GREEN-LOOP

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GREEN-LOOP

Sustainable manufacture systems towards novel bio-based materials

WP2 – Sustainability and Circularity by design

D2.5 – Standardization landscape for biomaterials

Version 1.0

Document information

Contractual Due date: 31.08.2023	**Delivery Date**: 22.08.2023
Author(s): ASI	
Lead Beneficiary of Deliverable: ASI (Austrian Standards International)	
Dissemination level: PU	
Nature of the Deliverable: Report	
Internal Reviewers: IDE, ISQ, MYX, LBRT, FHF, NCC, UBRIS, NIC	

GREEN-LOOP Key Facts

Project title	Sustainable manufacture systems towards novel bio-based materials
Starting date	09/01/2022
Duration in months	36
Call (part) identifier	TWIN GREEN AND DIGITAL TRANSITION 2021 (HORIZON-CL4-2021-TWIN-TRANSITION-01)
Topic	HORIZON-CL4-2021-TWIN-TRANSITION-01-05 Manufacturing technologies for bio-based materials (Made in Europe Partnership) (RIA)
Consortium	17 organizations. 15 EU Member States + 2 non-EU state

GREEN-LOOP Consortium Partners

	Partner	Acronym	Country
1	IDENER RESEARCH & DEVELOPMENT	IDE	ES
2	NATIONAL INSTITUTE OF CHEMISTRY	NIC	SI
3	SLOVENIAN NATIONAL BUILDING AND CIVIL E. I.	ZAG	SI
4	FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V	FHF	DE
5	LABRENTA SRL	LBRT	IT
6	MIXCYCLING SRL	MYX	IT
7	NEROSUBIANCO	NSB	IT
8	GERACE MARIA CRISTINA - TERRE DI ZOE'	TDZ	IT
9	IRIS TECHNOLOGY SOLUTIONS, SOCIEDAD LIMITADA	IRIS	ES
10	GLOWNY INSTYTUT GORNICTWA	GIG	PL
11	AACHEN UNIVERISTY: PROCESS CONTROL ENGINEERING / AACHEN UNIVERISTY: INSTITUTE OF SOCIOLOGY	AAU	DE
12	AUSTRIAN STANDARDS INTERNATIONAL	ASI	AT
13	INSTITUTO DE SOLDADURA E QUALIDADE	ISQ	PT
14	AXIA INNOVATION UG	AXIA	DE
15	ASOCIACIÓN DE INVESTIGACIÓN METALÚRGICA DEL NOROESTE	AIMEN	ES
16	NATIONAL COMPOSITE CENTER	NCC	UK
17	UNIVERSITY OF BRISTOL	UBRIS	UK

GREEN-LOOP is a project funded by the European Commission under the Horizon Europe - HORIZON-CL4-2021-TWIN-TRANSITION-01-05- Manufacturing technologies for bio-based materials (Made in Europe Partnership) (RIA) under Grand Agreement Number 101057765.

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Executive Summary

GREEN-LOOP aims at enhancing and supporting the bioeconomy at European level through robust product design adapted to new sustainable and circular schemes, reducing the cost of manufacture and accelerating the market introduction of novel bio-based products.

Throughout the project, 3 innovative bio-based materials and components will be designed and optimized for the industrial sectors of construction, packaging, food and beverage, and appliances and tooling. The value chain of each of the following three products will be optimized from raw material sources to End-Of-Life of products, ensuring the circular economy:

1) multifunctional rubber panels with fire resistance and vibrational applications,

2) bioplastic bottle closures for oil and fruit juice,

3) wood composites bearings for plastic injection machines.

The project duration extends from 2022-09-01 to 2025-09-01.

The work described in this deliverable (D2.5) is part of the work carried out in Task 2.4, belonging to *Work Package 2 – Sustainability and Circularity by design*. D2.5 builds on the preceding deliverable D2.4 (submitted in M5) and can therefore be seen as the updated version, including new insights gained. Throughout the project timeline, two further versions of the standardization landscape for biomaterials will be elaborated within Task 2.4 during the project, i.e. D2.6 (M36) and D2.7 (M24).

The present deliverable (D2.5) focuses on examining the feedback received from the consortium partners via a standardization questionnaire which was circulated to the partners in May 2023. Thereby, a first identification of potential standardization gaps is carried out and the lists of relevant standardization deliverables as indicated in the preceding D2.4 are narrowed down to fit the needs of the GREEN-LOOP project more precisely. This information supports GREEN-LOOP partners in integrating standardization-related activities into their tasks and work packages and in supporting ongoing standardization efforts (if any). Additionally, it will subsequently be used to develop a standardization roadmap with the participants in task 2.4 and other interested parties of the GREEN-LOOP consortium.

Deliverable 2.5 consists of two main parts. The first one focuses on analyzing the results received via the standardization questionnaire, while the second part of this deliverable provides a detailed standardization landscape for biomaterials, including an overview of the thematically relevant standards identified and an outlook for the upcoming deliverables.

Regarding the standardization landscape relevant to the GREEN-LOOP project, a total of 223 standardization deliverables published or under development were identified, consisting of 143 international standards, 34 European standards, 32 ASTM standards, 2 standards from Germany (DIN) and 1 British standard (BS). The results of the standardization questionnaire, which are described in more detail in section 4, highlight knowledge areas that are not covered by standardization yet and knowledge areas where project results could possibly be included in standardization processes. Notably, the answers given under questions 2, 4, and 5 hold significant importance in this regard. The information collected throughout the questionnaire will be further examined and discussed with task partners and other interested partners of the GREEN-LOOP consortium during the course of the project in order to determine concrete needs for action, as well as the next steps and the standardization plan.

In D2.5, general information on the standardization processes is kept brief to avoid repetition. For more detailed information regarding standardization processes, relevant standardization bodies and different

kinds of standardization deliverables, please refer to the preceding deliverable of T2.4, D2.4 (M5) – *Standardization landscape for biomaterials*.

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Abbreviations

The following table shows a short overview of the abbreviations used in this deliverable.

Table 1 - Abbreviations

Abbreviation	**Description**
ASTM	American Society for Testing and Materials
AWI	Approved Work Item
CD	Committee Draft
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CWA	CEN and/or CENELEC Workshop Agreement; standardization deliverable from a CEN and/or CENELEC workshop
D	Deliverable
EN	standard adopted by CEN or CENELEC
ETSI	European Telecommunications Standards Institute
FDIS	Final draft international standard
FprEN	Final draft European standard
IEC	International Electrotechnical Commission / standards developed by IEC
ISO	International Standardization Organisation / standards developed by ISO
ITU	International Telecommunication Union
MX	Month X of the GREEN-LOOP project
NSB	National Standardization Body
NWIP	New Work Item Proposal; proposal for a new work item which is submitted to the TC for approval
prEN	Draft European standard
SC	Subcommittee; SCs may be established by a TC having responsibility for a large programme of work; frequently in large ISO/TCs or IEC/TCs but being phased out in CEN/TCs and CENELEC/TCs; SCs operate more independently than WGs
TX.x	Task X.x
TC	Technical committee; a TC consists of a group of stakeholders from various fields of expertise drafting standards according to the most recent state of the art
TR	Technical report developed by CEN, CENELEC, ISO or IEC
TS	Technical specification developed by CEN, CENELEC, ISO or IEC
WG	Working group; A Working Group (WG) is established by a Technical Committee or a Subcommittee to undertake a specific short-term task within a target date
WD	Working draft
WI	Work item; specifies among other the title, scope and necessary expertise for developing a standardization deliverable
WP	Work package

1. Introduction

1.1. Objectives of the Work Package and Task

This deliverable (D2.5 – *Standardization landscape for biomaterials*) is developed within task 2.4 *Standardization activities of GREEN-LOOP*, which is part of GREEN-LOOP work package 2 – *Sustainability and Circularity by design* and is the succeeding document of D2.4 which was submitted in M05 of the project.

In general, WP2 aims at the following:

1) creating and utilizing a methodology to obtain optimized designs, ensuring the circularity of bio-based materials,
2) reducing the environmental impact by implementing A.I. models, thermo-economy studies and environmental analysis, and to implement a platform to evaluate and optimise the bio value chains.

In this context, task 2.4 focuses on investigating the standardization potential of the end products, allowing the project to interact with the related technical committees. In order to achieve this, the following will be developed throughout the project timeline:

- the standardization landscape, based on the needs of material development (WP3 to WP5) regarding relevant existing standards and the related standardization committees.
- a standardization plan detailing the relevant standardization activities and actions taken by the project (partners).

1.2. Scope of Deliverable

The first deliverable of task 2.4 (D2.4, M5) focused primarily on providing general standardization guidelines and description of the most common standardization processes and procedures, as well as on providing an overview of standardization activities potentially relevant to the scope of the GREEN-LOOP project.

Since the submission of the first deliverable, several further steps have been taken by within task 2.4 to support the project in the context of standardization and to achieve the goals of task 2.4. In particular, it is worthy highlighting that the GREEN-LOOP webinar on standardization organised by ASI which was conducted in April 2023 and allowed project partners to gain an insight to the world of standardization, as well as essential standardization processes and standardization bodies.

Additionally, all consortium partners of the GREEN-LOOP project were invited to participate in a standardization questionnaire focusing on the identification of relevant standardization gaps (i.e. gaps or barriers with regard to the implementation of existing standards or the lack of standards for a specific topic area).

As a result, the present deliverable (D2.5) focuses on presenting the feedback received from the consortium partners and a first identification of potential standardization gaps. This information will subsequently be used to develop a standardization roadmap with the participants in task 2.4 and other interested parties of the GREEN-LOOP consortium.

2. General Introduction to standardization

This section provides a brief introduction to the field of standardization. For a more detailed explanation of the standardization process, various international and European standardization organizations, and different types of standardization deliverables, please refer to the preceding deliverable of Task 2.4, D2.4 - *Standardization landscape for biomaterials* (M5).

Under the framework of standardization, subject matter experts come together to collaborate on specific topics with the aim of developing common recommendations based on the consolidation of diverse

perspectives. Standardization is guided by principles such as consensus, openness, inclusiveness, transparency, national commitment, and coherence, as outlined in the Agreement on Technical Barriers to Trade of the World Trade Organization (WTO TBT Agreement) and Regulation (EU) No 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European standardization.

A standard is defined as a "*document, established by consensus and approved by a recognized body that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context*" [1]. Each standard thrives on the exchange of content, ideas, practical experience, and an ongoing review. Their development is open to all, and unless a standard is cited as a requirement in legislation or in a legal contract, its use is voluntary.

Standards bring many benefits for their users: As standards are being developed by experts contributing their knowledge and competence, they enable access to the latest knowledge. By channelling different perspectives, they serve to unify and support in reducing discrepancies. Thus, they create ideal conditions for the free movement of goods and the exchange of services and create results that are easy to verify. When standards are properly applied, they can help to ensure that a product or service will meet specific quality criteria that meet customers' requirements. Also, they are an important tool for ensuring the compatibility of different products and components.

Participating in a standardization process can have positive effects on the experts involved. By contributing directly to the content of standards, they can benefit e.g. from discussions on customer interests between potential users and potential market partners who sit across from each other in a standardization committee. Standardization enables interaction between potential users and potential market partners who sit across from each other in a standardization committee. This facilitates timely processes for adaptation, renewal and innovation in the organizations concerned.

Standardization occurs on three different geographical levels, i.e. International, European and National. International standards are developed by the International Organization for Standardization (ISO), International Electrotechnical Committee (IEC) and International Telecommunication Union (ITU). European standards are developed by the European Committee for Standardization (CEN), European Committee for Electrotechnical Standardization (CENELEC) and European Telecommunications Standards Institute (ETSI).

Every European country and most countries worldwide have a designated National Standardization Body (NSB). NSBs manage national committees, where stakeholders draft national standards. Additionally, the NSBs are members of European and International standardization bodies and provide input for European and international standardization processes. Technical Committees (TCs) at the European and international level consist of representatives of their respective national mirror committees. Within the European and International TCs, these delegates do not speak on their behalf but express the opinion of the national committee.

Aside from the organisations mentioned so far, standards may also be developed by others, such as trade organizations. While these standards are not recognized by governments as formal standards, they are often accepted by full sectors of organizations as guidelines to be used.

All standardization bodies (national, European and international) have their well-defined rules for drafting standards related documents. Based on the cooperation agreements (Vienna Agreement between CEN and ISO, Frankfurt Agreement between CENELEC and IEC) and common Internal Regulations, the standardization processes of CEN, CENELEC, ISO, and IEC are harmonised. Also, most of the national drafting rules are based on the CEN/CENELEC and ISO/IEC rules.

To ensure that a standard is still up-to-date, European standards are reviewed at least every five years after their publication through the so-called Systematic Review process. However, an earlier review may take place following a request.

Various ways exist for interested parties to contribute to standardization processes.

They can actively participate in standardization committees or contribute as committee-external stakeholders. For example, any interested party may submit a proposal for a standardization project. Additionally, stakeholders may submit comments on a European draft standard through their NSBs and request amendments, reviews, or corrigenda for existing standards. An additional way to participate in standardization processes is via liaisons. A liaison can be requested by organizations, including forums and consortia, representing interest groups that are committed to provide input to the work of one or more Technical Bodies. One of the main benefits of being a liaison organization is the direct access to information and participation in Technical Bodies. Thereby, the organization can introduce preparatory work to support ongoing standardization activities, submit technical contributions and formulate advice on current and future standards programmes. The status of Liaison Organization may also be valuable in cases where a collaboration between an existing Technical Committee and a funded Research project is envisaged. It is worth noting that liaison organizations do not have voting rights [2].

3. Methodology for the elaboration of D2.5

In deliverable D2.4, which was submitted in M5, an overview of standards potentially relevant to the focus of the GREEN-LOOP project is presented. This overview was compiled through desktop research on thematically relevant standardization committees at CEN and ISO level. In addition, the participants of task 2.4 were kindly asked to indicate if, in their opinion, any standards were missing in the list. Furthermore, the leading partners of the technical work packages WP3, WP4 and WP5 were asked to indicate which of the identified standards they considered as particularly relevant to their work package.

In coordination with the leading partners of WP3, WP4 and WP5, the lists of relevant standards were narrowed down according to the relevance indicated for WP3, WP4 and WP5 in order to further sharpen their focus for the present deliverable, D2.5.

Additionally, a standardization questionnaire was set up aiming at the initial investigation of potential standardization gaps. These gaps could include for example technical gaps or barriers for the implementation of existing standards or the substantial need for a new standard in a specific field. In order to ensure a comprehensive understanding of standards relevant to the GREEN-LOOP project, the questionnaire also aimed to identify additional relevant standards which may not have been previously considered.

Throughout May 2023, the entire GREEN-LOOP consortium was kindly invited to complete the questionnaire. Annex II provides an overview of all questions included in the questionnaire.

Furthermore, a webinar on standardization was organized and conducted in April 2023 to provide consortium partners with relevant information regarding standardization procedures, standardization bodies, ways to contribute to standardization and steps needed to initiate a new standard or the revision of an existing standard.

4. Results of the Standardization Questionnaire

Overall, 20 replies to the standardization questionnaire were received throughout May 2023. Of all participants, only one person indicated to be personally involved in standardization procedures.

In the following parts, the responses of the main questions of the questionnaire are described. In this context it is important to mention that the questionnaire was designed with a branching question – If participants answered “None” to the first question, the second question was not displayed. For a detailed overview of the questions and structure of the questionnaire, please refer to Annex II.

Q.1 Which standards topically relevant to the GREEN-LOOP project do you use? (For example: "ISO 16620-1, Plastics — Biobased content — Part 1: General principles. Relevant for: WP4, WP5")

The first question of the questionnaire focused on *identifying standards which participants use and which are topically relevant to the GREEN-LOOP project*. Eight out of a total of 20 participants stated that they do not use any relevant standards, while twelve participants indicated that they use topically relevant standards and specified them. The relevance of the mentioned standards for individual WPs of the project was indicated by one partner only.

Overall, a total of 56 published ISO standards, 2 ISO standards under development, 27 published CEN standards, 3 CEN standards under development, 31 ASTM standards, 2 DIN standards and 1 BS standard were indicated as relevant for the GREEN-LOOP project. Details on the specified standards are provided in Table 2, Table 3, Table 4, Table 5, Table 6 in Annex I, in which the last column shows whether a standard was indicated via the questionnaire.

Some of the standards specified were already included in the list of standardization deliverables. However, a total of 13 ISO published standards, 20 published CEN standards, 1 CEN standard under development and 16 ASTM standards were identified which were not previously included in the lists of relevant standards.

Additionally, the following answers that don't relate directly to standards were indicated under question number 1:

- *"MOCA (Materials and Objectives in Contact with food) Analysis"* [Note ASI: see Regulation (EC) No 1935/2004 in Table 7 and EN 1186-1, EN 1186-2, EN 1186-3, EN 1186-11, EN 1186-13 in Table 4]
- *"Organic fruit and organic process to transform it"*
- *"The European Directive 2004/40/EC related to microwave exposure in the workplace: a case study"* [Note ASI: directive repealed]

Q.2 From your perspective: Are any of your before mentioned standards difficult to apply or are there any barriers for its implementation?

The second question focused on the identification of standardization gaps in any of the standards indicated under the previous question. In this regard, the term "standardization gap" refers technical gaps or barriers for the implementation of any of the standards mentioned under Q.1.

As mentioned earlier, the first question was designed as a branching question. Therefore, the second question was shown to 12 participants only. Overall, seven of 12 participants indicated that none of the before mentioned standards were difficult to apply and that there are no barriers for their implementation.

The five participants who stated that the indicated standards were difficult to apply or that there are any barriers for their implementation were asked to specify the existing difficulties or barriers. The following analyzable answers were received:

- *"None of the mentioned standards represents a barrier either to the application or to the development of materials. It should mention the additions of the following tests/standards (some included in D4.1):*
    - *EN 1186 - Materials and articles in contact with foodstuffs (same as MOCA)*
    - *UNI EN 13130 - Materials and articles in contact with foodstuffs - Plastics substances subject to limitation - 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 - SPECIFIC MIGRATION TEST*
    - *EN 1186 standard - GLOBAL MIGRATION TEST*

  - *ASTM D5229 - Standard Test Method for Moisture Absorption Properties and Equilibrium Conditioning of Polymer Matrix Composite Materials"*
- *"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"*
- *"Some test standards need additional decisions on testing parameters. They are possibly lacking appropriate conditioning. Some measurement techniques require extensive calibration and external data."*
- *"The determination includes several steps which are also long ones, i.e: soxhlet extraction with acetone for 16 h, toluene immersion for 72 h. The total protocol could take 1 working-week. Besides, the data used for the calculation of the Devulcanization percentage involves only gravimetric (weight) measurements."* [Note ASI: This comment refers to ASTM D 6814, Standard Test Method for Determination of Percent Devulcanization of Crumb Rubber Based on Crosslink Density].

Q.3 In your view, which main areas of knowledge relevant to the GREEN-LOOP project are already mostly covered by standards?

The following answers were provided by other participants:

- *"Testing and characterization of materials properties"*
- *"Thermal, mechanical and chemical testing of the material properties"*
- *"Mechanical testing"*
- *"All technical WPs working to identify relevant R&D solutions for the three Pilot Actions"*
- *"All the standards mentioned in question 2, plus the ones in the project proposal, cover the relevant areas"*
- *"WP3 - product performance"*
- *"Environmental LCA"*
- *"Microwave heating and ultrasound"*

With regard to the third question, it should be noted that some participants did either not answer this question or indicated that they are not a hundred percent aware of the areas covered by standards and could therefore not answer the question.

Q.4 In your view, which main areas of knowledge relevant to the GREEN-LOOP project are not covered by standardization yet?

The answers to the fourth question, which focused on relevant areas of knowledge which are not covered by standardization yet, might also provide first insights on potential standardization gaps, e.g. the need for a new standard for a specific field. With regard to relevant knowledge areas which are not covered by standardization yet, the following answers were received:

- *"Communication, Dissemination and Exploitation of results"*
- *"Biomass performance"*
- *"Probably the standards required for the commercialization of the final products. For WP4, it's mandatory that the bottle closures respect the alimentary standards (MOCA/EN 1186), whereas other standards are optional. Each cap must have a Technical Data Sheet (the safety one is optional) and have explicit conditions of sale (in accordance with the client)."*
- *"Specific characteristics / performance such as toxicity of released compounds, fire toxicity."*
- *"LCC, social-LCA"*
- *"Manufacturing process"*
- *"Bio contents and properties of new biomaterials"*

Q.5 In your view, is there a substantial need for a new standard related to the focus of the GREEN-LOOP project?

Overall, 15 people answered this question, with 4 people indicating that there is a substantial need for a new standard and 11 people indicating that they do not currently see a need for a new standard. Of all comments received to specify the need for a new standard, only the following two were evaluable:

- *"There is minor need, most WP3 performance are well covered"*
- *"At least related to the Percentage of Devulcanization of the Rubber as I mentioned. Also the purity of the Lignin extracts, although there is a protocol developed by NIC, it would be useful another one, simpler and faster."*

5. Standardization landscape

This section relates to the standardization landscape and includes an overview of relevant standards and standardization bodies within the focus of the GREEN-LOOP project.

As mentioned in section 3, the lists prepared for the preceding deliverable 2.4 (M5), were used as a baseline to develop new, narrowed down and more detailed lists of relevant standardization deliverables, by focusing on standardization deliverables which were indicated as relevant by project partners and/or received as input via our standardization questionnaire.

For the sake of readability, the updated individual tables are provided in Annex I. First, an overview of the relevant standards at ISO level is provided. Table 2 focuses on published ISO standards and Table 3 focuses on currently ongoing relevant standardization projects. Secondly, an overview of relevant standards on CEN level is provided. Table 4 provides information on published CEN standards while Table 5 indicates relevant ongoing standardization projects on CEN level. Finally, Table 6 gives an overview of relevant published standards of other standardization organizations.

Before submitting D2.5, all standards listed in Annex I were checked for their up-to-datedness (July 2023), the scopes of the individual standards were added to provide project partners with more insight on each standard's content and, where possible, a link to the website of the respective standardization bodies was added. It should also be noted that some of the standards that were listed as "under development" in D2.4 (M5) have in the meantime been published and were therefore moved to the table indicating the currently published standards. If one of the listed standards was indicated as applied and relevant to the GREEN-LOOP project via the standardization questionnaire, this is indicated in the last column "indicated in questionnaire".

Following the approach described in section 3, the standardization landscape relevant to the GREEN-LOOP project currently contains **a total of 223 standardization deliverables published or under development**.

With regard to **international standardization**, a total of 143 ISO standardization deliverables were identified, composed of 138 ISO standards and 5 ISO technical reports (ISO/TR). Additionally, 7 international standardization deliverables which are currently under development were identified. The standards indicated in Table 2 and Table 3 have all been and are being developed within one of the following 10 international technical committees, depending on the subject area concerned:

- ISO/TC 43, Acoustics
- ISO/TC 45, Rubber and rubber products
- ISO/TC 61, Plastics
- ISO/TC 87, Cork
- ISO/TC 92, Fire safety
- ISO/TC 123, Plain bearings

- ISO/TC 147, Water quality
- ISO/TC 163, Thermal performance and energy use in the built environment
- ISO/TC 207, Environmental management
- ISO/TC 219, Floor coverings

Regarding **European standardization**, 34 published European standards (EN) were identified, as well as 4 standardization deliverables which are currently under development. The standards indicated in Table 4 and Table 5 have all been and are being developed within the following 12 European technical committees, depending on the subject area concerned:

- CEN/TC 89, Thermal performance of buildings and building components
- CEN/TC 126, Acoustic properties of building elements and of buildings
- CEN/TC 127, Fire safety in buildings
- CEN/TC 134, Resilient, textile, laminate and modular mechanical locked floor coverings
- CEN/TC 184, Advanced technical ceramics
- CEN/TC 194, Utensils in contact with food
- CEN/TC 249, Plastics
- CEN/TC 254, Flexible sheets for waterproofing
- CEN/TC 261, Packaging
- CEN/TC 339, Slip resistance of pedestrian surfaces – Methods of evaluation
- CEN/TC 350, Sustainability of construction works
- CEN/TC 411, Bio-based products

In addition, **32 standards by the American society for Testing and Materials (ASTM) were identified throughout the process, as well as 2 standards from Germany (DIN) and 1 British standard (BS)**. These standards including their scopes are indicated in Table 6.

Additionally, Table 7 in Annex I provides an overview of regulations relevant to the GREEN-LOOP project.

For more detailed information on the number of standards indicated via the standardization questionnaire, please refer to section 4 of this document (D2.5).

In general, it is important to note that the lists indicated in Annex I are subject to change and will be continuously adapted to meet the project partner's needs. So far, the partners of the GREEN-LOOP project have reported only standards from ISO, CEN, ASTM, DIN or BS as relevant. However, it should be noted that important additional standardization documents from other organizations (e.g. OSHA, ACEA, WRAP, ECN) will of course be included in the list if they are mentioned as relevant by project partners.

These identified standards as well as other standards, which will be identified as relevant for GREEN-LOOP in the further course of the project, constitute the baseline for the next steps in T2.4 to derive together with the project partners improvements in standardization practices. Based on the feedback from the project partners such improvements might be requests to update existing standards to reflect the state of the art, to improve the level of interoperability, to align standards with the needs of the individual value chains of GREEN-LOOP and to close gaps in the standardization landscape in general.

6. Conclusions

The initial deliverable of task 2.4 (D2.4) focused primarily on providing general standardization guidelines and a description of the most common standardization processes and procedures, as well as on providing a first overview of standardization activities relevant to the scope of the GREEN-LOOP project. Building upon this foundation, the present deliverable (D2.5) takes a further step towards achieving the objectives of task 2.4.

Firstly, it presents an enhanced and more detailed standardization landscape, including an overview of pertinent standards for the GREEN-LOOP project (refer to section 5 and Annex I). This supports partners in integrating standardization-related activities in their respective work packages.

Secondly, the outcomes of the standardization questionnaire serve as an important basis for the next steps for developing a standardization plan. The collected information will be further examined and discussed with task partners and other interested partners of the GREEN-LOOP consortium. Notably, the answers to questions 2, 4, and 5 hold significant importance for the subsequent steps of task 2.4, as they provide initial insights into where results of the GREEN-LOOP project might be incorporated into standardization processes. All questions and responses received are indicated in section 4.

The responses received on questions 2 and 5 quite directly provide initial insights for potential standardization activities. Nevertheless, initial insights for potential standardization activities may also be gathered from the responses received in question 4, which inquired about main areas of knowledge relevant to the project not currently covered by standardization.

Via the standardization questionnaire, some participants of the GREEN-LOOP consortium indicated that areas such as testing, characterization of materials properties, and environmental life cycle assessment are already well covered by standardization (for the complete list, please refer to Q.3 in section 4). However, some participants also indicated topics such as the biomass performance, life cycle costing, social life cycle assessment and bio contents and properties of new biomaterials as areas lacking standardization (for the complete list, please refer to Q.4 in section 4).

As the indicated topic areas partially overlap, it can be concluded that a discussion and examination with task partners and interested partners of the GREEN-LOOP consortium will be needed in order to determine any concrete need for action, as well as the next steps and the standardization plan.

As mentioned earlier in section 3, the results of the standardization questionnaire, which was conducted in May 2023, have further improved the overview of relevant standards, making it more detailed and tailored to the specific needs of the GREEN-LOOP project (see Annex I). These lists are subject to change and will be continuously adapted to meet the project partner's needs.

At **International level**, a total of 143 relevant ISO standardization deliverables and 7 international standardization projects currently under development were identified. These standards have been and are being developed by 10 different ISO/TCs. A comprehensive overview, including the scopes of these standards and other relevant information, is provided in Table 2 and Table 3 of Annex I.

At **European level**, 12 relevant CEN/TCs were identified, with 34 relevant European standards published and 4 relevant standardization deliverables currently under development. A detailed overview including the scopes of these standards and other relevant information is provided in Table 4 and Table 5 of Annex I.

Additionally, the procedure described in section 3 led to the identification of **32 relevant ASTM standards, 2 standards from Germany (DIN) and 1 British standard (BS)** A detailed overview including the scopes of these standards and other relevant information is provided in Table 6 of Annex I.

7. Outlook and next steps

The standardization questionnaire's results which were addressed in the previous sections of this deliverable will be used as a baseline for elaborating the standardization potentials further. This will be done within the framework of task 2.4, but all interested partners of the GREEN-LOOP consortium are invited to contribute.

Depending on the outcomes of the discussions foreseen in T2.4 and the maturity of the proposed standardization gaps, individual approaches regarding the development of a standardization plan can be elaborated for the project value chains (e.g. preparation of a new work item proposal for either developing

a new standard or for the revision of an existing standard to be forwarded to the relevant standardization body) and an interaction with relevant technical committees can be enabled.

Also, depending on the outcome of the discussions, the possibility to participate in standardization processes via a Liaison between e.g. the GREEN-LOOP project and an existing relevant technical committee can be further evaluated. As also mentioned in D2.4 (M5), once approved, the liaison relationship allows representatives of the project to attend meetings, make proposals and give comments to topics under discussion. However, the project representatives will not have any voting rights and the different options for developing a liaison must be assessed for the individual case.

References and Resources

[1] CEN-CENELEC, „European Standards,“ 2022. [Online]. Available: https://www.cencenelec.eu/european-standardization/european-standards/#:~:text=A%20standard%20is%20a%20technical,repeatable%20way%20of%20doing%20something.

[2] CEN-CENELEC, „CEN-CENELEC Guide 25,“ 2022. [Online]. Available: https://www.cencenelec.eu/media/Guides/CEN-CLC/cenclcguide25.pdf.

Annex I

Table 2 - Published International standards relevant for the GREEN-LOOP project

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
ISO 10066	1991	Flexible cellular polymeric materials — Determination of creep in compression	This International Standard describes the procedure for determining the creep of a flexible cellular polymeric material when compressed by a static force, intended primarily for quality assurance in packaging applications. NOTE 1 The test may also be used to obtain design data. For example, a material that shows excessive creep is not likely to be selected for the manufacture of cushions to support packaged items because of the possibility of slippage during storage. The amount of creep and safe static stress that can be allowed depends on cushion thickness, package life and storage conditions.	ISO/TC 45	no
ISO 10140-1	2021	Acoustics — Laboratory measurement of sound insulation of building elements — Part 1: Application rules for specific products	This document specifies test requirements for the laboratory measurement of the sound insulation of building elements and products, including detailed requirements for the preparation and mounting of the test elements, and for the operating and test conditions. It also specifies the applicable quantities, and provides additional test information for reporting. The general procedures for airborne and impact sound insulation measurements are given in ISO 10140-2 and ISO 10140-3, respectively.	ISO/TC 43	yes
ISO 10140-2	2021	Acoustics — Laboratory measurement of sound insulation of building elements — Part 2: Measurement of airborne sound insulation	This document specifies a laboratory method for measuring the airborne sound insulation of building products, such as walls, floors, doors, windows, shutters, façade elements, façades, glazing, small technical elements, for instance transfer air devices, airing panels (ventilation panels), outdoor air intakes, electrical raceways, transit sealing systems and combinations, for example walls or floors with linings, suspended ceilings or floating floors. The test results can be used to compare the sound insulation properties of building elements, classify elements according to their sound insulation capabilities, help design building products which require certain acoustic properties and estimate the in situ performance in complete buildings. The measurements are performed in laboratory test facilities in which sound transmission via flanking paths is suppressed. The results of measurements made in accordance with this document are not applicable directly to the field situation without accounting for other factors affecting sound insulation, such as flanking transmission, boundary conditions and total loss factor.	ISO/TC 43	yes
ISO 10140-3	2021	Acoustics — Laboratory measurement of sound insulation of building elements — Part 3: Measurement of impact sound insulation	This document specifies laboratory methods for measuring the impact sound insulation of floor assemblies. The test results can be used to compare the sound insulation properties of building elements, classify elements according to their sound insulation capabilities, help design building products which require certain acoustic properties and estimate the in situ performance in complete buildings. The measurements are performed in laboratory test facilities in which sound transmission via flanking paths is suppressed. The results of measurements made in accordance with this document are not applicable directly to the field situation without accounting for other factors affecting sound insulation, such as flanking transmission, boundary conditions, and loss factor. A test method is specified that uses the standard tapping machine (see ISO 10140-5:2021, Annex E) to simulate impact sources like human footsteps when a person is wearing shoes. Alternative test methods, using a modified tapping machine or a heavy/soft impact source (see ISO 10140-5:2021, Annex F) to simulate impact sources with strong low frequency components, such as human footsteps (bare feet) or children jumping, are also specified. This document is applicable to all types of floors (whether heavyweight or lightweight) with all types of floor coverings. The test methods apply only to laboratory measurements.	ISO/TC 43	yes
ISO 10140-4	2021	Acoustics — Laboratory measurement of sound insulation	This document specifies the basic measurement procedures for airborne and impact sound insulation of building elements in laboratory test facilities	ISO/TC 43	yes

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
		of building elements — Part 4: Measurement procedures and requirements			
ISO 10140-5	2021	Acoustics — Laboratory measurement of sound insulation of building elements — Part 5: Requirements for test facilities and equipment	This document specifies laboratory test facilities and equipment for sound insulation measurements of building elements, such as: — components and materials; — building elements; — technical elements (small building elements); — sound insulation improvement systems. It is applicable to laboratory test facilities with suppressed radiation from flanking elements and structural isolation between source and receiving rooms. This document specifies qualification procedures for use when commissioning a new test facility with equipment for sound insulation measurements. It is intended that these procedures be repeated periodically to ensure that there are no issues with the equipment and the test facility.	ISO/TC 43	yes
ISO 10619-3	2011	Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 3: Bending tests at high and low temperatures	This part of ISO 10619 specifies a method for the determination of the bending characteristics of rubber and plastics hoses and tubing, including the force required for bending, over a range of temperatures from −60 ºC to +200 ºC. The nature of the apparatus, however, limits its applicability to rubber and plastics hoses and tubing of small internal diameter, i.e. up to 12,5 mm.	ISO/TC 45	no
ISO 10634	2018	Water quality — Preparation and treatment of poorly water-soluble organic compounds for the subsequent evaluation of their biodegradability in an aqueous medium	This document specifies techniques for preparing poorly water-soluble organic compounds (i.e. liquid and solid compounds) with a solubility in water of less than approximately 100 mg/l and introducing them into test vessels for a subsequent biodegradability test in an aqueous medium using standard methods. The subsequent tests on biodegradability are primarily methods using the analysis of the released carbon dioxide described in ISO 9439 and the determination of the oxygen described in ISO 9408 and following the usual precautions for ISO 10707. Thus, one can notice that the methods measuring the removal of dissolved organic carbon (DOC) are not appropriate. This document does not specify the biodegradation test methods. It is restricted to describing techniques for introducing the test compounds into the test medium and to keeping them in a dispersed state[4]. These techniques are implemented while observing the experimental conditions described in the standardized methods for evaluating biodegradability. ISO 9439, based on CO2 evolution, is not suitable for testing volatile compounds. Some of the preparation methods described in this document might not be accepted by regulators for making conclusions on the ready biodegradability of tested compounds. Examples of biodegradability curves are given in Annex A.	ISO/TC 147	no
ISO 1133-1	2022	Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of	This document specifies two procedures for the determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastic materials under specified conditions of temperature and load. Procedure A is a mass-measurement method. Procedure B is a displacement-measurement method. Normally, the test conditions for measurement of melt flow rate are specified in the material standard with a reference to this document. The test conditions normally used for thermoplastics are	ISO/TC 61	no

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
		thermoplastics — Part 1: Standard method	listed in Annex A. The MVR is particularly useful when comparing materials of different filler content and when comparing filled with unfilled thermoplastics. The MFR can be determined from MVR measurements, or vice versa, provided the melt density at the test temperature is known. This document is also possibly applicable to thermoplastics for which the rheological behaviour is affected during the measurement by phenomena such as hydrolysis (chain scission), condensation and cross-linking, but only if the effect is limited in extent and only if the repeatability and reproducibility are within an acceptable range. For materials which show significantly affected rheological behaviour during testing, this document is not appropriate. In such cases, ISO 1133-2 applies. NOTE The rates of shear in these methods are much smaller than those used under normal conditions of processing, and therefore it is possible that data obtained by these methods for various thermoplastics will not always correlate with their behaviour during processing. Both methods are used primarily in quality control.		
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	This part of ISO 1133 specifies a procedure for the determination of the melt volume-flow rate (MVR) and melt mass-flow rate (MFR) of thermoplastic materials that exhibit a high rheological sensitivity to the time-temperature history experienced by the sample during the test and/or to moisture. NOTE 1 Some grades of materials affected by hydrolysis are of, for example, poly(ethylene terephthalate) (PET), poly(butylene terephthalate) (PBT), poly(ethylene naphthalate) (PEN), other polyester types and polyamides; and by cross-linking are of, for example, thermoplastic elastomers (TPE) and thermoplastic vulcanizates (TPV). It is possible that this method will also be suitable for use with other materials. It is possible that this method will not be appropriate for materials whose rheological behaviour is extremely affected during testing (see Note 2). NOTE 2 For materials where the coefficient of variation of the MFR or MVR results is found to be higher than the precision mentioned in ISO 1133-1, the viscosity number in dilute solution (ISO 307, ISO 1628) can be more appropriate for characterization purposes. NOTE 3 Minor deviations from the equipment requirements, procedure and/or sample handling can result in considerable loss of reproducibility, repeatability and accuracy of the measurement. MVR results determined on different materials, indicating the repeatability of the test method of this part of ISO 1133 when measured under ideal measurement conditions, are reported in Annex B. MFR values can be determined by calculation from MVR measurements provided the melt density at the test temperature and pressure is known, or by measurement using a cutting device provided that the accuracy of the measurement is at least the same as that of the MVR measurement. NOTE 4 The density of the melt is required at the test temperature and pressure. In practice, the pressure is low and values obtained at the test temperature and ambient pressure suffice. The primary difference between this part of ISO 1133 and ISO 1133-1 is that this part of ISO 1133 specifies tighter tolerances on the temperature in the cylinder and on the time duration over which the material is subjected to that temperature. Thus the time-temperature history of the material is more tightly controlled and consequently, for materials that are likely to be affected by exposure to elevated temperatures, the variability of test results is reduced compared with whether the specifications of ISO 1133-1 were used.	ISO/TC 61	no

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
			This part of ISO 1133 also provides information for preparation and handling of moisture sensitive materials that again are critical to obtaining repeatable, reproducible and accurate data. The test conditions for measurement of the MVR and MFR are often specified in the material standard. However, for those materials where there are no test conditions specified in the material standard, it is necessary for the test conditions to be agreed between the interested parties.		
ISO 11344	2016	Rubber, raw synthetic — Determination of the molecular-mass distribution of solution polymers by gel permeation chromatography	This International Standard describes a method for the determination of the molecular mass, expressed as polystyrene, and the molecular-mass distribution of polymers produced in solution which are completely soluble in tetrahydrofuran (THF) and which have a molecular-mass range from 5 × 10^3 to 1 × 10^6. It is not the purpose of this International Standard to explain the theory of gel permeation chromatography.	ISO/TC 45	no
ISO 11346	2023	Rubber, vulcanized or thermoplastic — Estimation of life-time and maximum temperature of use	This International Standard specifies the principles and procedures for estimating the thermal endurance of rubbers from the results of exposure to elevated temperatures for long periods. Two approaches are specified (see Introduction): — one using the Arrhenius relation; — the other using the WLF equation. In this International Standard, the estimation of thermal endurance is based solely on the change in selected properties resulting from periods of exposure to elevated temperatures. The various properties of rubbers change at different rates on thermal ageing, hence comparisons between different rubbers can only be made using the same properties.	ISO/TC 45	no
ISO 11357-1	2023	Plastics — Differential scanning calorimetry (DSC) — Part 1: General principles	The ISO 11357 series specifies several differential scanning calorimetry (DSC) methods for the thermal analysis of polymers and polymer blends, such as — thermoplastics (polymers, moulding compounds and other moulding materials, with or without fillers, fibres or reinforcements), — thermosets (uncured or cured materials, with or without fillers, fibres or reinforcements), and — elastomers (with or without fillers, fibres or reinforcements). The ISO 11357 series is applicable for the observation and measurement of various properties of, and phenomena associated with, the above-mentioned materials, such as — physical transitions (glass transition, phase transitions such as melting and crystallization, polymorphic transitions, etc.), — chemical reactions (polymerization, crosslinking and curing of elastomers and thermosets, etc.), — the stability to oxidation, and — the heat capacity. This document specifies a number of general aspects of differential scanning calorimetry, such as the principle and the apparatus, sampling, calibration and general aspects of the procedure and test report common to all parts. Details on performing specific methods are given in subsequent parts of the ISO 11357 series (see Foreword).	ISO/TC 61	no
ISO 11359-1	2023	Plastics — Thermomechanical analysis (TMA) — Part 1: General principles	This document specifies the general conditions for the thermomechanical analysis of thermoplastics and thermosetting materials, filled or unfilled, in the form of sheet or moulded parts. Thermomechanical analysis consists of the determination of deformations of a test specimen under constant load as a function of temperature and/or time.	ISO/TC 61	yes
ISO 11359-2	2021	Plastics — Thermomechanical analysis (TMA) — Part 2: Determination of coefficient of	This document specifies a test method, using thermodilatometry[1], for the determination of the coefficient of linear thermal expansion of plastics in a solid state by thermomechanical analysis (TMA). This document also specifies the determination of the glass transition temperature using TMA.	ISO/TC 61	yes

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
		linear thermal expansion and glass transition temperature	NOTE The coefficient of linear thermal expansion can be measured using various types of thermodilatometry apparatus. This document concerns only TMA apparatus.		
ISO 11359-3	2019	Plastics — Thermomechanical analysis (TMA) — Part 3: Determination of penetration temperature	This document specifies a method for the determination of the penetration temperature of thermoplastics using thermomechanical analysis (TMA). NOTE This method can also be used to measure the softening point.	ISO/TC 61	yes
ISO 11734	1995	Water quality — Evaluation of the "ultimate" anaerobic biodegradability of organic compounds in digested sludge — Method by measurement of the biogas production	This International Standard specifies a screening method for the evaluation of the biodegradability of organic compounds at a given concentration by anaerobic microorganisms. The conditions described in this test do not necessarily correspond to the optimal conditions allowing the maximum value of biodegradation to occur, since a dilute sludge is used with a relatively high concentration of test chemical. The test allows exposure of sludge to the chemical for a period of up to 60 d, which is longer than the normal sludge retention time (25 d to 30 d) in anaerobic digesters, though digesters at industrial sites can have much longer retention times. The method applies to organic compounds with a known carbon content and which are — soluble in water; — poorly soluble in water, provided that a method of exact dosing is applicable; — not inhibitory to the test microorganisms at the concentration chosen for the test; inhibitory effects can be determined in separate tests or by an additional inhibition assay. For volatile substances a case by case decision is necessary. Some can be tested if handled with special care, for example no release of gas during the test.	ISO/TC 147	no
ISO 1183-1	2019	Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method (Corrected version 2019-05)	This document specifies three methods for the determination of the density of non-cellular plastics in the form of void-free moulded or extruded objects, as well as powders, flakes and granules. — Method A: Immersion method, for solid plastics (except for powders) in void-free form. — Method B: Liquid pycnometer method, for particles, powders, flakes, granules or small pieces of finished parts. — Method C: Titration method, for plastics in any void-free form. NOTE Density is frequently used to follow variations in physical structure or composition of plastic materials. Density can also be useful in assessing the uniformity of samples or specimens. Often, the density of plastic materials depend upon the choice of specimen preparation method. When this is the case, precise details of the specimen preparation method are intended to be included in the appropriate material specification. This note is applicable to all three methods.	ISO/TC 61	yes
ISO 1183-2	2019	Plastics — Methods for determining the density of non-cellular plastics — Part 2: Density gradient column method	This document specifies a gradient column method for the determination of the density of non-cellular moulded or extruded plastics or pellets in void-free form. Density gradient columns are columns containing a mixture of two liquids, the density in the column increasing uniformly from top to bottom. NOTE Density is frequently used to follow variations in physical structure or composition of plastic materials. Density can also be useful in assessing the uniformity of samples or specimens. The density of plastic materials can depend upon the choice of specimen preparation method. When this is the case, precise details of the specimen preparation method are intended to be included in the appropriate material specification.	ISO/TC 61	no
ISO 1183-3	1999	Plastics — Methods for determining the density of non-cellular plastics — Part 3: Gas pyknometer method	This part of ISO 1183 specifies a method for the determination of the density or the specific volume of solid non-cellular plastics of any shape which do not contain closed pores.	ISO/TC 61	no
ISO 12493	2023	Rubber, vulcanized or thermoplastic — Determination	This document describes two methods for measuring stress in tension under non-isothermal conditions. — Method A: The thermal stress is measured for various pre-strain and temperature conditions as a function of time.	ISO/TC 45	no

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
		of stress in tension under non-isothermal conditions	— Method B: The change of stress is measured in a test piece at a given strain and under variation of temperature at a given heating rate as a function of temperature. In this way, the determination of the thermal-mechanical behaviour of a rubber can be accelerated, e.g. for the purpose of comparative testing of aging or estimating the upper limit of the operating temperature. The measurement device, which is equipped with a suitable heating chamber, is used to record the stress as a function of time or temperature until the sample breaks or the stress has approached zero or for a certain time.		
ISO 13362	2000	Flexible cellular polymeric materials — Determination of compression set under humid conditions	This International Standard specifies a method for determining the compression set of flexible cellular materials under humid conditions. This method consists of maintaining the test piece under specified conditions of time, temperature, humidity and constant compressive strain and determining the effect on the thickness of the test piece after a specified recovery period.	ISO/TC 45	no
ISO 1382	2020	Rubber — Vocabulary	This document establishes a vocabulary of and is limited to those terms in general use throughout the rubber industry. It does not define terms intended for particular rubber products, some of which are given in the vocabulary standards listed in the Bibliography. It does not define terms that are generally understood or adequately defined in other readily available sources such as general dictionaries. The terms are listed in the alphabetical order of the English terms, with an index to the corresponding English terms attached. Symbols are included under their full descriptions.	ISO/TC 45	no
ISO 14040	2006/Amd 1	Environmental management — Life cycle assessment — Principles and framework — Amendment 1	ISO 14040:2006 describes the principles and framework for life cycle assessment (LCA) including: definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, the relationship between the LCA phases, and conditions for use of value choices and optional elements. ISO 14040:2006 covers life cycle assessment (LCA) studies and life cycle inventory (LCI) studies. It does not describe the LCA technique in detail, nor does it specify methodologies for the individual phases of the LCA. The intended application of LCA or LCI results is considered during definition of the goal and scope, but the application itself is outside the scope of this International Standard.	ISO/TC 207	yes
ISO 1407	2023	Rubber — Determination of solvent extract	This document specifies four methods for the quantitative determination of the material extractable from raw rubbers, both natural and synthetic; two of the methods are also applicable to the unvulcanized and vulcanized rubber compounds. Method A measures the mass of the solvent extract, after evaporation of the solvent, relative to the mass of the original test portion. Method B measures the difference in the mass of the test portion before and after extraction. Method C, which is for raw rubbers only, measures the difference in the mass of the test portion before and after extraction using boiling solvent. Method D, which is for raw rubbers only, measures the difference in the mass of the test portion before and after extraction relative to the mass of the original test portion. NOTE 1 Depending on the test method used, the conditioning of the test portion and the solvent used, the test result is not	ISO/TC 45	no

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
			necessarily the same. NOTE 2 Method C generally gives results which are lower than those obtained with methods A and B due to an equilibrium which is set up, particularly if large test portions are used, depending on the content and the nature of the extractable matter. Method C is, however, a quicker method than method A or method B. NOTE 3 Methods C and D are not suitable if the test portion disintegrates during the extraction. NOTE 4 Method D is normally used for production controls. Recommendations as to the solvent most appropriate for each type of rubber are given in Annex A.		
ISO 1408	1995	Rubber — Determination of carbon black content — Pyrolytic and chemical degradation methods	Describes a pyrolytic method (A) and two chemical degradation methods (B and C) for the determination of the carbon black content of artificial rubber and copolymers. Replaces the second edition, of which it constitutes a minor revision.	ISO/TC 45	no
ISO 140-8 (withdrawn, see ISO 10140-1 to -5)	1997	Acoustics — Measurement of sound insulation in buildings and of building elements — Part 8: Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight standard floor	Not available.	-	yes
ISO 14125	1998/Cor1:2001/Amd1:2011	Fibre-reinforced plastic composites — Determination of flexural properties	1.1 This International Standard specifies a method for determining the flexural properties of fibre-reinforced plastic composites under three-point (Method A) and four-point (Method B) loading. Standard test specimens are defined but parameters included for alternative specimen sizes for use where appropriate. A range of test speeds is included. 1.2 The method is not suitable for the determination of design parameters, but may be used for screening materials, or as a quality-control test. NOTE — For example, the flexural modulus is only an appropriate value of the tensile Young's modulus of elasticity as the test is not for the additional deflection due to the shear stress which leads to a lower value of the flexural modulus but uses test span/specimen thickness ratios that minimise this effect. Differences between tensile and flexural properties are also caused by the material structure/lay-up. 1.3 The method is suitable for fibre-reinforced thermoplastic and thermosetting plastic composites. Unreinforced and particle-filled plastics and plastics reinforced with short (i.e. less than 1 mm length) fibres are covered by ISO 178. 1.4 The method is performed using specimens which may be moulded to the chosen dimensions, machined from the central portion of the standard multi-purpose test specimen (see ISO 3167) or machined from semi-finished or finished products such as mouldings or laminates. 1.5 The method specifies preferred dimensions for the specimen. Tests which are carried out on specimens of other dimensions, or on specimens which are prepared under different conditions, may produce results which are not comparable. Other factors, such as the speed of testing and the conditioning of the specimens can influence the results. For materials which are not homogeneous	ISO/TC 61	no

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
			through the section, or above the linear-elastic response region, the result applies only to the thickness and structure tested. Consequently, when comparative data are required, these factors must be carefully controlled and recorded.		
ISO 1419	2019	Rubber- or plastics-coated fabrics — Accelerated-ageing tests	This document describes four methods of assessing the resistance of coated fabrics to deterioration by accelerated ageing.	ISO/TC 45	no
ISO 14309	2019	Rubber, vulcanized or thermoplastic — Determination of volume and/or surface resistivity	This document specifies a method for the determination of the volume and the surface resistivity of vulcanized or thermoplastic rubbers. The method can be applied to materials with a resistivity from 101 Ω·m to 1017 Ω·m.	ISO/TC 45	no
ISO 1431-1	2022	Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing	This document specifies the procedures intended for use in estimating the resistance of vulcanized or thermoplastic rubbers to cracking when exposed, under static or dynamic tensile strain, to air containing a definite concentration of ozone, at a definite temperature and, if required, at a definite relative humidity in circumstances that exclude the effects of direct light. Visual observation and/or image analysis are used to evaluate the formation and growth of cracks. The changes in physical or chemical properties resulting from exposure can also be determined. Reference and alternative methods for determining the ozone concentration are described in ISO 1431-3.	ISO/TC 45	no
ISO 1431-3	2017	Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 3: Reference and alternative methods for determining the ozone concentration in laboratory test chambers	This document describes three types of method for the determination of ozone concentration in laboratory test chambers. Method A — UV absorption: this is the reference method, and is used as the means of calibration for the alternative methods B and C. Method B — Instrumental techniques: B1: electrochemical B2: chemiluminescence Method C — Wet-chemical techniques: Procedure I Procedure II Procedure III	ISO/TC 45	no
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	This document specifies a method, by measuring the oxygen demand in a closed respirometer, for the determination of the degree of aerobic biodegradability of plastic materials, including those containing formulation additives. The test material is exposed in an aqueous medium under laboratory conditions to an inoculum from activated sludge. If an unadapted activated sludge is used as the inoculum, the test simulates the biodegradation processes which occur in a natural aqueous environment; if a mixed or pre-exposed inoculum is used, the method is used to investigate the potential biodegradability of a test material. The conditions used in this document do not necessarily correspond to the optimum conditions allowing maximum biodegradation to occur, but this document is designed to determine the potential biodegradability of plastic materials or give an indication of their biodegradability in natural environments. The method enables the assessment of the biodegradability to be improved by calculating a carbon balance (optional, see Annex E). The method applies to the following materials.	ISO/TC 61	no

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
			— Natural and/or synthetic polymers, copolymers or mixtures thereof. — Plastic materials which contain additives such as plasticizers, colorants or other compounds. — Water-soluble polymers. — Materials which, under the test conditions, do not inhibit the microorganisms present in the inoculum. Inhibitory effects can be determined using an inhibition control or by another appropriate method (see, for example, ISO 8192[2]). If the test material is inhibitory to the inoculum, a lower test concentration, another inoculum or a pre-exposed inoculum can be used.		
ISO 14852	2021	Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium — Method by analysis of evolved carbon dioxide	This document specifies a method, by measuring the amount of carbon dioxide evolved, for the determination of the degree of aerobic biodegradability of plastic materials, including those containing formulation additives. The test material is exposed in a synthetic medium under standardized laboratory conditions to an inoculum from activated sludge under aerobic conditions. The conditions used in this document do not necessarily correspond to the optimum conditions allowing maximum biodegradation to occur, but this test method is designed to measure the biodegradation of plastic materials and give an indication of their potential biodegradability. The method enables the assessment of the biodegradation to be improved by calculating a carbon balance (optional, see Annex C). The method applies to the following materials: — natural and/or synthetic polymers, copolymers or mixtures thereof; — plastic materials which contain additives such as plasticizers, colorants or other compounds; — water-soluble polymers; — materials which, under the test conditions, do not inhibit the microorganisms present in the inoculum. Inhibitory effects can be determined using an inhibition control or by another appropriate method (see, for example, ISO 8192[1]). If the test material is inhibitory to the inoculum, a lower test concentration, another inoculum or a pre-exposed inoculum can be used.	ISO/TC 61	no
ISO 14853	2016	Plastics — Determination of the ultimate anaerobic biodegradation of plastic materials in an aqueous system — Method by measurement of biogas production	ISO 14853:2016 specifies a method for the determination of the ultimate anaerobic biodegradability of plastics by anaerobic microorganisms. The conditions described in ISO 14853 do not necessarily correspond to the optimum conditions for the maximum degree of biodegradation to occur. The test calls for exposure of the test material to sludge for a period of up to 90 d, which is longer than the normal sludge retention time (25 to 30 d) in anaerobic digesters, although digesters at industrial sites can have much longer retention times. The method applies to the following materials: - natural and/or synthetic polymers, copolymers or mixtures thereof;	ISO/TC 61	no

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
			- plastic materials which contain additives such as plasticizers, colorants or other compounds; - water-soluble polymers; - materials which, under the test conditions, do not inhibit the microorganisms present in the inoculum. Inhibitory effects can be determined using an inhibition control or by another appropriate method (see e.g. ISO 13641). If the test material is inhibitory to the inoculum, a lower test concentration, another inoculum or a pre-exposed inoculum can be used.		
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 14855-1:2012 specifies a method for the determination of the ultimate aerobic biodegradability of plastics, based on organic compounds, under controlled composting conditions by measurement of the amount of carbon dioxide evolved and the degree of disintegration of the plastic at the end of the test. This method is designed to simulate typical aerobic composting conditions for the organic fraction of solid mixed municipal waste. The test material is exposed to an inoculum which is derived from compost. The composting takes place in an environment wherein temperature, aeration and humidity are closely monitored and controlled. The test method is designed to yield the percentage conversion of the carbon in the test material to evolved carbon dioxide as well as the rate of conversion. Also specified is a variant of the method, using a mineral bed (vermiculite) inoculated with thermophilic microorganisms obtained from compost with a specific activation phase, instead of mature compost. This variant is designed to yield the percentage of carbon in the test substance converted to carbon dioxide and the rate of conversion.	ISO/TC 61	no
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	This document specifies a method for determining the ultimate aerobic biodegradability of plastic materials under controlled composting conditions by gravimetric measurement of the amount of carbon dioxide evolved. The method is designed to yield an optimum rate of biodegradation by adjusting the humidity, aeration and temperature of the composting vessel. The method applies to the following materials: — natural and/or synthetic polymers and copolymers, and mixtures of these; — plastic materials that contain additives such as plasticizers or colorants; — water-soluble polymers; — materials that, under the test conditions, do not inhibit the activity of microorganisms present in the inoculum. If the test material inhibits microorganisms in the inoculum, another type of mature compost or pre-exposure compost can be used.	ISO/TC 61	no
ISO 15113	2005	Rubber — Determination of frictional properties (Corrected version 2005-10)	ISO 15113:2005 outlines the principles governing the measurement of coefficient of friction and describes a method suitable for measuring the coefficient of friction of a rubber against standard comparators, against itself, or against any other specified surface.	ISO/TC 45	no
ISO 15512	2019	Plastics — Determination of water content	This document specifies methods for the determination of the water content of plastics in the form of powder, granules, and finished articles. These methods do not test for water absorption (kinetics and equilibrium) of plastics as measured by ISO 62. Method A is suitable for the determination of water content as low as 0,1 % with an accuracy of 0,1 %. Method B and Method C are	ISO/TC 61	no

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			suitable for the determination of water content as low as 0,01 % with an accuracy of 0,01 %. Method D is suitable for the determination of water content as low as 0,01 % with an accuracy of 0,01 %. Method E is suitable for the determination of water content as low as 0,001 % with an accuracy of 0,001 %. The stated accuracies are detection limits which depend also on the maximal possible sample mass. The water content is expressed as a percentage mass fraction of water. Method D is suitable for polyamide (PA), polycarbonate (PC), polypropylene (PP), polyethylene (PE), epoxy resin, polyethylene terephthalate (PET), polyester, polytetrafluoroethylene (PTFE), polyvinyl chloride (PVC), polylactide (PLA), polyamidimid (PAI), it is especially not recommended for samples which can release NH3. Methods A, B, C and E are generally suitable for all types of plastic and moisture level. Water content is an important parameter for processing materials and is expected to remain below the level specified in the appropriate material standard. Six alternative methods are specified in this document. — Method A is an extraction method using anhydrous methanol followed by a Karl Fischer titration of the extracted water. It can be used for all plastics and is applicable to granules smaller than 4 mm × 4 mm × 3 mm. The method can also be used for, e.g. prepolymer materials in the form of a powder that are insoluble in methanol. — Method B1 is a vaporization method using a tube oven. The water contained in the test portion is vaporized and carried to the titration cell by a dry air or nitrogen carrier gas, followed by a Karl Fischer titration or a coulometric determination by means of a moisture sensor of the collected water. It can be used for all plastics and is applicable to granules smaller than 4 mm × 4 mm × 3 mm. — Method B2 is a vaporization method using a heated sample vial. The water contained in the test portion is vaporized and carried to the titration cell by a dry air or nitrogen carrier gas, followed by a Karl Fischer titration of the collected water. It can be used for all plastics and is applicable to granules smaller than 4 mm × 4 mm × 3 mm. — Method C is a manometric method. The water content is determined from the increase in pressure, which results when the water is evaporated under a vacuum. This method is not applicable to plastic samples containing volatile compounds, other than water, in amounts contributing significantly to the vapour pressure at room temperature. Checks for the presence of large amounts of volatile compounds are to be carried out periodically, for example by gas chromatography. Such checks are particularly required for new types or grades of material. — Method D is a thermocoulometric method using a diphosphorus pentoxide (P2O5) cell for the detection of the vaporized water. The water contained in the test portion is vaporized and carried to the sensor cell by a dry air or nitrogen carrier gas, followed by a coulometric determination of the collected water. This method is not applicable to plastic samples containing volatile compounds, other than water, in amounts contributing significantly to the vapour pressure at room temperature. This is specially related to volatile components which can react with the acidic coating of the diphosphorus pentoxide sensor, e.g. ammonia or any kind of amines. Checks for the presence of large amounts of volatile compounds are to be carried out periodically. Such checks are particularly required for new types or grades of material.		

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			— Method E is a calcium hydride based method. The water content of a sample evaporates due to a combination of vacuum and heating. The evaporated water reacts with calcium hydride to molecular hydrogen and calcium hydroxide. The hydrogen causes an increase of pressure in the vacuum that is proportional to the evaporated water. Volatile components, that do not react with calcium hydride condensate in a cooling trap and do not affect the measurement.		
ISO 15671	2023	Rubber and rubber additives — Determination of total sulfur content using an automatic analyser	This document specifies an instrumental (automatic analyser) method for the determination of total sulfur in rubber and rubber products.	ISO/TC 45	no
ISO 15985	2014	Plastics — Determination of the ultimate anaerobic biodegradation under high-solids anaerobic-digestion conditions — Method by analysis of released biogas	ISO 15985:2004 specifies a method for the evaluation of the ultimate anaerobic biodegradability of plastics based on organic compounds under high-solids anaerobic-digestion conditions by measurement of evolved biogas and the degree of disintegration at the end of the test. This method is designed to simulate typical anaerobic digestion conditions for the organic fraction of mixed municipal solid waste. The test material is exposed in a laboratory test to a methanogenic inoculum derived from anaerobic digesters operating only on pretreated household waste. The anaerobic decomposition takes place under high-solids (more than 20 % total solids) and static non-mixed conditions. The test method is designed to yield the percentage of carbon in the test material and its rate of conversion to evolved carbon dioxide and methane (biogas).	ISO/TC 61	no
ISO 16396-2	2022	Plastics — Polyamide (PA) moulding and extrusion materials — Part 2: Preparation of test specimens and determination of properties	ISO 16396-2:2017 specifies the methods of preparation of test specimens and the test methods to be used in determining the properties of polyamide moulding and extrusion materials. Requirements for handling test material and for conditioning both the test material before moulding and the specimens before testing are given. Procedures and conditions for the preparation of test specimens and procedures for measuring properties of the materials from which these specimens are made are given. Properties and test methods that are suitable and necessary to characterize polyamide moulding and extrusion materials are listed. The properties have been selected from the general test methods in ISO 10350-1. Other test methods in wide use for, or of particular significance to, these moulding and extrusion materials are also included in this document, as are the designatory properties viscosity number and tensile modulus of elasticity given in ISO 16396-1.	ISO/TC 61	no
ISO 16564	2004/Amd1:2006	Rubber, raw natural — Determination of average molecular mass and molecular-mass distribution by size exclusion chromatography (SEC)	ISO 16564:2004 specifies a method of determining the average molecular mass and the molecular-mass distribution of raw natural rubber dissolved in tetrahydrofuran. A set of polystyrene standards is used for calibration purposes (i.e. the method is a relative one). An alternative method, using cyclohexane as solvent and polyisoprene standards, is included in an informative annex.	ISO/TC 45	no
ISO 16620-1	2015	Plastics — Biobased content — Part 1: General principles	ISO 16620-1:2015 specifies the general principles and the calculation methods for determining the amount of biobased content in plastic products. These calculation methods are based on the carbon mass or mass of each constituent present in the plastic products. ISO 16620-1:2015 is applicable to plastic products and plastic materials, polymer resins, monomers, or additives, which are made from biobased or fossil-based constituents.	ISO/TC 61	yes
ISO 16620-2	2019	Plastics — Biobased content — Part 2: Determination of biobased carbon content	This document specifies a calculation method for the determination of the biobased carbon content in monomers, polymers, and plastic materials and products, based on the 14C content measurement.	ISO/TC 61	yes

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			This document is applicable to plastic products and plastic materials (e.g. plasticisers or modifiers), polymer resins, monomers, or additives, which are made from biobased or fossil-based constituents. Knowing the biobased content of plastic products is useful when evaluating their environmental impact.		
ISO 16620-3	2015	Plastics — Biobased content — Part 3: Determination of biobased synthetic polymer content	ISO 16620-3:2015 specifies the method of determining the amounts of biobased part in the biobased synthetic polymer in plastics products. This calculation method for biobased synthetic polymer content is based on the mass of biobased synthetic polymer in the plastics products. ISO 16620-3:2015 is applicable to plastic products and plastic materials, polymer resins, monomers, or additives (e.g. plasticizers or modifiers), which are made from biobased or fossil-based constituents.	ISO/TC 61	yes
ISO 16620-4	2016	Plastics — Biobased content — Part 4: Determination of biobased mass content	ISO 16620-4:2016 specifies a method of determining the biobased mass content in plastics products, based on the radiocarbon analysis and elemental analysis. ISO 16620-4:2016 is applicable to plastic products and plastic materials, polymer resins, monomers or additives, which are made from biobased or fossil-based constituents. This method is applicable, provided that the plastic product contains carbon element and that a statement giving its elemental composition and its biobased mass content is available.	ISO/TC 61	yes
ISO 16620-5	2017	Plastics — Biobased content — Part 5: Declaration of biobased carbon content, biobased synthetic polymer content and biobased mass content	ISO 16620-5:2017 specifies the requirements for the declarations and labels of the biobased carbon content, the biobased synthetic polymer content and the biobased mass content in plastic products. ISO 16620-5:2017 is applicable to plastic products and plastic materials, polymer resins, monomers or additives, which are made from biobased or fossil-based constituents.	ISO/TC 61	yes
ISO 16905	2015	Resilient floor coverings — Specification for rubber floor covering — Tile/Plank	ISO 16908:2015 specifies the characteristics of rubber floor tile/planks. ISO 16908:2015 includes a classification system based on intensity of use, which shows where resilient floor coverings should provide satisfactory service. ISO 16908:2015 specifies rubber floor tile/planks for applications involving the use of normal footwear and does not cover applications where special footwear, such as spiked shoes, may be involved.	ISO/TC 219	no
ISO 178	2019	Plastics — Determination of flexural properties	This document specifies a method for determining the flexural properties of rigid and semi-rigid plastics under defined conditions. A preferred test specimen is defined, but parameters are included for alternative specimen sizes for use where appropriate. A range of test speeds is included. The method is used to investigate the flexural behaviour of the test specimens and to determine the flexural strength, flexural modulus and other aspects of the flexural stress/strain relationship under the conditions defined. It applies to a freely supported beam, loaded at midspan (three-point loading test). The method is suitable for use with the following range of materials: — thermoplastic moulding, extrusion and casting materials, including filled and reinforced compounds in addition to unfilled types;	ISO/TC 61	no

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			rigid thermoplastics sheets; — thermosetting moulding materials, including filled and reinforced compounds; thermosetting sheets. In agreement with ISO 10350-1[5] and ISO 10350-2[6], this document applies to fibre-reinforced compounds with fibre lengths ≤7,5 mm prior to processing. For long-fibre-reinforced materials (laminates) with fibre lengths >7,5 mm, see ISO 14125[7]. The method is not normally suitable for use with rigid cellular materials or sandwich structures containing cellular material. In such cases, ISO 1209-1[3] and/or ISO 1209-2[4] can be used. NOTE 1 For certain types of textile-fibre-reinforced plastic, a four-point bending test is used. This is described in ISO 14125. The method is performed using specimens which can be either moulded to the specified dimensions, machined from the central section of a standard multipurpose test specimen (see ISO 20753) or machined from finished or semi-finished products, such as mouldings, laminates, or extruded or cast sheet. The method specifies the preferred dimensions for the test specimen. Tests which are carried out on specimens of different dimensions, or on specimens which are prepared under different conditions, can produce results which are not comparable. Other factors, such as the test speed and the conditioning of the specimens, can also influence the results. NOTE 2 Especially for injection moulded semi-crystalline polymers, the thickness of the oriented skin layer, which is dependent on the moulding conditions, also affects the flexural properties. The method is not suitable for the determination of design parameters but can be used in materials testing and as a quality control test.		
ISO 179-1	2023	Plastics — Determination of Charpy impact properties — Part 1: Non-instrumented impact test	This document specifies a method for determining the Charpy impact strength of plastics under defined conditions. A number of different types of specimen and test configurations are defined. Different test parameters are specified according to the type of material, the type of test specimen and the type of notch.	ISO/TC 61	yes
ISO 180	2023	Plastics — Determination of Izod impact strength	1.1 This document specifies a method for determining the Izod impact strength of plastics under defined conditions. A number of different types of specimen and test configurations are defined. Different test parameters are specified according to the type of material, the type of test specimen and the type of notch. 1.2 The method is used to investigate the behaviour of specified types of specimen under the impact conditions defined and for estimating the brittleness or toughness of specimens within the limitations inherent in the test conditions. 1.3 The method is suitable for use with the following range of materials: — rigid thermoplastic moulding and extrusion materials, including filled and reinforced compounds in addition to unfilled types; rigid thermoplastics sheets; — rigid thermosetting moulding materials, including filled and reinforced compounds; rigid thermosetting sheets, including	ISO/TC 61	no

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			laminates; — fibre-reinforced thermosetting and thermoplastic composites incorporating unidirectional or non-unidirectional reinforcements such as mat, woven fabrics, woven rovings, chopped strands, combination and hybrid reinforcements, rovings and milled fibres and sheet made from pre-impregnated materials (prepregs); — thermotropic liquid-crystal polymers. 1.4 The method is not normally suitable for use with rigid cellular materials and sandwich structures containing cellular material. Notched specimens are also not normally used for long-fibre-reinforced composites or thermotropic liquid-crystal polymers. 1.5 The method is suited to the use of specimens which can be either moulded to the chosen dimensions, machined from the central portion of a standard multipurpose test specimen (see ISO 20753) or machined from finished or semi-finished products such as mouldings, laminates and extruded or cast sheet. 1.6 The method specifies preferred dimensions for the test specimen. Tests which are carried out on specimens of different dimensions or with different notches, or specimens which are prepared under different conditions, may produce results which are not comparable. Other factors, such as the energy capacity of the apparatus, its impact velocity and the conditioning of the specimens can also influence the results. Consequently, when comparative data are required, these factors are to be carefully controlled and recorded. 1.7 The method is not intended to be used as a source of data for design calculations. Information on the typical behaviour of a material can be obtained, however, by testing at different temperatures, by varying the notch radius and/or the thickness and by testing specimens prepared under different conditions.		
ISO 1853	2018	Conducting and dissipative rubbers, vulcanized or thermoplastic — Measurement of resistivity	This document specifies the requirements for the laboratory testing of the volume resistivity of specially prepared test pieces of vulcanized or thermoplastic rubber compounds rendered conducting or dissipative by the inclusion of carbon black or ionizable materials. The tests are suitable for materials with a resistivity of less than about 108 Ω·m. Method 1 is the preferred method when test pieces with bonded electrodes are not available. Method 2 is the preferred method when test pieces are moulded with the inclusion of bonded electrodes. Method 3 is another method that can be used if the apparatus for method 1 or 2 is not available, but it has lower accuracy. If a reference to this document is made without specifying the method, method 1 is used.	ISO/TC 45	yes
ISO 188	2023	Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests	This document specifies accelerated ageing or heat resistance tests on vulcanized or thermoplastic rubbers/thermoplastic elastomers. Four methods are possible, they are detailed in Clause 5.	ISO/TC 45	no

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ISO 19701	2013	Methods for sampling and analysis of fire effluents	ISO 19701:2013 presents a range of sampling and chemical analytical methods suitable for the analysis of individual chemical species in fire atmospheres. The procedures relate to the analysis of samples extracted from an apparatus or effluent flow from a fire test rig or physical fire test model and are not concerned with the specific nature of the fire test. It does not cover aerosols and Fourier transform infrared (FTIR) technique.	ISO/TC 92	yes
ISO 19984-1	2017	Rubber and rubber products — Determination of biobased content — Part 1: General principles and calculation methods using the formulation of the rubber compound	ISO 19984-1:2017 specifies the general principles and the calculation methods for the determination of biobased content in rubber and rubber products, including polyurethanes, by using the compound formulation. These calculation methods are based on the mass or the carbon mass of each constituent present in the rubber or rubber product.	ISO/TC 45	no
ISO 19984-2	2017	Rubber and rubber products — Determination of biobased content — Part 2: Biobased carbon content	ISO 19984-2:2017 specifies measuring methods for the determination of biobased carbon contents in rubber and rubber products, including polyurethanes. The methods focus on carbon atoms in rubber or rubber products, and determine whether the carbon-containing component is biobased or not judging from the concentration of 14C, radiocarbon isotope. ISO 19984-2:2017 applies to rubber and rubber products such as raw materials, materials and final products.	ISO/TC 45	no
ISO 19984-3	2017	Rubber and rubber products — Determination of biobased content — Part 3: Biobased mass content	ISO 19984-3:2017 specifies measuring methods for the determination of the biobased mass contents in rubber and rubber products. The biobased mass content of rubber materials or final products can be determined by separating the sample into the rubber, the inorganic ingredient (including carbon black) and the solvent extract, each of whose 14C content is determined, and then converting the results to the biobased mass content using the procedure described in this document. ISO 19984-3:2017 applies to NR, IR, BR, SBR, IIR, BIIR, CIIR and their modified rubbers, as well as to their mixtures. ISO 19984-3:2017 uses only the accelerator mass spectrometry (AMS) method for the purpose of determination of biobased content.	ISO/TC 45	no
ISO 20028-2	2017	Plastics — Thermoplastic polyester (TP) moulding and extrusion materials — Part 2: Preparation of test specimens and determination of properties	ISO 20028-2:2017 specifies the methods of preparation of test specimens and the standard test methods to be used in determining the properties of thermoplastic polyester moulding and extrusion materials. Requirements for handling test material and for conditioning both the test material before moulding and the specimens before testing are given. Procedures and conditions for the preparation of test specimens in a specified state and procedures for measuring properties of the materials from which these specimens are made are given. Properties and test methods which are suitable and necessary to characterize thermoplastic polyester moulding and extrusion materials are listed. The properties have been selected from the general test methods in ISO 10350-1. Other test methods in wide use for or of particular significance to these moulding and extrusion materials are also included in this document, as are the designatory properties specified in ISO 20028-1 (viscosity number and tensile modulus of elasticity). In order to obtain reproducible and comparable test results, it is necessary to use the methods of specimen preparation and	ISO/TC 61	no

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			conditioning, the specimen dimensions and the test procedures specified herein. Values determined will not necessarily be identical to those obtained using specimens of different dimensions or prepared using different procedures.		
ISO 2007	2018	Rubber, unvulcanized — Determination of plasticity — Rapid-plastimeter method	ISO 2007:2007 specifies a method for the rapid determination of the plasticity of raw rubber and unvulcanized compounded rubber. It is applicable to the determination of the plasticity retention index (PRI) as specified in ISO 2930, Rubber, raw natural -- Determination of plasticity retention index (PRI).	ISO/TC 45	no
ISO 20819-2	2023	Plastics — Wood-plastic recycled composites (WPRC) — Part 2: Test methods	This document defines the test methods for fundamental physical properties and durability required for wood-plastic recycled composites (hereinafter called WPRC) stipulated in ISO 20819-1.	ISO/TC 61	no
ISO 22007-1	2017	Plastics — Determination of thermal conductivity and thermal diffusivity — Part 1: General principles	ISO 22007-1:2017 describes the background to methods for the determination of the thermal conductivity and thermal diffusivity of polymeric materials. Different techniques are available for these measurements and some may be better suited than others for a particular type, state and form of material. ISO 22007-1:2017 provides a broad overview of these techniques. Standards specific to these techniques, as referenced in this document, are used to carry out the actual test method.	ISO/TC 61	yes
ISO 22751	2020	Rubber- or plastic-coated fabrics — Physical and mechanical test — Determination of bending force	This document specifies a test method for the determination of the bending force of rubber or plastics-coated fabrics.	ISO/TC 45	no
ISO 2285	2019	Rubber, vulcanized or thermoplastic — Determination of tension set under constant elongation, and of tension set, elongation and creep under constant tensile load	This document specifies a number of methods of determining the dimensional changes in test pieces of vulcanized or thermoplastic rubber during and after tensile loading for relatively short periods under constant elongation or constant loading. The constant-elongation test is intended to measure the ability of rubbers to retain their elastic properties after extension, at a standard laboratory temperature, to a specified strain which is maintained for a specified time at the same or at a specified higher temperature and then released at the test temperature or at the standard laboratory temperature. The constant-load test specifies a method for the determination of elongation, creep and tension set of rubbers subjected to a constant load at standard laboratory temperature. The test methods are intended to measure the elastic properties of rubber in the hardness range 20 IRHD to 94 IRHD. The creep measurement is not intended for product design or the evaluation of low-creep materials. For these, ISO 8013 applies, and there is no agreement between the results of this test and those of ISO 8013. NOTE The constant-load test is primarily intended for the measurement of state of cure and the quality control of thin-walled products. An increase in the state of cure or degree of crosslinking is usually reflected in a decrease in set, creep or elongation.	ISO/TC 45	no
ISO 23529	2016	Rubber — General procedures for preparing and conditioning test pieces for physical test methods	ISO 23529:2016 specifies general procedures for the preparation, measurement, marking, storage, and conditioning of rubber test pieces for use in physical tests specified in other International Standards, and the preferred conditions to be used during the tests. Special conditions, applicable to a particular test or material or simulating a particular climatic environment, are not included, nor are special requirements for testing whole products. ISO 23529:2016 also specifies the requirements for the time interval to be observed between forming and testing of rubber test pieces and products. Such requirements are necessary to obtain reproducible test results and to minimize disagreements between customer and supplier.	ISO/TC 45	no

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ISO 23794	2023	Rubber, vulcanized or thermoplastic — Abrasion testing — Guidance	This document provides guidance on the determination of the abrasion resistance of vulcanized and thermoplastic rubbers. It covers both solid and loose abrasives. The guidelines given are intended to assist in the selection of an appropriate test method and appropriate test conditions for evaluating a material and assessing its suitability for a product subject to abrasion. Factors influencing the correlation between laboratory abrasion testing and product performance are considered, but, for example this document is not concerned with wear tests developed for specific finished rubber products, for example, trailer tests for tyres.	ISO/TC 45	yes
ISO 2393	2014	Rubber test mixes — Preparation, mixing and vulcanization — Equipment and procedures (Corrected version 2014-04)	ISO 2393:2014 specifies the equipment and procedures for the preparation, mixing, and vulcanization of rubber test mixes specified in the various International Standards for the evaluation of such test mixes.	ISO/TC 45	no
ISO 24087	2023	Rubber, vulcanized — Determination of the glass transition temperature and enthalpy by differential scanning calorimetry (DSC)	This document specifies a method of thermal analysis of vulcanized rubber by differential scanning calorimetry (DSC). This method is intended for the observation and measurement of various properties and phenomena associated, such as physical transitions (glass transition, melting and crystallization, polymorphic transitions, etc.).	ISO/TC 45	no
ISO 247	2016	Rubber -- Determination of ash (Revision of ISO 247:2006)	This document specifies three methods for the determination of ash from raw rubbers, compounded rubbers and vulcanizates. The methods are applicable to raw, compounded or vulcanized rubbers of the M, N, O, R and U families described in ISO 1629, except that: — Method A is not used for the determination of ash from compounded or vulcanized rubbers containing chlorine, bromine or iodine; — Method B is used for compounded or vulcanized rubbers containing chlorine, bromine or iodine. It shall not be used for uncompounded rubbers; — Method C is intended to be used for the determination of ash from raw, compounded or vulcanized rubber not containing chlorine, bromine or iodine by wrapping the test portion in ashless filter paper; — Lithium and fluorine compounds might react with silica crucibles to form volatile compounds, giving low ash results. Platinum crucibles shall therefore be used for ashing fluorine-containing and lithium-polymerized rubbers. This document does not cover the interpretation of the ash results as to the inorganic chemical content of a compound or vulcanizate. This is the responsibility of the analyst, who has to be aware of the behaviour of rubber additives at elevated temperatures.	ISO/TC 45	no
ISO 247-1	2018	Rubber — Determination of ash — Part 1: Combustion method	This document specifies three methods for the determination of ash from raw rubbers, compounded rubbers and vulcanizates. The methods are applicable to raw, compounded or vulcanized rubbers of the M, N, O, R and U families described in ISO 1629, except that: — Method A is not used for the determination of ash from compounded or vulcanized rubbers containing chlorine, bromine or iodine;	ISO/TC 45	no

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			— Method B is used for compounded or vulcanized rubbers containing chlorine, bromine or iodine. It shall not be used for uncompounded rubbers; — Method C is intended to be used for the determination of ash from raw, compounded or vulcanized rubber not containing chlorine, bromine or iodine by wrapping the test portion in ashless filter paper; — Lithium and fluorine compounds might react with silica crucibles to form volatile compounds, giving low ash results. Platinum crucibles shall therefore be used for ashing fluorine-containing and lithium-polymerized rubbers. This document does not cover the interpretation of the ash results as to the inorganic chemical content of a compound or vulcanizate. This is the responsibility of the analyst, who has to be aware of the behaviour of rubber additives at elevated temperatures.		
ISO 247-2	2018	Rubber — Determination of ash — Part 2: Thermogravimetric analysis (TGA)	This document specifies two methods for the determination of ash from raw rubbers, compounded rubbers and vulcanizates using a thermogravimetric analyser (TGA). The methods are applicable to raw, compounded or vulcanized rubbers of the M, O, R and U families described in ISO 1629: — Method A is applicable for the determination of the ash from raw rubbers. — Method B is applicable for the determination of the ash from compounded or vulcanized rubbers. The methods are not applicable for the determination of the ash from raw rubbers, compounded or vulcanized rubbers containing chlorine, bromine or iodine. This document does not cover the interpretation of the ash results from the inorganic chemical contents of compounded or vulcanized rubbers.	ISO/TC 45	no
ISO 248-2	2019	Rubber, raw — Determination of volatile-matter content — Part 2: Thermogravimetric methods using an automatic analyser with an infrared drying unit	1.1 This document specifies two thermogravimetric methods for the determination of moisture and other volatile-matter content in raw rubbers by using an automatic analyser with an infrared drying unit. 1.2 These methods are applicable to the determination of volatile-matter content in synthetic rubbers (SBR, NBR, BR, IR, CR, IIR, halogenated IIR and EPDM) listed in ISO 1629 and to various forms of raw rubber, such as bale, block, chip, pellet, crumb, powder and sheet. These methods might also be applicable to other raw rubbers only when the change in mass is proven to be due solely to loss of original volatile matter and not to rubber degradation. 1.3 The methods are not applicable to raw rubbers which need homogenizing as specified in ISO 1795. 1.4 The hot-mill method and the oven method specified in ISO 248-1 and the methods specified in this document might not give identical results. In cases of dispute, therefore, the oven method, procedure A, specified in ISO 248-1:2011, is the referee method.	ISO/TC 45	no

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			NOTE These methods can be useful for routine determinations, e.g. quality control, when the measurement conditions for the automatic analyser are fixed for a particular raw rubber or grade of raw rubber.		
ISO 24999	2008	Flexible cellular polymeric materials — Determination of fatigue by a constant-strain procedure (Corrected version 2008-09)	ISO 24999:2008 specifies a method for determining the loss in thickness of flexible cellular materials when compressed repetitively to a fixed level of strain. It is particularly useful for quality control in the manufacture of flexible polymeric cellular materials. Another procedure already exists as ISO 3385: this measures the fatigue characteristics of flexible polymeric cellular materials by constant-stress loading of the specimen rather than constant strain. It forms the basis of a material classification system in ISO 5999. These two fatigue procedures are complementary to each other and can both be useful in the prediction of end-use performance. The procedure and equipment used in this International Standard allow testing of a large number of test pieces at any one time, whereas ISO 3385 only allows testing of one test piece at a time under the compression device.	ISO/TC 45	no
ISO 2781	2018	Rubber, vulcanized or thermoplastic — Determination of density	This document specifies two methods of test for the determination of the density of solid vulcanized and thermoplastic rubbers. Such determinations are of importance in the control of the quality of a rubber compound and in the calculation of the mass of rubber required to produce a given volume of material. This document does not cover the determination of the relative density of rubber, which is the ratio of the mass of a given volume of rubber to the mass of an equal volume of pure water at a given temperature.	ISO/TC 45	no
ISO 2878	2017	Rubber, vulcanized or thermoplastic — Antistatic and conductive products — Determination of electrical resistance	ISO 2878:2017 specifies a method of test to determine the electrical resistance of antistatic and conductive products manufactured wholly or in part from rubber whose electrical resistance measured between defined points, when new, does not exceed 3 × 108 Ω and whose conductivity is derived from the addition of carbon black and/or other appropriate substances to the bulk of the material. NOTE Highly conductive mixes cannot be made in this way. ISO 2878:2017 specifies the electrode configuration for basic geometries, but it is intended that reference be made to relevant product specifications for requirements for specific products. It does not apply to: a) products the relevant surfaces of which are composed of mixtures of insulating and conductive areas; b) products with a substantial surface area of insulating material, except for footwear (which does not normally have a conductive or antistatic upper).	ISO/TC 45	yes
ISO 294-4	2018	Plastics — Injection moulding of test specimens of thermoplastic materials — Part 4: Determination of moulding shrinkage	This document specifies a method of determining the moulding shrinkage and post-moulding shrinkage of injection-moulded test specimens of thermoplastic material in the directions parallel to and normal to the direction of melt flow. For the determination of shrinkage of thermosets, see ISO 2577[2]. Moulding shrinkage as defined in this document excludes the effects of humidity uptake. This is included in post-moulding shrinkage and thus in total shrinkage. For cases when post-moulding shrinkage is caused by the uptake of humidity only, see ISO	ISO/TC 61	no

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			175[1]. Moulding shrinkage as defined in this document represents the so-called free shrinkage with unrestricted deformation of the cooling plates in the mould during the hold period. It is considered, therefore, as the maximum value of any restricted shrinkage.		
ISO 2951	2019	Rubber, vulcanized rubber — Determination of insulation resistance	This document specifies a method for the determination of the insulation resistance of vulcanized and thermoplastic rubbers without discrimination between the volume and surface resistances involved. This method is applicable only to the test pieces with a resistance greater than 108 Ω. NOTE Methods of test for test pieces with a lower resistance are described in ISO 1853 and ISO 2878. Because the test pieces are simply and easily prepared, this method is particularly useful for rapidly determining values which will give a general indication of quality when great accuracy is not required.	ISO/TC 45	yes
ISO 3011	2021	Rubber- or plastics-coated fabrics — Determination of resistance to ozone cracking under static conditions	This document specifies a method for the determination of the resistance of fabrics coated with rubber or plastics to ozone cracking under static conditions. The test is designed to determine the relative resistance to cracking of fabric coated with rubber or plastics when exposed under static strain to air containing ozone in the absence of direct sunlight. Like all ageing tests, it should be considered as a means of comparing articles of the same composition and destined for the same application, but not as an absolute criterion. It is preferable to limit the significance of the test by considering it only as a means of control when a fabric attains a resistance superior to a threshold given in comparison with a certain type of degradation. Taking these remarks into account, the results obtained at the time of test cannot be taken as a prediction of the length of life of the product.	ISO/TC 45	no
ISO 306	2022	Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST)	ISO 306:2004 specifies four methods for the determination of the Vicat softening temperature (VST) of thermoplastic materials: Method A50 using a force of 10 N and a heating rate of 50 °C/h Method B50 using a force of 50 N and a heating rate of 50 °C/h Method A120 using a force of 10 N and a heating rate of 120 °C/h Method B120 using a force of 50 N and a heating rate of 120 °C/h. The methods specified are applicable only to thermoplastics, for which they give a measure of the temperature at which the thermoplastics start to soften rapidly.	ISO/TC 61	no
ISO 3384-2	2019	Rubber, vulcanized or thermoplastic — Determination of stress relaxation in compression — Part 2: Testing with temperature cycling	This document specifies two methods for determining the decrease in counterforce exerted by a test piece of vulcanized or thermoplastic rubber which has been compressed to a constant deformation and then undergoes temperature cycling. Method A: The temperature is cycled at intervals between a high temperature for ageing and a low temperature for checking the sealing force at this low temperature. Method B: The temperature is cycled continuously between a high temperature and a low temperature to introduce thermal stress in the test piece. The counterforce is determined by means of a continuous-measurement system.	ISO/TC 45	no

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			Two forms of test pieces are specified in this document: cylindrical test pieces and rings. Comparison of results is valid only when made on test pieces of similar size and shape. The use of ring test pieces is particularly suitable for the determination of stress relaxation in liquid environments.		
ISO 3385	2014	Flexible cellular polymeric materials — Determination of fatigue by constant-load pounding	ISO 3385:2014 specifies a method for the determination of loss in thickness and loss in hardness of flexible cellular materials intended for use in load-bearing applications such as upholstery. It provides a means of assessing the service performance of flexible cellular materials based on rubber latex or polyurethane used in load-bearing upholstery. The method is applicable both to standard size test pieces cut from slabstock material and to shaped components. The measured loss in thickness and loss in hardness are related to, but are not necessarily the same as, the losses likely to occur in service. ISO 3385:2014 is not intended to function as a detailed engineering design specification for fatigue apparatus.	ISO/TC 45	no
ISO 3386-2	1997/Amd 1:2010	Flexible cellular polymeric materials — Determination of stress-strain characteristics in compression — Part 2: High-density materials	This part of ISO 3386 specifies a method for the determination of the compression stress-strain characteristics of flexible cellular polymeric materials of density greater than 250 kg/m3 The compression stress-strain characteristic is a measure of the load-bearing properties of the material, though not necessarily of its capacity to sustain a long-term load. The compression stress-strain characteristic differs from the indentation hardness characteristics (as determined in accordance with ISO 2439) which are known to be influenced by the thickness and the tensile properties of the flexible cellular material under test, the shape of the compression piate, and the shape and size of the test piece. ISO 3386-1 specifies a method for low-density flexible materials, and differs from Part 2 in the following ways: - Part 1 is concerned with materials of density up to 250 kg/m3, whilst Part 2 is mainly concerned with materials of density above 250 kg/m3; - compression stress values have been deleted from Part 2; - Part 2 does not allow the use of a cylindrical test piece. This part of ISO 3386 is a general method for testing denser flexible cellular materials (i.e. expanded cellular rubbers), measurements being made on one of more points on the steeply rising part of the stress-strain curve. The shape factor of the test piece is important and comparative test results can only be obtained on test pieces having the same shape factor. NOTE 1 For comparison purposes, the method may be used for material of 150 kg/m3 density or greater.	ISO/TC 45	no
ISO 34-2	2022	Rubber, vulcanized or thermoplastic — Determination of tear strength — Part 2: Small (Delft) test pieces	ISO 34-2:2015 specifies a method for the determination of the tear strength of small test pieces (Delft test pieces) of vulcanized or thermoplastic rubber. NOTE The method does not necessarily give results agreeing with those given by the method described in ISO 34-1, which uses trouser, angle and crescent test pieces. It is used in preference to ISO 34-1 when the amount of material available is limited, and might be particularly suitable for testing small finished products.	ISO/TC 45	no
ISO 3582	2000/Amd 1: 2007	Flexible cellular polymeric materials — Laboratory assessment of horizontal burning characteristics of small specimens subjected to a small flame — Amendment 1	This International Standard specifies a small-scale laboratory screening procedure for comparing the relative horizontal burning characteristics of small test pieces of flexible cellular polymeric material exposed to a low-energy source of heat. It is intended only for the purpose of assessing quickly and simply the horizontal burning characteristics of small test pieces of the material as such, i.e. considered without reference to the environmental conditions under which the material, or products made from it, may be used. As a consequence, it is not possible to establish a correlation between the results of this test and the performance of such materials or products under actual service conditions. The test is restricted to test pieces of thickness greater than 5 mm. Results of	ISO/TC 45	no

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			tests on test pieces of different thicknesses are not comparable. This test method is not intended to be used to assess the potential fire hazard in use. NOTE For cellular plastics having a density less than 250 kg/m3, another test method exists: ISO 9772:2001, Cellular plastics — Determination of horizontal burning characteristics of small specimens subjected to a small flame. The test equipment and procedures differ from those contained in this International Standard, and it should not therefore be assumed that they will produce identical test results.		
ISO 37	2017	Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties	This document specifies a method for the determination of the tensile stress-strain properties of vulcanized and thermoplastic rubbers. The properties which can be determined are tensile strength, elongation at break, stress at a given elongation, elongation at a given stress, stress at yield and elongation at yield. The measurement of stress and strain at yield applies only to some thermoplastic rubbers and certain other compounds.	ISO/TC 45	yes
ISO 4378-1	2017	Plain bearings — Terms, definitions, classification and symbols — Part 1: Design, bearing materials and their properties	This document specifies the most commonly used terms relating to design, bearing materials and their properties of plain bearings with their definitions and classification. For some terms and word combinations, their short forms are given, which can be used where they are unambiguous. Self-explanatory terms are given without definitions.	ISO/TC 123	yes
ISO 4378-2	2017	Plain bearings — Terms, definitions, classification and symbols — Part 2: Friction and wear	This document specifies the most commonly used terms relating to friction and wear of plain bearings with their definitions and classification. For some terms and word combinations, their short forms are given, which can be used where they are unambiguous. Self-explanatory terms are given without definitions.	ISO/TC 123	yes
ISO 4378-3	2017	Plain bearings — Terms, definitions, classification and symbols — Part 3: Lubrication	This document specifies the most commonly used terms relating to lubrication of plain bearings with their definitions and classification. For some terms and word combinations, their short forms are given, which can be used where they are unambiguous. Self-explanatory terms are given without definitions.	ISO/TC 123	yes
ISO 4378-4	2009	Plain bearings — Terms, definitions, classification and symbols — Part 4: Basic symbols	This part of ISO 4378 defines basic symbols for use in the field of plain bearings. Additional signs are also defined for use as superscripts and subscripts. The characters employed are drawn from the Latin and Greek alphabets, Arabic numerals and other signs, for example points, commas, horizontal lines or asterisks. In the simplest case, an application symbol consists of the basic character alone; in the most complex, of the basic character with subscripts and superscripts (additional signs). For the purposes of international applicability, all basic symbols and additional signs have been derived from English words, and designations used in technical literature up to now have been adopted as far as possible. Wide conformity of the symbols for all types of plain bearings has been attempted. This classification is established for use in calculations and technological and geometrical determinations, as well as in the quality assurance of plain bearings. Quantities having a fixed value for a certain construction are designated by capital letters, where possible. Depending on the special field of application, the basic characters specified are for stand-alone use or appropriately combined with additional signs, where necessary, to minimize the risk of confusion; multiple designations can be avoided by suitable indexing with additional signs.	ISO/TC 123	yes
ISO 4378-5	2009	Plain bearings — Terms, definitions, classification and symbols — Part 5: Application of symbols	This part of ISO 4378 specifies practical applications of the general symbols defined in ISO 4378-4, with regard to the calculations, design and testing of plain bearings. ISO 4378-4 distinguishes between basic characters and additional signs. Additional signs are subscripts and superscripts. The symbols necessary for plain bearing calculations, design, manufacture and testing are just basic characters or combinations of basic	ISO/TC 123	yes

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			characters and additional signs. This part of ISO 4378 lists symbols which have been found necessary for the calculations, design and testing of plain bearings. They have been defined in accordance with the recommendations given in ISO 4378-4. Angles and directions of rotation are defined positively as rotating in a left-hand (anticlockwise) direction; the same applies to rotational frequencies, and circumferential and angular velocities.		
ISO 4649	2017	Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device	ISO 4649:2017 specifies two methods for the determination of the resistance of rubber to abrasion by means of a rotating cylindrical drum device. The methods involve determination of the volume loss due to the abrasive action of rubbing a test piece over a specified grade of abrasive sheet. Method A is for a non-rotating test piece and method B is for a rotating test piece. For each method, the result can be reported as a relative volume loss or an abrasion resistance index. These test methods are suitable for comparative testing, quality control, specification compliance testing, referee purposes and research and development work. No close relation between the results of this abrasion test and service performance can be inferred. NOTE The abrasion loss is often more uniform using the rotating test piece because the whole surface of the test piece is in contact with the abrasive sheet over the duration of the test. However, there is considerable experience using the non-rotating test piece.	ISO/TC 45	yes
ISO 4650	2012	Rubber — Identification — Infrared spectrometric methods	This International Standard specifies two methods for the identification of rubbers, including thermoplastic elastomers, either in the raw state or in the form of vulcanized or unvulcanized mixes. The first method is based on infrared spectrometric examination using the transmission technique. The second method makes use of analysis by reflectance. A comparison of the spectra resulting from reflectance (attenuated total reflectance ATR) and transmission (film) is given in Annex A. Both methods comprise examination of polymers by their pyrolysis products (pyrolysates), or by films cast from solution or obtained by moulding (for raw rubbers only). Typical spectra are given in Annex B. The principle of the methods implies that sample preparation and analysis of the infrared spectra are carried out by experienced personnel and that the equipment used for the production of spectra is operated in accordance with the manufacturer's instructions for optimum performance. Details of the operation of infrared spectrometers are not included in this International Standard. The methods specified are qualitative methods only.	ISO/TC 45	no
ISO 4664-2	2006	Rubber, vulcanized or thermoplastic — Determination of dynamic properties — Part 2: Torsion pendulum methods at low frequencies	This part of ISO 4664 specifies methods, using a torsion pendulum, of determining the dynamic properties in shear, that is the shear modulus and mechanical damping, of vulcanized or thermoplastic rubbers over a wide temperature range at low frequencies in the range 0,1 Hz to 10 Hz and at comparatively low strains of less than 5 × 10^−4.	ISO/TC 45	no
ISO 4664-3	2021	Rubber, vulcanized or thermoplastic — Determination of dynamic properties — Part 3: Glass transition temperature (Tg)	This document specifies a method for determining the glass transition temperature, Tg, of vulcanized rubbers in the hardness range from 30 IRHD to 80 IRHD. The dynamic properties are measured via temperature sweep in sinusoidal deformation at a defined strain and frequency and Tg is determined from the peak in the tan δ versus temperature curve. Glass transition temperature, Tg, determined in this way serves the purpose of a guideline to the service temperature of the material.	ISO/TC 45	no

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ISO 4665	2016	Rubber, vulcanized or thermoplastic — Resistance to weathering	This International Standard specifies methods for the exposure of vulcanized or thermoplastic rubbers to natural or artificial weathering and methods for the determination of changes in colour, appearance, and physical properties resulting from exposure.	ISO/TC 45	no
ISO 4666-1	2010	Rubber, vulcanized — Determination of temperature rise and resistance to fatigue in flexometer testing — Part 1: Basic principles	This part of ISO 4666 establishes general principles for flexometer testing and defines the terms used. Flexometer testing makes possible predictions regarding the durability of rubbers in finished articles subject to dynamic flexing in service such as tyres, bearings, supports, V-belts, and cable-pulley insert rings. However, owing to the wide variations in service conditions, no simple correlation between the accelerated tests specified in the various parts of this International Standard and service performance can be assumed.	ISO/TC 45	no
ISO 4666-3	2022	Rubber, vulcanized — Determination of temperature rise and resistance to fatigue in flexometer testing — Part 3: Compression flexometer (constant-strain type)	This document specifies the flexometer test with constant-strain amplitude for the determination of the temperature rise and resistance to fatigue of vulcanized rubber. The flexometer specified is known as the Goodrich flexometer, but any other apparatus giving equivalent performance can be used. This document gives directions for carrying out measurements which make possible predictions regarding the durability of rubbers in finished articles subject to dynamic flexing in service, such as tyres, bearings, supports, V-belts, and cable-pulley insert rings. However, owing to the wide variations in service conditions, no simple correlation between the accelerated tests described in the various parts of this document and service performance can be assumed. The method is not intended for rubber having a hardness greater than 85 IRHD.	ISO/TC 45	no
ISO 4674-1	2016	Rubber- or plastics-coated fabrics — Determination of tear resistance — Part 1: Constant rate of tear methods	This part of ISO 4674 specifies two methods for determining the forces necessary to initiate and propagate tearing of a coated fabric using the constant rate of tear method. The methods described are the following: — method A: tongue tear; — method B: trouser tear.	ISO/TC 45	no
ISO 4674-2	2021	Rubber- or plastics-coated fabrics — Determination of tear resistance — Part 2: Ballistic pendulum method (Corrected version 2021-11)	This document specifies a method for the determination of tear resistance based on the action of an active force applied to a notched test piece. The test can be carried out on: — test pieces that have been conditioned in a standard atmosphere; or — test pieces that have undergone pre-treatment, e.g. water immersion. The results obtained by this method cannot be compared with those obtained by methods involving constant rate of tear.	ISO/TC 45	no
ISO 48-1	2018	Rubber, vulcanized or thermoplastic — Determination of hardness — Part 1: Introduction and guidance	This document provides guidance on the determination of the hardness of vulcanized and thermoplastic rubbers. It is intended to provide an understanding of the significance of hardness as a material property and to assist in the selection of an appropriate test method.	ISO/TC 45	yes
ISO 48-2	2018	Rubber, vulcanized or thermoplastic — Determination of hardness — Part 2: Hardness between 10 IRHD and 100 IRHD	This document specifies four methods for the determination of the hardness of vulcanized or thermoplastic rubbers on flat surfaces (standard-hardness methods) and four methods for the determination of the apparent hardness of curved surfaces (apparent-hardness methods). The hardness is expressed in international rubber hardness degrees (IRHD). The methods cover the hardness range from 10 IRHD to 100 IRHD. These methods differ primarily in the diameter of the indenting ball and the magnitude of the indenting force, these being chosen to suit the particular application. The range of applicability of each method is indicated in Figure 1. This document does not specify a method for the determination of hardness by a pocket hardness meter, which is described in ISO 48-5. This document specifies the following four methods for the determination of standard hardness. — Method N (normal test) is appropriate for rubbers with a hardness in the range 35 IRHD to 85 IRHD, but can also be used for hardnesses in the range 30 IRHD to 95 IRHD.	ISO/TC 45	yes

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			— Method H (high-hardness test) is appropriate for rubbers with a hardness in the range 85 IRHD to 100 IRHD. — Method L (low-hardness test) is appropriate for rubbers with a hardness in the range 10 IRHD to 35 IRHD. — Method M (microtest) is essentially a scaled-down version of the normal test method N, permitting the testing of thinner and smaller test pieces. It is appropriate for rubbers with a hardness in the range 35 IRHD to 85 IRHD, but can also be used for hardnesses in the range 30 IRHD to 95 IRHD. NOTE 1 The value of the hardness obtained by method N within the ranges 85 IRHD to 95 IRHD and 30 IRHD to 35 IRHD might not agree precisely with that obtained using method H or method L, respectively. The difference is not normally significant for technical purposes. NOTE 2 Because of various surface effects in the rubber and the possibility of slight surface roughness (produced, for example, by buffing), the microtest might not always give results agreeing with those obtained by the normal test. This document also specifies four methods, CN, CH, CL and CM, for the determination of the apparent hardness of curved surfaces. These methods are modifications of methods N, H, L and M, respectively, and are used when the rubber surface tested is curved, in which case there are two possibilities: a) the test piece or product tested is large enough for the hardness instrument to rest upon it; b) the test piece or product tested is small enough for both the test piece and the instrument to rest upon a common support. A variant of b) would be where the test piece rests upon the support surface of the instrument. Apparent hardness can also be measured on non-standard flat test pieces using methods N, H, L and M. The procedures described cannot provide for all possible shapes and dimensions of test piece, but cover some of the commonest types, such as O-rings. This document does not specify the determination of the apparent hardness of rubber-covered rollers, which is specified in ISO 48-6, ISO 48-7 and ISO 48-8. Figure 1 — Range of applicability Key X hardness (IRHD) a Method L and method CL. b Methods N and M and methods CN and CM. c Method H and method CH.		
ISO 48-3	2018	Rubber, vulcanized or thermoplastic — Determination of hardness — Part 3: Dead-load hardness using the very low rubber hardness (VLRH) scale	This document specifies a dead-load method for the determination of the hardness of very soft vulcanized or thermoplastic rubbers using the very low rubber hardness (VLRH) scale. The relation between the depth of penetration and the VLRH scale is linear.	ISO/TC 45	yes
ISO 48-4	2018	Rubber, vulcanized or thermoplastic — Determination of hardness — Part 4: Indentation hardness by durometer method (Shore hardness)	This document specifies a method for determining the indentation hardness (Shore hardness) of vulcanized or thermoplastic rubber using durometers with the following scales: — the A scale for rubbers in the normal-hardness range; — the D scale for rubbers in the high-hardness range; — the AO scale for rubbers in the low-hardness range and for cellular rubbers; — the AM scale for thin rubber test pieces in the normal-hardness range.	ISO/TC 45	yes

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ISO 48-5	2018	Rubber, vulcanized or thermoplastic — Determination of hardness — Part 5: Indentation hardness by IRHD pocket meter method	This document specifies a method for determining the indentation hardness of vulcanized or thermoplastic rubber by means of a pocket hardness meter calibrated in IRHD. The use of such meters is primarily intended for control, not specification, purposes (for specification, see ISO 48-2). It is possible to increase precision by fixing the pocket hardness meter on a support.	ISO/TC 45	yes
ISO 48-8	2018	Rubber, vulcanized or thermoplastic — Determination of hardness — Part 8: Apparent hardness of rubber-covered rollers by Pusey and Jones method	This document specifies a method for the determination of the apparent hardness of vulcanized- or thermoplastic-rubber roller covers, expressed as the Pusey and Jones indentation value. The Pusey and Jones plastometer apparatus is used to measure the depth of indentation of an indentor under a specified force into the surface of the rubber. The indentation value is not the same as that measured by the international rubber hardness test method ISO 48-2, since in this method the rubber immediately adjacent to the indentor is precompressed. The Pusey and Jones indentation value is an inverse measurement of hardness, i.e. the harder the rubber the lower the Pusey and Jones indentation value.	ISO/TC 45	yes
ISO 527-1	2019	Plastics — Determination of tensile properties — Part 1: General principles	1.1 This document specifies the general principles for determining the tensile properties of plastics and plastic composites under defined conditions. Several different types of test specimen are defined to suit different types of material which are detailed in subsequent parts of ISO 527. 1.2 The methods are used to investigate the tensile behaviour of the test specimens and for determining the tensile strength, tensile modulus and other aspects of the tensile stress/strain relationship under the conditions defined. 1.3 The methods are selectively suitable for use with the following materials: — rigid and semi-rigid moulding, extrusion and cast thermoplastic materials, including filled and reinforced compounds in addition to unfilled types; rigid and semi-rigid thermoplastics sheets and films; — rigid and semi-rigid thermosetting moulding materials, including filled and reinforced compounds; rigid and semi-rigid thermosetting sheets, including laminates; — fibre-reinforced thermosets and thermoplastic composites incorporating unidirectional or non-unidirectional reinforcements, such as mat, woven fabrics, woven rovings, chopped strands, combination and hybrid reinforcement, rovings and milled fibres; sheet made from pre-impregnated materials (prepregs); — thermotropic liquid crystal polymers. The methods are not normally suitable for use with rigid cellular materials, for which ISO 1926 is used, or for sandwich structures containing cellular materials.	ISO/TC 61	yes
ISO 527-2	2012	Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics	1.1 This part of ISO 527 specifies the test conditions for determining the tensile properties of moulding and extrusion plastics, based upon the general principles given in ISO 527-1. 1.2 The methods are selectively suitable for use with the following range of materials: — rigid and semi-rigid thermoplastics moulding, extrusion and cast materials, including compounds filled and reinforced by, for example, short fibres, small rods, plates or granules but excluding textile fibres (see ISO 527-4 and ISO 527-5). See ISO 527-1:2012, Clause 3 for the definition of "rigid" and "semi-rigid". — rigid and semi-rigid thermosetting moulding and cast materials, including filled and reinforced compounds but excluding textile fibres as reinforcement (see ISO 527-4 and ISO 527-5); — thermotropic liquid crystal polymers. The methods are not normally suitable for use with rigid cellular materials or sandwich structures containing cellular material. For rigid cellular materials see ISO 1926. The methods are not suitable for flexible films and sheets, of thickness smaller than 1 mm, see ISO 527-3.	ISO/TC 61	yes

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			1.3 The methods are applied using specimens which may be either moulded to the chosen dimensions or machined, cut or punched from injection- or compression-moulded plates. The multipurpose test specimen is preferred (see ISO 20753).		
ISO 527-3	2018	Plastics — Determination of tensile properties — Part 3: Test conditions for films and sheets	1.1 This document specifies the conditions for determining the tensile properties of plastic films or sheets less than 1 mm thick, based upon the general principles given in ISO 527-1. NOTE For sheets greater than 1 mm thick, the user is referred to ISO 527-2. 1.2 See ISO 527-1:2012, 1.2. 1.3 This document is not normally suitable for determining the tensile properties of a) cellular materials, and b) plastics reinforced by textile fibres. 1.4 See ISO 527-1:2012, 1.3.	ISO/TC 61	yes
ISO 527-4	2023	Plastics — Determination of tensile properties — Part 4: Test conditions for isotropic and orthotropic fibre-reinforced plastic composites	This document specifies the test conditions for the determination of the tensile properties of isotropic and orthotropic fibre-reinforced plastic composites, based upon the general principles given in ISO 527-1. NOTE 1 Unidirectional reinforced materials are covered by ISO 527-5. The methods are used to investigate the tensile behaviour of the test specimens and for determining the tensile strength, tensile modulus, Poisson's ratios and other aspects of the tensile stress-strain relationship under the defined conditions. The test method is suitable for use with the following materials: — fibre-reinforced thermosetting and thermoplastic composites incorporating non-unidirectional reinforcements such as mats, woven fabrics, woven rovings, chopped strands, combinations of such reinforcements, hybrids, rovings, short or milled fibres or preimpregnated materials (prepregs); NOTE 2 Injection moulded specimens are covered by ISO 527-2. — combinations of the above with unidirectional reinforcements and multidirectional reinforced materials constructed from unidirectional layers, provided such laminates are symmetrical; NOTE 3 Materials with completely or mainly unidirectional reinforcements are covered by ISO 527-5. — finished products made from materials mentioned above. The reinforcement fibres covered include glass fibres, carbon fibres, aramid fibres and other similar fibres.	ISO/TC 61	yes
ISO 527-5	2021	Plastics — Determination of tensile properties — Part 5: Test conditions for unidirectional fibre-reinforced plastic composites	This document specifies the test conditions for the determination of the tensile properties of unidirectional fibre-reinforced plastic composites, based upon the general principles given in ISO 527-1. NOTE Isotropic and orthotropic reinforced materials are covered by ISO 527-4. The methods are used to investigate the tensile behaviour of the test specimens and for determining the tensile strength, tensile modulus, Poisson's ratios and other aspects of the tensile stress-strain relationship under the conditions defined. The test method is suitable for all polymer matrix systems reinforced with unidirectional fibres and which meet the requirements, including failure mode, set out in this document. The method is suitable for composites with either thermoplastic or thermosetting matrices, including preimpregnated materials (prepregs). The reinforcements covered include carbon fibres, glass fibres, aramid fibres and other similar fibres. The reinforcement geometries covered include unidirectional (i.e. completely aligned) fibres and rovings and unidirectional fabrics and tapes.	ISO/TC 61	yes

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			The method is not normally suitable for multidirectional materials composed of several unidirectional layers at different angles (see ISO 527-4).		
ISO 5660-1	2015	Reaction-to-fire tests — Heat release, smoke production and mass loss rate — Part 1: Heat release rate (cone calorimeter method) and smoke production rate (dynamic measurement)	This part of ISO 5660 specifies a method for assessing the heat release rate and dynamic smoke production rate of specimens exposed in the horizontal orientation to controlled levels of irradiance with an external igniter. The heat release rate is determined by measurement of the oxygen consumption derived from the oxygen concentration and the flow rate in the combustion product stream. The time to ignition (sustained flaming) is also measured in this test. The dynamic smoke production rate is calculated from measurement of the attenuation of a laser light beam by the combustion product stream. Smoke obscuration is recorded for the entire test, regardless of whether the specimen is flaming or not.	ISO/TC 92	yes
ISO 5794-3	2011	Rubber compounding ingredients — Silica, precipitated, hydrated — Part 3: Evaluation procedures in a blend of solution styrene-butadiene rubber (S-SBR) and butadiene rubber (BR)	This part of ISO 5794 specifies the test formulation, equipment, procedure and test methods for determining the physical properties of precipitated hydrated silica in a compound based on a blend of solution styrene-butadiene and butadiene rubber. The formulation can be regarded as a model compound for silica-based passenger car tyre treads. NOTE 1 ISO 5794-2[2] specifies the test formulation, equipment, procedure and test methods for determining the physical properties of precipitated hydrated silica in a styrene-butadiene rubber mix. NOTE 2 ISO 5794-1[1] specifies methods for chemical analysis of precipitated hydrated silica, describes its physical and chemical properties, and classifies silicas with respect to their specific surface area obtained by nitrogen adsorption.	ISO/TC 45	no
ISO 604	2002	Plastics — Determination of compressive properties	This International Standard specifies a method for determining the compressive properties of plastics under defined conditions. A standard test specimen is defined but its length may be adjusted to prevent buckling under load from affecting the results. A range of test speeds is included. The method is used to investigate the compressive behaviour of the test specimens and for determining the compressive strength, compressive modulus and other aspects of the compressive stress/strain relationship under the conditions defined. The method applies to the following range of materials: — rigid and semi-rigid [1] thermoplastic moulding and extrusion materials, including compounds filled and reinforced by e.g. short fibres, small rods, plates or granules in addition to unfilled types; rigid and semi-rigid thermoplastic sheet; — rigid and semi-rigid thermoset moulding materials, including filled and reinforced compounds; rigid and semi-rigid thermoset sheet; — thermotropic liquid-crystal polymers. In agreement with ISO 10350-1 and ISO 10350-2, this International Standard applies to fibre-reinforced compounds with fibre lengths ≤ 7,5 mm prior to processing. The method is not normally suitable for use with materials reinforced by textile fibres (see references [2] and [5]), fibre-reinforced plastic composites and laminates (see [5]), rigid cellular materials (see [3]) or sandwich structures containing cellular material or rubber (see [4]). The method is performed using specimens which may be moulded to the chosen dimensions, machined from the central portion of a standard multipurpose test specimen (see ISO 3167) or machined from finished or semi-finished products such as mouldings or extruded or cast sheet. The method specifies preferred dimensions for the test specimen. Tests which are carried out on specimens of different dimensions, or on specimens which are prepared under different conditions, may produce results which are not comparable. Other factors, such as the test speed and the conditioning of the specimens, can also influence the results. Consequently, when comparable data are required, these factors must be carefully controlled and recorded.	ISO/TC 61	yes
ISO 62	2008	Plastics — Determination of water absorption	1.1 This International Standard describes a procedure for determining the moisture absorption properties in the “through-the-thickness” direction of flat or curved-form solid plastics. This International Standard also describes procedures for determining the	ISO/TC 61	no

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			amount of water absorbed by plastic specimens of defined dimensions, when immersed in water or when subjected to humid air under controlled conditions. The “through-the-thickness” moisture diffusion coefficient can be determined for single-phase material by assuming Fickian diffusion behaviour with constant moisture absorption properties through the thickness of the test specimen. This model is valid for homogeneous materials and for reinforced polymer-matrix composites tested below their glass transition temperature. However, some two-phase matrices such as hardened epoxies may require a multi-phase absorption model which is not covered by this International Standard. 1.2 Ideally, the best comparison of the water absorption properties and/or diffusion coefficients of materials should be carried out only using the equilibrium moisture content of plastics exposed to identical conditions. The comparison of materials using properties at moisture equilibrium does not assume, and is therefore not limited to, single-phase Fickian diffusion behaviour. 1.3 Alternatively, water absorption of plastic specimens of defined dimensions exposed to immersion or humidity under controlled conditions but for an arbitrary time period can be used to compare different batches of the same material or for quality control tests of a given material. For this type of comparison, it is essential that all test specimens be of identical dimensions and, as nearly as possible, have the same physical attributes, e.g. surface smoothness, internal stresses, etc. However, moisture equilibrium is not reached under these conditions. Therefore, results from this type of test cannot be used to compare the water absorption properties of different types of plastics. For more reliable results, simultaneous tests are recommended. 1.4 The results obtained using the methods described in this International Standard are applicable to most plastics but are not applicable to cellular plastics, granulates or powders, which can show additional absorption and capillary effects. Plastics exposed to moisture under controlled conditions for defined periods of time provide relative comparisons between them. The tests described for the determination of the diffusion coefficient may not be applicable to all plastics. Plastics that do not retain their shape when immersed in boiling water should not be compared using method 2 (see 6.4).		
ISO 6502-2	2018	Rubber — Measurement of vulcanization characteristics using curemeters — Part 2: Oscillating disc curemeter	This document specifies a method for determining selected vulcanization characteristics of a rubber compound by means of an oscillating disc curemeter. The introduction to the use of curemeters is described in ISO 6502-1.	ISO/TC 45	no
ISO 6502-3	2023	Rubber — Measurement of vulcanization characteristics using curemeters — Part 3: Rotorless curemeter	This document specifies a method for determining selected vulcanization characteristics of a rubber compound by means of a rotorless curemeter. An introduction to the use of curemeters is given in ISO 6502-1.	ISO/TC 45	no
ISO 6691	2021	Thermoplastic polymers for plain bearings — Classification and designation	This document specifies a classification and designation system for a selection of the most common unfilled thermoplastic polymers for plain bearings. The unfilled thermoplastic polymers are classified on the basis of appropriate levels of distinctive properties, additives and information about their application for plain bearings. The designation system does not include all properties; thermoplastic polymers having the same designation cannot therefore be interchanged in all cases. It also provides an outline of the properties and applications of the most common unfilled thermoplastic polymers as well as listing some of the fundamental parameters that influence the selection of thermoplastic polymers for use for plain bearings. NOTE In the further course of the work, it is intended to prepare standards on “thermosetting polymers” and “mixed polymers” for plain bearings.	ISO/TC 123	no
ISO 6721-11	2019	Plastics — Determination of dynamic mechanical properties — Part 11: Glass transition temperature	This document specifies methods for determining a value of the glass transition temperature (Tg) from the dynamic mechanical properties measured during a linear temperature scan under heating conditions. The glass transition temperature is an indicator of the transition from a hard and relatively brittle glassy state to a rubbery or viscous liquid state in an amorphous polymer or in amorphous regions of a partially crystalline polymer.	ISO/TC 61	yes

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			Usually referred to as dynamic mechanical analysis (DMA), the methods and their associated procedures can be applied to unreinforced and filled polymers, foams, rubbers, adhesives and fibre-reinforced plastics/composites. The methods are limited to materials that are inherently stable above Tg, i.e. amorphous materials that transform into a rubbery state or partially crystalline materials that keep their shape due to crystallinity. Different modes (e.g. flexure, torsion, shear, compression, tension) of dynamic mechanical analysis can be applied, as appropriate, to the form of the source material. Measured Tg values using instrumentation can vary as a result of material characteristics and/or the test set-up. The temperature sensor in a DMA instrument is not in contact with the test specimen and therefore measures temperature of the environment surrounding the specimen under test. The resulting data can vary with the heating rate applied. A procedure is included to take into account the thermal lag influencing the measured data.		
ISO 6914	2021	Rubber, vulcanized or thermoplastic — Determination of ageing characteristics by measurement of stress relaxation in tension	This document describes three methods for the measurement of the change of stress in a test piece at a given elongation for the purpose of determining the ageing characteristics of a rubber. — Method A is intended for measurement under continuous strain conditions. — Method B is the preferred method for measurement under intermittent strain conditions. — Method C is an alternative to method B for measurement under intermittent strain conditions in which the test piece is removed from the ageing environment for measurement of the stress at standard laboratory temperature. Measurements at a single elevated ageing temperature can be used for quality control purposes as a measure of heat-ageing resistance. Measurements at a number of temperatures can be used for research and development purposes to estimate long-term ageing characteristics in accordance with the procedures described in ISO 11346. Tests under continuous and intermittent strain conditions measure the results of different processes, and hence do not give the same results. The results of the intermittent methods B and C also cannot be expected to be the same as they use different test conditions.	ISO/TC 45	no
ISO 705	2015	Rubber latex — Determination of density between 5 degrees C and 40 degrees C	This International Standard specifies a method for the determination of the density of natural rubber latex concentrate between the temperatures of 5 °C and 40 °C. This International Standard is intended for use when density determinations are used to calculate the mass of a measured volume of latex in locations where it is not practical to weigh directly or to control the temperature of the laboratory.	ISO/TC 45	no
ISO 7148-2	2012	Plain bearings — Testing of the tribological behaviour of bearing materials — Part 2: Testing of polymer-based bearing materials	This part of ISO 7148 specifies tribological tests of polymer-based plain bearing materials under specified working conditions, i.e. load, sliding velocity and temperature, with and without lubrication. From the test results, data are obtained which indicate the relative tribological behaviour of metal-polymer and polymer-polymer rubbing parts. The purpose of this part of ISO 7148 is to obtain, for polymer material combinations used in plain bearings, reproducible measured values for friction and wear under specified and exactly-defined test conditions without lubrication (dry surfaces) and with lubrication (boundary lubrication). The test results give useful information for practical application only if all parameters of influence are identical. The more the test conditions deviate from the actual application, the greater the uncertainty of the applicability of the results.	ISO/TC 123	yes
ISO 7326	2016	Rubber and plastics hoses — Assessment of ozone resistance under static conditions	This document specifies five methods for determining the ozone resistance of the outer covers of hoses: — method 1, for bore sizes up to and including 25 mm, carried out on the hose itself; — method 2, for bore sizes greater than 25 mm, carried out on a test piece from the hose wall; — method 3, for bore sizes greater than 25 mm, carried out on a test piece from the cover;	ISO/TC 45	no

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			— method 4, for all bore sizes, carried out on the hose itself; — method 5, for all bore sizes, carried out on hoses that are expandable, for example textile-reinforced hoses. NOTE For hoses with built-in fittings from which it is not possible to take test pieces, the ozone resistance can be assessed on slabs in accordance with ISO 1431-1, using test sheets of the appropriate polymeric compound vulcanized to the same degree.		
ISO 7619-1	2018	Rubber, vulcanized or thermoplastic — Determination of indentation hardness — Part 1: Durometer method (Shore hardness)	This document specifies a method for determining the indentation hardness (Shore hardness) of vulcanized or thermoplastic rubber using durometers with the following scales: — the A scale for rubbers in the normal-hardness range; — the D scale for rubbers in the high-hardness range; — the AO scale for rubbers in the low-hardness range and for cellular rubbers; — the AM scale for thin rubber test pieces in the normal-hardness range.	ISO/TC 45	yes
ISO 7743	2017	Rubber, vulcanized or thermoplastic — Determination of compression stress-strain properties	This document specifies methods for the determination of the compression stress-strain properties of vulcanized or thermoplastic rubber using a standard test piece, a product or a part of a product. Four procedures are given: — using standard test piece A with the metal plates lubricated (method A); — using standard test piece A with the metal plates bonded to the test piece (method B); — using standard test piece B (method C); — using a product or a part of a product with the metal plates lubricated (method D). The methods are not suitable for materials that exhibit high set.	ISO/TC 45	no
ISO 812	2017	Rubber, vulcanized or thermoplastic — Determination of low-temperature brittleness	This document specifies a method for determining the lowest temperature at which rubber materials do not exhibit brittle failure or the temperature at which half of the test pieces used in a test fail when impacted under specified conditions. The temperatures thus determined do not necessarily relate to the lowest temperature at which the material can be used since the brittleness will be affected by the conditions of test and especially by the rate of impact. Data obtained by this method are, therefore, intended to be used to predict the behaviour of rubbers at low temperatures only in applications in which the conditions of deformation are similar to those specified in the test. Three procedures are described: — procedure A, in which the brittleness temperature is determined; — procedure B, in which the brittleness temperature for 50 % failure is determined; — procedure C, in which the test piece is impacted at a specified temperature. Procedure C is used in the classification of rubber materials and for specification purposes. NOTE A similar test for rubber-coated fabrics is described in ISO 4646.	ISO/TC 45	no
ISO 815-1	2019	Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures	This document specifies methods for the determination of the compression set characteristics of vulcanized and thermoplastic rubbers at ambient (one method) or elevated temperatures (three methods, A, B, and C, depending on the way the test piece is released at the end of the test). The methods are intended to measure the ability of rubbers of hardness within the range 10 IRHD to 95 IRHD to retain their elastic properties at specified temperatures after prolonged compression at constant strain (normally 25 %) under one of the alternative sets of conditions described. For rubber of nominal hardness 80 IRHD and above, a lower compression strain is used: 15 % for a nominal hardness from 80 IRHD to 89 IRHD and 10 % for a nominal hardness from 90 IRHD to 95 IRHD. NOTE 1 When rubber is held under compression, physical or chemical changes that prevent the rubber returning to its original dimensions after release of the deforming force can occur. The result is a set, the magnitude of which depends on the time and temperature of compression as well as on the time, temperature, and conditions of recovery. At elevated temperatures, chemical changes become increasingly more important and lead to a permanent set.	ISO/TC 45	no

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			NOTE 2 Short-time compression set tests, typically for 24 h, at elevated temperatures are commonly used as a measure of the state of cure, a means of material classification, and a specification to ensure the quality of a compound. Longer tests, typically for 1 000 h, at elevated temperatures take account of the effect of ageing and are often used to predict service performance, including that of sealing materials. Short-time tests at ambient temperature show mainly the effect of physical changes (re-orientation of the molecular chains and the fillers).		
ISO 815-2	2019	Rubber, vulcanized or thermoplastic — Determination of compression set — Part 2: At low temperatures	This document specifies two methods for the determination of the compression set characteristics of vulcanized and thermoplastic rubbers at low temperatures. Method 1 derives from the methodology used in ISO 815-1. Method 2 uses a specified testing device, allowing to measure and record the test piece thickness during recovery. Due to the load applied during recovery in method 2, no correlation can be established between the results given by both methods. NOTE When rubber is held under compression, physical or chemical changes that prevent the rubber returning to its original dimensions after release of the deforming force can occur. The result is a set, where the magnitude of which depends on the time and temperature of compression as well as on the time, temperature, and conditions of recovery. At low temperatures, changes resulting from the effects of glass hardening or crystallization become predominant and, since these effects are reversed by raising the temperature, therefore, the measurements are always taken at the test temperature.	ISO/TC 45	no
ISO 8302	1991	Thermal insulation — Determination of steady-state thermal resistance and related properties — Guarded hot plate apparatus	Defines the use of the guarded hot plate method to measure the steady-state heat transfer through flat slab specimens and the calculation of its heat transfer properties. Annex A forms an integral part of this standard. Annexes B, C and D are for information only.	ISO/TC 163	yes
ISO 868	2003	Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)	1.1 This International Standard specifies a method for the determination of the indentation hardness of plastics and ebonite by means of durometers of two types type A is used for softer materials and type D for harder materials (see the Note to 8.2). The method permits measurement either of the initial indentation or of the indentation after a specified period of time, or both. NOTE The durometers and the methods specified in this International Standard are referred to as type A Shore and type D Shore durometers and durometer methods, respectively. 1.2 This method is an empirical method intended primarily for control purposes. No simple relationship exists between indentation hardness determined by this method and any fundamental property of the material tested. For specification purposes, it is recommended that ISO 48, Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD), be used for the softer materials.	ISO/TC 61	yes
ISO 9028	2006	Rubber — Dissolution by acid digestion	This International Standard specifies methods for disintegration of raw rubber and rubber products by nitric acid or by a mixture of nitric and sulfuric acids. This International Standard is generally applicable, but is essential where potentially volatile elements or combinations of elements are present (i.e. As, Sb, Bi, and Zn + Cl, Cu + Cl and Pb + Cl). It is useful in these cases because lower temperatures are involved which result in less loss by volatilization. These methods will be used in order to produce solutions for the determination of metals, for example as traces, if the application of ISO 247 is not advisable. These methods prevent loss of volatile metal derivatives and the formation of insoluble metal silicates (which may result during dry ashing of halogenated rubbers containing zinc or of rubbers filled with silica).	ISO/TC 45	no

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ISO 9727-1	2007	Cylindrical cork stoppers — Physical tests — Part 1: Determination of dimensions	ISO 9727-1:2007 specifies a test method for determining the dimensions of cylindrical cork stoppers, namely diameter, length and, in some cases, ovalisation. It is applicable to all types of cylindrical cork stoppers as defined in ISO 633, ready for use or semi-worked.	ISO/TC 87	yes
ISO 9727-2	2007	Cylindrical cork stoppers — Physical tests — Part 2: Determination of mass and apparent density for agglomerated cork stoppers	ISO 9727-2:2007 specifies a test method for measuring the mass of cylindrical cork stoppers ready for use or semi-worked, totally or partially made of agglomerated cork, and calculating the apparent density of cylindrical cork stoppers ready for use or semi-worked, totally made of agglomerated cork.	ISO/TC 87	yes
ISO 9727-3	2007	Cylindrical cork stoppers — Physical tests — Part 3: Determination of humidity content	ISO 9727-3:2007 specifies a test method for determining the humidity content of cylindrical cork stoppers, ready for use or semi-worked.	ISO/TC 87	yes
ISO 9727-4	2007	Cylindrical cork stoppers — Physical tests — Part 4: Determination of dimensional recovery after compression	SO 9727-4:2007 specifies a test method for determining the percentage of diameter recovery of cylindrical cork stoppers, after compression. It is applicable to all types of cylindrical cork stoppers ready for use or semi-worked, intended to be completely inserted in the bottle neck (straight cork stoppers).	ISO/TC 87	yes
ISO 9727-5	2007	Cylindrical cork stoppers — Physical tests — Part 5: Determination of extraction force	ISO 9727-5:2007 specifies a test method for determining the maximum force necessary to extract a cylindrical cork stopper. It is applicable to all types of cylindrical cork stoppers ready for use, intended to be completely inserted in the bottle neck (straight cork stoppers).	ISO/TC 87	yes
ISO 9727-6	2007	Cylindrical cork stoppers — Physical tests — Part 6: Determination of liquid tightness	ISO 9727-6;2007 specifies a test method for determining the liquid tightness of a cylindrical cork stopper. It is applicable to all types of cylindrical cork stoppers ready for use, intended to be completely inserted in the bottle neck (straight cork stoppers).	ISO/TC 87	yes
ISO 9924-1	2023	Rubber and rubber products — Determination of the composition of vulcanizates and uncured compounds by thermogravimetry — Part 1: Butadiene, ethylene-propylene copolymer and terpolymer, isobutene-isoprene, isoprene and styrene-butadiene rubbers	ISO 9924-1:2016 specifies a thermogravimetric method for the determination of the total organic content, carbon black content and ash in vulcanizates and uncured compounds. The loss in mass at 300 °C is an approximate guide to the volatile-matter content of the compound. The method is suitable for the analysis of rubber compounds and vulcanizates containing the following rubbers occurring alone or as mixtures: a) polyisoprene of natural or synthetic origin; b) polybutadiene; c) styrene-butadiene copolymers; d) isobutylene-isoprene copolymers;	ISO/TC 45	yes

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			e) ethylene-propylene copolymers and related terpolymers. NOTE The field of application of the method may be extended to the analysis of compounds containing rubbers different from those given in this subclause, provided that the applicability of the method is tested beforehand using known compounds or vulcanizates having a similar composition. Other compounds are covered in ISO 9924-2. The method is not suitable for rubbers containing polymers which form a carbonaceous residue during pyrolysis, such as many chlorine- or nitrogen-containing rubbers. The method is also not suitable for materials containing additives which cause the formation of carbonaceous residues during pyrolysis, such as cobalt and lead salts or phenolic resins. The method is not suitable for compounds containing mineral fillers, such as carbonates or hydrated aluminium oxides, which decompose in the temperature range from 25 °C to 650 °C, unless suitable corrections based on prior knowledge of filler behaviour can be made. The method is not suitable for the determination of the total polymer content of compounds or vulcanizates containing non-rubber organic ingredients that cannot be completely removed by solvent extraction carried out in accordance with ISO 1407.		
ISO 9924-3	2009	Rubber and rubber products — Determination of the composition of vulcanizates and uncured compounds by thermogravimetry — Part 3: Hydrocarbon rubbers, halogenated rubbers and polysiloxane rubbers after extraction	This part of ISO 9924 specifies a thermogravimetric method for the determination of the main constituents of rubber compounds such as elastomer(s), carbon black and mineral filler. It establishes the “fingerprint” of the tested material. However, the result does not always correspond exactly to the theoretical formula of the rubber. This method applies to raw or compounded rubbers, vulcanized and unvulcanized, after preliminary extraction. This method applies to rubbers with hydrocarbon backbones (NR, BR, SBR, IIR, EPDM, ACM, AEM, etc.) used alone or as mixtures. For the mixtures, the polymer content corresponds to the total rubber, and it is not usually possible to identify individual polymers. This method applies to rubbers with halogenated hydrocarbon backbones (CR, CSM, FKM, CM, CO, ECO, etc.) or containing nitrogen (NBR, HNBR, NBR/PVC, etc.), as well as to their mixtures. However, these rubbers often form carbonaceous residues which interfere with the analysis. Application of an appropriate procedure minimizes these interferences. This method also applies to rubbers with a polysiloxane backbone (VMQ, etc.) and to rubbers not listed above.	ISO/TC 45	no
ISO/TR 16098	2012	Reclaimed rubbers and reclaimed crumb rubbers — Evaluation of dispersion in rubber mixes	This Technical Report specifies standard materials, standard test formulations, equipment and processing methods for evaluating the dispersion of reclaimed rubbers and reclaimed crumb rubbers in rubber mixes.	ISO/TC 45	no
ISO/TR 16314	2010	Rubber — Measurement of the aromaticity of oil in reclaimed rubbers	This Technical Report provides a method for the selective determination of polyaromaticity of oil in reclaimed rubbers. The method is based on nuclear magnetic resonance (NMR) spectrometry.	ISO/TC 45	no
ISO/TR 24699	2009	Rubber and rubber products — Environmental aspects — General guidelines for their inclusion in standards	This Technical Report provides guidelines for inclusion of environmental aspects in standards for rubber and rubber products. It proposes an approach which is directed at minimizing any adverse environmental impact of the products under consideration without detracting from the primary purpose of ensuring their adequate fitness for use. It closely follows the guidelines laid down in ISO 17422, with certain modifications to make it applicable to rubber and rubber products. The guidance provided by this Technical Report is intended primarily for use by standards writers. Over and above its primary purpose, however, the Technical Report provides guidance of value to those involved in design work and other activities where the	ISO/TC 45	no

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			environmental aspects of rubber and rubber products are being considered. It promotes the use of renewable, recycled and recyclable materials when environmentally beneficial and includes guidance on compliance with legislation concerning the end-of-life treatment of rubber products and the management of restricted and prohibited substances. NOTE This Technical Report is intended to promote the following practices: a) the use of techniques for identifying and assessing the environmental impact of technical provisions in standards, and for minimizing their adverse effects; b) the adoption of good practices such as: 1) environmentally sound procedures for the harvesting and production of raw materials, 2) procedures for minimizing environmental pollution during the life cycle of the product, 3) material and energy conservation during the service life of the product, 4) ensuring safety in the use of hazardous substances, 5) the use of technically justifiable procedures, 6) encouraging the use of performance criteria, rather than exclusion clauses such as are based, for example, only on chemical composition; c) paying due regard during standards development to environmental impact, product function and performance, health and safety, and regulatory requirements pertaining to end-of-life product disposal and the use of restricted substances; d) the regular review of existing standards in the light of technical innovations permitting improvement in the environmental impact of products; e) the application of life cycle analytical approaches wherever applicable and technically justifiable; f) the use of both recyclable and recycled materials in the construction of rubber products when environmentally beneficial and technically and economically justifiable; g) the use of designs and constructions that facilitate the disassembly of rubber products for recycling at the end of their service life when environmentally beneficial and technically and economically justifiable; h) the use of materials derived from renewable and sustainable resources in rubber and rubber products when environmentally beneficial and technically and economically justifiable.		
ISO/TR 4378-6	2012	Plain bearings — Terms, definitions, classification and symbols — Part 6: Abbreviated terms	This part of ISO 4378 gives the commonly used abbreviated terms related to plain bearings with their original terms.	ISO/TC 123	yes
ISO/TR 7620	2005	Rubber materials — Chemical resistance	This Technical Report describes a classification system for the reporting and tabulation of the chemical resistance of rubber materials. It also provide guidance on the testing and evaluation of rubber with particular reference to test chemicals described in a number of ISO standards. This document gives guidance on the behaviour of rubber in contact with chemicals such as aggressive gases and fluids, e.g. acids, alkalis, aqueous solutions, oil and solvents. The information given in this document is based on the practical experience of manufacturers and users of rubber materials. Unless there is prior knowledge or experience of the application, a selection based on the tables should always be confirmed by tests on the proposed rubber compounds using the actual product under the appropriate service conditions. In such tests, attention should also be given to the possibility of the rubber material contaminating the liquid or gas.	ISO/TC 45	no

Table 3 - International standards under development relevant for the GREEN-LOOP project

Document Nr.	Title	Scope	Status	Committee	Indicated in questionnaire
ISO/CD 1183-1	Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method	This document specifies three methods for the determination of the density of non-cellular plastics in the form of void-free moulded or extruded objects, as well as powders, flakes and granules. — Method A: Immersion method, for solid plastics (except for powders) in void-free form. — Method B: Liquid pycnometer method, for particles, powders, flakes, granules or small pieces of finished parts. — Method C: Titration method, for plastics in any void-free form. NOTE Density is frequently used to follow variations in physical structure or composition of plastic materials. Density can also be useful in assessing the uniformity of samples or specimens. Often, the density of plastic materials depend upon the choice of specimen preparation method. When this is the case, precise details of the specimen preparation method are intended to be included in the appropriate material specification. This note is applicable to all three methods.	CD	ISO/TC 61/SC 5	no
ISO/CD 12492	Rubber, raw — Determination of water content by Karl Fischer method	ISO 12492:2012 specifies a test method for the determination of water content of raw rubber and compounded rubber using a coulometric Karl Fischer titration method. It applies to the range for the water content between 0,01 % and 1 %. As this is a very sensitive method, contact of sample with any moisture, even from the surrounding environment, must be eliminated as much as possible.	CD	ISO/TC 45 SC 3	no
ISO/CD 527-2	Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics	ISO 527-2:2012 specifies the test conditions for determining the tensile properties of moulding and extrusion plastics, based upon the general principles given in ISO 527-1.	CD	ISO/TC 61/SC 2	yes
ISO/DIS 16620-4	Plastics — Biobased content — Part 4: Determination of biobased mass content	ISO 16620-4:2016 specifies a method of determining the biobased mass content in plastics products, based on the radiocarbon analysis and elemental analysis. ISO 16620-4:2016 is applicable to plastic products and plastic materials, polymer resins, monomers or additives, which are made from biobased or fossil-based constituents. This method is applicable, provided that the plastic product contains carbon element and that a statement giving its elemental composition and its biobased mass content is available.	DIS	ISO/TC 61/SC 14	yes
ISO/DIS 21561-2	Styrene-butadiene rubber (SBR) — Determination of the microstructure of solution-polymerized SBR — Part 2: FTIR with ATR method	ISO 21561-2:2016 specifies procedures for the quantitative determination of the microstructure of the butadiene and the content of styrene in solution-polymerized SBR (S-SBR) by Fourier Transform Infrared Spectrometry (FTIR) with Attenuated Total Reflection (ATR) method. The styrene content is expressed in mass % relative to the whole polymer. The vinyl, trans and cis contents are expressed in mol % relative to the butadiene content. This method is only applicable to raw rubbers. NOTE 1 Precision as shown in Annex A may not be obtained for S-SBRs containing polystyrene block or styrene content more than 45 mass %. NOTE 2 Only "vinyl", "trans" and "cis", are used in this part of ISO 21561. However, the expression of vinyl, trans and cis mean as	CD	ISO/TC 45 SC 3	no

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		follows in general: - vinyl: vinyl unit, vinyl bond, 1,2-unit, 1,2-bond, 1,2-vinyl-unit or 1,2-vinyl-bond; - trans: 1,4-trans unit, 1,4-trans bond, trans-1,4 unit or trans1,4 bond; - cis: 1,4-cis unit, 1,4-cis bond, cis-1,4 unit or cis-1,4 bond.			
ISO/DIS 23337	Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using the Improved Lambourn test machine	ISO 23337:2016 specifies a method for the determination of the resistance of rubber to abrasion using the Improved Lambourn test machine. The abrasion loss resulting from the slip caused by the difference in circumferential speed between a disc-shaped rubber test piece and an abrasive wheel, which are driven to rotate independently with their circumferences pressed against each other by a specified load, is determined. The test result can be reported as a volume loss per abrasion test time or running distance, and/or as an abrasion resistance index compared to a reference compound. As the Improved Lambourn test machine is capable of setting various abrasive conditions, such as slip rate, sliding speed and load, independently, this method is suitable for the evaluation of compounds for a range of rubber products, especially tyres, under a wide range of severity conditions. An example of the testing of tyre tread rubber is given in Annex A.	DIS	ISO/TC 45 SC 2	no
ISO/DIS 7148-2	Plain bearings — Testing of the tribological behaviour of bearing materials — Part 2: Testing of polymer-based bearing materials	This document specifies tribological tests of polymer-based plain bearing materials under specified working conditions, i.e. load, sliding velocity and temperature, with and without lubrication. From the test results, data are obtained which indicate the relative tribological behaviour of metal-polymer and polymer-polymer rubbing parts. The purpose of this document is to obtain, for polymer material combinations used in plain bearings, reproducible measured values for friction and wear under specified and exactly-defined test conditions without lubrication (dry surfaces) and with lubrication (boundary lubrication). The test results give useful information for practical application only if all parameters of influence are identical. The more the test conditions deviate from the actual application, the greater the uncertainty of the applicability of the results.	DIS	ISO/TC 123/SC 2	no

Table 4 – Published European standards relevant for the GREEN-LOOP project

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
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	This Part of this European Standard provides a guide to the selection of the appropriate conditions and test methods for the determination of overall migration into food simulants and test media from plastics which are intended to come into contact with foodstuffs.	CEN/TC 194	yes
EN 1186-11	2002	Materials and articles in contact with foodstuffs - Plastics - Part 11: Test methods for overall	This European Standard specifies test methods for the determination of the overall migration into fatty food simulants from plastics materials and articles into a mixture of 14C-labelled synthetic triglycerides at temperatures above 20 °C and up to, and including, 121 °C for selected times. These methods are suitable for plastics in the form of films and sheets, a wide range of articles or	CEN/TC 194	yes

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
		migration into mixtures of 14C-labelled synthetic triglycerides	containers from which test pieces of a suitable size can be cut and containers and articles that can be filled. The test methods described are applicable to all plastics.		
EN 1186-13	2002	Materials and articles in contact with foodstuffs - Plastics - Part 13: Test methods for overall migration at high temperatures	This European Standard specifies test methods for the determination of the overall migration into fatty food simulants from plastics materials and articles, by total immersion of test specimens in a fatty food simulant at temperatures from 100 °C up to and including, 175 °C for selected times. Also described is a procedure with a substitute test medium. In this substitute procedure the mass of components adsorbed on modified polyphenylene oxide (MPPO) is taken as a measure for the assessment of the overall migration into olive oil. NOTE 1 The total immersion test method has been written for use with the fatty food simulant, olive oil. The test method can also be used with appropriate modifications with other fatty food simulants called simulant D - a synthetic mixture of triglycerides, sunflower oil and corn oil. These other fatty food simulants produce different chromatograms for the simulant methyl esters to those of the methyl esters of olive oil. Suitable chromatogram peaks of the methyl esters of the other fatty food simulants should be selected for the quantitative determination of the simulant extracted from the test specimens. NOTE 2 A comparative migration test carried out with polypropylene and polyethylene terephthalate high temperature application containers as test samples at conditions 2 h at 100 °C and 2 h at 175 °C, respectively, in contact with 14C-labelled synthetic triglyceride and MPPO provided test results comparable within the analytical tolerance of the methods. NOTE 3 To obtain reproducible and repeatable results using the MPPO method it may be necessary to measure the temperature of the test specimen before starting the migration period. An appropriate method for measuring the temperature of the test specimen needs to be established. The described methods are most suitable for food contact articles in the form of sheets and films, but can also be applied to a wide range of ar (...abbreviated)	CEN/TC 194	yes
EN 1186-2	2022	Materials and articles in contact with foodstuffs - Plastics - Part 2: Test methods for overall migration in vegetable oils	This document specifies methods for measuring overall migration of plastic materials and articles intended to come into contact with foodstuffs by contacting test specimens with vegetable oils at temperatures greater than or equal to 4 °C and less than or equal to 175 °C. The overall migration from a sample of the plastics is determined as the loss in mass of non-volatile substances expressed: - per unit surface area; or - per kg of food simulant; or - per article after contact with a food simulant under defined conditions. According to the type of materials or shape of articles, contact with the food simulant is carried out on a single surface (pouch, cell, filling) or by immersion. This document does not cover the interpretation of the results which is expected to account for regulatory requirements.	CEN/TC 194	yes
EN 1186-3	2022	Materials and articles in contact with foodstuffs - Plastics - Part 3: Test methods for overall migration in evaporable simulants	This document specifies methods for measuring overall migration of plastic materials and articles intended to come into contact with foodstuffs by contacting test specimens with evaporable food simulants at temperatures greater than or equal to 4 °C and not exceeding the reflux temperature. The overall migration from a sample of the plastics is determined as the loss in mass of non-volatile substances expressed: - per unit surface area; or - per kg of food simulant; or - per article after contact with a food simulant under defined conditions. According to the type of materials or shape of articles, contact with the food simulant is carried out on a single surface (pouch, cell, filling) or by immersion. This document does not cover the interpretation of the results which is expected to account for regulatory requirements.	CEN/TC 194	yes
EN 12199	2020	Resilient floor coverings - Specifications for homogeneous and heterogeneous relief rubber floor coverings	This document specifies the characteristics of homogeneous and heterogeneous relief or studded rubber floor coverings, supplied in either tile or roll form. This document includes a classification system based on intensity of use, which shows where these resilient floor coverings will give satisfactory service (see EN ISO 10874). It also specifies requirements for marking.	CEN/TC 134	no
EN 12664	2001	Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter	This standard specifies principles and testing procedures for determining, by means of the guarded hot plate or heat flow meter methods, the thermal resistance of test specimens either in the dry state or conditioned to equilibrium with moist air, having a thermal resistance of not less than 0,1 m2·K/W and a (hygro)thermal transmissivity or thermal conductivity up to 2,0 W/(m·K). (It is expected that the thermal resistance of most masonry specimen will be less than 0,5 m2·K/W). NOTE 1 The lower limit for measurable thermal resistance is due to the effect of contact thermal resistances, which require special testing techniques	CEN/TC 89	yes

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
		methods - Dry and moist products of medium and low thermal resistance	described in this standard. Although this standard can be used for testing dry specimens of high and medium thermal resistance, i.e. on products having a thermal resistance of not less than 0,5 m2·K/W, the simpler procedures of EN 12667:2001 are recommended for such specimens. It applies in principle to any mean test temperature, but the equipment design in annex D is essentially intended to operate between a minimum cooling unit temperature of -100 °C and maximum heating unit temperature of +100 °C. NOTE 2 Limits to the mean test temperature are only imposed by the materials used in the apparatus construction and by ancillary equipment. It supplies additional limits for equipment performance and test conditions. It does not supply general equipment design procedures, equipment error analysis, equipment performance check or the assessment of equipment accuracy. It supplies example designs of equipment complying with the requirements set down in this standard. This standard does not supply general guidance and background information (e.g. the heat transfer property to be reported, product-dependent specimen preparations, suggested materials for vapour-tight envelopes when testing moist specimens, procedures requiring multiple measurements, such as those to assess the effec (...abbreviated)		
EN 12667	2001	Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance	This standard specifies principles and testing procedures for determining, by means of the guarded hot plate or heat flow meter methods, the thermal resistance of test specimens having a thermal resistance of not less than 0,5 m2·K/W NOTE 1 The above limit is due to the effect of contact thermal resistances. An upper limit for measurable thermal resistance depends upon a number of factors described in this standard, but a unique figure cannot be assigned. It applies in principle to any mean test temperature, but the equipment design in annex D is essentially intended to operate between a minimum cooling unit temperature of -100 °C and maximum heating unit temperature of +100 °C. NOTE 2 Limits to the mean test temperature are only imposed by the materials used in the apparatus construction and by ancillary equipment. It supplies additional limits for equipment performance and test conditions. It does not supply general equipment design procedures, equipment error analysis, equipment performance check or the assessment of equipment accuracy. It supplies example designs of equipment complying with the requirements set down in this standard. This standard does not supply general guidance and background information (e.g. the heat transfer property to be reported, product-dependent specimen preparations, procedures requiring multiple measurements, such as those to assess the effect of specimen non-homogeneities, those to test specimens whose thickness exceeds the apparatus capabilities, and those to assess the relevance of the thickness effect). Due to these limitations, this standard should be used in conjunction with the product standard relevant to the product to be tested. Although intended primarily for building materials, it can also be used for specimens of any material that conforms to the requirements specified. This standard does not cover measurements on moist products of any thermal resi (...abbreviated)	CEN/TC 89	yes
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	This part of this European Standard provides a guide to the selection of the appropriate conditions of contact of food simulants with the test article before the determination of specific migration of those substances subject to a migration limit. NOTE According to Directive 2002/72/EC[2] the determination of the migration of specified components in foodstuffs instead of the use of simulants is permitted. However, in that situation there is no need to give guidance on the test conditions of time and temperature as contact conditions shall be equal to conditions applied in real. Also general guidance is given for the determination of the amount of the substance in the final plastics material or article.	CEN/TC 194	yes
EN 13130-2	2004	Materials and articles in contact with foodstuffs - Plastics substances subject to limitation -	This part of this European Standard specifies methods for the determination of the monomer terephthalic acid in food simulants; distilled water, 3 % (w/v) acetic acid aqueous solution, 15 % (v/v) ethanol aqueous solution and olive oil and other fatty food simulants, simulants D, e.g. a mixture of synthetic triglycerides or sunflower oil or corn oil. The methods are capable of determining	CEN/TC 194	yes

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
		Part 2: Determination of terephthalic acid in food simulants	terephthalic acid in the food simulants at the level of the specific migration limit of 7,5 mg of terephthalic acid per kilogram of food simulants. NOTE This method was developed for the determination of terephthalic acid in 15 % (v/v) aqueous ethanol, as required by the regulations in force at the time the development work was carried out. However, this method, developed for 15 (v/v) aqueous ethanol, should be applicable to the determination in 10 (v/v) aqueous ethanol.		
EN 13130-3	2004	Materials and articles in contact with foodstuffs - Plastics substances subject to limitation - Part 3: Determination of acrylonitrile in food and food simulants	This part of this European Standard specifies a method for the determination of acrylonitrile monomer in foods and food simulants. The method is applicable to aqueous food simulants, to the fatty food simulant olive oil and other fatty food simulants, simulants D, e.g. a mixture of synthetic triglycerides or sunflower oil or corn oil, as well as to liquid and solid foodstuffs such as beverages and soft margarine. The level of acrylonitrile monomer determined is expressed as milligrammes of acrylonitrile per kilogram of food or food simulant. The method is appropriate for the quantitative determination of acrylonitrile monomer at minimum levels of down to 0,01 mg/kg to 0,005 mg/kg, or lower, in food simulant, depending on the applied test conditions (see NOTE in 8.2.3). With regard to the performance in the mentioned foodstuffs, in general, a direct detection limit of 0,02 mg/kg is achievable. NOTE This method was developed for the determination of acrylonitrile in 15 % v/v aqueous ethanol, as required by the regulations in force at the time the development work was carried out. However, this method, developed for 15 (v/v) aqueous ethanol, should be applicable to the determination in 10 (v/v) aqueous ethanol.	CEN/TC 194	yes
EN 13130-4	2004	Materials and articles in contact with foodstuffs - Plastics substances subject to limitation - Part 4: Determination of 1,3-butadiene in plastics	This part of this European Standard specifies a method for the determination of butadiene monomer in polymers. The method is applicable to acrylonitrile-butadiene-styrene copolymer (ABS) and to high-impact polystyrene (HIPS) as well as to other 1,3-butadiene polymers and copolymers where these are soluble in N,Ndimethylacetamide or finely dispersed, swollen suspensions in N,N-dimethylacetamide. The level of 1,3- butadiene monomer determined is expressed as milligrams of 1,3-butadiene per kilogram of polymer. The method is appropriate for the quantitative determination of 1,3-butadiene at a level of 0,1 mg/kg in the polymer.	CEN/TC 194	yes
EN 13130-5	2004	Materials and articles in contact with foodstuffs - Plastics substances subject to limitation - Part 5: Determination of vinylidene chloride in food simulants	This part of this European Standard specifies a method for the determination of vinylidene chloride monomer in food simulants. The method is applicable to aqueous food simulants, to the fatty food simulant olive oil and other fatty food simulants, simulants D, e.g. a mixture of synthetic triglycerides or sunflower oil or corn oil. The level of vinylidene chloride determined is expressed as milligrams of vinylidene chloride per kilogram of food simulant. The method is appropriate for the quantitative determination of vinylidene chloride at a level of 0,05 mg/kg. NOTE This method was developed for the determination of vinylidene chloride in 15 % (v/v) aqueous ethanol, as required by the regulations in force at the time the development work was carried out. However, this method, developed for 15 (v/v) aqueous ethanol, should be applicable to the determination in 10 (v/v) aqueous ethanol.	CEN/TC 194	yes
EN 13130-6	2004	Materials and articles in contact with foodstuffs - Plastics substances subject to limitation - Part 6: Determination of vinylidene chloride in plastics	This part of this European Standard specifies a method for the determination of vinylidene chloride (VdC) in plastics materials and articles. The method is applicable to poly(vinylidene chloride) (PVdC) films, PVdC coated films, and laminates and coextruded materials containing PVdC. The level of vinylidene chloride determined is expressed as milligrams of vinylidene chloride per kilogram of polymer. The method is appropriate for the quantitative determination of vinylidene chloride at a level of 5 mg/kg in plastics materials and articles.	CEN/TC 194	yes
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	This part of this European Standard specifies methods for the determination of monoethylene glycol and diethylene glycol in the food simulants; water, 3 % (w/v) acetic acid, 15 % (v/v) ethanol and olive oil and other fatty food simulants, simulants D, e.g. a mixture of synthetic triglycerides or sunflower oil or corn oil. The methods are capable of determining monoethylene glycol and diethylene glycol in food simulants separately, or combined, at the specific migration limit SML (T) of 30 mg/kg. NOTE This method was developed for the determination of monoethylene glycol and diethylene glycol in 15 % (v/v) aqueous ethanol, as required by the regulations in force at the time the development work was carried out. However, this method, developed for 15 (v/v) aqueous ethanol, should be applicable to the determination in 10 (v/v) aqueous ethanol.	CEN/TC 194	yes
EN 13130-8	2004	Materials and articles in contact with foodstuffs - Plastics substances subject to limitation -	This part of this European Standard describes a method for the determination of individual and total levels of residual isocyanates in plastics materials and articles. This method is applicable to the analysis of polyurethane polymers. The total level of isocyanate monomers in materials and articles determined according to the procedure described in this standard is given in milligrams of NCO	CEN/TC 194	yes

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
		Part 8: Determination of isocyanates in plastics	per kilogram of material or article. The method is capable of quantitative determination of individual isocyanates measured as NCO at 0,04 mg/kg and total isocyanates at 1,0 mg/kg. NOTE The method has been applied to the analysis of 9 isocyanate monomers listed in 3.1. It has not been applied to the analysis of octadecyl isocyanate, diphenylether-4,4-diisocyanate or 3,3-dimethyl-4,4-diisocyanatobiphenyl as samples of these monomers have not been obtained. There is no reason to anticipate that the method may not be suitable for the analysis of these monomers also.		
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 (consolidated version)	This European Standard specifies requirements and procedures to determine the compostability and anaerobic treatability of packaging and packaging materials by addressing four characteristics: 1) biodegradability, 2) disintegration during biological treatment, 3) effect on the biological treatment process and 4) effect on the quality of the resulting compost. In case of a packaging formed by different components, some of which are compostable and some other not, the packaging itself, as a whole is not compostable. However, if the components can be easily separated by hand before disposal, the compostable components can be effectively considered and treated as such, once separated from the non compostable components. This European Standard covers the compostability of packaging itself but does not address regulations that may exist regarding the compostability of any residual contents. This European Standard makes provision for obtaining information on the processing of packaging in controlled waste treatment plants but does not take into account packaging waste which may end up in the environment, through uncontrolled means, i.e. as litter. The essential relationship between this European Standard and the four other (mandated) European Packaging Standards and one (mandated) CEN Report is specified in EN 13427:2000.	CEN/TC 261	yes
EN 13501-1	2018	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests	This document provides the reaction to fire classification procedure for all construction products, including products incorporated within building elements with the exception of power, control and communication cables which are covered by EN 13501-6. Products are considered in relation to their end use application. This document applies to three categories, which are treated separately in this document: - construction products, excluding floorings and linear pipe thermal insulation products; - floorings; - linear pipe thermal insulation products.	CEN/TC 127	yes
EN 13501-5	2016	Fire classification of construction products and building elements - Part 5: Classification using data from external fire exposure to roofs tests	This European Standard provides the fire performance classification procedures for roofs/roof coverings exposed to external fire based on the four test methods given in CEN/TS 1187:2012 and the relevant extended application rules. For the classification of a roof/roof covering, only those test methods and those application rules need to be applied for which the corresponding classification is envisaged. Products are considered in relation to their end use application.	CEN/TC 127	yes
EN 13823	2020+A1 2022	Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item	This document specifies a method of test for determining the reaction to fire performance of construction products excluding floorings, and excluding products which are indicated in Delegated Regulation (EU) when exposed to thermal attack by a single burning item (SBI). The calculation procedures are given in Annex A. Information on the precision of the test method is given in Annex B. The calibration procedures are given in Annexes C and D, of which Annex C is a normative annex.	CEN/TC 127	yes
EN 1389 (withdrawn, replaced by EN ISO 18754)	2003	Advanced technical ceramics - Ceramic composites - Physical properties - Determination of density and apparent porosity	-	CEN/TC 184	yes

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
EN 13956	2012	Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics	This European Standard specifies the definitions and characteristics of plastic and rubber sheets including sheets made out of their blends and alloys (thermoplastic rubber) for which the intended use is roof waterproofing. It specifies the requirements and test methods and provides for the evaluation of conformity of the products with the requirements of this European Standard.	CEN/TC 254	yes
EN 14041	2018	Resilient, textile, laminate and modular multilayer floor coverings - Essential characteristics	This European Standard specifies the essential characteristics for the following types of floor coverings: - resilient floor coverings, excluding loose-laid mats; - textile floor coverings, excluding loose-laid (barrier) mats, runners and rugs; - laminate floor coverings; - modular multilayer floor coverings. These types of floor coverings may or may not be formulated to enhance the performance of one or more essential characteristics. These types of floor coverings are intended for internal use as floor coverings within a building according to the manufacturer's specifications. For these types of floor coverings this European standard specifies the assessment methods for determination of performances of the essential characteristics, the ways of expressing their performance, the systems for assessment and verification of constancy of performance (AVCP) their marking. This standard does not specify requirements of floor coverings, which are not related to the essential characteristics as defined in Regulation (EU) NoThis standard does not cover installation or maintenance of the floor coverings.	CEN/TC 134	yes
EN 14995	2006	Plastics - Evaluation of compostability - Test scheme and specifications	This European Standard specifies requirements and procedures to determine the compostability or anaerobic treatability of plastic materials by addressing four characteristics: I) biodegradability, II) disintegration during biological treatment, III) effect on the biological treatment process and IV) effect on the quality of the resulting compost. NOTE For packaging EN 13432 applies.	CEN/TC 249	no
EN 15534-1	2014+A1 2017	Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) - Part 1: Test methods for characterisation of compounds and products	This European Standard specifies test methods for the determination of properties of composites made from cellulose-based materials and thermoplastics, usually called wood-polymer composites (WPC) or natural fibre composites (NFC). This part of EN 15534 is applicable to cellular or non-cellular compounds and products, made from cellulose-based materials and thermoplastics, intended to be or being processed through plastics processing techniques, without threshold for the cellulose-based material content. All the properties listed in this part of EN 15534 are not necessarily assessed for a given application. Test parameters and requirements of the test methods for a given application are specified in the relevant part of EN 15534. Profiles for the management of electrical power cables, communication cables and power track systems used for the distribution of electrical power, profiles for windows or doors and profiles for guttering are not covered by EN 15534.	CEN/TC 249	no
EN 15804	2012+A2 2019/AC 2021	Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products	This European standard provides core product category rules (PCR) for Type III environmental declarations for any construction product and construction service. The core PCR: — defines the indicators to be declared, information to be provided and the way in which they are collated and reported, — describes which stages of a product’s life cycle are considered in the EPD and which processes are to be included in the life cycle stages, — defines rules for the development of scenarios, — includes the rules for calculating the Life Cycle Inventory and the Life Cycle Impact Assessment underlying the EPD, including the specification of the data quality to be applied, — includes the rules for reporting predetermined, environmental and health information, that is not covered by LCA for a product, construction process and construction service where necessary, — defines the conditions under which construction products can be compared based on the information provided by EPD. For the EPD of construction services the same rules and requirements apply as for the EPD of construction products.	CEN/TC 350	yes
EN 16165	2021	Determination of slip resistance of pedestrian surfaces - Methods of evaluation	This document specifies test methods for determining the slip resistance of surfaces used by pedestrians.	CEN/TC 339	yes
EN 16640	2017	Bio-based products - Bio-based carbon content - Determination of the bio-based carbon content using the radiocarbon method	This European Standard specifies a method for the determination of the bio-based carbon content in products, based on the 14C content measurement. This European Standard also specifies two test methods to be used for the determination of the 14C content from which the bio-based carbon content is calculated: - Method A: Liquid scintillation-counter method (LSC) ; - Method B: Accelerator mass spectrometry (AMS). A third method, Method C: Beta ionization (BI) can also be used for the determination of the 14C content and is described in Annex D (informative). The bio-based carbon content is expressed by a fraction of sample mass or	CEN/TC 411	no

Document Nr.	Publication	Title	Scope	Committee	Indicated in questionnaire
			as a fraction of the total carbon content. This calculation method is applicable to any product containing carbon, including bio composites.		
EN 17228	2019	Plastics - Bio-based polymers, plastics, and plastics products - Terminology, characteristics and communication	This document specifies the vocabulary, methods for characterization, and templates for reporting about bio-based polymers, plastics, and plastics products (including semi-finished plastics products and composites). In particular this document covers: terminology, bio-based content, bio-based carbon content, Life Cycle Assessment, sustainability aspects, and declaration tools. Biocompatible polymers and plastics for medical applications covered by specific provisions are out of the scope of this document.	CEN/TC 249	no
EN 1816	2020	Resilient floor coverings - Specification for homogeneous and heterogeneous smooth rubber floor coverings with foam backing	This document specifies the characteristics of homogeneous and heterogeneous smooth (including grained or embossed) rubber floor coverings with foam backing, supplied in roll or in tile form. This document includes a classification system based on intensity of use, which shows where these resilient floor coverings will give satisfactory service (see EN ISO 10874). It also specifies requirements for marking.	CEN/TC 134	no
EN 1817	2020	Resilient floor coverings - Specification for homogeneous and heterogeneous smooth rubber floor coverings	This document specifies the characteristics of homogeneous and heterogeneous smooth (including grained or embossed) rubber floor coverings, supplied in either tile or roll form. This document includes a classification system based on intensity of use, which shows where these resilient floor coverings should give satisfactory service (see EN ISO 10874). It also specifies requirements for marking.	CEN/TC 134	no
EN ISO 10534-2	2001	Acoustics - Determination of sound absorption coefficient and impedance in impedances tubes - Part 2: Transfer-function method (ISO 10534-2:1998)	This test method covers the use of an impedance tube, two microphone locations and a digital frequency analysis system for the determination of the sound absorption coefficient of sound absorbers for normal sound incidence. It can also be applied for the determination of the acoustical surface impedance or surface admittance of sound absorbing materials. Since the impedance ratios of a sound absorptive material are related to its physical properties, such as airflow resistance, porosity, elasticity and density, measurements described in this test method are useful in basic research and product development. The test method is similar to the test method specified in ISO 10534-1 in that it uses an impedance tube with a sound source connected to one end and the test sample mounted in the tube at the other end. However, the measurement technique is different. In this test method, plane waves are generated in a tube by a noise source, and the decomposition of the interference field is achieved by the measurement of acoustic pressures at two fixed locations using wall-mounted microphones or an in-tube traversing microphone, and subsequent calculation of the complex acoustic transfer function, the normal incidence absorption and the impedance ratios of the acoustic material. The test method is intended to provide an alternative, and generally much faster, measurement technique than that of ISO 10534-1. Compared with the measurement of the sound absorption in a reverberation room according to the method specified in ISO 354, there are some characteristic differences. The reverberation room method will (under ideal conditions) determine the sound absorption coefficient for diffuse sound incidence, and the method can be used for testing of materials with pronounced structures in the lateral and normal directions. However, the reverberation room method requires test specimens which are rather large, so it is no (...abbreviated)	CEN/TC 126	yes
EN ISO 11925-2	2020	Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2020)	This document specifies a method of test for determining the ignitability of products by direct small flame impingement under zero impressed irradiance using vertically oriented test specimens. Information on the precision of the test method is given in Annex A (informative). Information on testing not essentially flat end-use products is given in Annex B (normative). Information on testing perforated end-use products is given in Annex C (normative).	CEN/TC 127	yes
EN ISO 18754	2022	Fine ceramics (advanced ceramics, advanced technical ceramics) - Determination of density and apparent porosity (ISO 18754:2020)	This document specifies methods for the determination of the apparent solid density, bulk density, apparent porosity and geometric bulk density of fine ceramics, including all ceramic matrix composites. Two methods are described and are designated as Methods A and B, as follows: - Method A: Determination of bulk density, apparent solid density and apparent porosity by liquid displacement (Archimedes' method). - Method B: Determination of bulk density only, by measurement of geometric dimensions and mass.	CEN/TC 184	yes

Table 5 - European standards under development relevant for the GREEN-LOOP project

Document Nr.	Title	Scope	Status	Committee	Indicated in Questionnaire
FprEN ISO 10534-2	Acoustics - Determination of acoustic properties in impedance tubes - Part 2: Two-microphone technique for normal sound absorption coefficient and normal surface impedance (ISO/FDIS 10534-2:2023)	N/A	FprEN/FDIS	CEN/TC 126	yes
prEN 12664 rev (WI=00089201)	Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Dry and moist products of medium and low thermal resistance	This standard specifies principles and testing procedures for determining, by means of the guarded hot plate or heat flow meter methods, the thermal resistance of test specimens either in the dry state or conditioned to equilibrium with moist air, having a thermal resistance of not less than 0,1 m2.K/W and a (hygro)thermal transmissivity or thermal conductivity up to 2,0 W/(m.K). (It is expected that the thermal resistance of most masonry specimen will be less than 0,5 m2.K/W).	Preliminary	CEN/TC 89	yes
prEN 12667 rev (WI= 00089198)	Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance	This standard specifies principles and testing procedures for determining, by means of the guarded hot plate or heat flow meter methods, the thermal resistance of test specimens having a thermal resistance of not less than 0,5 m2 K/W.	Preliminary	CEN/TC 89	yes
prEN 13432 rev (WI=00261479)	Packaging - Requirements for packaging recoverable through composting and biodegradation - Test scheme and evaluation criteria for the final acceptance of packaging	This European Standard specifies requirements and procedures to determine the compostability and anaerobic treatability of packaging and packaging materials by addressing four characteristics: 1) biodegradability; 2) disintegration during biological treatment; 3) effect on the biological treatment process; 4) effect on the quality of the resulting compost. In case of a packaging formed by different components, some of which are compostable and some other not, the packaging itself, as a whole is not compostable.	Preliminary	CEN/TC 261	no

Table 6 - Other standards relevant for the GREEN-LOOP project

Document Nr.	Publication year	Title	Scope	Indicated in questionnaire
ASTM C 1166	2021	Standard Test Method for Flame Propagation of Dense and Cellular Elastomeric Gaskets and Accessories	1.1 This test method covers a laboratory procedure for determining flame propagation characteristics of a dense or cellular elastomeric gasket (such as expansion, lock-strip or compression gasket) or an accessory (such as a setting block, spacer or shim) when exposed to heat and flame, with no significance being attached to such matters as fuel contribution, rate of flame spread, smoke developed, or the nature and temperature of the products of combustion. 1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard. 1.3 This standard should be used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions and should not be used to describe or appraise the fire-hazard or fire-risk of materials, products, or assemblies under actual fire conditions. However, results of the test may be used as elements of a fire-hazard assessment or a fire-risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard or fire risk of a particular end use. 1.4 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of	yes

Document Nr.	Publication year	Title	Scope	Indicated in questionnaire
			this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.5 The committee with jurisdiction over this standard is not aware of any comparable standards published by other organizations. 1.6 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	
ASTM D 1002	2019	Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal)	1.1 This test method covers the determination of the apparent shear strengths of adhesives for bonding metals when tested on a standard single-lap-joint specimen and under specified conditions of preparation and test. 1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard. 1.3 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.4 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	yes
ASTM D 1414	2022	Standard Test Methods for Rubber O-Rings	1.1 These test methods describe the procedures for determining the physical properties of O-rings and changes in these properties due to aging. 1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only. 1.3 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.	yes
ASTM D 1415	2018	Standard Test Method for Rubber Property—International Hardness	1.1 This test method covers a procedure for measuring the hardness of vulcanized or thermoplastic rubber. The hardness is obtained by the difference in penetration depth of a specified dimension ball under two conditions of contact with the rubber: (1) with a small initial force and (2) with a much larger final force. The differential penetration is taken at a specified time and converted to a hardness scale value. 1.2 This test method is technically similar to ISO 48. 1.3 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.4 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	yes

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ASTM D 1434-82	2023	Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting	1.1 This test method covers the estimation of the steady-state rate of transmission of a gas through plastics in the form of film, sheeting, laminates, and plastic-coated papers or fabrics. This test method provides for the determination of (1) gas transmission rate (GTR), (2) permeance, and, in the case of homogeneous materials, (3) permeability. 1.2 Two procedures are provided: 1.2.1 Procedure M—Manometric. 1.2.2 Procedure V—Volumetric. 1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard. 1.4 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.	yes
ASTM D 2240	2021	Standard Test Method for Rubber Property—Durometer Hardness	1.1 This test method covers twelve types of rubber hardness measurement devices known as durometers: Types A, B, C, D, DO, E, M, O, OO, OOO, OOO-S, and R. The procedure for determining indentation hardness of substances classified as thermoplastic elastomers, vulcanized (thermoset) rubber, elastomeric materials, cellular materials, gel-like materials, and some plastics is also described. 1.2 This test method is not equivalent to other indentation hardness methods and instrument types, specifically those described in Test Method D1415. 1.3 This test method is not applicable to the testing of coated fabrics. 1.4 All materials, instruments, or equipment used for the determination of mass, force, or dimension shall have traceability to the National Institute for Standards and Technology, or other internationally recognized organizations parallel in nature. 1.5 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only. Many of the stated dimensions in SI are direct conversions from the U. S. Customary System to accommodate the instrumentation, practices, and procedures that existed prior to the Metric Conversion Act of 1975. 1.6 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.	yes
ASTM D 2734	2016	Standard Test Methods for Void Content of Reinforced Plastics	1.1 These test methods cover the void content of reinforced plastics or “composites.” The test methods are applicable to composites for which the effects of ignition on the materials are known. Most plastics, glass, and reinforcements fall into this class. These test methods are not applicable to composites for which the effects of ignition on the plastics, the reinforcement, and any fillers are unknown. This class may include silicone resins, which do not burn off completely, reinforcements consisting of metals, organic materials, or inorganic materials which may gain or lose weight, and fillers consisting of oxides, carbonates, etc., which may gain or lose weight. Note that separate weight loss tests of individual materials will usually, but not necessarily, give the same result as when all the materials are combined. NOTE 1: There is no known ISO equivalent to these test methods.	yes

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			1.2 The values stated in SI units are to be regarded as standard. 1.3 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.	
ASTM D 3767-03	2020	Standard Practice for Rubber—Measurement of Dimensions	1.1 This practice is intended for use in determining the geometrical dimensions of rubber products and specimens for physical tests. This practice describes procedures for determining length, width, thickness, diameter, and circumference. This practice does not cover sampling of materials or products, or locations where a sample is to be taken. 1.2 The values stated in either acceptable metric units or in other units shall be regarded separately as a standard. The values stated in each system may not be exact equivalents; therefore, each system must be used independently of the other, without combining values in any other way. 1.3 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.4 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	yes
ASTM D 395	2018	Standard Test Methods for Rubber Property—Compression Set	1.1 These test methods cover the testing of rubber intended for use in applications in which the rubber will be subjected to compressive stresses in air or liquid media. They are applicable particularly to the rubber used in machinery mountings, vibration dampers, and seals. Three test methods are covered as follows: Test Method Section A—Compression Set Under Constant Force in Air 8 – 11 B—Compression Set Under Constant Deflection in Air 12 – 15 C—Compression Set Under Constant Deflection in Air Considering Material Hardness 16 – 21	yes

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			1.2 The choice of test method is optional, but consideration should be given to the nature of the service for which correlation of test results may be sought. Unless otherwise stated in a detailed specification, Test Method B shall be used. 1.3 Test Method B is not suitable for vulcanizates harder than 90 IRHD. 1.4 The values stated in SI units are to be regarded as the standard. 1.5 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.6 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	
ASTM D 3985	2017	Standard Test Method for Oxygen Gas Transmission Rate Through Plastic Film and Sheeting Using a Coulometric Sensor	1.1 This test method covers a procedure for determination of the steady-state rate of transmission of oxygen gas through plastics in the form of film, sheeting, laminates, coextrusions, or plastic-coated papers or fabrics. It provides for the determination of (1) oxygen gas transmission rate (OTR), (2) the permeance of the film to oxygen gas (PO2), and (3) oxygen permeability coefficient (P’O2) in the case of homogeneous materials. 1.2 This test method does not purport to be the only method for measurement of OTR. There may be other methods of OTR determination that use other oxygen sensors and procedures. 1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard. 1.4 This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. 1.5 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	yes
ASTM D 412	2021	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension	1.1 These test methods cover procedures used to evaluate the tensile (tension) properties of vulcanized thermoset rubbers and thermoplastic elastomers. These methods are not applicable to ebonite and similar hard, low elongation materials. The methods appear as follows: Test Method A—Dumbbell and Straight Section Specimens Test Method B—Cut Ring Specimens	yes

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			NOTE 1: These two different methods do not produce identical results. 1.2 The values stated in either SI or non-SI units shall be regarded separately as normative for this standard. The values in each system may not be exact equivalents; therefore each system must be used independently, without combining values. 1.3 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.4 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	
ASTM D 4986	2022	Standard Test Method for Horizontal Burning Characteristics of Cellular Polymeric Materials	1.1 This fire-test-response standard contains a test method for small-scale laboratory procedures to be used to determine the relative rate of burning and the extent and time of burning of horizontally oriented cellular polymeric materials having a density less than 250 kg/m3. 1.2 The results are intended to serve as a preliminary indication of their acceptability with respect to flammability for a particular application. The final acceptance of the material is dependent upon its use in the end-product that conforms with the standards applicable to such end-product. 1.3 The classification system described in the Appendix X1 is intended for quality assurance and the preselection of component materials for products. 1.4 This standard measures and describes the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire hazard or fire risk assessment of the materials, products, or assemblies under actual fire conditions. 1.5 The values stated in SI units are to be regarded as standard. 1.6 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. For a specific hazard statement, see 6.1.1. 1.7 Fire testing is inherently hazardous. Adequate safeguards for personnel and property shall be employed in conducting these tests. NOTE 1: This test method is equivalent to ISO 9772. 1.8 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	yes

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ASTM D 5229	2020	Standard Test Method for Moisture Absorption Properties and Equilibrium Conditioning of Polymer Matrix Composite Materials	1.1 This test method covers a procedure for the determination of moisture absorption or desorption properties in the through-the-thickness direction for single-phase Fickian solid materials in flat or curved panel form. Also covered are procedures for conditioning test coupons prior to use in other test methods; either to an essentially moisture-free state, to equilibrium in a standard laboratory atmosphere environment, or to equilibrium in a non-laboratory environment. Also included are procedures for determining the moisture loss during elevated temperature testing, as well as moisture loss resulting from thermal exposure after removal from the conditioning environment, such as during strain gauge bonding. While intended primarily for laminated polymer matrix composite materials, these procedures are also applicable to other materials that satisfy the assumptions of 1.2. 1.2 The calculation of the through-the-thickness moisture diffusivity constant in Procedure A assumes a single-phase Fickian material with constant moisture absorption properties through the thickness of the specimen. The validity of the equations used in Procedure A for evaluating the moisture diffusivity constant in a material of previously unknown moisture absorption behavior is uncertain prior to the test, as the test results themselves determine if the material follows the single-phase Fickian diffusion model. A reinforced polymer matrix composite material tested below its glass-transition temperature typically meets this requirement, although two-phase matrices such as toughened epoxies may require a multi-phase moisture absorption model. While the test procedures themselves may be used for multi-phase materials, the calculations used to determine the moisture diffusivity constant in Procedure A are applicable only to single-phase materials. Other examples of materials and test conditions that may not meet the requirements are discussed in Section 6. 1.3 The evaluation by Procedure A of the moisture equilibrium content material property does not assume, and is therefore not limited to, single-phase Fickian diffusion behavior. 1.4 The procedures used by this test method may be performed, and the resulting data reduced, by suitable automatic equipment. 1.5 This test method is consistent with the recommendations of CMH-17 Rev G (1),2 which describes the desirable attributes of a conditioning and moisture property determination procedure. 1.6 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined. 1.6.1 Within the text, the inch-pound units are shown in brackets. 1.7 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.8 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	yes
ASTM D 575	2018	Standard Test Methods for Rubber Properties in Compression	1.1 These test methods cover two test procedures for determining the compression-deflection characteristics of rubber compounds other than those usually classified as hard rubber and sponge rubber.	yes

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			1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only. 1.3 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.4 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	
ASTM D 5963	2022	Standard Test Method for Rubber Property—Abrasion Resistance (Rotary Drum Abrader)	1.1 This test method covers the measurement of abrasion resistance of rubbers (vulcanized thermoset rubbers and thermoplastic elastomers) that are subject to abrasive/frictional wear in actual service. The abrasion resistance is measured by moving a test piece across the surface of an abrasive sheet mounted to a revolving drum, and is expressed as volume loss in cubic millimetres or abrasion resistance index in percent. For volume loss, a smaller number indicates better abrasion resistance, while for the abrasion resistance index, a smaller number denotes poorer abrasion resistance. 1.2 Test results obtained by this test method shall not be assumed to represent the wear behavior of rubber products experienced in actual service. 1.3 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only. 1.4 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.5 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	yes
ASTM D 6226	2021	Standard Test Method for Open Cell Content of Rigid Cellular Plastics	1.1 This test method covers cellular plastics, which are composed of membranes or walls of polymer separating small cavities or cells. These cells may be interconnecting (open cell), non-connecting (closed cell), or any combination of these types. This test method determines numerical values for open cells. It is a porosity determination, measuring the accessible cellular volume of a material. The remaining volume is that occupied by closed cells and cell walls. Since any conveniently sized specimen is typically obtained by some cutting operation, a fraction of the closed cells will be opened by specimen preparation and will be included as open cells, (see Note 2). 1.2 This test method provides good accuracy on predominantly highly open-celled materials. By not accounting for closed cells that were opened during specimen preparation, the accuracy decreases as the closed cell content increases and as the cell size increases. 1.3 The values as stated in SI units are to be regarded as the standard. The values in parentheses are given for reference only. 1.4 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.	yes

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			NOTE 1: This test method and ISO 4590 use the same basic principles but are significantly different in experimental detail. NOTE 2: Two procedures for correcting for cells opened during specimen preparation are described in Appendix X1.1. 1.5 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	
ASTM D 638	2022	Standard Test Method For Tensile Properties Of Plastics	1.1 This test method covers the determination of the tensile properties of unreinforced and reinforced plastics in the form of standard dumbbell-shaped test specimens when tested under defined conditions of pretreatment, temperature, humidity, and testing machine speed. 1.2 This test method is applicable for testing materials of any thickness up to 14 mm (0.55 in.). However, for testing specimens in the form of thin sheeting, including film less than 1.0 mm (0.04 in.) in thickness, ASTM standard D882 is the preferred test method. Materials with a thickness greater than 14 mm (0.55 in.) shall be reduced by machining. 1.3 This test method includes the option of determining Poisson's ratio at room temperature. NOTE 1: This standard and ISO 527-1 address the same subject matter, but differ in technical content. NOTE 2: This test method is not intended to cover precise physical procedures. It is recognized that the constant rate of crosshead movement type of test leaves much to be desired from a theoretical standpoint, that wide differences may exist between rate of crosshead movement and rate of strain between gage marks on the specimen, and that the testing speeds specified disguise important effects characteristic of materials in the plastic state. Further, it is realized that variations in the thicknesses of test specimens, which are permitted by these procedures, produce variations in the surface-volume ratios of such specimens, and that these variations may influence the test results. Hence, where directly comparable results are desired, all samples should be of equal thickness. Special additional tests should be used where more precise physical data are needed. NOTE 3: This test method may be used for testing phenolic molded resin or laminated materials. However, where these materials are used as electrical insulation, such materials should be tested in accordance with Test Methods D229 and Test Method D651. NOTE 4: For tensile properties of resin-matrix composites reinforced with oriented continuous or discontinuous high modulus >20-GPa (>3.0 × 106-psi) fibers, tests shall be made in accordance with Test Method D3039/D3039M. 1.4 Test data obtained by this test method have been found to be useful in engineering design. However, it is important to consider the precautions and limitations of this method found in Note 2 and Section 4 before considering these data for engineering design. 1.5 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only. 1.6 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.	yes

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ASTM D 6814	2018	Standard Test Method for Determination of Percent Devulcanization of Crumb Rubber Based on Crosslink Density	1.1 This test method covers the procedure for determining percent devulcanization from crosslink density measurements of devulcanized rubber and control crumb rubber in the laboratory. Percent devulcanization is a quantitative determination. 1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard. 1.3 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.4 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	yes
ASTM D 6866	2022	Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples using radiocarbon analysis	1.1 This standard is a test method that teaches how to experimentally measure biobased carbon content of solids, liquids, and gaseous samples using radiocarbon analysis. These test methods do not address environmental impact, product performance and functionality, determination of geographical origin, or assignment of required amounts of biobased carbon necessary for compliance with federal laws. 1.2 These test methods are applicable to any product containing carbon-based components that can be combusted in the presence of oxygen to produce carbon dioxide (CO2) gas. The overall analytical method is also applicable to gaseous samples, including flue gases from electrical utility boilers and waste incinerators. 1.3 These test methods make no attempt to teach the basic principles of the instrumentation used although minimum requirements for instrument selection are referenced in the References section. However, the preparation of samples for the above test methods is described. No details of instrument operation are included here. These are best obtained from the manufacturer of the specific instrument in use. 1.4 Limitation—This standard is applicable to laboratories working without exposure to artificial carbon-14 (14C). Artificial 14C is routinely used in biomedical studies by both liquid scintillation counter (LSC) and accelerator mass spectrometry (AMS) laboratories and can exist within the laboratory at levels 1,000 times or more than 100 % biobased materials and 100,000 times more than 1% biobased materials. Once in the laboratory, artificial 14C can become undetectably ubiquitous on door knobs, pens, desk tops, and other surfaces but which may randomly contaminate an unknown sample producing inaccurately high biobased results. Despite vigorous attempts to clean up contaminating artificial 14C from a laboratory, isolation has proven to be the only successful method of avoidance. Completely separate chemical laboratories and extreme measures for detection validation are required from laboratories exposed to artificial 14C. Accepted requirements are: (1) disclosure to clients that the laboratory(s) working with their products and materials also works with artificial 14C (2) chemical laboratories in separate buildings for the handling of artificial 14C and biobased samples (3) separate personnel who do not enter the buildings of the other (4) no sharing of common areas such as lunch rooms and offices	yes

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			(5) no sharing of supplies or chemicals between the two (6) quasi-simultaneous quality assurance measurements within the detector validating the absence of contamination within the detector itself. (1, 2, and 3)2 1.5 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. NOTE 1: ISO 16620-2 is equivalent to this standard. 1.6 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	
ASTM D 695	2016	Standard Test Method for Compressive Properties of Rigid Plastics	1.1 This test method covers the determination of the mechanical properties of unreinforced and reinforced rigid plastics, including high-modulus composites, when loaded in compression at relatively low uniform rates of straining or loading. Test specimens of standard shape are employed. This procedure is applicable for a composite modulus up to and including 41,370 MPa (6,000,000 psi). 1.2 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only. NOTE 1: For compressive properties of resin-matrix composites reinforced with oriented continuous, discontinuous, or cross-ply reinforcements, tests may be made in accordance with Test Method D3410/D3410M or D6641/D6641M. 1.3 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. A specific precautionary statement is given in 13.1. NOTE 2: This standard is equivalent to ISO 604.	yes
ASTM D 790	2017	Standard Test Methods For Flexural Properties Of Unreinforced And Reinforced Plastics And Electrical Insulating Materials	1.1 These test methods are used to determine the flexural properties of unreinforced and reinforced plastics, including high modulus composites and electrical insulating materials utilizing a three-point loading system to apply a load to a simply supported beam (specimen). The method is generally applicable to both rigid and semi-rigid materials, but flexural strength cannot be determined for those materials that do not break or yield in the outer surface of the test specimen within the 5.0 % strain limit. 1.2 Test specimens of rectangular cross section are injection molded or, cut from molded or extruded sheets or plates, or cut from molded or extruded shapes. Specimens must be solid and uniformly rectangular. The specimen rests on two supports and is loaded by means of a loading nose midway between the supports. 1.3 Measure deflection in one of two ways; using crosshead position or a deflectometer. Please note that studies have shown that deflection data obtained with a deflectometer will differ from data obtained using crosshead position. The method of deflection measurement shall be reported.	no

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			NOTE 1: Requirements for quality control in production environments are usually met by measuring deflection using crosshead position. However, more accurate measurement may be obtained by using an deflection indicator such as a deflectometer. NOTE 2: Materials that do not rupture by the maximum strain allowed under this test method may be more suited to a 4-point bend test. The basic difference between the two test methods is in the location of the maximum bending moment and maximum axial fiber stresses. The maximum axial fiber stresses occur on a line under the loading nose in 3-point bending and over the area between the loading noses in 4-point bending. A four-point loading system method can be found in Test Method D6272. 1.4 The values stated in SI units are to be regarded as the standard. The values provided in parentheses are for information only. 1.5 The text of this standard references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard. 1.6 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. NOTE 3: This standard and ISO 178 address the same subject matter, but differ in technical content. 1.7 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	
ASTM D 792	2020	Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement	1.1 These test methods describe the determination of the specific gravity (relative density) and density of solid plastics in forms such as sheets, rods, tubes, or molded items. 1.2 Two test methods are described: 1.2.1 Test Method A—For testing solid plastics in water, and 1.2.2 Test Method B—For testing solid plastics in liquids other than water. 1.3 The values stated in SI units are to be regarded as the standard. 1.4 Warning—Mercury has been designated by many regulatory agencies as a hazardous substance that can cause serious medical issues. Mercury, or its vapor, has been demonstrated to be hazardous to health and corrosive to materials. Use caution when handling mercury and mercury-containing products. See the applicable product Safety Data Sheet (SDS) for additional information. The potential exists that selling mercury or mercury-containing products, or both, is prohibited by local or national law. Users must determine legality of sales in their location. 1.5 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations	yes

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			prior to use. NOTE 1: This standard is not equivalent to ISO 1183–1 Method A. This test method provides more guidelines on sample weight and dimension. ISO 1183-1 allows testing at an additional temperature of 27 ± 2°C. 1.6 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	
ASTM D 814	2020	Standard Test Method for Rubber Property—Vapor Transmission of Volatile Liquids	1.1 This test method covers the measurement of the rate of vapor transmission of volatile liquids through a rubber sheet, disk, or diaphragm. 1.2 The values stated in SI units are to be regarded as the standard. 1.3 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.4 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	yes
ASTM E 1356 (withdrawn 2023, no replacement)	2014	Standard Test Method for Assignment of the Glass Transition Temperatures by Differential Scanning Calorimetry (Withdrawn 2023)	1.1 This test method covers the assignment of the glass transition temperatures of materials using differential scanning calorimetry or differential thermal analysis. 1.2 This test method is applicable to amorphous materials or to partially crystalline materials containing amorphous regions, that are stable and do not undergo decomposition or sublimation in the glass transition region. 1.3 The normal operating temperature range is from −120 to 500°C. The temperature range may be extended, depending upon the instrumentation used. 1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard. 1.5 ISO standards 11357–2 is equivalent to this standard. 1.6 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.	yes
ASTM E 1678	2021	Standard Test Method for Measuring Smoke Toxicity for Use in Fire Hazard Analysis	1.1 This fire-test-response standard covers a means for determining the lethal toxic potency of smoke produced from a material or product ignited while exposed to a radiant heat flux of 50 kW/m2 for 15 min. 1.2 This test method is limited to test specimens no larger than 76 mm by 127 mm (3 in. by 5 in.), with a thickness no greater than 51 mm (2 in.). Specimens are intended to be representative of finished materials or products, including composite and combination systems.	yes

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			1.3 Lethal toxic potency values associated with 30-min exposures are predicted using calculations that use combustion atmosphere analytical data for carbon monoxide, carbon dioxide, oxygen (vitiation) and, if present, hydrogen cyanide, hydrogen chloride, and hydrogen bromide. The predictive equations are therefore limited to those materials and products whose smoke toxicity can be attributed to these toxicants. An animal check determines the extent to which additional toxicants contribute to the lethal toxic potency of the smoke. 1.4 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard. 1.5 This standard measures and describes the response of materials, products, or assemblies in response to heat under controlled conditions, but does not by itself incorporate all factors required for fire hazard of fire risk assessment of the materials, products, or assemblies under actual fire conditions. 1.6 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations (particularly with regard to the care and use of experimental animals) prior to use. For specific hazards statements, see Section 7 and Note X1.1. 1.7 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	
ASTM E 2235	2020	Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods	1.1 This test method covers the measurement of sound decay rate in rooms and the calculation of the sound absorption of the room and its contents. The sound absorption so calculated may be used in calculations in sound insulation test methods. 1.2 The method shall be used only in conjunction with other test methods where the logarithm of the sound absorption is used in formulas. It is not sufficiently precise for use in situations where room sound absorption is to be used without taking logarithms. 1.3 For laboratory measurements of the sound absorption of materials and objects, Test Method C423 should be used. 1.4 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.5 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	yes
ASTM E 413	2022	Classification for Rating Sound Insulation	1.1 This classification covers methods of calculating single-number acoustical ratings for laboratory and field measurements of sound attenuation obtained in one-third octave bands. 1.2 The name given to the single-number rating is assigned by the test method that invokes this classification. 1.3 Test methods that invoke this classification include: 1.3.1 Test Method E90—The single-number rating is called sound transmission class (STC). 1.3.2 Test Method E336—Single number ratings are noise isolation class (NIC), normalized noise isolation class (NNIC), and apparent sound	yes

Document Nr.	Publication year	Title	Scope	Indicated in questionnaire
			transmission class (ASTC). 1.3.3 Test Method E596—The single-number rating is called noise isolation class (NIC). 1.3.4 Test Method E1414—The single-number rating is called ceiling attenuation class (CAC). 1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard. 1.5 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	
ASTM E 492	2022	Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine	1.1 This test method covers the laboratory measurement of impact sound transmission of floor-ceiling assemblies using a standardized tapping machine. It is assumed that the test specimen constitutes the primary sound transmission path into a receiving room located directly below and that a good approximation to a diffuse sound field exists in this room. 1.2 Measurements may be conducted on floor-ceiling assemblies of all kinds, including those with floating-floor or suspended ceiling elements, or both, and floor-ceiling assemblies surfaced with any type of floor-surfacing or floor-covering materials. 1.3 This test method prescribes a uniform procedure for reporting laboratory test data, that is, the normalized one-third octave band sound pressure levels transmitted by the floor-ceiling assembly due to the tapping machine. 1.4 Laboratory Accreditation—The requirements for accrediting a laboratory for performing this test method are given in Annex A2. 1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard. 1.6 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.7 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	yes
ASTM E 90	2016	Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements	1.1 This test method covers the laboratory measurement of airborne sound transmission loss of building partitions such as walls of all kinds, operable partitions, floor-ceiling assemblies, doors, windows, roofs, panels, and other space-dividing elements. 1.2 Laboratories are designed so the test specimen constitutes the primary sound transmission path between the two test rooms and so approximately diffuse sound fields exist in the rooms. 1.3 Laboratory Accreditation—The requirements for accrediting a laboratory for performing this test method are given in Annex A4. 1.4 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.	yes
ASTM E 989	2021	Standard Classification for Determination of Single-Number Metrics for Impact Noise	1.1 This classification provides a method for determining a rating that can be used to compare the levels of impact noise generated by a standard tapping machine and transmitted through different floor-ceiling assemblies. 1.2 The name given to the rating is assigned by the test method that invokes this classification. 1.3 This classification is applicable only to one third octave band impact noise data obtained using the standard tapping machine described in Test Methods E492 and E1007. 1.4 Test methods that invoke this classification include: 1.4.1 Test Method E492 – the single-number rating is called impact insulation class (IIC). 1.4.2 Test Method E1007 – the single-number ratings are called apparent impact insulation class (AIIC), impact sound rating (ISR), and normalized impact sound rating (NISR). 1.4.3 Test Method E2179 – the single-number rating is called the change in impact insulation class (ΔIIC). 1.5 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations	yes

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			prior to use. 1.6 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	
ASTM F 1249	2020	Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor	1.1 This test method covers a procedure for determining the rate of water vapor transmission through flexible barrier materials. The method is applicable to sheets and films up to 3 mm (0.1 in.) in thickness, consisting of single or multilayer synthetic or natural polymers and foils, including coated materials. It provides for the determination of (1) water vapor transmission rate (WVTR), (2) the permeance of the film to water vapor, and (3) for homogeneous materials, water vapor permeability coefficient. NOTE 1: Values for water vapor permeance and water vapor permeability must be used with caution. The inverse relationship of WVTR to thickness and the direct relationship of WVTR to the partial pressure differential of water vapor may not always apply. 1.2 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.3 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	yes
ASTM F 2476	2020	Standard Test Method for the Determination of Carbon Dioxide Gas Transmission Rate (CO2TR) Through Barrier Materials Using an Infrared Detector	1.1 This method covers a procedure for determination of the steady-state rate of transmission of carbon dioxide gas through plastics in the form of film, sheeting, laminates, coextrusions, or plastic-coated papers or fabrics. It provides for the determination of (1) carbon dioxide gas transmission rate (CO2TR), (2) the permeance of the film to carbon dioxide gas (PCO2), and (3) carbon dioxide permeability coefficient (P'CO2) in the case of homogeneous materials. 1.2 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. 1.3 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.	yes
BS 4142:2014+A1:2019	2014/2019	Methods for Rating and Assessing Industrial and Commercial Sound	1.1 This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes: sound from industrial and manufacturing processes; sound from fixed installations which comprise mechanical and electrical plant and equipment; sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from fork-lift trucks, or that from train or ship movements on or around an industrial and/or commercial site. The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.	yes

Document Nr.	Publication year	Title	Scope	Indicated in questionnaire
			1.2 This standard is applicable to the determination of the following levels at outdoor locations: rating levels for sources of sound of an industrial and/or commercial nature; and ambient, background and residual sound levels, for the purposes of: investigating complaints; assessing sound from existing, proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and assessing sound at proposed new dwellings or premises used for residential purposes. 1.3 The determination of noise amounting to a nuisance is beyond the scope of this British Standard. Sound of an industrial and/or commercial nature does not include sound from the passage of vehicles on public roads and railway systems. The standard is not intended to be applied to the rating and assessment of sound from: recreational activities, including all forms of motorsport; music and other entertainment; shooting grounds; construction and demolition; domestic animals; people; public address systems for speech; and other sources falling within the scopes of other standards or guidance. The methodology set out in Clauses 7, 8, and 9 of this standard is not intended to be used to assess the extent of the impact at indoor locations. Internal sound levels can be taken into account as outlined in Clause 11. The standard is not intended to be applied to the assessment of indoor sound levels. The standard is not applicable to the assessment of low frequency noise. NOTE Information on the assessment of low frequency noise is given in NANR45 [1, 2].	
DIN 1850-6	1998	Plain bearings - Part 6: Thermoplastic bushes	This document specifies dimensions for bushings made of thermoplastics.	yes
DIN 31698	1979	Plain Bearings, Fits	Scope not available	yes

Table 7 - Relevant regulations

Document Nr.	**Title**
Regulation (EC) No 1935/2004	Regulation of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC
Regulation (EC) 2017/625	Regulation (EU) 2017/625 of the European Parliament and of the Council of 15 March 2017 on official controls and other official activities performed to ensure the application of food and feed law, rules on animal health and welfare, plant health and plant protection products, amending Regulations (EC) No 999/2001, (EC) No 396/2005, (EC) No 1069/2009, (EC) No 1107/2009, (EU) No 1151/2012, (EU) No 652/2014, (EU) 2016/429 and (EU) 2016/2031 of the European Parliament and of the Council, Council Regulations (EC) No 1/2005 and (EC) No 1099/2009 and Council Directives 98/58/EC, 1999/74/EC, 2007/43/EC, 2008/119/EC and 2008/120/EC, and repealing Regulations (EC) No 854/2004 and (EC) No 882/2004 of the European Parliament and of the Council, Council Directives 89/608/EEC, 89/662/EEC, 90/425/EEC, 91/496/EEC, 96/23/EC, 96/93/EC and 97/78/EC and Council Decision 92/438/EEC (Official Controls Regulation)
Regulation (EC) No 852/2004	Regulation of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs
Regulation (EC) No 2023/2006	This Regulation lays down the rules on good manufacturing practice (GMP) for the groups of materials and articles intended to come into contact with food listed in Annex I to Regulation (EC) No. 1935/2004 and combinations of those materials and articles or recycled materials and articles used in those materials and articles. These rules apply to all sectors and to all stages of manufacture, processing and distribution of materials and articles, up to but excluding the production of starting substances.

Annex II

GREEN-LOOP Standardisation Questionnaire

Dear partners,

throughout the GREEN-LOOP project, either feedback on existing standards or proposals for new standards are to be developed.

Therefore, this questionnaire aims at identifying possible standardisation gaps for standards relevant to the project's topic area. The term "standardisation gap" refers to either technical gaps or barriers for the implementation of existing standards or the substantial need for a new standard in a specific field.

In order to identify these standardisation gaps, we depend on your feedback and expertise.

This questionnaire includes a maximum of 7 questions and is open until the end of May 2023.

We're looking forward to receiving your feedback and remain at your disposal for any related questions.

Best regards,
Christina Galle and Lisa Filzmaier
on behalf of the Austrian Standards International team (leading partner of T2.4)

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GREEN-LOOP Standardisation Questionnaire

1. Which standards topically relevant to the GREEN-LOOP project do you use? (for example: "ISO 16620-1, *Plastics — Biobased content — Part 1: General principles.* Relevant for: WP4, WP5")

- ◯ None.
- ◯ I use the following standards (please also indicate the GREEN-LOOP WPs they are relevant for)

GREEN-LOOP Standardisation Questionnaire

2. From your perspective: Are any of your before mentioned standards difficult to apply or are there any barriers for its implementation?

- ◯ No
- ◯ Yes (please indicate the standard and specify the difficulties or barriers for its application)

GREEN-LOOP Standardisation Questionnaire

3. In your view, which main areas of knowledge relevant to the GREEN-LOOP project are already mostly covered by standards?

4. In your view, which main areas of knowledge relevant to the GREEN-LOOP project are not covered by standardisation yet?

5. In your view, is there a substantial need for a new standard related to the focus of the GREEN-LOOP project?

- ○ No
- ○ Yes (please specify)

GREEN-LOOP Standardisation Questionnaire

6. Are you already involved in standardisation processes?

- ○ No
- ○ Yes, I am involved in the following technical committees or working groups:

7. Would you like to add any additional comment?

- ○ No
- ○ Yes (please specify)