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Minimum standard for determining the recyclability of packaging subject to system participation pursuant to section 21 (3) VerpackG

**in consultation with the German Environment Agency
(Umweltbundesamt)**

Table of contents

- 1 Introduction..... 4
- 2 Minimum criteria 4
- 3 Object of determination..... 5
- 4 Details of the requirements set forth in 2..... 6
 - 4.1. Existence of sorting and recycling infrastructure 6
 - 4.2. Sortability and separability 8
 - 4.3. Recycling incompatibilities 8
 - 4.4. Available recyclable content and determining recyclability 9
- 5 Determination procedure 9
- 6 Definitions..... 9
 - 6.1 Recyclability..... 9
 - 6.2 High-quality recycling..... 10
 - 6.3 Combination packaging..... 10
 - 6.4 Packaging as a whole 10
 - 6.5 Metallisation..... 10
 - 6.6 Metric scaling..... 10
 - 6.7 Ordinal scaling 10
 - 6.8 Recyclates 10
 - 6.9 Recyclable materials / recyclables 11
 - 6.10 Foreign material..... 11
 - 6.11 Available recyclable content..... 11
 - 6.12 Good materials 11
 - 6.13 Fibrous material 11
 - 6.14 Composite packaging / composites..... 11
 - 6.15 Plastics 11
 - 6.16 Targeted separability 11
 - 6.17 Fibre-based packaging..... 12
 - 6.18 Fibre-based composite packaging 12
- 7 Abbreviations..... 12
- Appendices 14
 - Appendix 1: Material types, material groups and recycling paths 15
 - Appendix 2: Packaging characteristics requiring the testing of identifiability, including targeted separability, in sensor-based sorting by measurement 33

Appendix 3: Overview of packaging groups/sorts and material-specific recycling
incompatibilities 34

Appendix 4: Flowchart of the determination procedure 36

1 Introduction

An essential goal of extended producer responsibility regulations is to provide producers with incentives to take the environmental impact of their products throughout the entire product lifecycle and in particular their eventual disposal into account as early as in the process of designing and producing their products.¹ For this reason, the legislative body has broadened extended producer responsibility provisions under the Verpackungsgesetz (Packaging Act – VerpackG) to include an obligation for systems (system operators according to section 18 VerpackG) to set monetary incentives within the framework of system participation fees.

Section 21 VerpackG requires taking general recyclability into account when calculating participation fees. In this context, legal requirements in the form of specific increases or reductions in participation fees have not been enacted since, on the one hand, with the current state of knowledge they could not be quantified in a generally binding manner and, on the other hand, it would be a significant encroachment on the freedom of the systems to set prices as protected under German antitrust law.² Specifically, section 21 (1) VerpackG stipulates that:

'(1) Systems are obliged to calculate their participations fees in such a way that incentives are included with a view to the production of packaging subject to system participation

- 1. to promote the use of materials and material combinations that allow for the highest possible percentage to be recycled, taking into account the practice of sorting and recovery [...]*

In order to provide the systems with a uniform framework for the determination of recyclability as defined in section 21 (1) no. 1, section 21 (3) provides for the annual publication of a minimum standard by the Zentrale Stelle Verpackungsregister (Central Agency Packaging Register – ZSVR), in agreement with the German Environment Agency (Umweltbundesamt – UBA).³ The Verpackungsgesetz requires annual publication of the minimum standard, in agreement with the German Environment Agency and no later than 1 September.

The stakeholders were initially involved in the preparation of this minimum standard in the form of an expert committee. The minimum standard was drafted largely on the basis of the recommendations of the ZSVR's Expert Committee III; following that, results from a consultation procedure on the draft guidelines were included as well. The minimum standard was finalised following completion of the consultation procedure.

2 Minimum criteria

When determining recyclability, the available recyclable content of a packaging should be taken as the minimum starting point for further considerations. In determining the available recyclable content, at least the following three requirements must be verified and taken into account:

- 1) There must be a **sorting and recycling infrastructure** that allows for high-quality mechanical recycling for this packaging.
- 2) The packaging must be designed in a way that the share to be transferred for high-quality recycling can be **sorted**; the packaging components must be **separable** to the extent that this is required for high-quality mechanical recycling.

¹ Bundestag-Drucksache 18/11274, explanatory statement for section 21, p. 107

² *ibid*

³ *ibid*

- 3) The packaging components, or substances contained in the packaging materials, must not be recycling-incompatible; **recycling incompatibilities** could render recycling unsuccessful.

If a packaging meets these requirements, the available recyclable content (per packaging as a whole, see 6.11 below) determines (maximum) recyclability. If the minimum criteria no. 1 or 3 are not met, the packaging is not recyclable under this minimum standard. Criterion no. 2 can have a quantitative impact upon determination. Systems may also take further criteria into account when determining recyclability.

3 Object of determination

It is the packaging as a whole⁴, after use, that is the object of determination.

The determination of recyclability refers to the unfilled packaging as a whole, including all related packaging components such as labels, sealing films, lids and closures, adhesive applications, etc. (packaging as a whole). Determination of recyclability must not be based on individual packaging components that could only be obtained by a merely theoretical dismantling of the packaging.

Components of combination packaging can only be determined separately if they necessarily and irrevocably have to be separated for consumption or use. Determining recyclability based on individual packaging components is also permissible in cases where the packaging components can be separated from each other simply through mechanical stress during transportation or sorting; as such, they would appear separately in sorting, as can be assumed, e.g. for slip or snap-on lids.

The determination of packaging in groups is permissible if the individual packagings in such a group possess the same material structure and only differ in terms of contents and/or quantity, but not in terms of relevant process-specific criteria (see **criteria in 4 and the respective appendices**). An example of where classification of packaging as a group is not possible, are plastic articles which are identical in their material structure but which are only partially sortable due to their different colouring.

⁴ 'Functional unit of packaging' within the meaning of DIN/EN 13430, or DIN/EN 13427. This functional unit of packaging usually consists of various components (the smallest parts of a packaging).

4 Details of the requirements set forth in 2

4.1. Existence of sorting and recycling infrastructure

If a packaging matches the 'good material description' in **Appendix 1, column 4 ('Good material description')** (taking into account any disqualifications in column 5), it can be assumed that an infrastructure of sorting and high-quality mechanical recycling is available on the market. In the determination, the recyclable materials named in **Appendix 1, column 6**, are included proportionally.

If a packaging material cannot be assigned to one of the (listed) material groups, the packaging material is considered to be not recyclable according to current common practices. For packaging types and materials that are not included in Appendix 1 (see column 1 in conjunction with column 2), e.g. biodegradable plastics or natural materials such as wood, a lack of recycling infrastructure is to be assumed as a matter of principle. These packaging types and materials are usually not sorted out and therefore not recycled; as a consequence, they are to be classified as non-recyclable.

If, in individual cases, the existence of the infrastructure required for high-quality mechanical recycling as well as its use can be proven, an exception may apply. Proof must be provided for each individual case, and comprise the following:

- 1) evidence that the result of the recycling process is of high quality within the meaning of the minimum standard, and
- 2) weighing notes evidence that this recycling path has received at least the equivalent of the target material volume.

The following examples serve to clarify the procedure:

Example 1:

A producer of frozen products distributes these goods in large polystyrene (EPS) boxes. It has been determined that the packaging complies with the process-specific criteria under 4.2 and 4.3 of this minimum standard. To fulfil their producer responsibility, the party subject to system participation has agreed that the system will ensure that during the reference year at least the equivalent of the specific EPS participation volume be transferred for high-quality recovery. The system has classified the packaging as recyclable.

Evidence must be produced as follows:

- certificate issued for the EPS recycling plant(s) as the final recipient pursuant to the Verpackungsgesetz, certifying high-quality, mechanical EPS recycling;
- verifiable documentation demonstrating that packaging subject to system participation in a volume in line with the specific participation volume has been collected, as well as verifiable documentation of the corresponding volumes delivered to the certified EPS recycling plant(s).

Example 2:

A producer packages goods in transparent PET-A monolayer trays. All packaging characteristics comply with the process-specific criteria under 4.2 and 4.3, for example labels made from PP have been applied with wash-off adhesives. The participation volume is 600 tonnes p.a. The system has classified the packaging as recyclable. The system has committed to transferring a corresponding volume of PET trays for high-quality mechanical recycling in the reference year. To this end, the system has entered into an agreement with a PET recycling plant that produces PET pellets from these trays and has been certified for the 328-2 group with a mechanical recycling rate of 100%.

Evidence must be produced for:

- In the case of the 328-2 group, a delivery volume of at least 2,000 tonnes (equivalent to a maximum of 600 tonnes of trays)
- Actual existence of the equivalent in trays
- Transfer for high-quality mechanical recycling (facility certificate)

4.2. Sortability and separability

For the determination of recyclability, **sortability by means of sensor-based sorting** must be taken into account for the following materials: glass, plastics (excluding films group), liquid packaging board, and fibre-based packaging. Empirical testing is only required if one of the characteristics listed in **Appendix 2 ('Packaging characteristics requiring the testing of identifiability, including targeted separability, in sensor-based sorting by measurement')** applies.⁵

For **fibre-based packaging**, the gradual defiberability of the fibrous material is decisive. In the case of fibre-based composite packaging (except for liquid packaging board) and PPC packaging for non-dry contents – i.e. fibre-based packaging for example for liquids, certain foodstuffs, oils and emulsions – evidence must be provided that the operating conditions (for example, dwell time and other operating parameters in the processing of the material) of the respective recovery path (PPC or lightweight packaging collection) result in the dispersion of the fibrous material, and that the fibrous material is recycled. This obligation to provide evidence does not apply to fibre-based packaging that is typically filled with contents that are dry (< 15% moisture content), free-flowing or particulate, such as flour or sugar.

If, during the pulping of **fibre-based packaging**, substances that cannot be classified as fibrous material pass into the aqueous phase (water-soluble, colloiddally dissolved or finely dispersed), these shall be quantified by a suitable testing method and deducted when calculating the fibrous material yield.⁶ Where wet-strength agents, impregnating agents, waxes, etc., are used for fibre-based packaging, and in the case of paper or cartons (excluding liquid packaging board) coated or metallised on both sides, the determination of recyclability needs to be based on the relevant testing methodology.

When determining the recyclability of **plastic packaging**, it must be ensured that the **density** of the shredded material (usually <1 cm²) allows for it to be assigned to the correct flow of recyclables. For example, packaging or packaging components made of polyolefins, which have a density of more than 0.995 g/cm³ as a result of additives, fillers or multi-layering, must be regarded as non-recyclable.

In the case of **glass packaging** with adhesive labels made from plastic, the glass share covered by these labels cannot be classified as recyclable content if the adhesive labels are waterproof/hydrophobic. With demijohns, i.e. bottles covered with a basket, the glass share is to be considered completely lost. Glass shares with a level of transmission of less than 10% in a 400 nm to 780 nm wave range (e.g. due to varnishing or tinting) cannot be classified as recyclable content.

4.3. Recycling incompatibilities

The declaration of the recyclability of a packaging requires that no combinations of materials or substances are used that can impede a successful recycling. **Appendix 3 ('Overview of packaging groups/sorts and material-specific recycling incompatibilities')** provides the basis for determining incompatibilities. For any deviating determination in the sense that incompatible

⁵ This means that, as a rule, no empirical test is required. If an empirical test is necessary in exceptional cases, it must be carried out with a standard operating detection unit, not with a hand-held scanner. In such a case, the result of this empirical test is included in the determination.

⁶ A testing method suitable for this purpose is, for example, PTS-RH 025/2022.

substances do not negatively affect recyclability in individual cases, individual evidence produced through analytical testing must be provided.

Where packaging has been designed in such a way that residual contents remain inside the packaging even after the packaging has been emptied as intended, the influence of the residual contents has to be taken into account when determining recycling incompatibilities⁷ if the contents cannot be separated during the recycling process.

4.4. Available recyclable content and determining recyclability

The content available for recycling (based on the packaging as a whole, see 6.11 below) determines the recyclability according to this minimum standard.

In the case of **metal packaging, metal-containing packaging** as well as **metal-containing composites** (multi-layer packaging with an aluminium layer, aerosol cans, composite cans with a tinplate bottom, etc.), the determination of recyclability is limited to the metal shares.⁸ This does not apply to metallised packaging, or pots with aluminium lids. Liquid packaging board with a metal share is also excluded; here, recyclability shall be limited to the fibrous material content.

For **fibre-based packaging** that does not contain any metal the determination of recyclability must be limited to the fibrous material content; their recyclability must be determined according to their fibrous material content.⁹

Recyclability must then be ranked on a metric or ordinal scale (the latter with more than three scale degrees).¹⁰ The indication of the scale value and, if not self-explanatory, the scale units are required for the documentation of the determination result by the systems.

In addition, the assignment according to 4.1 must be specified.

5 Determination procedure

A flowchart of the determination procedure is contained in **Appendix 4**.

6 Definitions

In this document, the following definitions apply:

6.1 Recyclability

In contrast to the recycling concept as defined in the Kreislaufwirtschaftsgesetz (Circular Economy Act – KrWG), 'recyclability' in this document always refers to high-quality and mechanical recycling (mechanical recycling is defined in section 3 (19) VerpackG) This concept of recyclability encompasses the fundamental and gradual suitability of any given packaging to substitute virgin material in applications typical for that material after undergoing recovery processes available on an industrial scale.

⁷ Contents to be considered in combination with plastic packaging include silicones, acrylates, polyurethanes and other cross-linking substances, waxes and paraffins, as well as bituminous compounds.

⁸ Otherwise, an individual statement including supportive evidence must be provided.

⁹ Otherwise, an individual statement including supportive evidence must be provided.

¹⁰ Once the system reports submitted in 2023 have been evaluated, a decision will be made on further requirements for the representation of recyclability in the minimum standard (2024).

6.2 High-quality recycling

For the purposes of this minimum standard, high-quality recycling means a process that leads to a recyclate of a quality that allows it to be substituted for primary raw material of the same substance. To be classified as 'high-quality recycling', it is irrelevant whether the recyclate is deployed in primary¹¹ or secondary¹² use cases. Recycling methods are not classified as leading to 'high-quality' recycling if they enable packaging waste to be processed only up to the point required for incorporating the recyclate into foreign material products¹³ or products¹⁴ that are not typically made from virgin material of the same substance.

6.3 Combination packaging

Combination packaging is multi-part retail packaging that consists of different materials separable by hand.

6.4 Packaging as a whole

The packaging as a whole is the entire unfilled packaging, including all related packaging components such as labels, sealing films, lids and closures, adhesive applications, etc. Determining the recyclability based on the individual packaging components as a result of a theoretical decomposition of the packaging is not permitted (exception: combination packaging under the conditions listed under 3.).

6.5 Metallisation

Metallised films are produced by coating a carrier film, e.g. made of plastic, with a very thin film of (ultrapure) aluminium. This gives the film a metallic sheen; also, metallised film offers protection against light and oxygen.

6.6 Metric scaling

A characteristic that consists of a number and has a dimension as well as a zero point.

6.7 Ordinal scaling

A qualitative characteristic with a natural order (e.g. school grading system or 'very good', 'good', 'bad', etc.).

6.8 Recyclates¹⁵

A product (substance or mixture) obtained from waste which is suitable to substitute virgin material in applications typical for that material.

¹¹ Examples of primary use cases (i.e. deployment in use cases of the same type) include using glass fragments from recycled waste glass to produce container glass or using polypropylene granulate to produce paint buckets or nursery plant pots for garden beds.

¹² Examples of secondary use cases include using packaging steel scrap in the production of constructional steel or polypropylene granulate in the production of cleaning buckets or filing trays.

¹³ Examples of use cases with low recyclate requirements include using cellulose fibres as filler material in road construction.

¹⁴ In particular, substitutes for wood, concrete or natural stone made from plastics that have undergone dry-mechanical treatment, such as palisades.

¹⁵ This definition of recyclates is applicable only to the minimum standard in relation to section 21 (1) no. 1 VerpackG.

6.9 Recyclable materials / recyclables

Recyclable materials / recyclables are those materials of a packaging that are to be recovered as recyclates through the respective material-specific recycling process (e.g. steel, metallic aluminium, PE, (cellulose) fibre, PET, etc.).

6.10 Foreign material

Foreign material is material that cannot be classified as recyclable content of any given packaging.

6.11 Available recyclable content

The available recyclable content is the proportion of recyclable materials of the packaging as a whole that is available for recycling, taking into account the provisions of this minimum standard (see 2 to 5 above).

6.12 Good materials

Within the meaning of this document, good materials are the components of any given packaging designated as desirable in a waste specification/sorts definition. Examples of good material – in particular in contrast to 'recyclable materials/recyclables' – include: tinsplate packaging, aluminium packaging, PE bottles, liquid packaging board, PET bottles, each including ancillary components such as labels and closures.

6.13 Fibrous material

For determining the recyclable content, 'fibrous material' can be defined as the sum of fibre, filling material, starch, coating colour including binder, as well as additives typically used in the paper industry such as wet-strength agents, glue and bound water.

6.14 Composite packaging / composites

Composite packaging is packaging made from two or more material types that cannot be separated by hand (section 3 (5) VerpackG). For determining the recyclability of composite packaging within the meaning of this minimum standard, it means such packaging where no single material type accounts for more than 95% of packaging mass (section 16 (3) VerpackG).

6.15 Plastics

To the determination of recyclable content for plastic-based packaging the following applies: the recyclable content (PE, PP, PO, etc.) for 'plastic-based packaging' is equal to the eponymous main part of polymer (plus additives, fine-disperse filling and strengthening agents, as well as pigments included in the polymer matrix composite).

6.16 Targeted separability

Targeted separability is the mechanical separability of packaging into target groups (pursuant to Appendix 1, column 3) during industrial sorting, based on the degree of identification, mass and geometric properties.

6.17 Fibre-based packaging

Fibre-based packaging within the meaning of this minimum standard is packaging containing more than 50% fibrous material (see 6.13 above).

6.18 Fibre-based composite packaging

Fibre-based composite packaging within the meaning of this minimum standard is composite packaging (see 6.14 above) containing more than 50% fibrous material (see definitions under 6.13 above).

7 Abbreviations

In this document, the following relevant abbreviations are used:

Al	Aluminium
BT	<i>Bundestag</i> (German parliament)
EPS	Expanded polystyrene
EPRC	European Paper Recycling Council
EVA	Ethylene vinyl acetate
EVOH	Ethylene vinyl alcohol copolymer
Fe	Ferrous metal
FKN	Liquid packaging board
HDPE	High-density polyethylene
HV	Adhesion promoters
KrWG	<i>Kreislaufwirtschaftsgesetz</i> (German Circular Economy Act)
KS	Plastic
LDPE	Low-density polyethylene
Lightweight packaging	Lightweight packaging
MAH	Maleic anhydride
MHD	Minimum shelf life
MPO	Mixed polyolefin
MSN	Volume flow record
NC	Nitrocellulose (also known as cellulose nitrate)
OPS	Oriented polystyrene
PA	Polyamide
PE	Polyethylene
PE-X	Cross-linked polyethylene

PET	Polyethylene terephthalate
PET-A	(Amorphous) PET
PET-G	Glycol-modified polyethylene terephthalate
PO	Polyolefin
POM	Polyoxymethylene
PP	Polypropylene
PPC	Paper/paperboard/cardboard
PPC from lightweight packaging	Paper/paperboard/cardboard from the lightweight packaging collection group
PS	Polystyrene
PTS	<i>Papiertechnische Stiftung</i> (Paper Technology Foundation)
PVC	Polyvinyl chloride
PVDC	Polyvinylidene chloride
UFI code	Unique Formula Identifier Code
VerpackG	Verpackungsgesetz (Packaging Act)

Appendices

Appendix 1	Material types, material groups and recycling paths	Page 15
Appendix 2	Packaging characteristics requiring the testing of identifiability, including targeted separability, in sensor-based sorting by measurement	Page 33
Appendix 3	Overview of packaging groups/sorts and material-specific recycling incompatibilities	Page 34
Appendix 4	Flowchart of the determination procedure	Page 36

Appendix 1: Material types, material groups and recycling paths¹⁶

The following steps are required to verify whether there is a sorting and recovery infrastructure (recycling infrastructure) for a certain packaging and to determine its recyclable content, based on this Appendix:

1. Packaging whose recyclability is to be determined is assigned to a packaging type and the corresponding material of the main component based on the listing in **column 1** in conjunction with **column 2**. Assignments based solely on column 4 – with column 1 in conjunction with column 2 being disregarded – are not permissible.

For packaging types and materials that are not included in this Appendix (see column 1 in conjunction with column 2), e.g. biodegradable plastics or natural materials such as wood, a lack of recycling infrastructure is to be assumed as a matter of principle. These packaging types and materials are usually not sorted out and therefore not recycled; as a consequence, they are to be classified as non-recyclable.

2. Check conformity of the packaging whose recyclability is to be determined (example: PP yoghurt pot with PP/EVOH sealing film) with the corresponding good material description in **column 4** (result, for example: the 'pot' packaging type with PP as the main component, in the subgroup of 'three-dimensional plastic packaging, matches column 4).
3. Check conformity of the packaging with the specification. This is the case if the packaging does not match the corresponding description in **column 5** (result, for example: no conformity).
4. **Case A:** If the previous steps have yielded positive results: identify the recyclable materials from **column 6** (result, for example: PP (PO) share).
Case B: If the previous steps have yielded negative results: check for an alternative in column 1 in conjunction with column 2 (see first step).

¹⁶ The Appendix is based on the system's specifications as stated in their volume flow records, as well as on the following product specifications:

- Duales System Deutschland GmbH, DSD: Downloads – Specifications: <https://www.gruener-punkt.de/en/downloads>.
- EcoPaperLoop: Enhancing Paper Recycling in Europe – Optimising Paper Products, Packaging and Collection Systems, as per 2014. Available online at <http://www.ecopaperloop.eu/outcome/EcoPaperLoop-Complete.pdf>;
- BDE, BV Glas, bvse: T 120 guideline on 'Quality requirements for glass fragments, to be used in the container glass industry';
- List of grades of paper: DIN EN 643: paper, cardboard and paperboard – European List of Standard Grades of Paper and Board for Recycling, as per 2014.

The classification of packaging types and materials in column 3 is based on the German Environment Agency's annual analysis of sorting and recovery practice available at <https://www.umweltbundesamt.de/publikationen/praxis-der-sortierung-verwertung-von-verpackungen-0>.

The ZSVR and the German Environment Agency plan to adjust the structure of Appendix 1 going forward, in particular the structure of column 3, A to C. The main purpose of the adjustment will be to clarify the mandatory consequences resulting from a classification into column 3B and how to proceed with column 3B.

5. Check whether it can be assumed – without further evidence – that there is a recycling infrastructure.
- If the group number corresponding to the packaging's assignment is listed in **column 3A**, it can be assumed that the packaging will be transferred extensively, or to a high degree, to high-quality, mechanical recycling procedures (subject to the remaining minimum criteria being met).¹⁷
- If the corresponding group number is listed in **column 3C**, the sorting and recycling infrastructure for this packaging only marginally or in individual cases meets the criterion specified under 4.1 (subject to the remaining minimum criteria being met; e.g. EPS).¹⁸ In such cases, **individual evidence** supporting a high-quality, mechanical recycling is strictly necessary¹⁹. The criterion of 4.1 above is only deemed met for the volumes for which evidence can be produced that the competent system has transferred them for high-quality recycling. Evidence for the applicable reference period must be included in the report pursuant to section 21 (2) VerpackG; if no such evidence is included, it will be assumed that no recycling infrastructure is available.
- If the corresponding group number is listed in **column 3B**, it is generally and technically possible to recycle the packaging (subject to the remaining minimum criteria being met), or the packaging is generally recycled, but as things currently stand a high-quality, mechanical recycling only applies in part. In this case it is also recommended that individual evidence be supplied for the transfer for high-quality, mechanical recycling (see the procedure in the case of classifications under column 3C).
- If a group number is given in brackets, evidence is required exclusively for those shares that are assigned to the packaging type group listed in column 1.
6. If there is a recycling infrastructure, the recyclable content will be taken into account when determining recyclability. The remaining minimum criteria must be verified (see 4.2 et seqq. above).

¹⁷ Explanation: The ZSVR and UBA define the delineation criterion for column 3A as the availability of sorting and recycling capacities for at least 80% of the corresponding packaging material based on the current practice of sorting and recovering the waste collected by the systems.

¹⁸ Explanation: The ZSVR and UBA define the delineation criterion for column 3C as a maximum of 20% of the packaging material being transferred to the corresponding sorting and recycling paths.

¹⁹ See 4.1.

Material group: plastic packaging							
Subgroup: three-dimensional (rigid and semi-rigid) plastic packaging made from PE, PP, PS or PET							
1	2	3			4	5	6
Packaging types	Main component material	Recycling infrastructure existence per group number			Good material description ²⁰	Packaging/materials that do not meet the specification	Recyclable material
		3A	3B	3C			
		Given	To a limited extent	In individual cases / to a marginal extent			
<ul style="list-style-type: none"> - Bottles ≤ 5l in volume - Cups, pots - Trays, blisters - Tubes - Tins - Buckets ≤ 5l in volume - Canisters ≤ 5l in volume - etc. 	PE	329 (323, 351)			Rigid, system-compatible plastic articles made from PE, ≤ 5l in volume, such as bottles and trays, including ancillary components such as closures, labels, etc.	Sealant cartridges	HDPE (PO) share
	PP	324 (323, 351)			Rigid, system-compatible plastic articles made from PP, ≤ 5l in volume, such as bottles, trays and cups, including ancillary components such as closures, labels, etc.	Sealant cartridges	PP (PO) share
	PS		331 (351)			Rigid, system-compatible plastic articles made from PS, ≤ 1l in volume, such as cups and trays, including ancillary components such as closures, labels, etc.	Foamed plastics, including EPS articles

²⁰ For many groups, the product specification for good material (see footnote 16) includes the addition that packaging must be 'used, emptied'. Within the meaning of this minimum standard, this passage would be ambiguous; it was thus not added to this Appendix.

Material group: plastic packaging							
Subgroup: three-dimensional (rigid and semi-rigid) plastic packaging made from PE, PP, PS or PET							
1	2	3			4	5	6
Packaging types	Main component material	Recycling infrastructure existence per group number			Good material description ²¹	Packaging/materials that do not meet the specification	Recyclable material
		3A	3B	3C			
		Given	To a limited extent	In individual cases / to a marginal extent			
<ul style="list-style-type: none"> - Buckets > 5l in volume - Canisters > 5l in volume 	PE, PP	322 (324, 329, 323, 351)			Rigid, system-compatible plastic articles, such as bottles > 5l in volume, and buckets, canisters and bulk packs ≤ 200l in volume, including ancillary components such as closures, labels, etc.	Sealant cartridges	PO share

²¹ For many groups, the product specification for good material (see footnote 16) includes the addition that packaging must be 'used, emptied'. Within the meaning of this minimum standard, this passage would be ambiguous; it was thus not added to this Appendix.

Material group: plastic packaging							
Subgroup: three-dimensional (rigid and semi-rigid) plastic packaging made from PE, PP, PS or PET							
1	2	3			4	5	6
Packaging types	Main component material	Recycling infrastructure existence per group number			Good material description ²²	Packaging/materials that do not meet the specification	Recyclable material
		3A	3B	3C			
		Given	To a limited extent	In individual cases / to a marginal extent			
PET bottles, transparent (clear or coloured)	PET-A	325 (328-1) (328-2) (328-3)			Rigid, system-compatible articles made from PET, ≤ 5l in volume. Includes ancillary components such as closures, labels, etc. Examples include bottles containing beverages, detergent and household cleaning agents.	Opaque PET bottles and other PET articles	PET, PO from closures
Other PET packaging - Trays - Slip lids - Cups, pots - Tins - Cosmetic jars - Blister packs	PET-A monolayer			328-5 ²³ (328-1) (328-2) (328-3) 328-6	System-compatible tray packaging made from polyethylene terephthalate (PET), ≤ 5l in volume when assembled 1. Trays, e.g. for cold cuts, fruits and vegetables, salads, etc. 2. Transparent PET bottles, including ancillary components such as labels, etc.		PET

²² For many groups, the product specification for good material (see footnote 16) includes the addition that packaging must be 'used, emptied'. Within the meaning of this minimum standard, this passage would be ambiguous; it was thus not added to this Appendix.

²³ For the 328-5, 328-1, 328-2, 328-3 and 328-6 groups, a recycling infrastructure can only be deemed available where **individual evidence** is provided.

Material group: plastic packaging							
Subgroup: three-dimensional (rigid and semi-rigid) plastic packaging made from PE, PP, PS or PET							
- Other thermoforms							

Material group: plastic packaging							
Subgroup: films and flexible plastic packaging as well as foams							
1	2	3			4	5	6
Packaging types	Main component material	Recycling infrastructure existence per group number			Good material description ²⁴	Packaging/materials that do not meet the specification	Recyclable material
		3A	3B	3C			
		Given	To a limited extent	In individual cases / to a marginal extent			

²⁴ For many groups, the product specification for good material (see footnote 16) includes the addition that packaging must be 'used, emptied'. Within the meaning of this minimum standard, this passage would be ambiguous; it was thus not added to this Appendix.

Material group: plastic packaging								
Subgroup: films and flexible plastic packaging as well as foams								
Large-format films > A4 - Films - Bags - Carrier bags - Shrink wrap - Bubble wrap - etc.	PE		310			System-compatible articles made from plastic film, surface area > A4 in size, such as bags, carrier bags and shrink wrap, including ancillary components such as labels, etc.	Aluminised plastics	LDPE (PO) share
	PP			(310)				PO share

Material group: plastic packaging							
Subgroup: films and flexible plastic packaging as well as foams							
1	2	3			4	5	6
Packaging types	Main component material	Recycling infrastructure existence per group number			Good material description ²⁵	Packaging/materials that do not meet the specification	Recyclable material
		3A	3B	3C			
		Given	To a limited extent	In individual cases / to a			

²⁵ For many groups, the product specification for good material (see footnote 16) includes the addition that packaging must be 'used, emptied'. Within the meaning of this minimum standard, this passage would be ambiguous; it was thus not added to this Appendix.

Material group: plastic packaging							
Subgroup: films and flexible plastic packaging as well as foams							
				marginal extent			
Flexible plastic packaging made from PP and PE - Sachets - Bags - Pouches - Stand-up pouches - Tubular bags - Foams - Nets - etc.	PE		323-2 (310, 323)		System-compatible, flexible articles that are typically considered packaging, made from PO plastics (PE, PP), such as films, bags (incl. aluminised), and rigid PO plastics, such as trays, lids, including ancillary components such as closures, labels, etc.		PO share
	PP		323-2 (323) 324-2	(324-1) ²⁶	System-compatible, flexible articles that are typically considered packaging, made from PO plastics (PE, PP), such as films, bags (incl. aluminised), and rigid PO plastics, such as trays, lids, including ancillary components such as closures, labels, etc.		PO share

Material group: plastic packaging							
Subgroup: films and flexible plastic packaging, as well as foams							
1	2	3			4	5	6
Packaging types	Main component material	Recycling infrastructure existence per group number			Good material description ²⁷	Packaging/materials that do not meet the specification	Recyclable material
		3A	3B	3C			

²⁶ For the 324-1 group, a recycling infrastructure can only be deemed to exist where **individual evidence** is provided.

²⁷ For many groups, the product specification for good material (see footnote 16) includes the addition that packaging must be 'used, emptied'. Within the meaning of this minimum standard, this passage would be ambiguous; it was thus not added to this Appendix.

Material group: plastic packaging

Subgroup: films and flexible plastic packaging, as well as foams

		Given	To a limited extent	In individual cases / to a marginal extent			

Material group: plastic packaging							
Subgroup: films and flexible plastic packaging, as well as foams							
Expanded polystyrene (EPS)	PS				340 ²⁸	System-compatible components made from white and granular expanded polystyrene, including ancillary components such as labels, etc.	PS
<ul style="list-style-type: none"> - Coolboxes - Edge protectors and other shock absorbers for electronic equipment - etc. 							

Material group: fibre-based packaging							
Subgroup: liquid packaging board							
1	2	3			4	5	6
Packaging types	Main component material	Recycling infrastructure existence per group number			Good material description ²⁹	Packaging/materials that do not meet the specification	Recyclable material
		3A	3B	3C			
		Given	To a limited extent	In individual cases / to			

²⁸ For the 340 group, a recycling infrastructure can only be deemed to exist where **individual evidence** is provided. Another requirement whose fulfilment must currently be evidenced is that the volumes in question were previously collected by the competent system in a **mono-collection**, outside the usual LVP kerbside collection.

²⁹ For many groups, the product specification for good material (see footnote 16) includes the addition that packaging must be 'used, emptied'. Within the meaning of this minimum standard, this passage would be ambiguous; it was thus not added to this Appendix.

Material group: fibre-based packaging							
Subgroup: liquid packaging board							
				a marginal extent			
Liquid packaging board	Paper, paperboard, cardboard	512/510			System-compatible retail packaging made from cardboard composite materials, consisting of cardboard/PE or cardboard/aluminium/PE, for liquid or flowable product filling (liquid, paste or flowable/particulate), including ancillary components such as closures, etc.	Other articles made from paper, paperboard, cardboard	Share of fibrous material ³⁰

³⁰ Where polyolefin and metal shares are to be accounted for as recyclable material, individual evidence must be produced for their high-quality mechanical recycling.

Material group: fibre-based packaging							
Subgroup: other fibre-based composite packaging							
1	2	3			4	5	6
Packaging types	Main component material	Recycling infrastructure existence per group number			Good material description ³¹	Packaging/materials that do not meet the specification	Recyclable material
		3A	3B	3C			
		Given	To a limited extent	In individual cases / to a marginal extent			
Other fibre-based composite packaging (main component not metal) such as <ul style="list-style-type: none"> - Laminated folding boxes - Composite cans - Coated paper - Paper cups coated on both sides 	Paper, paperboard, cardboard		(550) ³²		System-compatible PPC articles as well as PPC-based composites, including ancillary components.	Liquid packaging board, waxed, paraffin, bitumen and oil paper	Share of fibrous material

³¹ For many groups, the product specification for good material (see footnote 16) includes the addition that packaging must be 'used, emptied'. Within the meaning of this minimum standard, this passage would be ambiguous; it was thus not added to this Appendix.

³² For packaging that is not typically filled with dry contents, individual evidence must be submitted in accordance with the detailed provision in 4.2.

Material group: fibre-based packaging

Subgroup: other fibre-based composite packaging

- Cardboard tubes etc.							
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Material group: fibre-based packaging							
Subgroup: PPC packaging							
1	2	3			4	5	6
Packaging types	Main component material	Recycling infrastructure existence per group number			Good material description ³³	Packaging/materials that do not meet the specification	Recyclable material
		3A	3B	3C			
		Given	To a limited extent	In individual cases / to a marginal extent			
PPC packaging (excluding fibre-based composite packaging) <ul style="list-style-type: none"> - Corrugated board - Folding boxes - Paper bags and pouches - etc. 	Paper, paperboard, cardboard	1.01.00 ³⁴ , ³⁵			System-compatible articles made from PPC	Liquid packaging board, waxed, paraffin, bitumen and oil paper	Share of fibrous material

³³ For many groups, the product specification for good material (see footnote 16) includes the addition that packaging must be 'used, emptied'. Within the meaning of this minimum standard, this passage would be ambiguous; it was thus not added to this Appendix.

³⁴ As per DIN EN 643.

³⁵ For packaging that is not typically filled with dry contents, individual evidence must be submitted in accordance with the detailed provision in 4.2.

Material group: ferrous metals packaging and ferrous metals composite packaging							
1	2	3			4	5	6
Packaging types	Main component material	Recycling infrastructure existence per group number			Good material description ³⁶	Packaging/materials that do not meet the specification	Recyclable material
		3A	3B	3C			
		Given	To a limited extent	In individual cases / to a marginal extent			
Tinplate and sheet metal packaging, as well as composites containing tinplate such as <ul style="list-style-type: none"> - Tins of preserves - Aerosol cans - Lacquer and paint cans - Tin buckets - Composite cans with a tinplate bottom - etc. 	Steel	410/412			System-compatible articles made from tinplate, such as beverage or food cans and buckets, including ancillary components such as labels, etc.		Fe share and Al share

³⁶ For many groups, the product specification for good material (see footnote 16) includes the addition that packaging must be 'used, emptied'. Within the meaning of this minimum standard, this passage would be ambiguous; it was thus not added to this Appendix.

Material group: aluminium packaging, and packaging containing aluminium							
Subgroup: aluminium packaging and aluminium-based composites							
1	2	3			4	5	6
Packaging types	Main component material	Recycling infrastructure existence per group number			Good material description ³⁷	Packaging/materials that do not meet the specification	Recyclable material
		3A	3B	3C			
		Given	To a limited extent	In individual cases / to a marginal extent			
Aluminium packaging and aluminium-based composites such as <ul style="list-style-type: none"> - Tins of preserves - Aerosol cans - Aluminium trays - Aluminium tubes - etc. 	Aluminium	420			System-compatible articles made from aluminium or containing aluminium foil, such as trays and wrapping film, including ancillary components such as closures, labels, etc.		Fe share and Al share

³⁷ For many groups, the product specification for good material (see footnote 16) includes the addition that packaging must be 'used, emptied'. Within the meaning of this minimum standard, this passage would be ambiguous; it was thus not added to this Appendix.

Material group: aluminium packaging, and packaging containing aluminium							
Subgroup: composite packaging containing aluminium foil							
1	2	3			4	5	6
Packaging types	Main component material	Recycling infrastructure existence per group number			Good material description ³⁸	Packaging/materials that do not meet the specification	Recyclable material
		3A	3B	3C			
		Given	To a limited extent	In individual cases / to a marginal extent			
Composite packaging containing aluminium foil - Tablet blisters - Stand-up pouches - Powdered soup pouches - Tubes - etc.	Plastic or PPC	420			System-compatible articles made from aluminium or containing aluminium foil, such as trays and wrapping film, including ancillary components such as closures, labels, etc.		Al share

³⁸ For many groups, the product specification for good material (see footnote 16) includes the addition that packaging must be 'used, emptied'. Within the meaning of this minimum standard, this passage would be ambiguous; it was thus not added to this Appendix.

Material group: glass packaging							
1	2	3			4	5	6
Packaging types	Main component material	Recycling infrastructure existence per group number			Good material description ³⁹	Packaging/materials that do not meet the specification	Recyclable material
		3A	3B	3C			
		Given	To a limited extent	In individual cases / to a marginal extent			
Container glass and glass packaging - Food jars - Bottles - Cosmetic jars - Flacons - etc.	Soda-lime glass	T 120			Container glass from households, commerce and manufacturing, such as bottles, glasses, pharmaceutical and cosmetic glass (soda-lime glass).	Leaded glass, untreated safety glass, glass-ceramic, illuminants, TV glass, quartz glass and any other glass containing lead	Glass share; Fe share and Al share from lids and closures

³⁹ For many groups, the product specification for good material (see footnote 16) includes the addition that packaging must be 'used, emptied'. Within the meaning of this minimum standard, this passage would be ambiguous; it was thus not added to this Appendix.

Appendix 2: Packaging characteristics requiring the testing of identifiability, including targeted separability, in sensor-based sorting by measurement

Plastic packaging

- Large labels (taking up > 50% of the projected surface) made from foreign material
- Full sleeve labels (excluding full sleeves of PET hollow bodies without a light barrier – clear or light blue – where OPS PET or PO sleeves are used)
- Multi-layer structure (excluding PE/PP EVOH)
- Metallisation (excluding on the inside/in the middle layer)
- Dyeing using soot-carbon-based pigments (also when used for internal layers)
- Different types of plastic used on front and back sides
- Metal pigments applied on a large scale (taking up > 50% of the projected surface) (lacquering, coating or embossing)
- Nets

Fibre-based composite packaging

- Fully lacquered surface
 - Excluding clear protective lacquer up to a thickness of ≤ 5 micrometers
 - Excluding internal bag layers if the grammage is at least 100 g/m^{240}
- Plastic-coated surface
 - Excluding internal bag layers if the grammage is at least 100 g/m^{240}
- Metal pigments applied on a large scale (taking up > 50% of the projected surface) (lacquering, print, coating or embossing)
- Dyed black, using soot-carbon-based pigments
- > 50% fully printed black (including background) using soot-carbon-based pigments

PPC packaging

- Fully lacquered surface
 - Excluding clear protective lacquer up to a thickness of ≤ 5 micrometers
 - Excluding internal bag layers if the grammage is at least 100 g/m^{240}
- Plastic-coated surface
 - Excluding internal bag layers if the grammage is at least 100 g/m^{240}
- Metal pigments applied on a large scale (taking up > 50% of the projected surface) (lacquering, print, coating or embossing)

Liquid packaging board

- Design different from standard structure (no wet-strength cardboard, PE \pm aluminium)

Glass

- Non-transparent/non-translucent glass packaging (see provision in 4.2)

⁴⁰ The 2024 minimum standard will examine whether this exemption can be expanded to include other fibre-based packaging.

Appendix 3: Overview of packaging groups/sorts and material-specific recycling incompatibilities

Group	Incompatibilities
PE films > A4 in size	Fibre-based labels if the cellulose share cannot be removed by means of cold washing; PA layers (excluding nylon 6 or co-polyamide 6-66 in coextruded PE/PA films without EVOH, combined with MAH-grafted PE as an adhesive promoter at a ratio of at least 0.5 g of adhesive per 1 g of PA); PE-X components; PVDC layers; other non-PE polymeric layers (excluding adhesion promoters, adhesives, PP, EVA and EVOH), non-polymeric layers (excluding SiOx/AIOx/metallisations); NC inks used in adhesive side printing. ⁴¹
Flexible PE < A4 in size and flexible PP	Silicone components; Foamed non-thermoplastic elastomers with a density of < 1 g/cm ³ ; Foamed non-polyolefin components; Fibre-based labels if the cellulose share cannot be removed in cold washing. ⁴¹
Rigid PE	Silicone components; Fibre-based labels if the cellulose share cannot be removed by means of cold washing; components of foamed non-thermoplastic elastomers; PET sleeves with a density of < 1 g/cm ³ ; PA layers, PE-X components, PVDC layers; Non-PO plastics with a density of < 1 g/cm ³ . ⁴¹
Rigid PP	Silicone components; Components of foamed non-thermoplastic elastomers; Fibre-based labels if the cellulose share cannot be removed by means of cold washing; PET sleeves with a density of < 1 g/cm ³ ; PA layers; PVDC layers; Non-PO plastics with a density of < 1 g/cm ³ . ⁴¹
Rigid PS	Foreign plastics or multi-layers with a density of 1.0-1.08 g/cm ³ ; Fibre-based labels if the cellulose share cannot be removed by means of cold washing. ⁴¹
Transparent PET bottles and other transparent, rigid PET packaging	PET-G components; POM components; PVC components; EVOH layers; silicone components; PA monolayers for transparent PET bottles, colourless and 'light blue'; PVC labels/sleeves; PS labels/sleeves; PET-G labels/sleeves; other labels/sleeves/printed top film with a density of > 1 g/cm ³ (including printing and lacquering); Other blended barriers; PA additives for transparent PET bottles, colourless and 'light blue'; Non-removable washable adhesive applications (in water or alkaline at 80° C); Non-magnetic metals; Elastomer components with a density of > 1 g/cm ³ ; direct print (excluding production codes, 'best before' dates and UFI codes ⁴²) ⁴¹ .

⁴¹ The 2024 minimum standard will examine whether NC inks used for direct printing or PVC inks used for adhesive side printing or direct printing need to be classified as incompatible; it will also examine whether flexible PE < A4 in size and flexible PP need to be classified as incompatible.

⁴² The UFI (unique formula identifier) code is used to uniquely identify hazardous mixtures in order to enable poison control centres to administer first aid faster. The code is found on products classified as hazardous to health or physical hazards under EU Regulation (EC) 1272/2008 (CLP Regulation).

Group/sort	Incompatibilities
PPC Fibre-based composite packaging Liquid packaging board	Water-insoluble or non-redispersible adhesive applications and polymeric thermoplastic dispersion coatings, unless it is proven that they do not lead to incompatibilities in the recyclate. ⁴³ The exceptions granted for hotmelt adhesives in the ERPC Scorecard ⁴⁴ apply (softening temperature of the adhesive (according to R&B): $\geq 68^{\circ}\text{C}$, layer thickness (non-reactive adhesives): $\geq 120\ \mu\text{m}$, layer thickness (reactive adhesives): $\geq 60\ \mu\text{m}$, horizontal dimension of the adhesive application (in either direction): $\geq 1.6\ \text{mm}$). ⁴⁵
Glass	Lead from crystal glass packaging; borosilicate glass; Glass packaging with ceramic components; Glass packaging with metal nets; Swing tops with non-ferromagnetic metal shares only.

⁴³ A testing method suitable to proof this is, for example, PTS-RH 021:2012.

⁴⁴ www.paperforrecycling.eu/download/882.

⁴⁵ The 2024 minimum standard will examine whether fibre-based packaging that has been dyed black needs to be classified as incompatible.

Appendix 4: Flowchart of the determination procedure

The flowchart models the determination procedure according to 2 to 4 above. It should be noted that the packaging being determined (object of determination) always undergoes the whole test, but that only the determined proportion of the relevant recyclable material is included in the final measurement/scaling.

