Practical user guide for the minimum standard for determining the recyclability of packaging subject to system participation

pursuant to section 21 (3) VerpackG

The information presented in this user guide is designed to provide tips on how to apply the minimum standard for design for recyclability (2025 edition). It is for informational purposes only and has no legal authority.

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Overview

This document is intended to provide wide-ranging practical support for using the minimum standard for determining the recyclability of packaging subject to system participation under section 21 (3) VerpackG (Packaging Act). This user guide was developed to give producers and distributors of empty packaging or packaged goods a clear understanding of the requirements of the minimum standard and how they are put into practice for the German Market.

The minimum standard, published by the Zentrale Stelle Verpackungsregister (Central Agency Packaging Register – ZSVR) in agreement with the German Environment Agency (Umweltbundesamt) sets out a uniform methodology for determining the recyclability of packaging. The determination result is not only relevant for the cost of the participation fees calculated by system operators, it also helps companies to improve the recyclability of their packaging design and to prepare for upcoming European regulations, such as the EU Packaging and Packaging Waste Regulation (PPWR).

The user guide provides a step-by-step explanation of how to determine the recyclability of a unit of packaging. It guides users through the process of

— delineating the unit of packaging under consideration (object of determination),

— assigning it to the new PPWR-based packaging categories and

— actually making the determination using detailed criteria.

Practical examples and commentary are designed to provide additional support in making sense of more complex cases, making it easier to use the minimum standard. The goal is to provide a broad range of users with assistance in determining and documenting the recyclability of their packaging.

Identifying the object of determination as a starting point

To determine the recyclability of packaging, the first step is to identify which unit of packaging or packaging components require their own determination (cf. also Chapter 2, minimum standard, 'object of determination'). Particularly where loose or separable packaging components are concerned, it is important to figure out whether they should be dealt with as a whole or individually.

> Remember that a unit of packaging may consist of multiple objects of determination (packaging components).

The following steps are specifically designed to help assess whether the determination should be made in respect to each individual component or all of them as a whole:

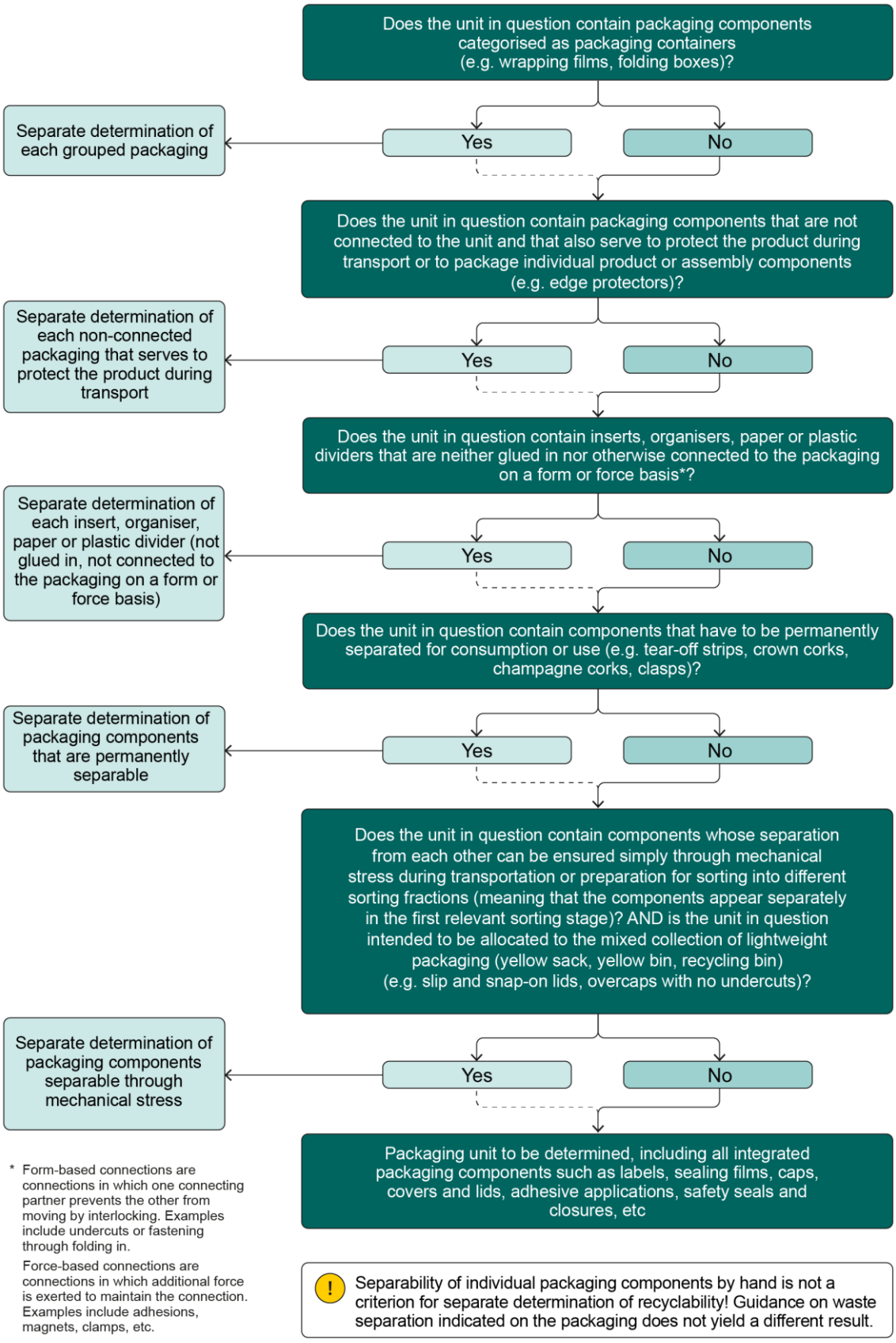


Figure 1: Identify the object of determination

After identifying the individual objects of determination, proceed through all of the following steps for each object of determination, including any corresponding (integrated) packaging components. The result for each individual object of determination applies in isolation – do not use this information to offset the individual determination values (i.e. pro rata, by weight).

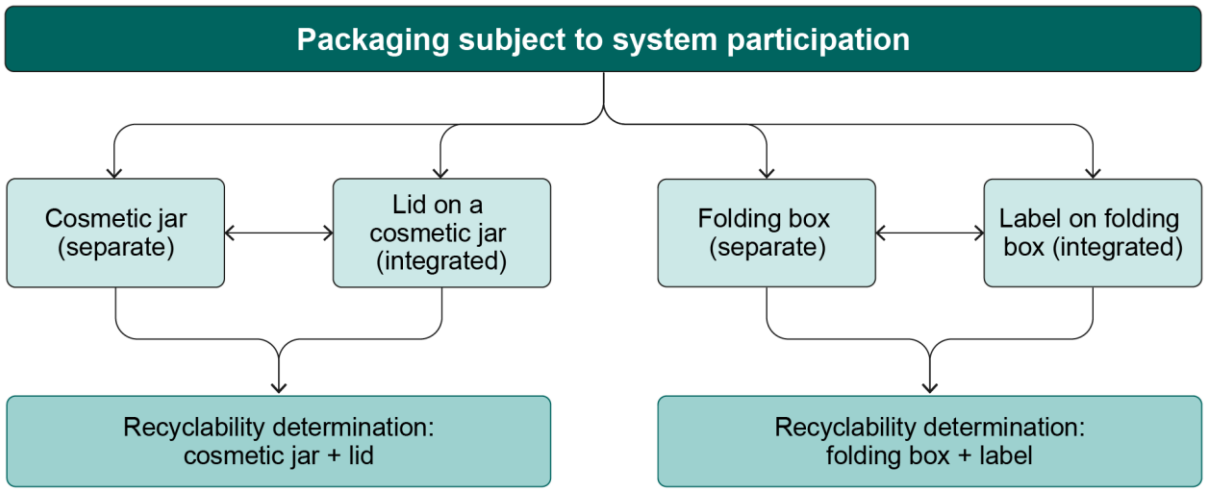


Figure 2: Determination of recyclability for a lidded cosmetic jar filled with cream, also packaged in a folding box with an adhesive label.

Annex 1 of this user guide contains a list compiled by the ZSVR containing packaging components, subdivided into separate (i.e. to be determined independently) and integrated packaging components. Please note that this list is not exhaustive.

For a detailed illustration, please refer to the example in Annex 2 of this guide.

Steps to determine the recyclability of each object of determination

This chapter contains a step-by-step guide for determining recyclability using Annex 2 'Determination principles and requirements' for individual packaging categories in the minimum standard. For illustration purposes, wax-coated kraft paper is used as the object of determination.

Formula for determining recyclability:

$$\text{Recyclability [\%]} = \frac{\text{Valuable material share [g] - design-related valuable material losses [g]}}{\text{Total weight of the object of determination [g]}} \times 100$$

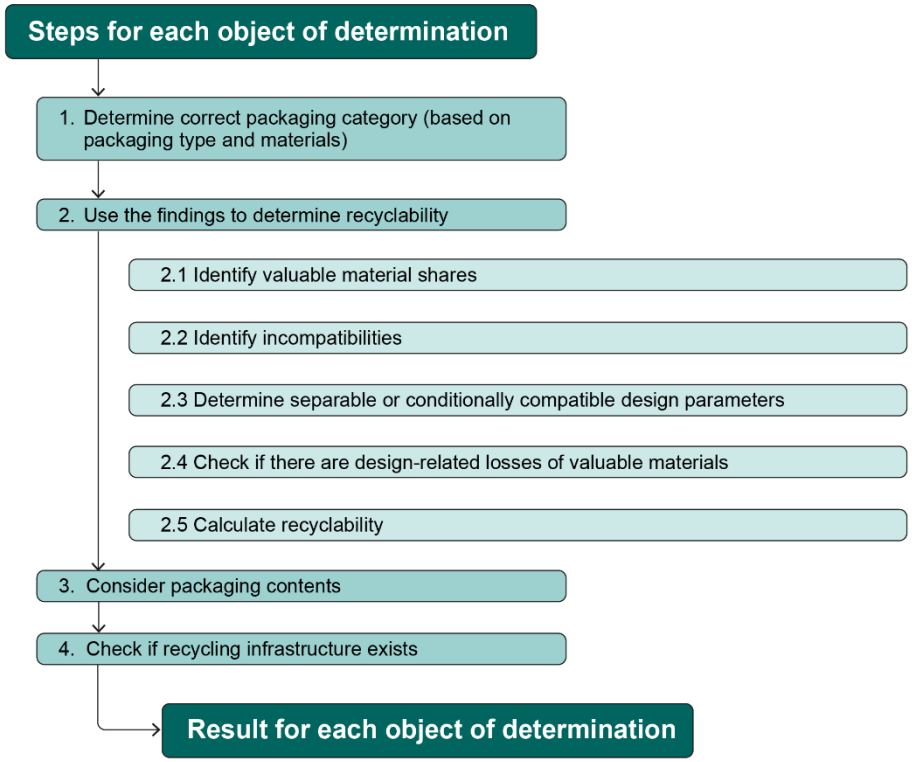


Figure 3: Overview of the steps for each object of determination

Please note: a unit of packaging may consist of multiple objects of determination. Users must follow the four steps described below for each object of determination individually.

Step 1: Determine correct packaging category (based on packaging type and materials)
The following figure shows an overview of all the PPWR packaging categories (Annex 2, table 1). The first categorisation is made using the dominant packaging material of the main body by weight. Then there is a specification of the packaging type by material. Here a further categorisation is made using the predominant, i.e. dominant packaging type by weight and/or material[1]. Then Annex 2 of the minimum standard can be used to determine which determination principles and requirements should be applied.

Objects of determination that cannot be assigned to any packaging category should be categorised as non-recyclable as a general rule.

Example: The object of determination comprises 20 grams of kraft paper and 0.5 grams of wax coating. We categorise the packaging under the paper/cardboard packaging material (main material).

Explanation: Fibrous material accounts for a >95% share of the packaging (cf. definitions (7) and (8) in the minimum standard, Chapter 5, Terminology and definitions). As such, it should be categorised under the paper/cardboard packaging type (excluding composite packaging). The categorisation below is made using Annex 2.2 of the minimum standard.

[1] For specific examples of packaging types, please refer to Annex 1 of the minimum standard.

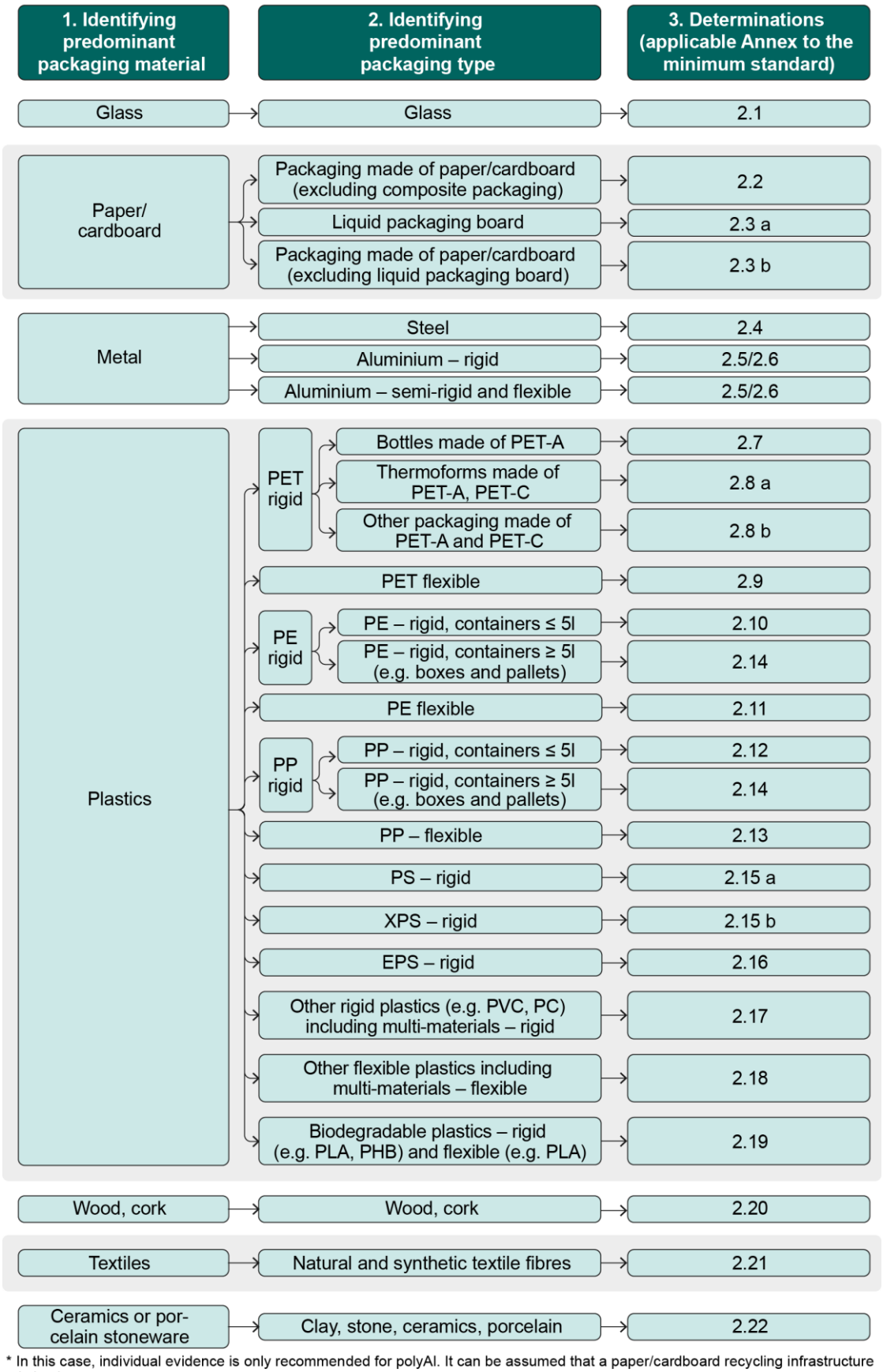


Figure 4: Determine the correct packaging category

Step 2: Use the findings to determine recyclability

The tables in Annex 2 of the minimum standard categorise different design parameters according to their recyclability. These parameters are subdivided according to:

— valuable material,
— incompatibility,
— separable or conditionally compatible,
— requiring examination.

These categories were defined by the ZSVR and German Environment Agency on a scientific basis and in reference to the waste management context.

To make the determination, the following steps are carried out:

Step 2.1 Identify valuable material shares

In the first step, the valuable material shares of the object of determination should be identified in the valuable materials column and the weight should be determined. If multiple valuable materials are listed in the same table, these are added together.

Example: For a packaging unit made of paper/cardboard, the valuable material 'kraft paper' is identified. In our example, we are using 20 grams of kraft paper as the valuable material.

Paper/cardboard packaging (excluding composite packaging) | Reference application: Corrugated base paper

Main body

Identified valuable material			Valuable material	Incompatibilities[11]	Separable or conditionally compatible	Examination of design-related valuable material losses
Main body	Material	Corrugated board	X			
		Kraft paper	X			
		Moulded pulp, highly compressed	X			P6.2
		Moulded pulp, slightly compressed	X			
		Glassine	X			
		Bogus paper	X			
		Wrapping tissue	X			
		Bitumen paper		X		
		Oil paper		X		
		Wax/paraffin paper		X		
		Paper/cardboard, other sorts	X			
		Cellophane			X	
		Foamed, extruded, thermoformed component made of starch			X	
		Aluminium lamination			X	P0.1
		Plastic film (extrusion lamination, film lamination)			X	

Figure 5: Identify valuable material shares – excerpt from minimum standard Annex 2.2

Step 2.2 Identify incompatibilities

The second step requires checking whether any of the incompatibilities listed in the table apply. If so, the recyclability is 0% and we have the determination result.

Example: For the packaging made of kraft paper, the table in Annex 2 states that 13 incompatibilities must be ruled out (cf. Annex 2.2 minimum standard). In our example, we have assumed that none of these incompatibilities apply so we can proceed to the next steps.

Paper/cardboard packaging (excluding composite packaging) | Reference application: Corrugated base paper						
Main body						
Check if these or other incompatibilities apply			Valuable material	Incompatibilities[11]	Separable or conditionally compatible	Examination of design-related valuable material losses
	Material	Corrugated board	X			
		Kraft paper	X			
		Moulded pulp, highly compressed	X			P6.2
		Moulded pulp, slightly compressed	X			
		Glassine	X			
		Bogus paper	X			
		Wrapping tissue	X			
		Bitumen paper		X		
		Oil paper		X		
		Wax/paraffin paper		X		
		Paper/cardboard, other sorts	X			
		Cellophane			X	
		Foamed, extruded, thermoformed component made of starch			X	
		Aluminium lamination			X	P0.1
		Plastic film (extrusion lamination, film lamination)			X	
Main body	Dyeing	Dyed black, using soot-carbon-based pigments				P2
	Other equipment (of the paper)	Dry strength agent: PVOH	X			P6.2
		Dry strength agent: Starch (mass and surface)	X			
		Dry strength agent: Other synthetic polymers	X			P6.2
		Sizing agent, hydrophobic (mass and surface)	X			
		Wet strength agent, impregnating agent	X			P6.2
		Mineral fillers	X			
		Other equipment	X			
	Barriers and surface finish (of the paper)	Metallisation			X	
		Mineral pigment coating incl. binding agent	X			
		Polymer dispersion coating (thermoplastic)		X		P8
		Polymer mineral coating (thermoplastic)		X		P8
		Silicone coating			X	P6.2
		Paraffin, wax, oil			X	P6.2
		Other surface finish		X		P6.2, P8

Figure 6: Identify incompatibilities – excerpt from minimum standard Annex 2.2

Step 2.3 Determine separable or conditionally compatible design parameters

In the third step, the object of determination is examined to see if it has any components that are categorised as 'separable or conditionally compatible' according to the relevant table in Annex 2 of the minimum standard. These components, and any that are not listed in the table at all (for example specific valuable materials), have a neutral effect on recycling. That means that they do not represent an incompatibility that would cause recyclability to be 0%. However, they are also not counted as a valuable material for recovery.

For the calculation, that means that:

- The weight of these components does not count towards the share of valuable materials (the numerator in the formula).
- However, it is part of the total weight of the object of determination (the denominator in the formula).

Because of this, these shares reduce the final recyclability percentage without having to actively make any deduction from the valuable material already identified.

Example: The packaging made of kraft paper contains a wax coating (0.5 grams). In step one, the only valuable material identified was 20 grams of kraft paper, which is correct, but our packaging as a whole weighs 20.5 grams with the wax coating. No correction to the valuable material share therefore needs to be made.

Avoid this common mistake: Incomplete data can lead to other materials being counted as the valuable material share when really they should be deducted. Please carefully examine whether the packaging unit being considered actually contains the relevant materials. Examples include printing ink and coatings that are mistakenly counted towards the valuable material instead of being deducted.

Paper/cardboard packaging (excluding composite packaging) | Reference application: Corrugated base paper						
Main body						
Check if separable or conditionally compatible parameters apply		Identify wax in object of determination	Valuable material	Incompatibilities[11]	Separable or conditionally compatible	Examination of design-related valuable material losses
Main body	Dyeing	Dyed black using soot-carbon-based pigments				P2
	Other equipment (of the paper)	Dry strength agent: PVOH	X			P6.2
		Dry strength agent: Starch (mass and surface)	X			
		Dry strength agent: Other synthetic polymers	X			P6.2
		Sizing agent, hydrophobic (mass and surface)	X			
		Wet strength agent, impregnating agent	X			P6.2
		Mineral fillers	X			
		Other equipment	X			
	Barriers and surface finish (of the paper)	Metallisation			X	
		Mineral pigment coating incl. binding agent	X			
		Polymer dispersion coating (thermoplastic)		X		P8
		Polymer mineral coating (thermoplastic)		X		P8
		Silicone coating			X	P6.2
		Paraffin, wax, oil			X	P6.2
		Other surface finish		X		P6.2, P8
	Additives and coatings (of the plastic layer)	AlOx			X	
		Metallisation			X	
		SiOx			X	

Figure 7: Determine separable or conditionally compatible design parameters – excerpt from minimum standard Annex 2.2

Step 2.4 Check for design-related valuable material losses

The forth step requires checking whether any of the 'design-related valuable material losses' listed in the table apply. If so, the extent of the losses must be identified.

Please note: Checking for design-related valuable material losses is essential for making a robust determination about the recyclability of packaging. As such, it is best to assume the greatest possible valuable material losses.

Example: For the packaging made of kraft paper, it is necessary to check for 22 parameters according to the table to determine the design-related valuable material losses (cf. Annex 2.2. of the minimum standard). The wax coating on the kraft paper means an examination is required (P6.2). This examination reveals, for example, a 20% valuable material loss (i.e. 20% of the kraft paper). That results in a design-related valuable material loss of 4 grams.

Paper/cardboard packaging (excluding composite packaging) | Reference application: Corrugated base paper

Main body

Identify if there is a need to check for design-related losses of valuable materials.

			Valuable material	Incompatibilities[11]	Separable or conditionally compatible	Examination of design-related valuable material losses
	Barriers and surface finish (of the paper)	Metallisation			X	
		Mineral pigment coating incl. binding agent	X			
		Polymer dispersion coating (thermoplastic)		X		P8
		Polymer mineral coating (thermoplastic)		X		P8
		Silicone coating			X	P6.2
		Paraffin, wax, oil			X	P6.2
		Other surface finish		X		P6.2, P8
	Additives and coatings (of the plastic layer)	AlOx			X	
		Metallisation			X	
		SiOx			X	

Examination of design-related valuable material losses

P0.1	Presence of an aluminium foil layer: examination required (test if necessary) whether the design causes sorting into aluminium fraction. If so, a complete loss of valuable material for packaging category 2 has to be assumed.
P0.2	Presence of ferromagnetic components ≥ 5% by weight in relation to the object of determination: examination required (test if necessary) whether the design causes sorting into ferrous metal fraction. If so, a complete loss of valuable material for packaging category 2 has to be assumed.
P2	Testing required to determine if identifiability, including targeted separability, is given in a sensor-based sorting context. Restrictions must be taken into account as proportionate losses of valuable material.
	When determining the recyclability of fibre-based packaging, the gradual defiberability of the fibrous material is a decisive factor. In the case of paper/cardboard 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 parameters in the processing of the material) of the respective recovery path (packaging collection) result in the dispersion of the fibrous material, and that the fibrous ation to provide evidence does not apply to fibre-based packaging that is typically filled 5% moisture content), free-flowing or particulate, such as flour or sugar. The non-recoverable must be deducted to determine the available valuable material share. If, during the pulping of fibre-based packaging, substances that cannot be classified as fibrous material pass into the aqueous phase (water-soluble, colloidally dissolved or finely dispersed), these must be quantified by a suitable testing method and deducted when calculating the fibrous material recovery rate.
P6.2	If wet-strength agents, impregnating agents, waxes, etc., are used for fibre-based packaging, and in the case of paper or cardboard (excluding liquid packaging board) coated or metallised on both sides, the determination of defiberability needs to be based on a suitable testing methodology. The non-recoverable fibrous material share must be deducted to determine the available valuable material share. If, during the pulping of fibre-based packaging, substances that cannot be classified as fibrous material pass into the aqueous phase (water-soluble, colloidally dissolved or finely dispersed), these must be quantified by a suitable testing method and deducted when calculating the fibrous material recovery rate.

Audit criterion P6.2 applies to the share of wax. The table states that a check is required.

Figure 8: Check for design-related valuable material losses – excerpt from minimum standard Annex 2.2

Step 2.5 Calculate recyclability

The following formula can now be used to calculate recyclability.

$$\text{Recyclability [\%]} = \frac{\text{Valuable material share [g] - design-related valuable material losses [g]}}{\text{Total weight of the object of determination [g]}} \times 100$$

Example: For the kraft paper packaging, the calculation is as follows:

$$\text{Recyclability [\%]} = \frac{20\text{-}4}{20{,}5} \times 100 \approx 78{,}05\ \%$$

The recyclability of the determined packaging is therefore 78.05 %.

Step 3: Consider contents

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 impact of the residual contents,
- assuming the contents cannot be separated completely during the recycling process without causing significant valuable material losses,
- has to be taken into account when determining incompatibilities.

Please note that 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.

This means that if the packaging comes into contact with the contents listed, the following must be done:

First it should be checked whether the packaging can be (completely) emptied. If the answer is no (the packaging cannot be completely emptied), find out whether the residual contents are contaminants that can be removed in the recycling process. If not, it must be demonstrated that inclusion of the relevant material in the recyclate does not result in any significant qualitative deterioration in order to declare recyclability of more than 0 %.

That means that some packaged goods can reduce the recyclability of a packaging unit to 0 %.

Example: The kraft paper packaging can be emptied well and does not contain any contents that can have a negative impact on recycling. As such, the recyclability remains 78.05 %.

Step 4: Check if recycling infrastructure exists

The last step requires checking whether recycling infrastructure is in practice available, established and proven in an operational environment so that it can be assumed that it is highly likely that recycling will occur in practice. Below you will find an overview for the packaging types for which individual evidence is recommended or mandatory (marked in red) for the calculated result to be valid.

If individual evidence for the packaging type at hand is mandatory but not available, the recyclability is 0 %.

Example: For the object of determination at hand made of kraft paper and wax, individual evidence is not recommended or mandatory, because this packaging type is categorised as paper/cardboard (excluding composite packaging). As such, the result remains 78.05 %. Because this is the last step, we have our final result of 78.05 % for this object of determination.

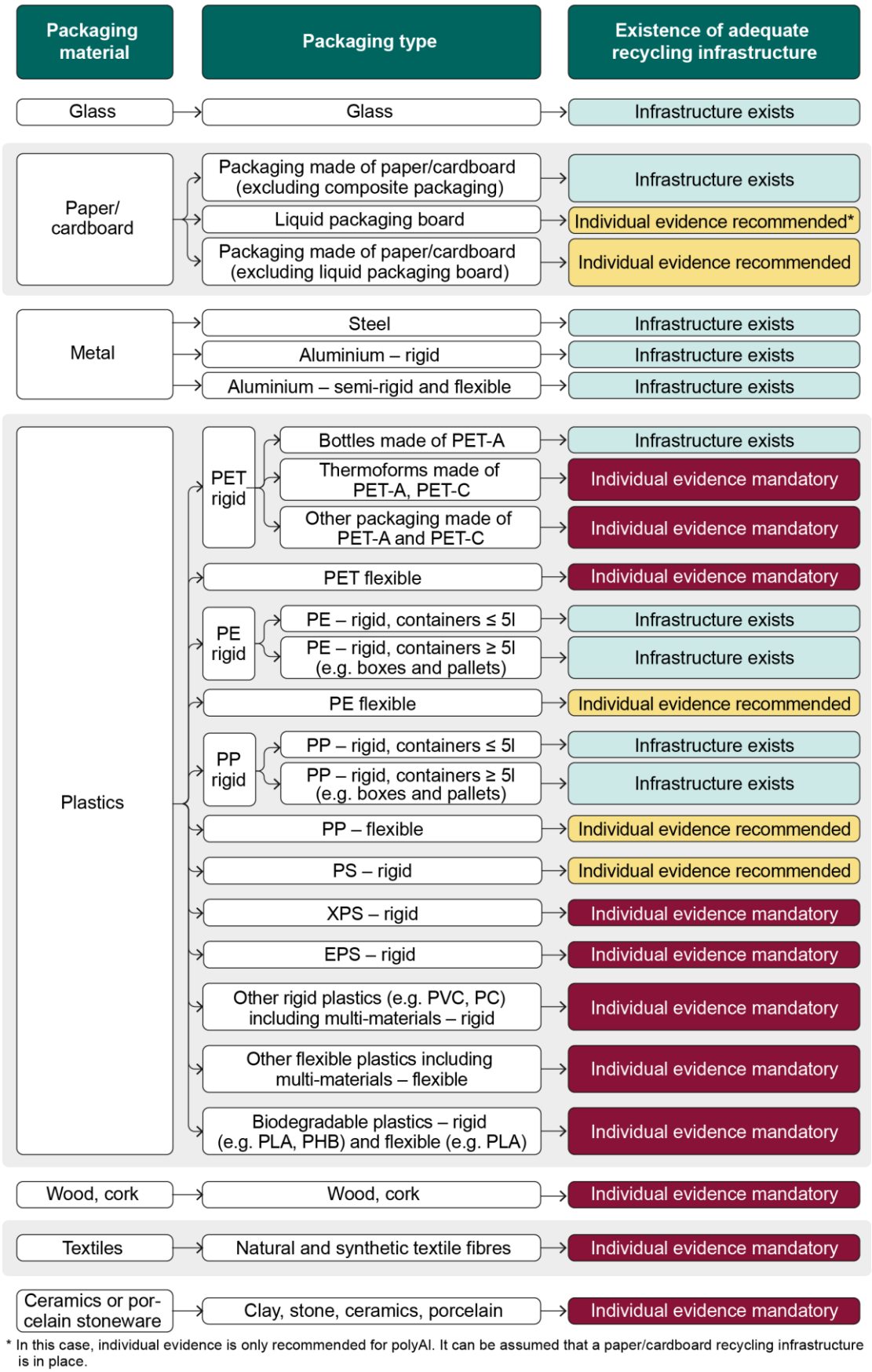


Figure 9: Check if recycling infrastructure exists

Explanation of the result

Recyclability as a percentage – what the figure tells us

The calculated percentage for a packaging unit's recyclability indicates the available valuable material share of a unit of packaging. It is a measure of how well designed the examined packaging is for the established sorting and recycling processes in Germany. A high percentage means that a large share of the packaging by weight could be converted to high-quality secondary raw materials that replace the primary raw materials. This figure is the basis for the financial incentives that system operators set to foster design for recyclability in packaging as part of their participation fees. Design for recycling can also have a positive effect on how high system participation fees are.

How can a positive result translate into measures? (Conformity, participation fees, marketing claims)

— Conformity: The 2025 minimum standard is heavily based the methodology and categories of the EU Packaging and Packaging Waste Regulation (PPWR). A good determination result is a strong indication of a packaging unit's future conformity under Article 6 PPWR. However, it is not a formal declaration of conformity under the PPWR. In future, although the exact timing is unclear because a delegated act is still outstanding, a declaration of conformity will be required for each unit of packaging. It is based on technical documentation, a proposed version of which will be made available after the minimum standard. Detailed requirements on the declaration of conformity will only be available once the delegated EU act has been published.
— Participation fees: As a percentage, the determination result of the recyclability of a unit of packaging offers system operators a foundation for setting graduated system participation fees for recyclable packaging under section 21 VerpackG.
— Marketing claims: The determination result of a packaging unit's recyclability as a percentage is an official figure under German law. When marketing claims are made on packaging or in communication (for example, 'recyclable'), all the general marketing law regulations apply, such as the German Act Against Unfair Competition (UWG), to prevent misleading marketing.

Result optimisation with individual evidence

If users disagree with the initial recyclability result for their unit of packaging, it may be possible to achieve a better result by providing individual evidence or undergoing testing. Extensive individual evidence from a testing laboratory is not always required if a precise and reproducible measurement methodology has been applied. This is the case, for example, for the P5 test for the density criterion that is usually calculated and documented by producers themselves. Increasingly, expert opinions from packaging material suppliers can be used when providing individual evidence.

The following explains how to proceed in these situations:

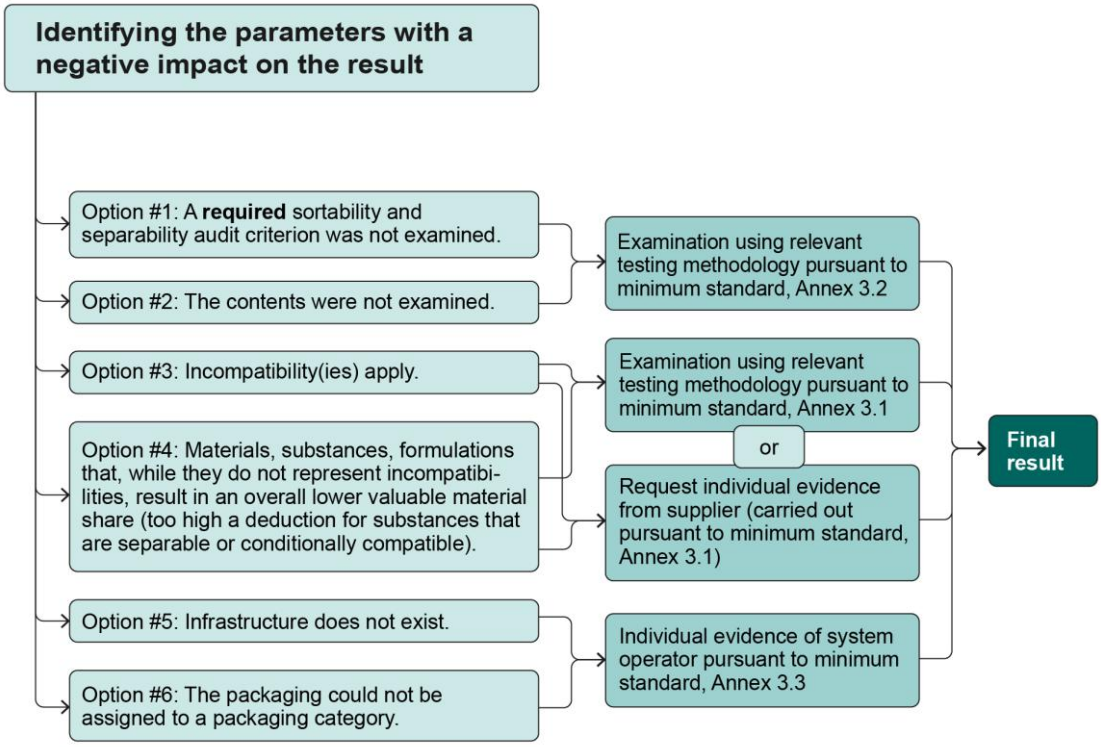


Figure 10: Individual evidence based on identified parameters

How is individual evidence provided?

First, identify the parameters that had a negative impact on the determination result. Depending on the cause, there are usually a variety of ways to arrive at a final recyclability determination:

Options 1 and 2: Lack of testing

If no testing has been done for a design parameter categorised as 'requiring examination' (in relation to sorting and separability or the contents), the testing can be conducted. The requirements for this sort of testing are set out in Annex 3.2 of the minimum standard. Not all testing needs to be conducted in a laboratory. Some criteria can also be tested using simple testing methods.

Options 3 and 4: Incompatibility or low share of valuable material

If an incompatibility applies to the packaging in question or if certain materials, substances or formulations lead to a low share of valuable materials, there is a way to evidence compatibility through testing under Annex 3.1 of the minimum standard. If robust individual evidence from a supplier is already available, no further testing in necessary. One thing to note is the scope that the individual evidence was intended to cover (for example, ‘recyclate reference applications’). The supplier's individual evidence must also be provided according to the requirements in Annex 3.1 of the minimum standard.

Option 5: Lack of recycling infrastructure

For some packaging categories, the minimum standard assumes that there is a lack of recycling infrastructure as a general rule, which is why recyclability is initially 0%. In this case, any recyclability other than 0% can only be established with dedicated individual evidence of the existence of recycling infrastructure. The precise requirements for this evidence are set out in Annex 3.3 of the minimum standard. This evidence can only be issued by a system operator.

Option 6: Not possible to assign to a packaging category

If the packaging cannot be assigned to any of the packaging categories defined in Annex 1 of the minimum standard, as a general rule it is deemed to be non-recyclable with a recyclability of 0%. For any other determination, individual evidence can be provided in line with the requirements in Annex 3.3 of the minimum standard. This evidence can only be issued by a system operator.

By providing one or more forms of individual evidence, the result previously obtained can be reviewed and improved depending on the circumstances.

The individual steps at a glance

Further support: To quickly make another determination on the recyclability of different units of packaging, you can use the following quick guide of the steps described in detail above.

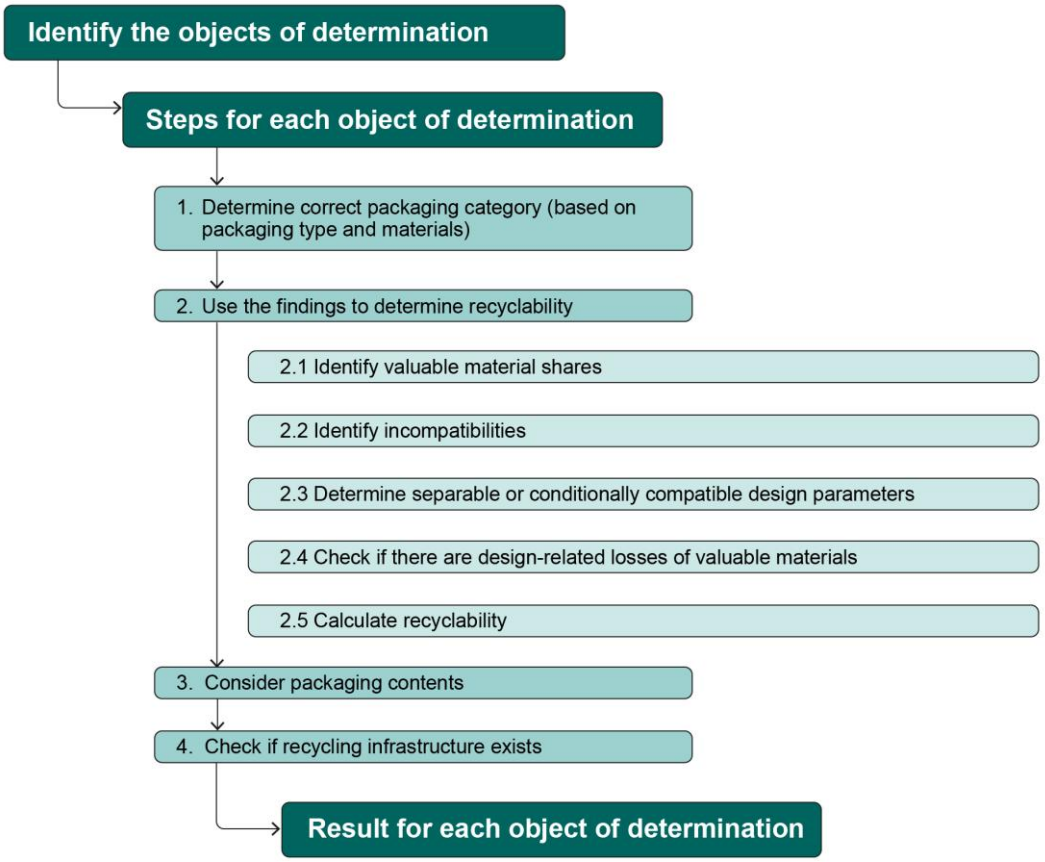
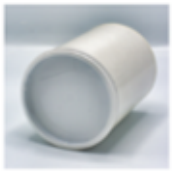
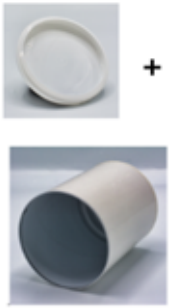


Figure 11: The individual steps at a glance

Annex 1 – Component list

The following table is designed to help users delineate the object of determination. It lists examples of packaging components and whether they are categorised as separate or integrated components. The list is not exhaustive.

Component	Classification as		Comments	Example (packaging unit)	Object of deter-mination
	Separate	Integrated			
Covers and lids					
Crown corks	x				
				Image source: iStock	
Clasps and champagne corks made of cork	x				
				Image source: iStock	
Overcap without undercut (except for glass packaging), for example an aerosol can	x		Releases under light impact stress (for example in sieving).		
				Image source: iStock	

Component	Classification as		Comments	Example (packaging unit)	Object of determination
	Separate	Integrated			
Covers and lids					
Caps with or without screw closure on glass packaging		x		 Image source: iStock	
Snap-on caps (for example on yoghurt pots)	x			 Image source: Institut cyclos-HTP GmbH	
Snap-on lids on composite cans	x		Releases from the can under light pressure (already in collection vehicles).	 Image source: Institut cyclos-HTP GmbH	
Bayonet lock, screw closure		x		 Image source: iStock	

Component	Classification as		Comments	Example (packaging unit)	Object of deter-mination
	Separate	Integrated			
Covers and lids					
Twist-off closure	x			 Image source: Institut cyclos-HTP GmbH	 +
Twist & drink closure on ampoules	x			 Image source: Institut cyclos-HTP GmbH	
Shrink capsules and sleeves with side perforation	x		Shrink capsules have to be torn open along the full length of the perforation when opening the bottle.	 Image source: Institut cyclos-HTP GmbH	 +
Shrink capsules and sleeves with horizontal tear-off strips		x	Upper part of the shrink capsule as a separate component, lower part of the shrink capsule remains on the neck of the bottle after opening (therefore integrated).	 Image source: Institut cyclos-HTP GmbH	

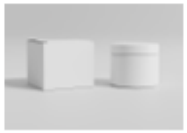
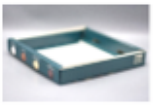
Component	Classification as		Comments	Example (packaging unit)	Object of deter-mination
	Separate	Integrated			
Covers and lids					
Tape		x			
				Image source: iStock	
Sealing films and lids Rule: lidding films, sealing films are always integrated packaging components					
Aluminium lids (for example on yoghurt pots)		x			
				Image source: iStock	
Lidding films for thermos-formed packaging (for example cheese or sausage packaging)		x			
				Image source: Institut cyclos-HTP GmbH	
Tear-off strips on bags					
Pouch with tear-off notch and zip	x		Pouch is heat sealed in above the zip so that the heat seal needs to be torn to be opened.		+
				Image source: iStock	

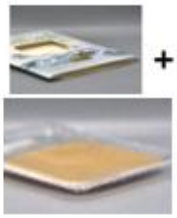
Component	Classification as		Comments	Example (packaging unit)	Object of determination
	Separate	Integrated			
Tear-off strips on bags					
Pouch with cut opening (also marked with scissors symbol)		x	Does not need to be cut all the way across to remove the product (product removed by 'cutting up' or 'tearing open'), for example a mozzarella bag.	 Image source: iStock	
Labels with shrink sleeves Rule: labels with shrink sleeves are integrated packaging components.					
Labels		x		 Image source: iStock	
Booklet label		x		 Image source: Institut cyclos-HTP GmbH	
Full sleeves/ shrink sleeves (also with perforation)		x		 Image source: Institut cyclos-HTP GmbH	

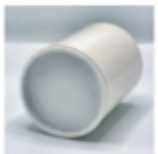
Component	Classification as		Comments	Example (packaging unit)	Object of deter-mination
	Separate	Integrated			
Wrapping films					
As grouped packaging (for example box of chocolates, multipacks)	x			 Image source: iStock	 +  Image source: Institut cyclos-HTP GmbH; iStock
Wrapping films with horizontal tear-off strip, for example (upper part) on a carton of cigarettes	x		Wrapping film must be removed using the tear-off strip to open the carton of cigarettes.	 Image source: Institut cyclos-HTP GmbH	 + 
Wrapping film (lower part) with horizontal tear-off strip (for example a carton of cigarettes)		x	Remains attached to the main component	 Image source: Institut cyclos-HTP GmbH	

Component	Classification as		Comments	Example (packaging unit)	Object of determination
	Separate	Integrated			
Safety, tamper evident and freshness seals and similar					
Safety seal with vertical perforation	x			 Image source: Institut cyclos-HTP GmbH	 + 
Tamper evident freshness seal (for example ketchup bottles, cosmetic jars, toothpaste tubes)	x			 Image source: Institut cyclos-HTP GmbH	 + 
Tamper evident freshness seal for push/ breakthrough (for example tomato paste, sauces)		x		 Image source: Institut cyclos-HTP GmbH	
Material-identical tear-off strip (for example on chewing gum bottle)	x			 Image source: Institut cyclos-HTP GmbH	 + 

Component	Classification as		Comments	Example (packaging unit)	Object of determination
	Separate	Integrated			
Safety, tamper evident and freshness seals and similar					
Safety clip on a pump attachment	x			 Image source: Institut cyclos-HTP GmbH	
Pull tab as tamper evident closure for complete removal (for example on paint buckets, cans)	x			 Image source: Institut cyclos-HTP GmbH	
Pull tab as tamper evident closure, attached on one side, remains on the bucket		x		 Image source: Institut cyclos-HTP GmbH	

Component	Classification as		Comments	Example (packaging unit)	Object of determination
	Separate	Integrated			
Grouped packaging rule: Grouped packaging should always be determined separately.					
Folding box with loose film bag (for example muesli, baking mixes)	x		Film bag and folding box should each be determined separately as components.		 + 
				Image source: Institut cyclos-HTP GmbH	
Folding box with cosmetic jar or tube (for example creams)	x		Cream jar and folding box should each be determined separately as components.		 + 
				Image source: iStock	
Folding box with blister pack (for example tablets)	x				 + 
				Image source: iStock	
Other components					
Inserts such as cushions or thermoforms (for example as a sorting insert in a praline box)	x				 + 
				Image source: iStock	Image source: Institut cyclos-HTP GmbH; iStock

Component	Classification as		Comments	Example (packaging unit)	Object of determination
	Separate	Integrated			
Other components					
Bag with glued carton label/glued carton sleeve		x			
				Image source: Institut cyclos-HTP GmbH	
Paper sleeve (non-adhesive cardboard slipcase, e.g. smoked salmon packaging)	x				
				Image source: Institut cyclos-HTP GmbH	
3-component cup (cardboard outer shell or sleeve/plastic inner cup/ aluminium blank)		x			
				Image source: Institut cyclos-HTP GmbH	
Absorbent pads (glued and not glued)		x			
				Image source: iStock	
Drinking straw (in wrapping film, glued to the beverage carton)		x	Drinking straw remains in container after consumption.		
				Image source: Institut cyclos-HTP GmbH	

Component	Classification as		Comments	Example (packaging unit)	Object of determination
	Separate	Integrated			
Other components					
Blister with glued cardboard backing		x		 Image source: iStock	
Clip as bag closure	x			 Image source: iStock	 Image source: iStock; Institut cyclos-HTP GmbH
Hang tag with textile band		x		 Image source: iStock	
Utensils, dosage aids (loose in packaging)	x		Illustration is intended only as an example to help in delineation of dosage aid.	 Image source: Institut cyclos-HTP GmbH	

Annex 2 – Packaging examples

Detailed example for the full process of determining recyclability for an example unit of packaging (all steps):

PET bowl (including sealing film) with paper sleeve

First: Identify the object of determination (using Figure 1 and Annex 1 of the minimum standard, Chapter 2):

The paper sleeve is outer packaging and as such is a separate packaging component so must be determined separately from the primary packaging (bowl with sealing film). The sealing film, however, is an integrated component of the bowl because it does not have to be permanently separated for use/consumption. That means there are two objects of determination. A quick look at the examples in Annex 1 confirms the categorisation.

Object of determination 1: PET bowl including sealing film

Object of determination 2: Paper sleeve

Object of determination 1: PET bowl including sealing film

Relevant data set (example, details provided)

Component	Material	Weight (g)	Total share
Bowl (main body)	PET-A (mono-material)	25.0 g	92.6%
Top film	PE layer	1.0 g	3.7%
	PP layer	0.8 g	3%
	Printing ink	0.1 g	0.3%
	Laminating adhesive	0.1 g	0.4%
Total		**27.0 g**	**100%**

Step 1: Assign to packaging category

Step	Categorisation	Comments
Predominant packaging material	Plastics	At 99.3%, plastic is the dominant material
Predominant packaging type	PET-A – rigid: Thermoforms made of PET-A and PET-C	The dominant material is PET-A at 92.6%, the packaging unit is rigid and a thermoform.
Determinations (relevant minimum standard Annex)	2.8 a	

Step 2: Determine recyclability under Annex 2, 2.8 a minimum standard

Step	Categorisation	Share	Comments
2.1. Identify valuable material shares	PET-A	25 g	Only the PET-A share is classified as a valuable material. Therefore only 25.0 g is identified as valuable material.
2.2. Identify incompatibilities	No incompatibilities	/	The packaging is free of materials with an 'incompatibility' categorisation (for example, EVOH, PVC, PA layers).
2.3. Check for separable or conditionally compatible design parameters	PE layer	1.0 g	The PE/PP top film plus printing ink and adhesives are foreign materials but not incompatibilities. They do not count towards the valuable material share.
	PP layer	0.8 g	
	Printing ink	0.1 g	
	Laminating adhesive	0.1 g	
2.4. Check for design-related valuable material losses	No need for testing	0 g	There are no criteria for design-related valuable material losses according to Annex 2.8 a.
2.5. Calculating recyclability using the formula	(25.0 g - 0 g) / (27 g) = 92.6%		The recyclability result is 92.6% under Annex 2 of the minimum standard.

Step 3: Consider contents

Step	Categorisation	Comments
Check the contents	No impact	The assumption is that the contents can be completely emptied from the packaging and that they do not have any negative impact on the recycling process.

Step 4: Check for the existence of infrastructure

Step	Categorisation	Comments
Check for existence of recycling infrastructure in line with Figure 9	Individual evidence mandatory	There is currently no recycling infrastructure for the PET-A bowl. That means that the theoretical recyclability just determined drops from 92.6% to 0% (cf. Figure 9).

Result for PET-A bowl object of determination: 0%

A result of 92.6% could be possible if it can be proved that recycling infrastructure for PET-A bowls actually exists. To do so, individual evidence must be provided as per Annex 3.3 of the minimum standard. It must be confirmed by a system operator.

Object of determination 2: Paper sleeve

Relevant data set (example, details provided)

Component	Material	Weight (g)	Total share
Sleeve (main body)	Kraft paper (fibrous material)	5.50 g	91.7%
	Printing ink (excluding substances on the EuPIA Exclusion List)	0.20 g	3.3%
	Foil stamping (hot stamping foil)	0.10 g	1.7%
	Seam adhesion: hot-melt adhesive application (EPRC scorecard criteria fulfilled)	0.20 g	3.3%
Total		**6.0 g**	**100%**

Step 1: Assign to packaging category

Step	Categorisation	Comments
Predominant packaging material	Paper/cardboard	At 91.7%, kraft paper (paper/cardboard) is the dominant material.
Predominant packaging type	Composite packaging, primarily paper/cardboard (excluding liquid packaging board)	Because the paper share is below 95%, the sleeve is formally categorised as composite packaging.
Determinations (relevant minimum standard Annex)	2.3 b	

Step 2: Determine recyclability under Annex 2, 2.8 a minimum standard

Step	Categorisation	Share	Comments
2.1. Identify valuable material shares	Kraft paper (fibrous material)	5.5 g	Kraft paper is categorised as a valuable material.
2.2. Identify incompatibilities	No incompatibilities	/	The packaging is free of materials with an 'incompatibility' categorisation.
2.3. Check for separable or conditionally compatible design parameters	Printing ink	0.20 g	The foil stamping plus printing ink and adhesives are foreign materials but not incompatibilities. They do not count towards the valuable material share.
	Foil stamping	0.10 g	
	Hot-melt adhesive application (EPRC fulfilled)	0.20 g	
2.4. Check for design-related valuable material losses	No need for testing	0 g	Because a recyclable adhesive application (EPRC criteria fulfilled) has been used, there is no need for further examination. There are no criteria for design-related valuable material losses.
2.5. Calculating recyclability using the formula	(5.5 g - 0 g) / (6 g) = 91.7%		The recyclability result is 91.7% under Annex 2 of the minimum standard.

Step 3: Consider contents

Step	Categorisation	Comments
Check the contents	Not applicable	As grouped packaging, the sleeve does not come into contact with the contents.

Step 4: Check for the existence of infrastructure

Step	Categorisation	Comments
Check for existence of recycling infrastructure in line with Figure 9.	Individual evidence mandatory	Recycling capacity is currently limited for the paper sleeve. This does not directly impact on the theoretical recyclability of 91.7%. Individual evidence is recommended, however (cf. Figure 9).

Result for paper sleeve object of determination: 91.7%

The recyclability of the paper sleeve is high. However, it is recommended that individual evidence be provided in line with Annex 3.3 of the minimum standard. It must be confirmed by a system operator.

Object of determination	Result	Optimisation potential
PET bowl including sealing film	0.0%	Result of 92.6% possible with individual evidence
Paper sleeve	91.7%	Individual evidence recommended (no direct impact on the result)

The following examples are intended to help apply Annex 2 of the minimum standard in practice.

A 2.1 (glass) – example 1

Canning jars with wrap-around label and screw cap			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Glass container (main body)	Normal glass (soda-lime glass), clear	93,4%	Valuable material		93,4%	
Wrap-around label	Printing ink	0,02%	Separable or conditionally compatible			
	Paper	0,5%	Separable or conditionally compatible			
	Adhesives	0,1%	Separable or conditionally compatible			
Screw cap	Lacquer	0,1%	Not mentioned			
	Tinplate	5,3%	Valuable material		5,3%	
	Sealant	0,5%	Not mentioned			
Sticker/label on cap	Printing ink	0,01%	Separable or conditionally compatible			
	Paper	0,1%	Separable or conditionally compatible			
	Adhesives	0,02%	Separable or conditionally compatible			
Total		100,0%			98,7%	

A 2.1 (glass) – example 2

Dropper bottle with wrap-around PP label			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Bottle (main body)	Normal glass (soda-lime glass), brown	90,2%	Valuable material		90,2%	
Cap	HDPE	7,3%	Separable or conditionally compatible			
Dropper insert	LDPE	1,8%	Separable or conditionally compatible			
Wrap-around label	Printing ink	0,04%	Separable or conditionally compatible			
	Plastic: PP	0,5%	Separable or conditionally compatible	P2.1	-34,4%	The glass share covered by an adhesive plastic label amounts to 8.960 g (34.4 percent of packaging mass)
	Adhesives	0,2%	Separable or conditionally compatible			
Total		100,0%			55,8%	

A 2.2 (paper/cardboard) – example 1

Folding box			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Folding box (main body)	Protective/top lacquer (clear) in a thickness of ≤ 5 µm	0,9%	Separable or conditionally compatible			
	Printing ink (excl. substances on EuPIA Exclusion List)	1,2%	Separable or conditionally compatible			
	Paper/cardboard incl. mineral pigment-based coating	96,1%	Valuable material		96,1%	
	Seam adhesion: dispersion adhesive	0,7%	Separable or conditionally compatible			
	Flaps: hot-melt adhesive application, EPRC scorecard criteria fulfilled	1,1%	Separable or conditionally compatible			
Total		100,0%			96,1%	

A2.3b (other paper/cardboard composites) – example 1

Fibre-based drinking cup			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Cup wall	Protective/top lacquer (clear) in a thickness of ≤ 5 µm	1,2%	Separable or conditionally compatible			
	Printing ink (excl. substances on EuPIA Exclusion List)	0,9%	Separable or conditionally compatible			
	Paper/cardboard incl. mineral pigment-based coating	76,6%	Valuable material		76,6%	
	Polymeric dispersion coating (thermoplastic)	4,6%	Incompatibility	P8	Approved by testing	Paper lab tests showed no significant adhesive effect (cf. lab report)
Cup bottom	Polymeric dispersion coatings (thermoplastic)	0,9%	Incompatibility	P8	Approved by testing	Paper lab tests showed no significant adhesive effect (cf. lab report)
	Cardboard	15,7%	Valuable material		15,7%	
Total		100,0%				

Other design parameters				
Contents	Non-dry contents, i.e. fibre-based packaging, e.g. for liquids, certain foodstuffs, oils and emulsions.	P6.1	-12,0%	Paper lab showed a 12% loss of fibrous material (as a percentage of packaging mass, cf. lab report)
			80,3%	

A2.3b (other paper/cardboard composites) – example 2

Folding box (PETmet / cardboard)			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Folding box (main body)	Protective/top lacquer (clear)	0,5%	Separable or conditionally compatible			
	Printing ink (excl. substances on EuPIA Exclusion List)	0,8%	Separable or conditionally compatible			
	PET	4,1%	Separable or conditionally compatible			
	Metallisation	0,0%	Separable or conditionally compatible			
	Laminating adhesive	5,1%	Separable or conditionally compatible			
	Paper/cardboard incl. mineral pigment-based coating	89,1%	Valuable material		89,1%	
	Seam adhesion: dispersion adhesive	0,5%	Separable or conditionally compatible			
Total		100,0%				
Other design parameters						
Structure	Plastic-coated surface – excl. internal bag layers if the grammage is at least 100 g/m²			P2	-89,1%	NIR lab: The folding box is not identifiable as paper/cardboard (cf. lab report). This results in a complete valuable material loss, as it cannot be identified or separated in a targeted manner using sensor-based sorting.
Decoration	Metal pigments applied on a large scale (taking up > 50% of the projected surface) (lacquering, print, coating or embossing)			P2		
					0,0%	

A2.4 (steel) – example 1

Food can made from tinplate			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Can incl. floor	Tinplate	82,7%	Valuable material		82,7%	
	Lacquer / coating	0,5%	Separable or conditionally compatible			
	Sealant	0,2%	Not mentioned			
Lid with pull-ring	Tinplate	12,6%	Valuable material		12,6%	
Wrap-around label	Printing ink	3,9%	Separable or conditionally compatible			
	Paper		Separable or conditionally compatible			
	Adhesives		Separable or conditionally compatible			
Total		100,0%			95,3%	

A2.5/2.6 (aluminium) – example 1

Aluminium-based tube			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Tube body (main body)	Outer lacquer	0,8%	Separable or conditionally compatible			
	Printing ink	0,5%	Separable or conditionally compatible			
	Aluminium	91,7%	Valuable material		91,7%	
	Inner lacquer	0,8%	Separable or conditionally compatible			
Screw cap	Plastic: PP	6,2%	Separable or conditionally compatible			
Total		100,0%			91,7%	

A2.7 (PET bottles) – example 1

PET squeeze bottle			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Bottle body (main body)	PET-A (transparent, clear)	69,4%	Valuable material		69,4%	
Closure with valve	PP	24,8%	Valuable material		24,8%	
	TPE PO with a density of < 1g/cm³	0,8%	Separable or conditionally compatible			
Labels on front and back	Printing ink	0,3%	Separable or conditionally compatible			
	PP	3,5%				
	Adhesive application (wash-off capability unknown)	1,2%	Incompatibility		No incompatibility	Individual evidence of wash-off capability was provided retrospectively by the label producer.
Total		100,0%			94,3%	

A2.8a (PET thermoforms) – example 1

MAP tray made of PET-A			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Tray (main body)	PET-A	81,7%	Valuable material		81,7%	
Absorbent pads	PE films	1,3%	Separable or conditionally compatible			
	Cellulose	3,9%	Separable or conditionally compatible			
	Superabsorbent polymer / absorbent	1,3%	Separable or conditionally compatible			
	Hot-melt adhesive application (not wash-off-able in alkaline hot wash, 80 °C)	1,7%	Incompatibility			
Top film with a density of > 1g/cm³	Lacquer	0,2%	Incompatibility			
	PET-A	1,9%				
	Printing ink (PU-based binder), partial coverage	0,1%				
	Laminating adhesive (PU-based)	0,3%				
	PET-A incl. copolyester	3,8%				
Label (back)	Printing ink	0,1%	Separable or conditionally compatible			
	Thermosensitive coating	0,1%				
	Thermal paper (BPA-free, not equipped with wet strength agent)	3,2%				
	Adhesive application (not wash-off-able in alkaline hot wash, 80 °C)	0,6%	Incompatibility			
Total		100,0%			-81,7%	Where one or more design parameters are assigned to the 'incompatibilities' category, recyclability is 0%.
					0,0%	

A2.8b (other PET packaging) – example 1

Flat PET jar with closure made of PP			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Jar (main body)	PET-A	56,5%	Valuable material		56,5%	
Insert (rigid)	PP	15,6%	Valuable material		15,6%	Categorisation in line with ancillary component 'closure/functional head'
Closure	Lacquer	0,01%	Not mentioned			
	Hot foil stamping (as metallic decoration)	0,0003%	Not mentioned			
	PP	24,0%	Valuable material		24,0%	
	Hot-melt adhesive application (PO-based)	0,4%	Not mentioned			
	PE (liner)	1,6%	Valuable material		1,6%	
Wrap-around label (density < 1 g/cm³)	Printing ink	0,1%	Separable or conditionally compatible			
	PP	1,4%				
	Adhesive application (wash-off-able in alkaline hot wash, 80 °C)	0,3%	Separable or conditionally compatible			Individual evidence of wash-off capability is available from label producer.
Total		100,0%				

Other design parameters				
Structure	Different types of plastic used on front and back sides	P2	-48,9%	NIR lab: The bottom side of the packaging is identified as PET. The top side cannot be identified as PET (cf. lab report). The position-dependant identifiability restriction results in a valuable material loss of 50% of the total valuable material share.
Decoration	Metal pigments applied on a large scale (taking up > 50% of the projected surface) (lacquering, coating or embossing)	P2		
			48,9%	

A2.10 (PE – rigid) – example 1

PE-based tube, highly filled			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Tube (main body)	Lacquer	0,6%	Separable or conditionally compatible	P5		The determined density of the filled structure is > 1 g/cm³. The resulting loss of valuable material is set out below.
	Printing ink	0,5%	Separable or conditionally compatible			
	LDPE	25,0%	Valuable material		25,0%	
	HDPE (incl. 20% titanium dioxide)	30,3%	Valuable material		30,3%	
Shoulder	HDPE	13,7%	Valuable material		13,7%	
Closure	PP	29,8%	Valuable material		29,8%	
Total		100,0%		P5	-55,3%	Deduction due to density-related valuable material losses, see above.
					43,6%	

A2.12 (PP – rigid) – example 1

PP-based MAP tray			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Thermoformed tray (main body)	PP	38,2%	Valuable material		38,2%	
	PP-based adhesion promoters	3,2%	Valuable material		3,2%	
	EVOH	2,2%	Separable or conditionally compatible			
	PP-based adhesion promoters	3,2%	Valuable material		3,2%	
	PP	38,2%	Valuable material		38,2%	
Top film	BOPP	2,6%	Valuable material		2,6%	
	Printing ink (PU-based binder), partial coverage	0,3%	Separable or conditionally compatible			
	Laminating adhesive (PU-based)	0,3%	Separable or conditionally compatible			
	PP	1,9%	Valuable material		1,9%	
	PP-based adhesion promoters	0,5%	Valuable material		0,5%	
	EVOH	0,5%	Separable or conditionally compatible			
	PP-based adhesion promoters	0,5%	Valuable material		0,5%	
	PP	1,9%	Valuable material		1,9%	
	PE-PB peel	0,6%	Not mentioned			
Label (back)	Printing ink, partial coverage	0,1%	Separable or conditionally compatible			
	Thermosensitive coating	0,2%	Separable or conditionally compatible			
	Thermal paper (BPA-free, not equipped with wet strength agent, removable by means of cold washing)	4,4%	Separable or conditionally compatible			
	Adhesives	1,1%	Separable or conditionally compatible			
Total		100,0%			90,3%	

A2.12 (PP – rigid) – example 2

Black PP detergent bottle			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Bottle body (main body)	PP incl. black colour batch (contains soot-carbon pigments)	69,9%	Valuable material	P2	69,9%	NIR lab: bottle body is not identified as PP (cf. lab report)
Cap / dosing cap	PP	26,2%	Valuable material		26,2%	
Labels on front and back	Printing ink	0,1%	Separable or conditionally compatible			
	PE	3,2%	Valuable material		3,2%	
	Adhesives	0,5%	Separable or conditionally compatible			
Total		100,0%		P2	-99,4%	Complete valuable material loss, as it cannot be identified or separated in a targeted manner using sensor-based sorting (see above)
					0,0%	

A2.13 (PP – flexible) – example 1

Sachet (OPP/OPPmet/CPP)			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Film	Matt lacquer	2,2%	Separable or conditionally compatible			
	OPP	23,9%	Valuable material		23,9%	
	Printing ink (PU-based binder)	2,6%	Separable or conditionally compatible			
	Laminating adhesive (PU-based)	1,8%	Separable or conditionally compatible			
	OPP	11,9%	Valuable material		11,9%	
	Metallisation (on the inside)	0,1%	Separable or conditionally compatible			P2 criterion not met, as metallisation is on the inside.
	Laminating adhesive (PU-based)	1,8%	Separable or conditionally compatible			
	CPP	55,7%	Valuable material		55,7%	
Total		100,0%			91,5%	

A2.15 (PS – rigid) – example 1

PS cup with OPS sleeve and aluminium lid			Comparison with Annex 2		Recyclability calculation	
Packaging components	Materials	Total share	Category as per Annex 2	Examination of design-related valuable material losses	Recyclability calculation	Comments
Cup (main body)	PS	80,0%	Valuable material		80,0%	
Sleeve	Printing ink	0,4%	Separable or conditionally compatible			
	OPS	11,6%	Valuable material		11,6%	
Lid	Top lacquer	0,2%	Separable or conditionally compatible			
	Printing ink	0,3%	Separable or conditionally compatible			
	Primer	0,1%	Not mentioned			
	Aluminium	7,1%	Valuable material		7,1%	Inclusion as a valuable material subject to individual evidence pursuant to Annex 3.3
	Heat-sealing lacquer	0,3%	Separable or conditionally compatible			
Total		100,0%			91,6%	Result excl. aluminium share in lid as valuable material
					98,7%	Result incl. aluminium share in lid as valuable material