ISCC PLUS 203 – 2
CHAIN OF CUSTODY

Version 1.1

ISCC
International Sustainability & Carbon Certification
PLUS

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Content

1. Introduction

Evidence of compliance with ISCC PLUS

Every element of a supply chain for certified materials must provide evidence of compliance with ISCC PLUS requirements. This is obtained through the certification of every supply chain element. To ensure that all the relevant product properties and related sustainability characteristics are forwarded through the supply chain to the market, adequate traceability and chain of custody measures are required.

Traceability

According to the International Organization for Standardization (ISO) the term 'traceability' describes the ability to identify and trace the origin, processing history, distribution and location of products and materials through supply chains.[1] Traceability includes the requirement to be able to physically trace products and materials through supply chains but also to be able to tell what products are made of and how they have been processed.

Chain of custody

'Chain of custody' is a general term for the process of transferring, monitoring and controlling inputs and outputs and related specific information as they move through the supply chain. This provides credibility that a given batch of material or product is associated with a set of specific characteristics (sustainability characteristics) and that the information on the specific characteristics linked to the material or product is transferred, monitored and controlled throughout the supply chain. Different chain of custody methods are available for the handling of certified materials along the supply chain and are introduced in the following chapters of this document.

Assignment of sustainability characteristics

The combination of both the traceability and chain of custody requirements ensure that the physical flow of materials can be traced back and forth throughout the supply chain, which ensures credible and justified claims about the certified products. The transfer of sustainability characteristics along the supply chain must always be accompanied by a physical transfer of material. This also ensures that sustainability characteristics can be assigned to individual physical consignments of material, and that the quantity of certified materials and products withdrawn at any stage of the supply chain does not exceed the quantity of certified material introduced to the supply chain. The term consignment, or 'batch', describes a specific amount of material with the same sustainability characteristics. In the following the term 'batch' will be uniformly used.

Overview of the content

Chapter 2 defines the scope and normative references of this document.

Chapter 3 describes the requirements for the chain of custody methods that are eligible under this standard. The requirements cover the physical handling of materials and the respective quantity-bookkeeping.

[1] *ISO 22095:2020*

Specific requirements of each chain of custody method are covered under Chapter 4 (Physical Segregation), Chapter 5 (Controlled Blending) and Chapter 6 (Mass Balance).

Chapter 7 describes how biogenic content of the certified product can be proven via ^{14}C Isotope Measurement.

2. Scope and Normative References

Relevant for entire supply chain

The requirements described in this document apply to all elements of the supply chain of certified materials that must be covered by certification (refer to System Document *ISCC PLUS 203-1 – Traceability*).

The requirements have been developed in alignment with Renewable Energy Directive EU/2018/2001 (here referred to as RED III), ISO 22095:2020, and ISO/DIS 13662:2025, where applicable, to ensure consistency with recognised international standards and regulatory framework.

These requirements must be taken into account by all participants of the certification system, i.e. certification bodies (CB) and auditors, as well as System Users and other economic operators covered by ISCC certification.

3. Requirements for Chain of Custody

Chain of custody

'Chain of custody' is a process, by which inputs and outputs and associated information are transferred, monitored and controlled as they move through each step in the relevant supply chain (ISO 22095:2020).

Input is a raw material or product that enters the system boundary of a system user at any stage of the supply chain, including both certified and non-certified materials used in the production process. Output is an intermediate or final product[2] that leaves the system boundary of a system user, generated at any stage of the supply chain, including all certified and non-certified products resulting from the production process. The link of sustainability characteristics and the physical material depends on the chain of custody method applied.

3.1. Chain of Custody Methods

This chapter provides a detailed description of the different methods of chain of custody[3] that can be applied according to the ISCC PLUS standard: Physical Segregation, Controlled blending and Mass balance.

Physical Segregation

Physical Segregation is the chain of custody method, under which materials with different sustainability characteristics are kept physically separated from each other on their journey through the supply chain. The physical mix of certified and non-certified material is not allowed during any stage (processing,

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[2] In case of First Gathering Point, Collecting Point, Trader and Trader with Storage scopes, the output can also be raw material.

[3] Please also refer to ISO 22095 for further information on Chain of Custody methods. From ISCC perspective the approaches are in general aligned with the standard. ISCC Standard requirements prevail for ISCC audits.

storage and transport). There are two types of Physical Segregation, which are described in detail later in this chapter (see Chapter 4.1 and Chapter 4.2).

Controlled Blending

Controlled blending refers to a planned blending regime between materials with different specific characteristics resulting in constant, known and verifiable content of sustainability characteristics in the final product.

Mass Balance

Mass balance allows certified materials, with varying sustainability characteristics, to be physically mixed with non-certified materials. The characteristics and quantities of each batch must remain traceable within the mixture. The quantity of certified product with attributed sustainability characteristics (leaving the supply chain at any point) must not exceed the certified input amounts entering that point.

3.2. General Requirements for Chain of Custody Methods

Separate bookkeeping based on sustainability characteristics

The system user must keep site-specific quantity bookkeeping separately for all materials with different sets of sustainability characteristics, even if the chosen chain of custody method allows for the physical mixing of material. The sustainability characteristics that must be distinguished in the quantity-bookkeeping are described in the relevant chapters of the chain of custody method.

If materials are processed (or losses of material occur due to internal company processes), the appropriate conversion factor or consumption factor shall be calculated and applied to determine the amount of certified output correctly.

Deviations between physical and documented stock

Deviations between the amount of material physically in stock and the material documented in the quantity bookkeeping may occur. This can be the case, for example, if the amount of certified material as stated on a sustainability declaration is higher or smaller than the amount shown on the weighbridge for the actual received material. If during an audit a deviation of up to 0.5% is detected between the material physically in stock and the material in stock according to the quantity bookkeeping this can be accepted without further explanation. Any deviations larger than 0.5% have to be documented appropriately and verified during the audit. For the quantity bookkeeping the actual quantities should be used e.g. quantities that can be proven by weighbridge protocols or other such means. In case of incorrect information on incoming sustainability declarations the issuing party must be contacted (refer to System Document *ISCC PLUS 203-1 – Traceability).*

No multiple accounting allowed

The sustainability characteristics of a specific amount of certified material can be used only once and for one application only (also includes any statements such as ‘sustainable’ or ‘certified’ that are related to the specific amount). “Multiple accounting” (application of the sustainability characteristics more than once) is not allowed under ISCC[4]. Multiple accounting is a serious

[4] *The multiple accounting of individual sustainability characteristics is also prohibited.*

violation of ISCC requirements. The risk for multiple accounting increases if a company is simultaneously certified under more than one certification scheme.

Awareness of multiple accounting risk

To minimise the risk of multiple accounting an eligible and high-level member of staff of the economic operator issuing the sustainability declarations has to sign a statement/declaration confirming the awareness that multiple accounting is not allowed.

Verification of documents for all schemes

To ensure that no multiple accounting takes place, the auditor must verify during the audit whether a company is certified under more than one certification scheme, by verifying audit reports, site-specific quantity-bookkeeping and other documentation of the schemes used. The economic operators must declare the names of all schemes they participate in and must provide the auditor with all relevant information and documentation on the schemes used (refer to System Document *ISCC PLUS 201 – System Basics).*

Information system

Each economic operator must operate an information system, which is able to keep track of the amounts of certified material sourced and sold. This could include, inter alia, a digital database, documentation with unique reference numbers for batches or similar.

The quantity-bookkeeping and physical mixture of sustainable material is limited to certain periodical and spatial boundaries:

Periodical boundary

Periodical boundary: The timeframe, in which the input materials and products with specific sustainability characteristics must be balanced. The timeframe (period) is maximum three months for all other economic operators. Only for producers of agricultural biomass or forest biomass and First Gathering Points sourcing agricultural or forest biomass, the timeframe is maximum twelve months.

Spatial boundary

Spatial boundary: The location (spatial entity) for which the chain of custody requirements must be applied. This means that they must refer to one geographical location with precise boundaries (site of operation). Chain of custody methods under ISCC PLUS are applied site-specifically.

Scope-specific quantity bookkeeping

If an economic operator is certified under multiple scopes, the quantity-bookkeeping must be specific to the certified scopes. This means the economic operator must be able to demonstrate which transactions have been made under each scope by indicating the input and output of each scope separately.

Transfer of sustainability characteristics

The transfer of sustainability characteristics from one system user to the other must always be accompanied by a physical transfer of material. The transfer of sustainability characteristics from certified material to fossil material is not possible, even if they have the same chemical composition[5]. The same applies

[5] *Such transfer can only be possible under the Mass Balance – Credit Method (in accordance to the Mass Balance guardrails).*

for certified materials having different physical phases or states, as these states are determined by different energy levels.

3.3. Consideration of Losses

Losses

Losses refer to unrecoverable materials that are rendered unusable during a process (e.g., thermal degradation, evaporation) or physically discarded (e.g., production waste). During a process, any material that does not end up in a product or a co-product must be considered a loss. The losses must always be quantified and documented. In the quantity-bookkeeping, the losses must be subtracted from the sustainability characteristics that are transferred to the product.

Losses for all type of materials

Whenever materials, certified or non-certified, are processed, losses will occur naturally. When considering the losses, it is not possible to reflect the losses for only certified or non-certified material. Losses will instead always refer to all type of inputs based on the actual production setup and operational data.

Losses are accounted through conversion factor or consumption factor. Under ISCC PLUS, the system users must choose one method (either conversion factor or consumption factor) for calculating the losses for the certification period. Once the method for calculating the losses is chosen, it is not allowed to change it within the certification period.

Operational data and site-specific

The determination of the conversion factor and consumption factor must be conducted based on the operational data of the processing unit, hence it is not allowed to determine the conversion factors based on theoretical data. The determination of conversion factors and consumption factors must always be site-specific.

Individual conversion or consumption factors

Each plant (e.g. Converter, Compounding, Polymerization plant), regardless of if they are combined under one certificate at one site or not, must have their own conversion or consumption factor. If they are located within one site (under one certificate), they must be clearly separated from each other for individual conversion or consumption factors. When products of each step are sold individually, the conversion (consumption factor) of the specific process (products) must be applied.

Global conversion or consumption factor

On the other hand, if the processes are sequenced for a specific production of product(s) where the intermediate products of the individual processes cannot be or are not sold separately, then a global conversion (consumption factor) can be applied for the site, which takes into account all the process steps.

3.3.1. Conversion Factors

Conversion factors

Conversion factor (CF) is the first option, for system users to account for their losses from processing of certified materials. Conversion factors are applied to determine the amount of a specific product with certain sustainability characteristics, based on the amount of specific input material with certain sustainability characteristics.

Conversion factors must be provided for all the elements in the supply chain, where changes in quantities occur and must be applied, when there is change in quantity of certified material due to processing, irrespective of the chosen chain of custody method. Conversion factors must be clearly documented and must be verified during the audit.

Product group

Conversion factors do not need to be calculated for each single product. 'Product groups'[6] can be defined to determine 'simplified conversion factors' for all products from this group. The conversion factor for the whole group of products can be determined based on the "weighted" average. Precondition for simplified conversion factors is a transparent description of the defined product groups. Also, there must be a clear link to respective data in the documentation system, which must be provided during the third-party audit.

Conversion factors can be applied for all chain of custody methods and MB options, except for Trace-the-Atom mass balance approach.

The conversion factor of a specific process for a certain period is calculated as follows:

$$CF(\%) = \frac{Ao}{A_i} \times 100$$

CF: Conversion Factor
A_o: Amount of the total produced output material
A_i: Amount of the total processed input material

For operations that do not result in a change of quantity of the material, such as the storage of materials, the conversion factor (CF) can be assumed to be 1 (CF=1).

Furthermore, it should be noted that it is not possible to calculate a conversion factor that is greater than one.

3.3.2. Consumption Factors

Consumption Factor

The Consumption Factor (ConsF) represents the amount of a specific (certified) input that has been consumed in order to produce the desired amounts of an output. It is possible to determine the consumption factor based on each input and translate this to each output individually. Hence, the consumption factor might be more accurate in terms of certified shares especially in the case of multistep reactions in comparison with the conversion factor which is applied for the whole process.

In the case of chemical reactions, the application of consumption factors requires detailed knowledge on the reaction pathways. Bills of material and/ or process orders can be used for the consumption factor calculation. They

[6] *The product groups refer to the same material entries in the ISCC PLUS List of Eligible Materials.*

must be updated and adjusted based on actual consumption data on a regular basis (e.g. annually).

The consumption factor can be applied for any process, where direct connection between individual inputs or parts of inputs to the outputs is available. Therefore, the consumption factor can be applied for all chain of custody methods and MB options. However, it is mandatory to use consumption factor for the cases below, as consumption factor reflects the input specific losses:

- Trace-the-Atom Approach (see Chapter 6.4.2)
- Consideration of Hetero Atoms (see Chapter 6.4.4)
- Post-industrial or atmospheric CO_2 reacting with certified inputs (see Chapter 6.4.5)

The consumption factor of a specific product for a certain period is calculated as follows:

$$ConsF_i = \frac{A_i}{A_o}$$

ConsF: *Consumption Factor*
A_i: *Amount of the processed certified input material*
A_o: *Amount of produced output material with contribution of input i*

4. Physical Segregation

Physical Segregation is the chain of custody method, under which certified and non-certified materials are kept physically separated always.

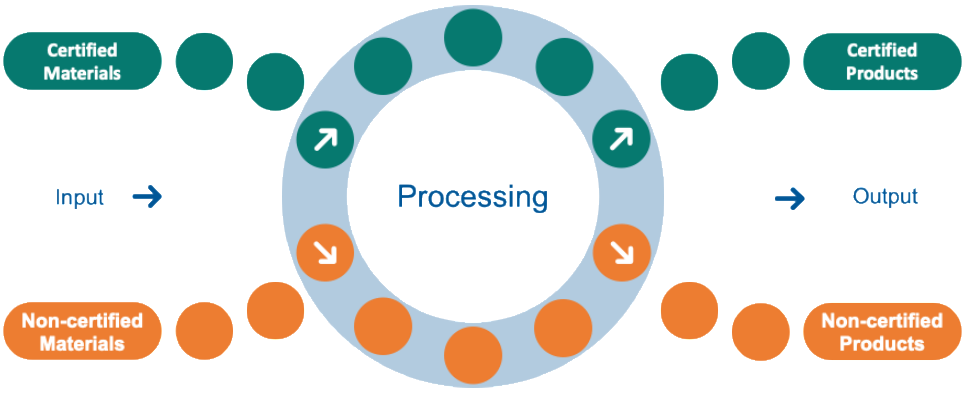


Figure 1: Physical Segregation Chain of Custody model under ISCC PLUS

Hard IP and Soft IP

Two levels of Physical Segregation can be applied:

- **Hard Identity Preservation (IP)[7]:** The physical mix of certified and non-certified material is not allowed. Furthermore, certified materials with different sustainability characteristics must be kept physically separate throughout the supply chain.
- **Soft Identity Preservation (IP)[8]:** The physical mix of non-certified and certified material is not allowed. However, the physical mix of certified materials with identical sustainability characteristics but different origins, is allowed throughout the supply chain.

Under Physical Segregation, it must be possible to identify batches of material throughout the entire production and distribution process.

Physical Segregation can be achieved by:

1 Setting up parallel processes for production, storage and transport.

2 Setting up sequential (periodical) processes at the site of production, storage or transport.

Under both Hard IP and Soft IP Physical Segregation models, the conversion and consumption factors can be applied for the calculation of losses and amount of certified product(s).

4.1. Hard Identity Preserved

Physical segregation of all batches

Under Hard IP, each certified batch of material can be physically identified throughout the entire production, transportation and trading processes, and distribution process. The complete physical separation of the material from non-certified materials and certified materials with different sustainability characteristics, must be ensured.

Identity Preserved

Since the mixing of certified material with different characteristics is not allowed, the identity of the material between the quantity-bookkeeping and the physical product is preserved under Hard IP. The Hard IP option can only be applied, if the input material was also physically segregated under Hard IP throughout the whole upstream supply chain.

The quantity bookkeeping of the batches is always identical to the physical status (see also Figure 2), i.e. batches 123, 124 and 125 are segregated physically and in the bookkeeping.

Hard IP can be applied if batches 123 and 124 differ in terms of at least one of the sustainability characteristics.

[7] *Identity Preserved model according to ISO 22095:2020*
[8] *Segregated model according to ISO 22095:2020*

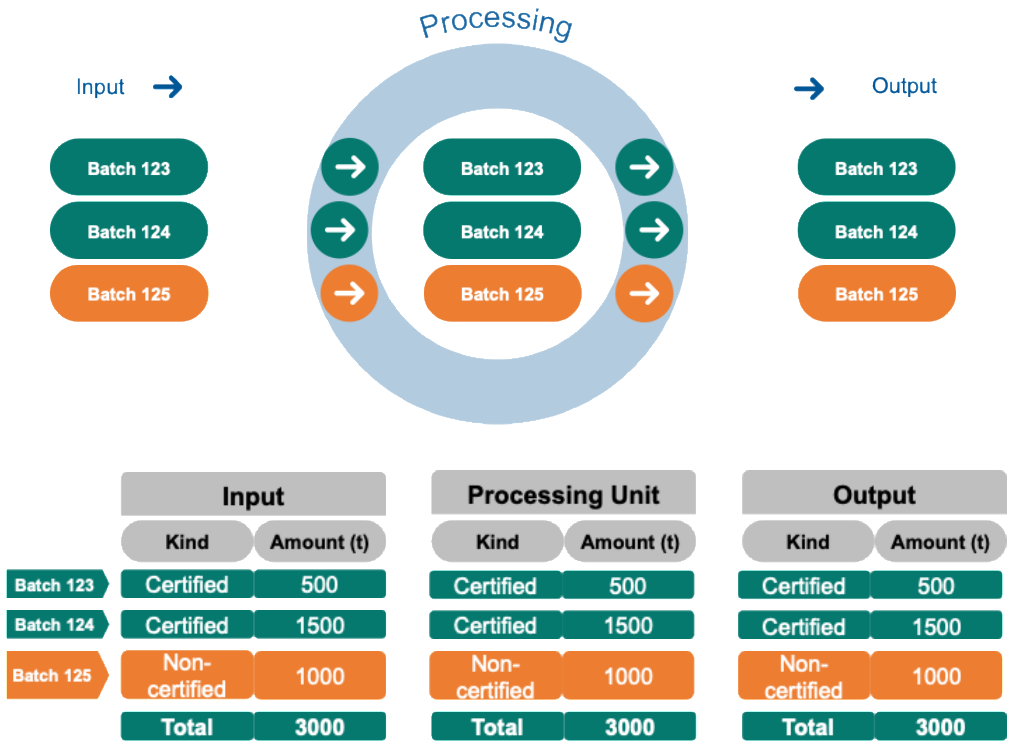


Figure 2: Physical Segregation of all Batches (CF=1)

Figure 3 illustrates that the sustainability characteristics of the incoming batches are the same apart from the country of origin of the raw material. For incoming batch 123 the country of origin is Canada while for batch 124 the country of origin of the raw material is the USA. This means that batch 123 and 124 can neither be merged physically, nor in the bookkeeping. The different countries of origin are stated on both the incoming and outgoing sustainability declarations. Therefore, the sustainability characteristics as stated in the bookkeeping match with the characteristics of the physical batches.

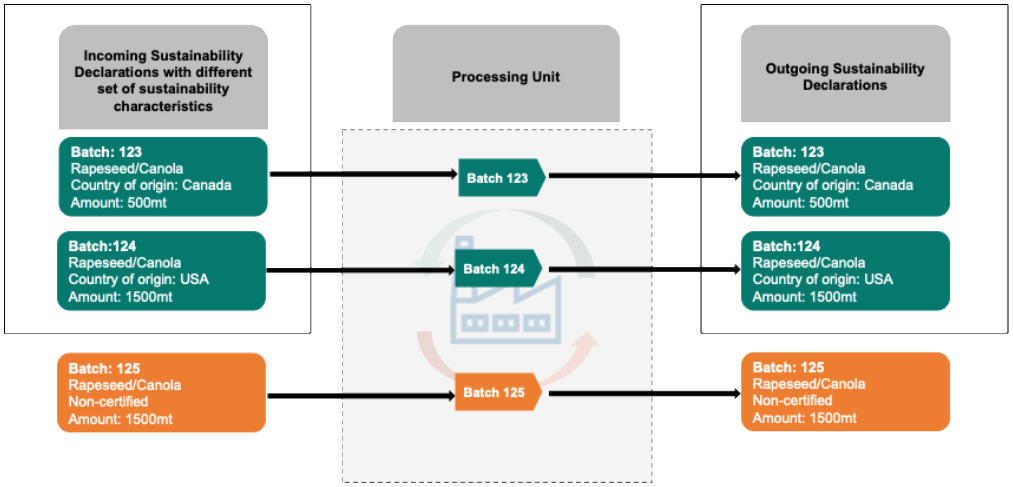


Figure 3: Assigning Sustainability Characteristics to outgoing Batches via sustainability declarations (CF =1)

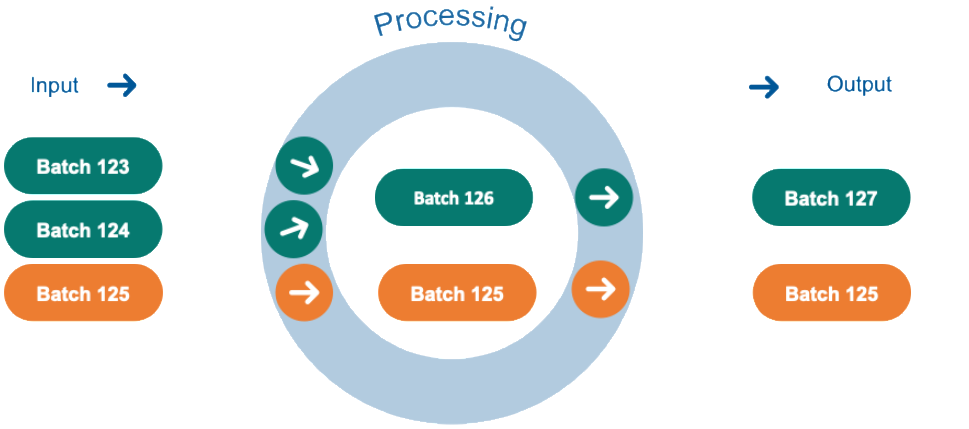
At no point in time can more material with specific sustainability characteristics be withdrawn than the equivalent material that has been added (e.g. the outgoing batch 123 shall not exceed 500 tons). The outgoing batches can be split into sub-batches with different quantities, as long as the sum of all sub-batches does not exceed the total quantity (e.g. outgoing batch 123 could be split into three sub-batches of 100, 150 and 250 tons with the same sustainability characteristics).

4.2. Soft Identity Preserved

Mixing materials with different origins

The Soft IP model allows batches of certified material to be physically mixed, if sustainability characteristics are identical but origins are different (see Figure 4). It also requires the physical separation of the certified material and non-certified material. The Soft IP option can only be applied, if the input material was also treated as Soft IP or Hard IP throughout the whole upstream supply chain.

In the quantity-bookkeeping, batches of certified materials with different sustainability characteristics must be kept separated. Only batches with identical sustainability characteristics with different origins can be merged in the bookkeeping.



Input			Processing Unit			Output		
Batch	Kind	Amount (t)	Batch	Kind	Amount (t)	Batch	Kind	Amount (t)
123	Certified	500	126	Certified	2000	127	Certified	2000
124	Certified	1500						
125	Non-certified	1000	125	Non-certified	1000	125	Non-certified	1000
Total	-	3000	Total	-	3000	Total	-	3000

Figure 4: Physical Segregation of Certified and Non-Certified Batches (CF=1)

If batches 123 and 124 have identical sustainability characteristics but different countries of origin of the raw material, the sustainability declarations of the outgoing batches 127 and 128 must contain the same sustainability characteristics as the incoming sustainability characteristics of batches 123

and 124. They cannot exceed the quantity of 500 tons or 1500, respectively tons (see Figure 5)

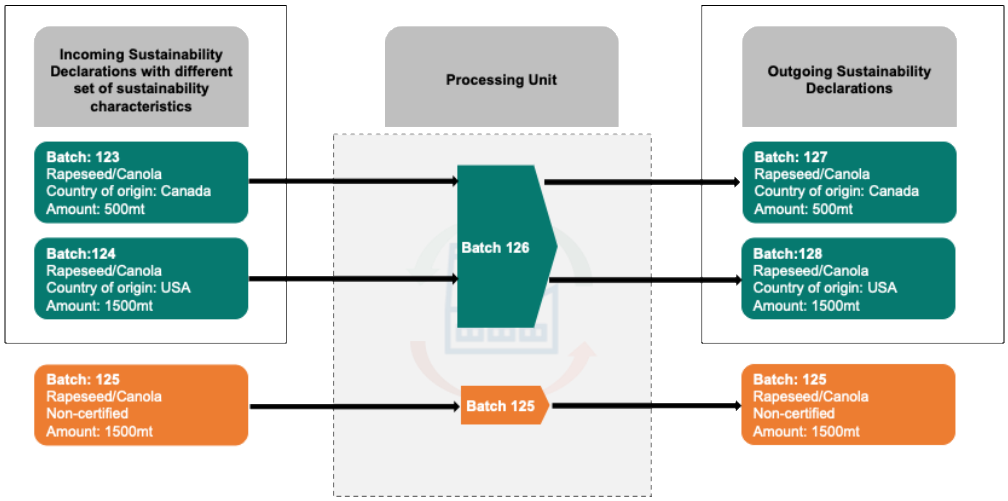


Figure 5: Assigning Sustainability Characteristics to Outgoing Batches via sustainability declarations (CF=1)

If a physical mixture of certified material is split up, the sustainability characteristics from the bookkeeping can be assigned to any physical batch of certified material. Batches of output material can be split up into sub-batches, as long as the total quantity of the sub-batches with the respective sustainability characteristics does not exceed the total quantity of the certified material.

At no point in time can more material with specific sustainable characteristics be withdrawn than the equivalent material has been introduced to the system (e.g. the outgoing batch 127 in Figure 5 shall not exceed 500 tons).

5. Controlled Blending

Controlled Blending

Controlled Blending is the second chain of custody option available under ISCC PLUS. This model allows for the mixing of certified materials and non-certified materials in fixed, known proportions, ensuring that the resulting product has a constant and verifiable certified content.

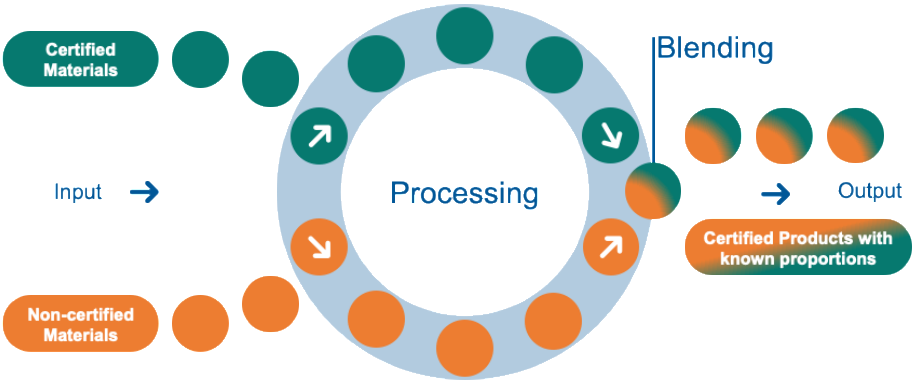


Figure 6: Controlled Blending Chain of Custody model under ISCC PLUS

This Chain of Custody method is common for blending processes, where certified and non-certified materials are physically mixed without change in their chemical structure.

Controlled Blending with chemical reaction

In addition, controlled blending can be applied equally in chemical or biological reactions, provided that the feedstocks are introduced in constant, known, and verifiable proportions, ensuring a consistent and traceable certified content in the resulting product. Accurate accounting requires a clear understanding of the reaction mechanism and documented process data, including material losses calculated either with conversion or consumption factor. This ensures that the amount and content of the certified material can always be determined.

There are three possibilities for controlled blending to be considered correctly applied:

- For single-input, single-output scenarios[9], the product retains the same certified proportion as the input.
- For a process, where a certified input reacts with a non-certified one, and the certified proportion in the output remains known and verifiable.
- For a process, where the inputs have already been blended, consisting of both certified and non-certified materials, the certified share of the output is calculated according to the ratio of certified to non-certified content in the input, with any input losses reflected to both certified and non-certified portions.

If the input material already consists of a mixture of certified and non-certified components whose ratio cannot be clearly established, the process can no longer be considered Controlled Blending.

Ratio must be known always

Key feature of Controlled Blending is that the ratio between certified and non-certified inputs must be known at all times, to determine the percentage of the

[9] *One type of input (both certified and non-certified) processed for one type of product*

certified content in the product and to ensure the chain of custody requirements are fulfilled.

Clear documentation of the certified percentage of each output must be ensured. The percentage of controlled blended output shall be achieved by monitoring and documentation:

- The quantity of physical inputs and outputs must be recorded at all times.
- If the input material is received under the Chain of Custody method Controlled Blending, percentage of certified material in the input must be known before processing.
- The certified share of the product cannot exceed the proportion of certified share of the input material received.
- The certified percentage of the blended material must be documented and physically tracked throughout production, transport, and storage.

The Controlled Blending chain of custody method can only be applied, if the certified input material was also handled under the chain of custody method of Controlled Blending or Physical Segregation, throughout the whole upstream supply chain.

To ensure compliance with the chain of custody requirement of Controlled Blending, after the blending procedure, certified material (controlled blended) and non-certified materials must be physically segregated during storage and transport (and also processing, if processed further). Blended material must be clearly identifiable throughout the entire downstream supply chain. Lastly, volume reconciliation should be conducted regularly to verify that all outputs align with the input ratio over a defined period, such as per batch, shipment, or storage cycle.

As the certified material content is known and can be proved, content-based claims can be used with this CoC. This is also possible with Physical segregation, but not with Mass Balance.

Under Controlled Blending, both conversion factor and consumption factor can be applied to account for the losses.

6. Mass Balance

Mass Balance

Mass Balance is the third chain of custody method. Under the mass balance approach, the certified and non-certified materials can be physically mixed but shall be kept segregated on a bookkeeping basis.

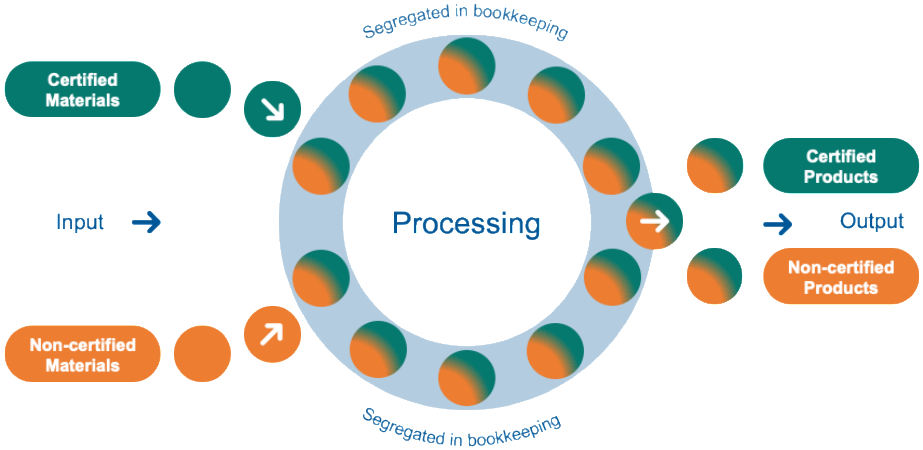


Figure 7: Mass Balance Chain of Custody model under ISCC PLUS

Transfer of sustainability characteristics

When certified and non-certified material are processed together, then it is possible to attribute the sustainability characteristics (equivalent to the amount of the certified input) to the output, considering the losses and the mass balance attribution guardrails. Similarly, when both certified and non-certified materials of the same type are stored together within the same physical compartment (i.e. within a single tank or pipeline), the amount equivalent to the certified input material withdrawn from this compartment can be considered as certified.

Mass Balance Methods

There are two different methods for the implementation of the mass balance model[10]:

- **Rolling average percentage method:** This method is applicable, when the proportion of used input(s) with specific sustainability characteristics fluctuates over a defined time period (averaging period) and allows an average percentage claim to the output produced.
- **Credit method:** In this method, the certified input(s) is attributed to dedicated output volumes, which leads to output volumes with and without attributed certified content in a given period (mass balance period). Under this method, recorded output amount of each type shall be equivalent to the physical input, taking into account the losses[11]. The credit amounts for each type of input used and output attributed must be kept correctly for every period. More information on Credit Method can be found in Chapter 6.5.

The mass balance claims shall clearly communicate when the sustainable characteristics are attributed by either the rolling average percentage method or the credit method.

[10] *ISO 22095:2020*
[11] *ISO/DIS 13662:2025*

6.1. Terms & Definitions

Mass balance accounting or mass balance bookkeeping is the term that refers to quantity-bookkeeping records specific to the materials that will be part of the mass balance (chain of custody method) in that site/scope. It signifies the inventory of certified input materials and output material, available credits and reallocation of credits between batches within the established guardrails. The physical materials in relation to sustainability characteristics must be kept correctly.

Mass balancing or mass balance calculation: on the other hand, is the term used as a general name for attribution or determination of certified share. This term includes the calculation for attribution of sustainability characteristics from input to output or calculation for the determination of percentage and amount of product originating from certified input. The calculations must account for the losses via conversion factor or consumption factor (see Chapter 3.3).

Attribution refers to the process of assigning sustainability characteristics (credits) from certified input materials to specific output products. Based on the attribution approach, the share can be either in proportion or limited to the certified amount of the inputs and must be applied within the rules and boundaries defined by the mass balance system.

Certified share: Refers to the percentage/share of the atoms/molecules in a chosen output originating from the certified input(s) or the percentage/share of the attributed credits to the total amount of material. Under the Trace-the-Atom approach, the certified share is calculated based on the chemical reaction and respective amount of atoms originating from the sustainable input and present in the output(s).

Certified amount: The amount of material that the sustainability characteristics is actually attributed to. Certified amount refers to the exact amount attributed to an output (or determined amount) and can be less than the total amount of the output produced. For the different attribution approaches, it depends on the attributed amount within the guardrails. On the other hand, for the determination (Trace-the-Atom) approach, it can be calculated by multiplying the certified share (based on the chemical reaction) and the amount of output that is produced with certified input(s).

Chemical connectivity refers to the connection between the input and output during processing. It depends on the interaction between different input materials as they move through various stages of the process. This involves the understanding of production process, reaction mechanism and how these inputs are reacting with each other to produce the end-product(s).

It must be ensured that both below-mentioned characteristics are met to ensure chemical connectivity:

- **Chemical link:** The theoretical possibility of chemically converting the certified input(s) to the output(s).
- **Process feasibility:** Availability of technical infrastructure to produce the output or part(s) of output by processing the certified input materials.[12]

If chemical connectivity is ensured, it means that process outputs (products) can contain molecules or atoms of the certified input, after its processing (or chemical reaction).

6.2. General Requirements for Mass Balance

Mass Balance

Under mass balance, the physical mixing of material with different sustainability characteristics and the mixing of certified and non-certified material is allowed, while ensuring that the sustainability characteristics remain assigned to physical batches of material on a bookkeeping basis.

Loss of individual properties

Due to the physical mixing, the mixture loses its individual properties. The sustainability characteristics of materials can therefore only be determined via the bookkeeping. This requires the mass balance accounting and the verification of the mass balance accounting with respect to the chosen period for balancing.

The mass balance must contain information concerning all the sustainability characteristics and the sizes of the batches with the different sustainability characteristics that are mixed. The information must remain assigned to the mixture. The sum of all batches that are withdrawn from the mixture must have the same sustainability characteristics in the same quantities as the sum of all the batches that were added to the mixture. This balance must be achieved over an appropriate period of time.

Site-specific mass balance

Both the mass balance bookkeeping and mass balance calculation must be site-specific, i.e. they shall at least be operated at the level of a geographical location with precise boundaries within which the materials can be mixed. “Sites” refer to locations/addresses of individual legal entities.

A separate mass balance bookkeeping and mass balance calculation shall be set up for every production site, even if they are under the same legal entity. Also, for the external storage facilities used or storage facilities certified as part of a logistics network, a separate mass balance bookkeeping is mandatory. In these cases, separate mass balance bookkeeping for each storage site must be kept. If more than one legal entity is operating at one site, each legal entity is required to operate its own mass balance bookkeeping and mass balance calculation.

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[12] This requirement is beyond theoretical possibility. The infrastructure/machinery to produce the output (at least partially) from the certified input must be in place, operational and must have been used within the last two mass balance period to produce the output.

Scope-specific mass balance

If an economic operator is certified under multiple scopes, the mass balance accounting and mass balance calculation must be specific to the certified scopes.

The amounts processed in different processing steps should be covered in separate mass balances unless it is ensured that the entire input is processed into the same output. A certified processing unit must be able to demonstrate the types and amounts of material that are physically processed in the certified unit. Exact descriptions of incoming and outgoing materials per certified scope are essential. If a processing unit buys and sells certified material but does not physically process the material, this transaction must be covered under the certification scope Trader. For each mass balance the complete documentation must be available for verification during the audit.

Material-specific mass balance

Mass balances must be kept material-specific indicating the respective raw material.

Physical link required

Certified material can only be included in a mass balance bookkeeping/calculation, if it is physically received at the site of the economic operator covered by certification. It is not possible to add certified material to a mass balance bookkeeping without the physical intake of the material at the site for which the mass balance is kept unless there is a multi-site credit transfer applied (see Chapter 6.5).

Sustainability characteristics

The same sustainability characteristics as provided on sustainability declarations must be distinguished in the bookkeeping. Within the mass balance bookkeeping, batches of input material can be merged if they have the same sustainability characteristics and are handled under the same chain of custody option. It is not possible to merge batches of input materials freely within the bookkeeping system, if they have different sustainability characteristics, or if they have none at all, or if they are handled under different chain of custody options.

Downgrading

It is possible to merge specific batches of certified input materials in the mass balance bookkeeping, if certain sustainability characteristics are downgraded. However, this is only possible if all other sustainability characteristics except for the one being downgraded, are identical. The term “downgrading” refers to the transition of certified materials from higher to lower sustainability characteristics.

When it comes to downgrading between different chain of custody methods, it is only possible to downgrade from a chain of custody method that has stricter requirements to a chain of custody method that has comparatively less stricter requirements (e.g., from Soft Identity preserved to Mass balance), and not the other way around.[13]

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[13] *Order of strictness for the chain of custody methods under ISCC (most strict to less strict) – 1) Hard IP 2) Soft IP 3) Controlled blending 4) Mass Balance Rolling average percentage method 5) Mass balance Credit method*

Grading of chain of custody

The strictest chain of custody method under ISCC PLUS would be Physical segregation followed by Controlled Blending and then Mass balance. Under the chain of custody method of Mass balance, it should be noted that the Rolling average percentage method is subject to stricter requirements than the Credit method.

Under mass balance, it is possible to downgrade when:

1 System users want to have a higher quantity of certified material with a similar set of sustainability characteristics.

2 The complete information about the sustainability characteristics is not available for a batch of certified materials.

Waste Status

If certified material is received with a sustainability declaration that states "Pre-consumer" waste material and is physically mixed with a certified material of "Mixed/Unspecified" status, the resulting batch can be downgraded to "Mixed/Unspecified", instead of having split up batches with two different waste status.

To / From	Pre-consumer	Post-consumer	Mixed/Unspecified
Pre-consumer	X	No	Yes
Post-consumer	No	X	Yes
Mixed/Unspecified	No	No	X

Table 1: Downgrading for Waste-Status (X – represents the same category – downgrading is not possible, Yes – represents downgrading is possible, No – represents downgrading is not possible.)

In another instance, if an ISCC PLUS certified system user receives bio-circular feedstocks (UCO, agricultural, forestry, and industrial residues etc.) or products from an ISCC EU certified system user, the waste status may not be clear, hence the material cannot be assigned as "pre-consumer" or "post-consumer" waste. As a result, it must be classified as "mixed" or "unspecified" in accordance with the ISCC PLUS requirements.

Certified materials with Add-ons (e.g. FSS Add-on) can be downgraded to less or no Add-ons applied.

Multi-site credit transfer

With respect to the 'multi-site credit transfer option' i.e., applicable under the Credit Method (see Chapter 6.5), a System User only can downgrade from certified materials that have not undergone 'multi-site credit transfer' to materials that have applied the 'multi-site credit transfer'.

"Raw material" and "country of origin" are optional information in the sustainability declaration. If the system user receives this information, they can keep this information to ensure a higher level of sustainability characteristics for the outgoing products. However, it is possible for the system user to also

downgrade the material by removing both “raw material” and “country of origin” from the outgoing batches. It is not possible afterwards to retrieve this information in the downstream.

6.3. Mass Balancing Guardrails

The following guardrails/rules must be applied for the correct application of the mass balancing options:

1 **Chemical connectivity:** Chemical Connectivity must be ensured for the system user to attribute the sustainability characteristics from the certified input to the outputs (see Chapter 6.2)

2 **Physical Output:** The amount of attributable credits cannot be higher than the physical output (certified and non-certified) in a mass balance period. It is not possible to attribute to a quantity of output, which is not produced at the site within a mass balance period.

3 **Operational Data:** Within the traceability system all data related to inputs, outputs, losses, production and attribution shall be collected and documented. All data used shall be valid for the relevant evaluation period. Each certified output material/product with specified characteristics must be calculated defined conversion or consumption factor, reflecting relevant inputs with specified characteristics. The conversion factor/consumption factor must be determined based on operational data.

4 **Site specific:** It must be ensured that the mass balance is done site specific. Under ISCC PLUS, both the mass balance accounting and mass balance calculations (the attribution/determination) must be done on a site level. Company level mass balance is not possible.

Transparency

Although it is not a limitation on the mass balance approach, ISCC PLUS has the requirement when it comes to the transparent communication about the use of mass balance approach. It is crucial that the system users are communicating the use of mass balance with their downstream supply chain. This transparent communication within the supply chain includes amongst others, the transfer of information on the used mass balancing option, application of multi-site credit transfer, etc. The transparent communication is made via sustainability declarations, which is also critical for the end product communications and claims (for further details, refer to Guidance Document *ISCC 208 – Logos & Claims*).

6.4. Rolling Average Percentage Method

Rolling Average Percentage Method is a relatively stricter mass balance method as it is ensured that the certified input materials are physically used for the production of attributed outputs.

Averaging period

Under the Rolling Average Percentage Method, system user shall define a time period, under which they would make an average claim regarding the

certified share of the product. This time period is referred as 'averaging period'. An averaging period can be a maximum of 3 months, and it cannot be shorter than 1 day. As a minimum requirement for averaging, the minimum averaging period cannot be shorter than the amount of time required to produce minimum two batch (unit) of products.

Averaging periods can be defined by the companies based on their production cycles within the limitations above. Once set, the duration of the averaging period cannot be changed for at least 6 months.

It is not possible to attribute the sustainability characteristics to any of the batches produced out of the averaging period. System users can only keep the attributed products in their bookkeeping, if the physical batches from the averaging period is still in their inventory.

Material usage/processing within the averaging period

Moreover, to ensure that the rolling average percentage period is properly initiated, the received material must be used (processed) within the defined averaging period. Introducing the material into the system, such as storing it in stock or inventory, is not sufficient to attribute the sustainability characteristics to the output.

For each averaging period, the following documentation on the mass balance accounting must be available and will be verified during the audit:

- Start and end date of averaging period
- Inventory of input and output at the beginning of the averaging period
- Amount and description of incoming and outgoing material during the averaging period
- Amount of certified product that can be transferred to the next period (if available) (physical batches must be in the inventory)
- Amount of certified input material from the previous period (if available) (physical batches must be in the inventory)
- Conversion factor/consumption factor (if applicable)
- Under this method, the system users shall calculate and disclose the average claim either by:
- The weighted average mass of inputs and/or outputs belonging to a specific material category. or;
- The weighted average percentage of a material or product with a specific characteristic, calculated by dividing its mass to the total input or output mass.

Both the conversion factor or consumption factor (as described in Chapter 3.3) can be used to account for the losses and shall be considered when

calculating the rolling average percentage for the amount of certified product(s).

6.5. Credit Method

Under the ISCC PLUS Credit Mass Balance Method, credit refers to a quantified unit, representing the sustainability characteristics derived from certified input material.

Attributable credits are the sustainability characteristics that are derived from the certified input and are calculated and assigned accordingly to the output, based on the mass balance attribution guardrails. The amount of attributable credits refers to the quantity of the credits that can be attributed to a particular output within the mass balance calculation guardrails. The amounts of attributable credits derived from each type of certified input used and attributed to products must be kept and documented correctly and must be verified during the audit.

Mass balance period

For mass balance calculations, a defined timeframe must be established by the end of which the total mass of incoming and outgoing batches, along with their corresponding sustainability characteristics, must be balanced. Under ISCC PLUS Credit Mass Balance Method, the maximum mass balance period is three months. The beginning of the period must start prior or at the beginning of the certification.

There is an exception for producers of agricultural biomass (Farms or Plantations), forest biomass (Forest Sourcing Areas) and First Gathering Points, sourcing only agricultural biomass or forest biomass. For those economic operators, mass balance period can be up to twelve months. However, if the mass balance period is longer than three months it is not possible to go into a deficit within the mass balance period (i.e. it is not possible to sell more material as certified, than is available amount in the mass balance bookkeeping).

System users may choose a period less than three months, for example, one month. The rationale for the maximum period of three months is twofold:

- A shorter mass balance calculation period does not offer additional security against fraud.
- Reducing the period to much shorter timeframes will increase the costs significantly and reduce the flexibility for market players without improving security and sustainability in the supply chain.

Mass balance periods shall be continuous in time, i.e. gaps between mass balance periods shall not occur. This means that even for periods in which no movement of certified material occurs, mass balance bookkeeping must be kept. The mass balance periods for the certification period (i.e. start and end date) must be clearly documented by the system user and must be verified during the audit. Any changes in the mass balance period must be clearly

documented by the economic operator and must be reported to the certification body before the adjustment.

For each mass balance period the following documentation on the mass balance accounting must be available and will be verified during the audit:

- Start and end date of mass balance period
- Inventory of input and output at the beginning of the mass balance period
- Amount and description of incoming and outgoing material during the mass balance period
- Amount of credits that can be transferred to the next period (if available)
- Amount of credits from previous period (if available)
- Conversion factor/consumption factor (if applicable)

6.4.1. Credit Transfer under Credit Method

Under Credit Method, it is possible to transfer credits from one mass balance period to the next. This is possible regardless of the amount of material in stock (certified and non-certified) at the end of the mass balance period. It should be ensured that a company is continuously certified, i.e. that no time gaps between certification periods occur.

Negative balance in mass balance period is not permitted

A negative balance of credits in a mass balance bookkeeping is not permitted under ISCC. A negative balance occurs if the dispatched material is more than the received at the end of a mass balance period (including the already existing inventory of certified material at the beginning of the mass balance period). If a negative balance occurs at the end of a mass balance period, the certified company must inform the certification body immediately and without being requested.

At the end of a mass balance period the quantity bookkeeping either has to be balanced or have credits of certified material that can be carried forward. To verify if the amounts of certified input and output material are balanced at the end of the period or if credits occur, the calculations and the bookkeeping of the system user must include amounts of incoming certified input material, which has been processed; amounts of certified input material (in stock); amounts of outgoing certified output material and amounts of certified output material (in stock). Based on the later, the conversion or consumption factor must be applied on the input in order to account correctly for the output.

Transferring credits between materials is only allowed for identical products or product groups[14]. Furthermore, the respective sustainability characteristics have to be reflected when transferring credits between materials. For example, it is not possible to transfer credits between materials with a different scope of raw material certification.

Multi-site credit transfer

Mass balances shall be kept strictly site-specific. Credits achieved within one site's mass balance cannot be transferred to another site's mass balance. An exception applies for processing units and storage facilities[15] certified under ISCC PLUS. They can transfer credits between different sites under the following conditions:

- Supplier and recipient of credits must be part of the same company/corporate group/joint venture (see specification below).
- Sites must be located within national borders or within neighbouring countries (sharing an inland border).
- Sites must have the same scope of certification.
- Applicable only for the same kind of outgoing intermediate or final product (the output on the certificate annex has to be the same).
- Mass balances must be kept site-specific.
- Individual ISCC certification must be in place for each site that is involved in the multi-site credit transfer.[16]
- Certificates can be issued by differing certification bodies if full documentation is available.

Multi-site credit transfer for joint ventures

Under ISCC PLUS it is also possible to transfer credits between sites that are part of the same company or corporate group or joint venture. A corporate group is defined as a number of consolidated legal entities guided by a parent company. Precondition for the latter case is that the company transferring credits to another operational unit (being part of the joint venture) holds at least 50% in the other company. This has to be proven accordingly to the auditor. The other additional requirements for multi-site credit transfer under ISCC as stated above remain unchanged and have to be equally fulfilled.

Operations that are both certified under ISCC EU and ISCC PLUS can transfer credits from ISCC EU to ISCC PLUS mass balances, if the material is "ISCC

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[14] Please refer to the ISCC PLUS List of Eligible Materials, where the names of all products or more general group of products are listed. If the specification of products differs, the products are not considered identical (or part of the same product group). Only when specifications are the same or there is no specification mentioned, the product is considered to be part of the same product group.

[15] Not applicable for raw materials and audit scopes farm/plantation, forest sourcing area, FGP, PoO, CP, FPR

[16] For storage facilities, they must be covered under one of the options described in (System Document ISCC PLUS 203-1 – Traceability).

Compliant" and the other sustainable characteristics are identical. However, it is not possible to transfer credits from ISCC PLUS to ISCC EU mass balances.

6.4.2. Mass Balancing Options under Credit Method

Under credit method, the sustainability characteristics can be attributed to the output within certain guardrails and limitations. Different mass balancing options under Credit Method leads to different amounts (or shares) of certified products. Different mass balancing approaches are shown in Figure 6.

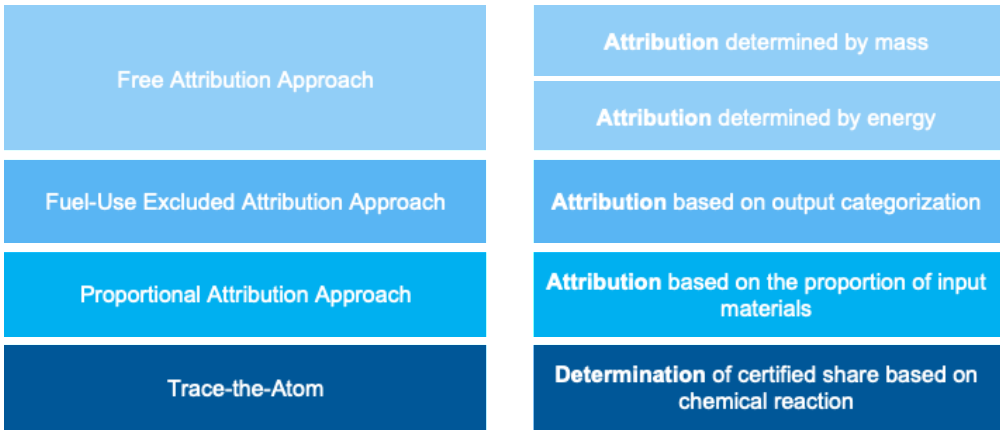

Figure 6: Overview on mass balancing options under ISCC PLUS Credit Mass Balance Method

Free Attribution Approach

Under Free Attribution Approach, the system user can attribute the sustainability characteristics from the certified input materials to the products, within the system boundary and the guardrails described in Chapter 6.2. This attribution can be done irrelevant of the proportion of the certified input material to the other inputs and categorisation of the products. System users can freely attribute the sustainability characteristics from the certified input(s) to one (or multiple) products that can be attributed to.

In instances where multiple processes lead to the production of an intermediate product that is sold individually, the conversion factor(s) relevant to the process steps from which the intermediate/final product originate must be applied. Thus, the focus of the analysis is exclusively on the relevant input, output and losses of the process[17].

In order to calculate the certified share, the amount of certified input, product (output) and the losses can be described based on their mass (Option 1: Attribution determined by mass) or based on their energetic value (Option 2: Attribution determined by energy).

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[17] *Process losses include parts of the material feedstocks (inputs) of a process, which are used energetically and therefore not converted to products but to waste streams like CO_2 (e.g. the part of ethylene in ethylene oxide production which is oxidized to CO2 and hence used for energetical purposes in the process). This does not include the internal energetical usage of fuel products (outputs) of a process, e.g. a steam cracker (no "auto-consumption exempt" under certified free attribution).*

Reflection of input characteristics

In addition to the mass balancing guardrails in Chapter 6.2, there is an additional guardrail under Free Attribution approach regarding Reflection of input characteristics.

Reflection of input characteristics:

The input characteristics under Free Attribution approach can be reflected in two possible ways:

- Complete reflection of input characteristics – where the outgoing material's certified share is completely reflected based on only the share of certified input(s).
- Compensation of input characteristics – when the non-certified inputs apart from the certified inputs are compensated based on the certified inputs' sustainability characteristics for the certified share of the outgoing material.

Under Free Attribution, in cases where the input characteristics are compensated to the output beyond the proportion of the certified input to the total inputs, it must be ensured that the sustainability characteristics are attributed to output(s) or part(s) of output(s), based on inputs which are "similar-in-nature" with specified characteristics.

Similar-in-nature refers to material, products, or concepts that share e.g. common characteristics, functionalities, qualities, composition or attributes, making them alike in fundamental aspects[18].

Compensation of input characteristics is only allowed:

- When the certified inputs and other inputs, although not certified, are among the List of Materials Eligible for ISCC Certification and are similar-in-nature
- Between inputs that are intermediate products according to the list of materials eligible under ISCC
- Under Free Attribution for multi-input processes
- For materials that are handled under the scope of Processing unit
- Within the Mass Balancing guardrails (see Chapter 6.2)

Transparency of information

If the output of a process is compensated beyond the proportion of the certified inputs, the System User shall indicate in their outgoing SDs that the specified outgoing material does not completely reflect the input characteristics and has been compensated based on the above specifications.

[18] *ISO/DIS 13662:2025. Guidance and clarifications on similar-in-nature are further provided in the ISCC PLUS Mass Balance Guidance Document*

Once a certified material has been compensated earlier in the supply chain, an entity in the downstream, which handles/further processes the respective certified material, cannot claim "full reflection of input characteristics" for the specific batch. In such cases, it must be ensured that information regarding reflection of input characteristics is forwarded based on the compensation applied earlier in the supply chain by the respective entity.

Attribution Determined by Mass

The first option of mass balancing that falls under the free attribution approach is attribution determined by mass. Under this approach, the amount of attributable credits is calculated based on the masses of inputs and outputs. The amount of the input material with specific sustainability characteristics coming into the system boundary is turned into credits that is for the input material. Then, the amount of attributable credits are calculated based on the conversion factor or consumption factor, which defines the amount of product that can be sold as certified.

Conversion Factor calculation for attribution determined by mass:

The conversion factor for attribution determined by mass is calculated based on the formula below:

$$CF(\%) = \frac{Ao}{A_i} \times 100$$

CF: *Conversion Factor*
A_o: *Total amount of output (including both certified and non-certified materials, based on mass)*
A_i: *Total amount of input (including both certified and non-certified materials, based on mass)*

By applying the CF to the amount of certified input, system users can calculate the actual amount of credits of certified material that can be attributed to the process outputs. It is expressed as:

$$A_{Cr} = CF \times A_{CI}$$

A_{Cr} : *Amount of Attributable Credits*

A_{CI} : *Amount of Certified Input*

The amount of attributable credits can then be attributed freely to one (or more) products of the process within the mass balancing guardrails.

Attribution Determined by Energy

The second option of mass balancing that falls under the free attribution approach is attribution determined by energy. Under this approach, the

amount of attributable credits is calculated based on the energy content of inputs and outputs.

The amount of the input material with specific sustainability characteristics coming into the system boundary is turned into credits that is for the input material. Then, the amount of attributable credits is calculated based on the conversion factor, which defines the amount of product that can be sold as certified. It is not possible to use consumption factor for attribution determined by energy.

Conversion Factor calculation for attribution determined by energy:

Under this mass balancing option, it is required to know the quantities of all inputs as well as the quantities of all outputs and their energy content[19], including both certified and non-certified materials. The conversion factor for attribution determined by energy is calculated based on the formula below:

$$CF(\%) = \frac{Ao}{A_i} \times 100$$

CF: *Conversion Factor*
A_o: *Total amount of output (including both certified and non-certified materials, based on energy)*
A_i: *Total amount of input (including both certified and non-certified materials, based on energy)*

By applying the CF to the amount of certified input, system users can calculate the actual amount of sustainable material that can be attributed to the process outputs. It is expressed as:

$$A_{Cr} = CF \times A_{CI}$$

A_{Cr} = *Amount of Attributable Credits (based on energy)*

A_{CI} = *Amount of Certified Input (based on energy)*

The amount of attributable credits can then be attributed freely to one (or more) products of the process within the mass balancing guardrails. It is crucial to keep in mind that the conversion factor under this approach is calculated for energy, hence the amount of certified input must also be put in the formula in terms of energy. This would lead to amount of attributable credits to be in terms of energy. When attributing the credits, the system user must use the lower heating value of the product that the credits are attributed to, in order to determine the amount of certified output.

[19] *Energy content is calculated by multiplying the amount of material with the corresponding lower heating value of the material*

For calculation of the losses under attribution determined by energy, it would be only possible to use the conversion factor.

Attribution based on output categorization – Fuel-Use Excluded Attribution Approach

Under the "Fuel-Use Excluded" approach, system users—similar to the "free attribution" approach—have the freedom to attribute sustainability characteristics from inputs to outputs within the defined boundaries and system limits (Chapter 6.2). However, in this approach, such attribution is preceded by a classification of the entire process outputs. A distinction is made between outputs used to generate energy (fuels) and outputs that can be traded as products or components of products without further (chemical) processing (non-fuels).

The part of fuel used outputs which are derived from the certified input material cannot be attributed to other output materials.[20, 21] Fuel used outputs are outputs that can be consumed internally (to provide energy for the process, “auto-consumption”) and as well as sold (to be used at downstream operators for energetic purposes).

To calculate the part of the fuel used outputs, which are derived from certified input material, an attribution of the certified input material to energetically used outputs according to real yields or input shares is mandatory. This certified share of energetically used outputs cannot be re-attributed to material outputs.

Proportional Attribution Approach

Under this approach, the determination of the certified share of the outputs is based on the proportion of the certified inputs that are fed into that process[22]. The available credit from the certified inputs is split according to the yield or distribution of the outputs.

In case there are multiple (co-)products from a process, all the respective outputs must be attributed with the determined certified share based on the proportion of the amount of certified inputs to the total amount of inputs. A “re-attribution” or “shift” of attributed certified share from one product of the process to another is not allowed under this approach.

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[20] This option is also referred to “fuel-exempt” and is in line with the definition of recycling in the EU waste framework directive, which “does not include energy recovery and the reprocessing into materials that are to be used as fuel” (directive 2008/98/EC, Art 3 (17)) (refer to System Document ISCC PLUS 202-5 – Waste and Residues).

[21] Details of the implementation of an energy excluded approach under ISCC PLUS are under development, e.g. the consideration of products which can be used either for energetical purposes or as a material feedstock. Additional guidance will be published separately to this system document in the Mass Balance Guidance document.

[22] Proportional attribution is applicable for single input-single output, single input-multiple output and multiple input-single output scenarios.

The specific quantities of each input and output that are utilised in a process are used to determine these certified shares. The certified share of the input is determined based on the below formula:

$$Share\ of\ certified\ input\ (\%) = \frac{(Amount\ of\ certified\ input)}{(Total\ amount\ of\ all\ inputs)}\ x\ 100$$

With the below formula the individual certified share of each output can be determined:

$$Certified\ amount\ of\ the\ respective\ output\ = Share\ of\ certified\ input\ (\%)\ x\ Amount\ of\ respective\ output$$

In the case of the proportional attribution, although losses must be calculated, the certified shares are not directly determined based on these losses (unlike attribution determined by mass/energy). For consideration of losses either the conversion factor or the consumption factor is calculated. The losses are calculated in order to determine the yield or the distribution of the outputs.

Requirements for Mass Balancing of Renewable Electricity in Electrolysis Processes:

For processes in which renewable electricity enables chemical reactions and is used to produce one or several products, mass balancing is limited to a "proportional approach" or "stoichiometric approach". This means that the certified share must be attributed to all process products in the same ratio in which these products are generated per unit of consumed electricity.

For example, in case of a chloralkaline processing unit in which renewable electricity, sodium chloride and water are used to produce chlorine as the main product, the process yields equivalent amounts of chlorine, sodium hydroxide and hydrogen (for every mole of chlorine produced, one mole of hydrogen and two moles of sodium hydroxide are also produced). In this case it is not allowed to e.g. transfer credits from chlorine to hydrogen or vice versa.

Trace-the-Atom (Determination of certified share based on chemical reaction)

The fourth mass balancing option under ISCC PLUS is called Trace-the-Atom. It can also be used to determine the certified share of the output(s), based in the share of atoms derived from certified inputs in the output molecules. Here, instead of attributing sustainability characteristics based on mass or energy, attribution follows the share of atoms originating from the input in the output. To apply this mass balancing option, the mechanism of the reaction must be known and followed.

To calculate the certified share, the amount of atoms (total molecular weight of atoms) originating from the certified input is divided by the molecular weight of the output. Under the Trace-the-Atom approach, the certified share is determined, hence it is based on the chemical composition of the product. Therefore, it is not possible to have a certified share in the output that is

beyond the number of atoms originating from the certified input under Trace-the-Atom approach.

Although the certified share of an output is determined via the chemical reaction, this approach is still credit based as the system user chooses dedicated product amounts (e.g. batches), to which the sustainability characteristics of certified input is attributed to. Also, the operational data of the processing unit must be used to take process losses into account and determine the amount of certified output. For this a consumption factor should be used, as it represents the relation between the certified input to the output.

Consumption Factor under Trace-the-Atom

In the Trace-the-Atom approach only consumption factor can be applied, as the atoms of each input shall be taken into account when calculating the certified share of the output. There is no possibility for the conversion factor to be used in this approach, as the conversion factor is considering the total amounts of output(s) in relation to the total amounts of input(s). Therefore, the following calculations can be used:

$$Certified\ share\ of\ the\ respective\ output\ (\%) = \frac{Amount\ of\ certified\ input\ (based\ on\ atoms)}{Amount\ of\ respective\ output\ (based\ on\ atoms)}\ x\ 100$$

Amount of attributable credits to a certain product is limited to the relative share of output derived from certified input. It is not possible to attribute to any batch of products higher than this percentage, which is calculated based on the atoms originating from the certified input to the certified output. If the credits available are more than the actual amount produced, the leftover can be either attributed to fossil-based parts of the product or transferred to the next period.

In the absence of a chemical reaction - where the origin of atoms from input to output can be directly traced - the certified share can still be quantified and passed down the supply chain. This information must be documented in the sustainability declaration, for example, by specifying the exact molecular weight of the certified atoms as a proportion of the total molecular weight of the material.

6.4.3. Consideration of Additives, Masterbatches and Not certified Organic Content for Mass Balancing

Limits for conversion factors

The sum of all additives, masterbatches and not certified organic compounds must be less than 3% of the total mass or energetic value per product, in order to be neglected from the mass balance calculation[23]. Components that exceed 3% of the total quantity of the product must be entirely taken into account in the mass balance calculation. Excluding the 3% from total amount of additives is not possible.

[23] *Under this approach, system users can end up claiming more certified material than sourced*

Taking into account the tolerance level of neglection, it is not allowed to use a conversion factor >1.

6.4.4. Consideration of Hetero Atoms as part of certified share

Hetero atoms as part of certified share

If a product consists of carbon atoms and hetero atoms such as oxygen (O), hydrogen (H) or nitrogen (N), the hetero atoms are considered to be part of the certified share of the product, as long as they are derived from the ISCC compliant input material (molecule). Example is the oxygen atom in bio ethanol, where the oxygen atom is also originating from the biomass.

If oxygen or nitrogen from ambient air reacts with an ISCC compliant input material, the oxygen and nitrogen atoms derived from ambient air are also considered to be part of the certified share of the product[24] (e.g. nitrogen in ammonia production reacting with certified hydrogen, see certification example 5 in Annex I – 4. Certification Examples) and it is allowed to make a claim on the corresponding share[25]. This is allowed when using directly ambient air as a reactant or purified oxygen or purified nitrogen derived from ambient air.

It is not allowed to attribute the certified share of oxygen and nitrogen in the downstream production processes of the supply chain to other atoms. If oxygen or nitrogen atoms from ISCC compliant input materials are no longer present in the certified output material (molecule)[26], the certified share needs to be reduced by the respective mass of the removed oxygen and nitrogen atoms. The certified free attribution is hence restricted in those cases to the mass of the other content from the ISCC compliant input material[27].

In the Hetero atom approach, the presence of hetero atoms is directly traceable from the input(s) to the output(s). Consequently, losses may only be calculated using a defined consumption factor.

Water is not among the list of eligible materials for ISCC. It is not possible to have water as a certified input or certified output.

6.4.5. Requirements for CO_2 Certifications

CO_2 as a raw material

CO_2 from the following sources can be used under ISCC PLUS:

[24] Under this approach, system users can end up claiming more certified material than sourced
[25] This explicitly does not hold for the reaction of oxygen or nitrogen with non-compliant (fossil) input. In case of Processing ISCC compliant input with non-compliant input (same material), only oxygen or nitrogen reacting with the ISCC compliant share of the input material can be considered to be part of the certified share of the product.
[26] E.g., due to oxygen or nitrogen atoms leaving the production process as O_2 or N_2 or if the oxygen or nitrogen atoms are present in output materials with no attributed sustainability characteristics.
[27] Hetero atoms from impurities in input materials with weight percentages <1% do not need to be taken into account for this requirement.

- Biogenic CO_2 which originates from biomass[28]
- Atmospheric CO_2 from direct air capture
- Post-industrial (fossil) CO_2 captured from industrial processes, which use fossil sources to deliberately produce electricity, heat, or materials (e.g., cement, iron and steel, petrochemical industry)

Biogenic CO_2 can be certified as a product and a raw material without additional requirements.[29]

Atmospheric and post-industrial CO_2 can be certified only as a raw material if specific requirements are fulfilled. These requirements depend on the production setup, which uses CO_2 as an input. As CO_2 does not contain usable energy, the energy needed to drive these production processes comes from other reactants. Hence, potential certifiable setups under ISCC PLUS must fulfil the following preconditions:

- **Post-industrial or atmospheric CO_2 and hydrogen as reactant**

  If post-industrial or atmospheric CO_2 reacts with hydrogen, the hydrogen shall be ISCC compliant (bio, (bio-)circular or renewable-energy-derived hydrogen), in order to claim products derived from the reaction of post-industrial or atmospheric CO_2 with H_2 as ISCC compliant (see certification example 1 in Annex II).

- **Post-industrial or atmospheric CO_2 and other materials as reactants**

  CO_2 is used in the chemical industry for the production of different products (e.g., urea). The outputs of such processes can get ISCC PLUS certified if the following two requirements are both met:

  - At least one other relevant process input (reactant of post-industrial or atmospheric CO_2) in the production process - besides the post-industrial or atmospheric CO_2 - shall be ISCC compliant (for relevance of process inputs see certification example 2 in Annex II).
  - Only the outputs of the process can get ISCC PLUS certified, which contain the carbon derived from the fossil or atmospheric CO_2 and

[28] *'Biomass' means the biodegradable fraction of products, waste and residues of biological origin from agriculture, including vegetal and animal substances, from forestry and related industries, including fisheries and aquaculture, as well as the biodegradable fraction of waste, including industrial and municipal waste of biological origin (https://knowledge4policy.ec.europa.eu/glossary-item/biomass_en)*

[29] *For biogenic CO_2 as a product, the conventional mass balance regulations of ISCC PLUS apply. However, in a process producing biogenic CO_2 next to other co-products, the attribution of the biogenic input material to the products needs to follow the chemical reaction (Trace-the-Atom).*

/ or other ISCC compliant inputs (no attribution from CO_2 to other carbon atoms allowed).

Additionally, during the audit, it must be verified that the CO_2 was not deliberately produced for use in the above-mentioned production processes. If these requirements are met, CO_2 can be used as a raw material under ISCC PLUS. The atoms derived from the CO_2 in the products can be taken into account to calculate the certified share[30].

No deliberate production of CO_2

For biogenic CO_2, additional claims on the origin of CO_2 can be made.

Under CO_2 certification, both rolling average and credit-based methods are applicable. The certified share in the outputs will be based on the amount of certified input introduced and processed, independently of the choice of rolling or credit-based method.

If a certified material reacts with post-industrial or atmospheric CO_2, the losses of the process must be calculated by using the consumption factor of the reaction (Chapter 3.3).

6.4.6. Overview of Requirements for Mass Balance Audits

The verification of mass balances is an integral part of the audit of an economic operator. It shall be verified by the auditor that the amount of certified product that has been claimed do not exceed the amount that is actually available, based on the amount of certified material and – if applicable – credits from previous mass balance period. Also it shall be ensured that no multiple accounting of certified material has taken place.

Prior to the audit, the economic operator must submit all site-specific mass balance bookkeeping to the CB conducting the audit. This applies to all mass balance bookkeeping relevant for the certification of the economic operator, i.e. every site (external storage facility or dependent collecting point) covered by the certificate.

In the case of an initial (first) audit, the economic operator must set up a mass balance system, which is checked by the auditor during the audit. For all further audits, the auditor must verify at least a sample of mass balance periods (including inputs, outputs, conversion factors and credits carried forward) and must check this against the bookkeeping and documentation.

Mass balance system shall be in place for Initial audit

The following specific aspects and documents must be taken into account for mass balances audits, including:

- List of all sites and scopes that are covered under the certification (e.g. external storage sites, dependent collecting points, etc.). Separate

[30] *Under this approach, system users can end up claiming more certified material than sourced*

mass balance bookkeeping shall be maintained for each site and scope.

> List of all inputs, outputs and inventory (and credits) per site, including descriptions of the materials and information on the suppliers and recipients respectively. This list must include both certified and non-certified materials, and if relevant, must also include fossil materials handled by the sites.

> Conversion or consumption factors applied. (In the case of waste/residues, it is especially important to ensure that the conversion process was not modified to produce more waste or residues).

> Timeframe of mass balance or averaging periods. The start and end date of each mass balance or averaging period must be documented transparently. The economic operator must inform the certification body about any changes to the mass balance or averaging period.

> Verification of the mass balance calculation to ensure that the bookkeeping is balanced or that certified amounts were calculated correctly.

> Certified inputs and outputs must be accompanied by a set of sustainability characteristics (reflected on incoming and outgoing sustainability declarations, (refer to System Document *ISCC PLUS 203-1 – Traceability*). During the audit it must be checked that sustainability characteristics from incoming sustainability declarations were taken into account correctly to set up the mass balance bookkeeping, and that the sustainability characteristics were attributed correctly to the outgoing material/products.

> Mass balance bookkeeping and other relevant documentation of other certification schemes used by the economic operator must be taken into account to ensure that no multiple accounting has taken place.

7. Proof of Biogenic Content via ^{14}C Isotope Measurement

Under ISCC PLUS, the ^{14}C isotope analysis is used to determine the actual bio-based carbon content in a product by measuring the ratio of carbon-14 (^{14}C) to carbon-12 (^{12}C) isotopes. This method is based on the principle that bio-based materials, derived from recent biological sources, contain trace amounts of ^{14}C, whereas fossil-based materials do not, as their ^{14}C has completely decayed over time.

The application of this method must be tailored to the specific product type, and the measurement must be supported either by scientific justification or

relevant standards[31]. For example, the ^{14}C testing can be used to analyse a product made from a mix of bio-based and fossil-based polymers in order to determine its actual bio-based carbon content.

This analytical approach is independent of the chain of custody models and can serve as a complementary tool to reinforce claims made under ISCC PLUS. Because the bio-content is scientifically verified, claims about the bio-based share can be made directly on the product with a high level of confidence.

Since the origin of non-carbon atoms (such as oxygen, hydrogen, nitrogen, and other hetero atoms) cannot be determined through ^{14}C analysis, the Hetero atom approach is used to assess bio-based content after such analysis: If a product is synthesized using reactants from both biomass and non-biomass sources, any heteroatoms (e.g., O, H, N) that are chemically bonded to a carbon structure known to be derived from biomass are counted as part of the bio-based content[32]. For further information on Hetero Atom cases, see Chapter 6.4.4.

[31] *Guidance for sampling regime for ^{14}C Isotope measurement is provided in the ISCC Guidance Document 203-01: Co-Processing Requirements*

[32] *For further information please refer to DIN EN 16785-1*

ANNEX I – Differences between ISCC EU and ISCC PLUS regarding Traceability and Chain of Custody

Issue	ISCC EU	ISCC PLUS
Transfer of positive credits to the next mass balance period	Only, if at least the equivalent amount of physical material (sustainable and unsustainable) is in stock	Positive credit transfer possible with no time limit even if no physical material is in stock
Transfer of credit between different sites	Transfer of credits between different sites not allowed	Transfer of credits to other sites of the same company, corporate group or joint venture possible for processing units and storage locations under certain conditions
Mutual acceptance of ISCC EU and ISCC PLUS	Deliveries solely from ISCC PLUS certified companies not accepted	Under ISCC PLUS entities handling “ISCC compliant” material can be accepted under ISCC PLUS
Applicable claims	“ISCC Compliant” and “EU RED compliant”	“ISCC Compliant”. If applicable, claims for voluntary Add-ons used (ISCC claims and logos document)
GHG information on sustainability declaration	Mandatory (special requirements for final biofuels see table below)	Only if the voluntary Add-on “GHG emissions” is applied

ANNEX II – General Certification Examples

The below given examples show possible certifications under ISCC PLUS on an exemplary basis. The list is not complete. Adaptations of the individual examples shown here may be necessary due to different requirements of different setups. The list aims to support the establishment of a uniform terminology and handling and to provide orientation for certification.

Example number	Inputs	Outputs	Description
1	Renewable-energy-derived hydrogen, post-industrial CO_2	Renewable-energy-derived, circular methanol	To produce ISCC PLUS certified methanol from post-industrial CO_2, ISCC compliant hydrogen must be used. The same is true for ISCC compliant methane from post-industrial CO_2 (SNG). The raw material category of the product (e.g. methanol) in such cases will be the raw material category of the hydrogen (bio, (bio-) circular, renewable-energy-derived) and circular (for the post-industrial CO_2).
2	Bio ammonia, atmospheric CO_2	Bio urea	ISCC PLUS certified urea can be produced from atmospheric CO_2 and ISCC compliant ammonia (bio, (bio-)circular, renewable-energy-derived). The other relevant process input besides atmospheric CO_2, which needs to be ISCC compliant, is ammonia in this example. Hence, in this example, the carbon and oxygen atom of urea derived from atmospheric CO_2 are part of the certified product. The raw material category of the ammonia can be solely used as the raw material category for urea.
3	Renewable electricity	Renewable-energy-derived chlorine, Renewable-energy-derived hydrogen, Renewable-energy-derived sodium hydroxide	In the Chloralkali electrolysis electrical current is used to produce chlorine at the anode and hydrogen at the cathode. Hence electricity is an integral part of the reaction of the production process and can be considered as the main feedstock. The material feedstocks water and sodium chloride itself are not certified. All products of this production process (chlorine, hydrogen, sodium hydroxide) can be claimed “renewable-energy-derived”.
4	Renewable-energy-derived	Renewable-energy-derived	A combination of raw material categories for the super absorbing polymer (SAP) sodium

	sodium hydroxide, bio acrylic acid	bio sodium polyacrylate	polyacrylate is possible, since this reflects the chemical reaction and both inputs with different raw material categories are present in the certified output. The masses of the parts of SAP derived from each raw material category need to be stated separately in the sustainability declaration.
5	Renewable-energy-derived hydrogen, N_2 from air	Renewable-energy-derived ammonia	The nitrogen atoms, which were derived from ambient air and which reacted with ISCC compliant hydrogen are part of the certified share of ammonia. In case of mass balanced hydrogen from fossil and certified sources only the nitrogen reacting with the ISCC compliant share of hydrogen is considered for the certified share of ammonia.