9782:1993	Plastics — Reinforced moulding compounds and prepregs — Determination of apparent volatile-matter content
ISO/TR 13883:1995	Plastics — Guide to the writing of test methods
ISO/TR 17801:2014	Plastics — Standard table for reference global solar spectral irradiance at sea level — Horizontal, relative air mass 1
ISO/TR 18486:2018	Plastics — Parameters comparing the spectral irradiance of a laboratory light source for weathering applications to a reference solar spectral irradiance
ISO/TR 19032:2019	Plastics — Use of polyethylene reference specimens (PERS) for monitoring laboratory and outdoor weathering conditions
ISO/TR 22007-5:2011	Plastics - Determination of thermal conductivity and thermal diffusivity - Part 5: Results of interlaboratory testing of poly(methyl methacrylate) samples
ISO/TS 15791-2:2017	Plastics — Development and use of intermediate-scale fire tests for plastics products — Part 2: Use of intermediate-scale tests for semi-finished and finished products

ISO/TS 19022:2016	Plastics — Method of controlled acceleration of laboratory weathering by increased irradiance
ISO/TS 19278:2019	Plastics — Instrumented micro-indentation test for hardness measurement
ISO 6603-2:2000	Plastics — Determination of puncture impact behaviour of rigid plastics — Part 2: Instrumented impact testing
ISO 6721-1:2019	Plastics — Determination of dynamic mechanical properties — Part 1: General principles
ISO 6721-10:2015	Plastics — Determination of dynamic mechanical properties — Part 10: Complex shear viscosity using a parallel-plate oscillatory rheometer
ISO 6721-11:2019	Plastics — Determination of dynamic mechanical properties — Part 11: Glass transition temperature
ISO 6721-12:2022	Plastics — Determination of dynamic mechanical properties — Part 12: Compressive vibration — Non-resonance method
ISO 6721-2:2019	Plastics — Determination of dynamic mechanical properties — Part 2: Torsion-pendulum method
ISO 6721-3:2021	Plastics — Determination of dynamic mechanical properties — Part 3: Flexural vibration — Resonance-curve method
ISO 6721-4:2019	Plastics — Determination of dynamic mechanical properties — Part 4: Tensile vibration — Non-resonance method
ISO 6721-5:2019	Plastics — Determination of dynamic mechanical properties — Part 5: Flexural vibration — Non-resonance method
ISO 6721-6:2019	Plastics — Determination of dynamic mechanical properties — Part 6: Shear vibration — Non-resonance method
ISO 6721-7:2019	Plastics — Determination of dynamic mechanical properties — Part 7: Torsional vibration — Non-resonance method
ISO 6721-8:2019	Plastics — Determination of dynamic mechanical properties — Part 8: Longitudinal and shear vibration — Wave-propagation method
ISO 6721-9:2019	Plastics — Determination of dynamic mechanical properties — Part 9: Tensile vibration — Sonic-pulse propagation method
ISO 7214:2012	Cellular plastics — Polyethylene — Methods of test
ISO 75-1:2020	Plastics — Determination of temperature of deflection under load — Part 1: General test method
ISO 75-2:2013	Plastics — Determination of temperature of deflection under load — Part 2: Plastics and ebonite

ISO 75-3:2004	Plastics — Determination of temperature of deflection under load — Part 3: High-strength thermosetting laminates and long-fibre-reinforced plastics
ISO 7616:1986	Cellular plastics, rigid — Determination of compressive creep under specified load and temperature conditions
ISO 7765-1:1988	Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 1: Staircase methods
ISO 7765-2:2022	Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 2: Instrumented puncture test
ISO 7808:1992	Plastics — Thermosetting moulding materials — Determination of transfer flow
ISO 7850:1986	Cellular plastics, rigid — Determination of compressive creep
ISO 8256:2004	Plastics — Determination of tensile-impact strength
ISO 8295:1995	Plastics — Film and sheeting — Determination of the coefficients of friction
ISO 8296:2003	Plastics — Film and sheeting — Determination of wetting tension
ISO 844:2021	Rigid cellular plastics — Determination of compression properties
ISO 845:2006	Cellular plastics and rubbers — Determination of apparent density
ISO 846:2019	Plastics — Evaluation of the action of microorganisms
ISO 8570:1991	Plastics — Film and sheeting - Determination of cold-crack temperature
ISO 8604:1988	Plastics — Prepregs — Definitions of terms and symbols for designations
ISO 8660:2002	Plastics — Determination of permanganate absorption number of caprolactam — Spectrometric method
ISO 868:2003	Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)
ISO 871:2022	Plastics — Determination of ignition temperature using a hot-air furnace
ISO 877-1:2009	Plastics — Methods of exposure to solar radiation — Part 1: General guidance

ISO 877-2:2009	Plastics — Methods of exposure to solar radiation — Part 2: Direct weathering and exposure behind window glass
ISO 877-3:2018	Plastics — Methods of exposure to solar radiation — Part 3: Intensified weathering using concentrated solar radiation
ISO 8985:2022	Plastics — Ethylene/vinyl acetate copolymer (EVAC) thermoplastics — Determination of vinyl acetate content
ISO 899-1:2017	Plastics — Determination of creep behaviour — Part 1: Tensile creep
ISO 899-2:2003	Plastics — Determination of creep behaviour — Part 2: Flexural creep by three-point loading
ISO 899-2:2003/Amd 1:2015	Plastics — Determination of creep behaviour — Part 2: Flexural creep by three-point loading — Amendment 1
ISO 9054:1990	Cellular plastics, rigid — Test methods for self-skinned, high-density materials
ISO 9113:2019	Plastics — Polypropylene (PP) and propylene-copolymer thermoplastics — Determination of isotactic index
ISO 9352:2012	Plastics — Determination of resistance to wear by abrasive wheels
ISO 9370:2017	Plastics — Instrumental determination of radiant exposure in weathering tests — General guidance and basic test method
ISO 9702:1996	Plastics — Amine epoxide hardeners — Determination of primary, secondary and tertiary amine group nitrogen content
ISO 974:2000	Plastics — Determination of the brittleness temperature by impact
ISO 9772:2020	Cellular plastics — Determination of horizontal burning characteristics of small specimens subjected to a small flame
ISO 9773:1998	Plastics — Determination of burning behaviour of thin flexible vertical specimens in contact with a small-flame ignition source
ISO 9773:1998/Amd 1:2003	Plastics — Determination of burning behaviour of thin flexible vertical specimens in contact with a small-flame ignition source — Amendment 1: Specimens
ISO 9782:1993	Plastics — Reinforced moulding compounds and prepregs — Determination of apparent volatile-matter content
ISO/TR 13883:1995	Plastics — Guide to the writing of test methods
ISO/TR 17801:2014	Plastics — Standard table for reference global solar spectral irradiance at sea level — Horizontal, relative air mass 1



ISO/TR 18486:2018	Plastics — Parameters comparing the spectral irradiance of a laboratory light source for weathering applications to a reference solar spectral irradiance
ISO/TR 19032:2019	Plastics — Use of polyethylene reference specimens (PERS) for monitoring laboratory and outdoor weathering conditions
ISO/TR 22007-5:2011	Plastics - Determination of thermal conductivity and thermal diffusivity - Part 5: Results of interlaboratory testing of poly(methyl methacrylate) samples
ISO/TS 15791-2:2017	Plastics — Development and use of intermediate-scale fire tests for plastics products — Part 2: Use of intermediate-scale tests for semi-finished and finished products
ISO/TS 19022:2016	Plastics — Method of controlled acceleration of laboratory weathering by increased irradiance
ISO/TS 19278:2019	Plastics — Instrumented micro-indentation test for hardness measurement

**Table B.2: Standards related to packaging and use of plastics for upPE-T project**

Reference	Document title
FprEN 17427	Packaging — Requirements and test scheme for carrier bags suitable for treatment in well-managed home composting installations
FprEN 17428	Packaging - Determination of the degree of disintegration under simulated home composting conditions
prEN 12374	Packaging - Flexible tubes - Terminology
prEN 12377	Packaging - Flexible tubes - Test method for the air tightness of closures
prEN 16565	Packaging - Flexible tubes - Test method to determine the orientation of the flip-top cap
CEN/TR 15356-1:2006	Validation and interpretation of analytical methods, migration testing and analytical data for materials and articles in contact with food - Part 1: General considerations
CEN/TR 16353:2012	Packaging - Safety guidelines for flexible plastic packaging to minimize the risk of suffocation to children
CR 1460:1994	Packaging - Energy recovery from used packaging
EN 1183:1997	Materials and articles in contact with foodstuffs - Test methods for thermal shock and thermal shock endurance
EN 1186-1:2002	Materials and articles in contact with foodstuffs - Plastics - Part 1: Guide to the selection of conditions and test methods for overall migration
EN 1186-13:2002	Materials and articles in contact with foodstuffs - Plastics - Part 13: Test methods for overall migration at high temperatures
EN 1186-2:2022	Materials and articles in contact with foodstuffs - Plastics - Part 2: Test methods for overall migration in vegetable oils
EN 1186-3:2022	Materials and articles in contact with foodstuffs - Plastics - Part 3: Test methods for overall migration in evaporable simulants
EN 12546-1:2000	Materials and articles in contact with foodstuffs - Insulated containers for domestic use - Part 1: Specification for vacuum ware, insulated flasks and jugs
EN 12546-1:2000/AC:2005	Materials and articles in contact with foodstuffs - Insulated containers for domestic use - Part 1: Specification for vacuum ware, insulated flasks and jugs
EN 12546-2:2000	Materials and articles in contact with foodstuffs - Insulated containers for domestic use - Part 2: Specification for insulated bags and boxes

EN 12546-3:2000	Materials and articles in contact with foodstuffs - Insulated containers for domestic use - Part 3: Specification for thermal packs
EN 13045:2022	Packaging - Flexible cylindrical plastic tubes - Dimensions and tolerances
EN 13130-1:2004	Materials and articles in contact with foodstuffs - Plastics substances subject to limitation - Part 1: Guide to test methods for the specific migration of substances from plastics to foods and food simulants and the determination of substances in plastics and the selection of conditions of exposure to food simulants
EN 13130-2:2004	Materials and articles in contact with foodstuffs - Plastics substances subject to limitation - Part 2: Determination of terephthalic acid in food simulants
EN 13130-7:2004	Materials and articles in contact with foodstuffs - Plastics substances subject to limitation - Part 7: Determination of monoethylene glycol and diethylene glycol in food simulants
EN 13461:2009	Packaging - Cylindrical flexible laminated tubes - Dimensions and tolerances
EN 13628-1:2002	Packaging - Flexible packaging material - Determination of residual solvents by static headspace gas chromatography - Part 1: Absolute methods
EN 13628-2:2002	Packaging - Flexible packaging material - Determination of residual solvents by static headspace gas chromatography - Part 2: Industrial methods
EN 14477:2004	Packaging - Flexible packaging material - Determination of puncture resistance - Test methods
EN 14479:2004	Packaging - Flexible packaging material - Determination of residual solvents by dynamic headspace gas chromatography- Absolute method
EN 14481:2003	Materials and articles in contact with foodstuffs - Plastics - Test methods for the determination of fatty contact
EN 14867:2005	Packaging - Plastic freezer bags - Specifications and test methods
EN 14979:2006	Packaging - Flexible plastic/metal laminate tubes - Dimensions and tolerances of nozzle S 13
EN 15284:2007	Materials and articles in contact with food stuffs - Test method for the resistance to microwave heating of ceramic, glass, glass-ceramic or plastics cookware
EN 15593:2008	Packaging - Management of hygiene in the production of

	packaging for foodstuffs - Requirements
EN 16063:2011	Packaging - Rigid plastic containers - Nomenclature of plastic finishes
EN 16064:2011	Packaging - Rigid plastic containers - PET finish 30/25 High (18,5)
EN 16065:2011	Packaging - Rigid plastic containers - PET finish 30/25 Low (16,8)
EN 16066:2011	Packaging - Rigid plastic containers - PET finish 26,7 (lead 6,35)
EN 16067:2011	Packaging - Rigid plastic containers - PET finish 26,7 (lead 9,00)
EN 16068:2011	Packaging - Rigid plastic containers - PET finish 38
EN 16284:2013	Packaging - Flexible laminate and plastic tubes - Test method to determine the adhesive strength of the membrane
EN 16565:2014	Packaging - Flexible tubes - Test method to determine the orientation of the flip-top cap
EN 16592:2014	Packaging - Rigid plastic containers - PET finish 29/25 (12,6)
EN 16592:2022	Packaging - Rigid plastic containers - PET finish 29/25 (12,6)
EN 16593:2014	Packaging - Rigid plastic containers - PET finish BVS 30H60
EN 16594:2014	Packaging - Rigid plastic containers - PET finish 26/22 (12,0)
EN 17665:2022	Packaging - Test methods and requirements to demonstrate that plastic caps and lids remain attached to beverage containers
EN 862:2016	Packaging - Child-resistant packaging - Requirements and testing procedures for non-reclosable packages for non-pharmaceutical products
ISO 11156:2011	Packaging — Accessible design — General requirements
ISO 11897:1999	Packaging — Sacks made from thermoplastic flexible film — Tear propagation on edge folds
ISO 15119:2000	Packaging — Sacks — Determination of the friction of filled sacks
ISO 17480:2015	Packaging — Accessible design — Ease of opening
ISO 22015:2019	Packaging — Accessible design — Handling and manipulation
ISO 6590-2:1986	Packaging — Sacks — Vocabulary and types — Part 2: Sacks

	made from thermoplastic flexible film
ISO 6591-2:1985	Packaging — Sacks — Description and method of measurement — Part 2: Empty sacks made from thermoplastic flexible film
ISO 7023:1983	Packaging — Sacks — Method of sampling empty sacks for testing
ISO 780:2015	Packaging — Distribution packaging — Graphical symbols for handling and storage of packages
ISO 7965-2:1993	Sacks — Drop test — Part 2: Sacks made from thermoplastic flexible film
ISO 8351-2:1994	Packaging — Method of specification for sacks — Part 2: Sacks made from thermoplastic flexible film
ISO 8367-2:1993	Packaging — Dimensional tolerances for general purpose sacks — Part 2: Sacks made from thermoplastic flexible film
ISO/TR 18568:2021	Packaging and the environment — Marking for material identification

**Table B.3: Standards related to environment management and life cycle assessment for upPE-T project**

Reference	Document title
FprEN 17428	Packaging - Determination of the degree of disintegration under simulated home composting conditions
prEN 15941	Sustainability of construction works - data quality for environmental assessment of products and construction works - Selection and use of data
ISO/WD 4924	Eco-design principle, requirement and guideline for express packaging
ISO/WD TR 18607	Packaging—Packaging and the environment — Guidebook for environment conscious designing of packaging based on ISO 18600 series of standards
CEN/TR 13688:2008	Packaging - Material recycling - Report on requirements for substances and materials to prevent a sustained impediment to recycling
CEN/TR 13695-2:2019	Packaging - Requirements for measuring and verifying the four heavy metals and other dangerous substances present in packaging, and their release into the environment - Part 2: Requirements for measuring and verifying dangerous substances present in packaging, and their release into the environment
CEN/TR 13910:2010	Packaging - Report on criteria and methodologies for life cycle analysis of packaging
CEN/TR 14520:2007	Packaging - Reuse - Methods for assessing the performance of a reuse system
CEN/TR 15941:2010	Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data
CEN/TR 16721:2014	Bio-based products - Overview of methods to determine the bio-based content
CEN/TR 16957:2016	Bio-based products - Guidelines for Life Cycle Inventory (LCI) for the End-of-life phase
CEN/TR 16970:2016	Sustainability of construction works - Guidance for the implementation of EN 15804
CEN/TR 17005:2016	Sustainability of construction works - Additional environmental impact categories and indicators - Background information and possibilities - Evaluation

	of the possibility of adding environmental impact categories and related indicators and calculation methods for the assessment of the environmental performance of buildings
CEN/TR 17341:2019	Bio-based products - Examples of reporting on sustainability criteria
CEN/TR 17674:2021	Bio-based products- Use of stable isotope ratios of Carbon, Hydrogen, Oxygen and Nitrogen as tools for verification of the origin of bio-based feedstock and characteristics of production processes - Overview of relevant existing applications
CR 12340:1996	Packaging - Recommendations for conducting life-cycle inventory analysis of packaging systems
CR 13504:2000	Packaging - Material recovery - Criteria for a minimum content of recycled material
CR 13686:2001	Packaging - Optimization of energy recovery from packaging waste
CR 13695-1:2000	Packaging - Requirements for measuring and verifying the four heavy metals and other dangerous substances present in packaging and their release into the environment - Part 1: Requirements for measuring and verifying the four heavy metals present in packaging
EN 13193:2000	Packaging - Packaging and the environment - Terminology
EN 13427:2004	Packaging - Requirements for the use of European Standards in the field of packaging and packaging waste
EN 13428:2004	Packaging - Requirements specific to manufacturing and composition - Prevention by source reduction
EN 13429:2004	Packaging - Reuse
EN 13430:2004	Packaging - Requirements for packaging recoverable by material recycling
EN 13431:2004	Packaging - Requirements for packaging recoverable in the form of energy recovery, including specification of minimum inferior calorific value
EN 13432:2000	Packaging - Requirements for packaging recoverable through composting and biodegradation - Test scheme and evaluation criteria for the final acceptance of packaging
EN 13432:2000/AC:2005	Packaging - Requirements for packaging recoverable

	through composting and biodegradation - Test scheme and evaluation criteria for the final acceptance of packaging
EN 13437:2003	Packaging and material recycling - Criteria for recycling methods - Description of recycling processes and flow chart
EN 13439:2003	Packaging - Rate of energy recovery - Definition and method of calculation
EN 13440:2003	Packaging - Rate of recycling - Definition and method of calculation
EN 14045:2003	Packaging - Evaluation of the disintegration of packaging materials in practical oriented tests under defined composting conditions
EN 14046:2003	Packaging - Evaluation of the ultimate aerobic biodegradability of packaging materials under controlled composting conditions - Method by analysis of released carbon dioxide
EN 14047:2002	Packaging - Determination of the ultimate aerobic biodegradability of packaging materials in an aqueous medium - Method by analysis of evolved carbon dioxide
EN 14048:2002	Packaging - Determination of the ultimate aerobic biodegradability of packaging materials in an aqueous medium - Method by measuring the oxygen demand in a closed respirometer
EN 14182:2002	Packaging - Terminology - Basic terms and definitions
EN 15804:2012+A2:2019	Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
EN 15804:2012+A2:2019/AC:2021	Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
EN 15942:2021	Sustainability of construction works - Environmental product declarations - Communication format business-to-business
EN 16575:2014	Bio-based products – Vocabulary
EN 16640:2017	Bio-based products - Bio-based carbon content - Determination of the bio-based carbon content using the radiocarbon method
EN 16640:2017/AC:2017	Bio-based products - Bio-based carbon content -



	Determination of the bio-based carbon content using the radiocarbon method
EN 16751:2016	Bio-based products - Sustainability criteria
EN 16760:2015	Bio-based products - Life Cycle Assessment
EN 16766:2017	Bio-based solvents - Requirements and test methods
EN 16785-1:2015	Bio-based products - Bio-based content - Part 1: Determination of the bio-based content using the radiocarbon analysis and elemental analysis
EN 16785-2:2018	Bio-based products - Bio-based content - Part 2: Determination of the bio-based content using the material balance method
EN 17228:2019	Plastics - Bio-based polymers, plastics, and plastics products - Terminology, characteristics and communication
EN 17351:2020	Bio-based products - Determination of the oxygen content using an elemental analyser
EN 17615:2022	Plastics - Environmental Aspects - Vocabulary
ISO 10210:2012	Plastics — Methods for the preparation of samples for biodegradation testing of plastic materials
ISO 13975:2019	Plastics — Determination of the ultimate anaerobic biodegradation of plastic materials in controlled slurry digestion systems — Method by measurement of biogas production
ISO 14001:2015	Environmental management systems — Requirements with guidance for use
ISO 14002-1:2019	Environmental management systems — Guidelines for using ISO 14001 to address environmental aspects and conditions within an environmental topic area — Part 1: General
ISO 14004:2016	Environmental management systems — General guidelines on implementation
ISO 14005:2019	Environmental management systems — Guidelines for a flexible approach to phased implementation
ISO 14006:2020	Environmental management systems — Guidelines for incorporating ecodesign
ISO 14007:2019	Environmental management — Guidelines for determining environmental costs and benefits
ISO 14008:2019	Monetary valuation of environmental impacts and

	related environmental aspects
ISO 14009:2020	Environmental management systems — Guidelines for incorporating material circulation in design and development
ISO 14016:2020	Environmental management — Guidelines on the assurance of environmental reports
ISO 14031:2021	Environmental management — Environmental performance evaluation — Guidelines
ISO 14033:2019	Environmental management — Quantitative environmental information — Guidelines and examples
ISO 14034:2016	Environmental management — Environmental technology verification (ETV)
ISO 14040:2006	Environmental management — Life cycle assessment — Principles and framework
ISO 14040:2006/Amd 1:2020	Environmental management — Life cycle assessment — Principles and framework — Amendment 1
ISO 14044:2006	Environmental management — Life cycle assessment — Requirements and guidelines
ISO 14044:2006/Amd 1:2017	Environmental management — Life cycle assessment — Requirements and guidelines — Amendment 1
ISO 14044:2006/Amd 2:2020	Environmental management — Life cycle assessment — Requirements and guidelines — Amendment 2
ISO 14045:2012	Environmental management — Eco-efficiency assessment of product systems — Principles, requirements and guidelines
ISO 14046:2014	Environmental management — Water footprint — Principles, requirements and guidelines
ISO 14050:2020	Environmental management — Vocabulary
ISO 14063:2020	Environmental management — Environmental communication — Guidelines and examples
ISO 14851:2019	Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium — Method by measuring the oxygen demand in a closed respirometer
ISO 14852:2021	Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium — Method by analysis of evolved carbon

	dioxide
ISO 14853:2016	Plastics — Determination of the ultimate anaerobic biodegradation of plastic materials in an aqueous system — Method by measurement of biogas production
ISO 14855-1:2012	Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions — Method by analysis of evolved carbon dioxide — Part 1: General method
ISO 14855-2:2018	Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions — Method by analysis of evolved carbon dioxide — Part 2: Gravimetric measurement of carbon dioxide evolved in a laboratory-scale test
ISO 15270:2008	Plastics — Guidelines for the recovery and recycling of plastics waste
ISO 15985:2014	Plastics — Determination of the ultimate anaerobic biodegradation under high-solids anaerobic-digestion conditions — Method by analysis of released biogas
ISO 16620-1:2015	Plastics — Biobased content — Part 1: General principles
ISO 16620-2:2019	Plastics — Biobased content — Part 2: Determination of biobased carbon content
ISO 16620-3:2015	Plastics — Biobased content — Part 3: Determination of biobased synthetic polymer content
ISO 16620-4:2016	Plastics — Biobased content — Part 4: Determination of biobased mass content
ISO 16620-5:2017	Plastics — Biobased content — Part 5: Declaration of biobased carbon content, biobased synthetic polymer content and biobased mass content
ISO 16929:2021	Plastics — Determination of the degree of disintegration of plastic materials under defined composting conditions in a pilot-scale test
ISO 17088:2021	Specifications for compostable plastics
ISO 17422:2018	Plastics — Environmental aspects — General guidelines for their inclusion in standards
ISO 17556:2019	Plastics — Determination of the ultimate aerobic biodegradability of plastic materials in soil by measuring the oxygen demand in a respirometer or

	the amount of carbon dioxide evolved
ISO 18601:2013	Packaging and the environment — General requirements for the use of ISO standards in the field of packaging and the environment
ISO 18603:2013	Packaging and the environment — Reuse
ISO 18604:2013	Packaging and the environment — Material recycling
ISO 18605:2013	Packaging and the environment — Energy recovery
ISO 18606:2013	Packaging and the environment — Organic recycling
ISO 18830:2016	Plastics — Determination of aerobic biodegradation of non-floating plastic materials in a seawater/sandy sediment interface — Method by measuring the oxygen demand in closed respirometer
ISO 19679:2020	Plastics — Determination of aerobic biodegradation of non-floating plastic materials in a seawater/sediment interface — Method by analysis of evolved carbon dioxide
ISO 20200:2015	Plastics — Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test
ISO 21067-1:2016	Packaging — Vocabulary — Part 1: General terms
ISO 21067-2:2015	Packaging — Vocabulary — Part 2: Packaging and the environment terms
ISO 21930:2017	Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services
ISO 21931-1:2022	Sustainability in buildings and civil engineering works — Framework for methods of assessment of the environmental, social and economic performance of construction works as a basis for sustainability assessment — Part 1: Buildings
ISO 22403:2020	Plastics — Assessment of the intrinsic biodegradability of materials exposed to marine inocula under mesophilic aerobic laboratory conditions — Test methods and requirements
ISO 22526-1:2020	Plastics — Carbon and environmental footprint of biobased plastics — Part 1: General principles
ISO 22526-2:2020	Plastics — Carbon and environmental footprint of biobased plastics — Part 2: Material carbon footprint, amount (mass) of CO <sub>2</sub> removed from the air and

	incorporated into polymer molecule
ISO 22526-3:2020	Plastics — Carbon and environmental footprint of biobased plastics — Part 3: Process carbon footprint, requirements and guidelines for quantification
ISO 22766:2020	Plastics — Determination of the degree of disintegration of plastic materials in marine habitats under real field conditions
ISO 23517:2021	Plastics — Soil biodegradable materials for mulch films for use in agriculture and horticulture — Requirements and test methods regarding biodegradation, ecotoxicity and control of constituents
ISO 23832:2021	Plastics — Test methods for determination of degradation rate and disintegration degree of plastic materials exposed to marine environmental matrices under laboratory conditions
ISO 23977-1:2020	Plastics — Determination of the aerobic biodegradation of plastic materials exposed to seawater — Part 1: Method by analysis of evolved carbon dioxide
ISO 23977-2:2020	Plastics — Determination of the aerobic biodegradation of plastic materials exposed to seawater — Part 2: Method by measuring the oxygen demand in closed respirometer
ISO Guide 64:2008	Guide for addressing environmental issues in product standards
ISO/TR 14047:2012	Environmental management — Life cycle assessment — Illustrative examples on how to apply ISO 14044 to impact assessment situations
ISO/TR 14049:2012	Environmental management — Life cycle assessment — Illustrative examples on how to apply ISO 14044 to goal and scope definition and inventory analysis
ISO/TR 14073:2017	Environmental management — Water footprint — Illustrative examples on how to apply ISO 14046
ISO/TR 16218:2013	Packaging and the environment — Processes for chemical recovery
ISO/TR 17098:2013	Packaging material recycling — Report on substances and materials which may impede recycling
ISO/TR 21960:2020	Plastics — Environmental aspects — State of knowledge and methodologies

ISO/TR 23891:2020	Plastics — Recycling and recovery — Necessity of standards
ISO/TS 14027:2017	Environmental labels and declarations — Development of product category rules
ISO/TS 14048:2002	Environmental management — Life cycle assessment — Data documentation format
ISO/TS 14071:2014	Environmental management — Life cycle assessment — Critical review processes and reviewer competencies: Additional requirements and guidelines to ISO 14044:2006
ISO/TS 14072:2014	Environmental management — Life cycle assessment — Requirements and guidelines for organizational life cycle assessment