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Introduction

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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



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ISO/DIS 13662

Chain of custody - Mass balance - Requirements and guidelines

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 308, *Chain of custody*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The mass balance model is one of five chain of custody models outlined in ISO 22095. The mass balance model allows organisations a method of mixing or co-processing inputs with and without specified characteristics while documenting the movement of the inputs and their specified characteristics so that the characteristics can be appropriately accounted for and attributed to outputs within the same system boundary.

The mass balance approach is ideally suited for certain situations, such as when a segregated or identity preserved chain of custody is not feasible. For instance, in many supply chains, materials are combined to make new products and the materials become indistinguishable in the mixing, but it is known that a certain amount of input and their specified characteristics such as sustainably grown, or made with fair trade labour practices, are in the system, therefore it becomes appropriate to pass forward those characteristics through this chain of custody model. Many industries currently use this model including transportation, agriculture, textiles, forestry, construction, chemicals, metals, steel, energy, glass, plastics, organics and inorganics.

However, when mass balance is applied differently in the market, this inconsistent application can create confusion among consumers, policy makers, standard setters, and other stakeholders. Inconsistent application of the mass balance model reduces its credibility. This document provides guidance to explain the mass balance chain of custody model and limit the risk of confusion on mass balance claims in the marketplace and throughout the value chain.

Chain of custody - Mass balance - Requirements and guidelines

1 Scope

This document provides requirements and guidelines for the application of the mass balance chain of custody model, as defined in ISO 22095, to any material or product flow within mass balance systems, including how to attribute specified characteristics to flows of such processes.

This document provides requirements and guidelines for the following matters, amongst others:

- differentiations from controlled blending and book & claim;
- general requirements for organizations active in a mass balance chain of custody;
- system boundaries including geography and time;
- conversion factors;
- the rolling average percentage method;
- the credit method;
- transparency, communication, and claims.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 22095:2020, *Chain of custody — General terminology and models*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22095 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

administrative document

documentation that uniquely identifies the entitlement to claim the ownership of the specified characteristics of materials or products at the respective point in the chain of custody

3.2

administrative document flow

process that uniquely identifies the entitlement to the claim of ownership, as well as the ability to transfer the claim of ownership of the specified characteristics of materials or products through the chain of custody

3.3

attribution

assignment of specified characteristics to *outputs* (3.19) or part of the outputs

3.4

balancing period

time frame when the *inputs* (3.15) and *outputs* (3.19) with specified characteristics are balanced in the temporal boundaries of the system

3.5

book and claim model

chain of custody model in which the *administrative record flow* (3.2) is not necessarily connected to the physical flow of material or product throughout the supply chain

Note 1 to entry: This chain of custody model is also referred to as "certificate trading" or "credit trading".

Note 2 to entry: The book and claim model is often suitable where material or product with specified characteristics cannot, or only with difficulty, be kept physically separate from material or product without specified characteristics, such as renewable power in an electricity grid which also has power from non-renewable sources.

Note 3 to entry: Within a book and claim system, a Transferable Instrument with Entitlement to Claim (TIEC) represents the right to claim specified characteristics, which can be bought, sold or otherwise transferred between *organizations* (3.18). The term "certificates" is used in ISO 22095:2020, whereas the term "TIEC" is used here for consistency. TIEC is defined in 3.27.

[SOURCE: ISO 22095:2020, 3.3.5, modified — In Note 1 and 2 to entry the wording has been modified, Note 3 to entry has been added.]

3.6

claim

declared information regarding the specified characteristics of a material or product

Note 1 to entry: Information can be any message or representation, including text, pictorial, graphic or symbolic representation in any form in the context of a commercial communication.

Note 2 to entry: A claim can be made using various means or channels for example on the product or physically attached to the product or physical or virtual information about the product.

[SOURCE: ISO 22095:2020, 3.5.10, modified — Notes 1 and 2 to entry have been added.]

3.7

claim period

time frame when *claims* (3.6) can be made on products

3.8

consumption factor

special case of *conversion factor* (3.9) that considers a subset of *inputs* (3.15) and *outputs* (3.19)

3.9

conversion factor

ratio which is used to determine the quantity of *output* (3.19) or part of the output with specified characteristics that can be obtained from the quantity of the *input* (3.15) with specified characteristics, taking into account any losses

3.10

credit

representation of the quantity of attributable *units* (3.29) with entitlement to claim the ownership of specified characteristics

3.11

credit account

system used by *organizations* (3.18) to record and track the *credits* (3.10) associated with specified characteristics

3.12

destructive process

processing for the purpose of the recovery of materials without preserving the original product or component

EXAMPLE Disintegration (crushing, shredding, milling, grinding), concentration (separation, non-destructive depollution, homogenization), refining and re-melting.

[SOURCE: ISO 59014:2024, [\[11\]](#) 3.6, modified — ‘process to obtain secondary materials without any intent of’ deleted, replaced with ‘processing for the purpose of the recovery of materials without’; Example modified: ‘destructive depollution’ to ‘non-destructive depollution’.]

3.13

double counting

accounting for *inputs* ([3.15](#)) or *outputs* ([3.19](#)) or specified characteristics more than once

[SOURCE: ISO 14050:2020, [\[5\]](#) 3.5.25]

3.14

evaluation period

time frame when the performance of the chain of custody system is monitored, measured, analyzed and evaluated, by conducting audits to assess the performance of the chain of custody system procedures and the conformance with all applicable requirements

3.15

input

material or product that enters an *organization* ([3.18](#)) or part of an organization

Note 1 to entry: Input can be used at any stage of the supply chain.

Note 2 to entry: Input can also include reused and recycled materials or products.

Note 3 to entry: Input can have associated information, such as specified characteristics.

[SOURCE: ISO 22095:2020, 3.2.2, modified — Notes 1, 2 and 3 to entry have been modified.]

3.16

mass balance model

chain of custody model in which materials or products with a set of specified characteristics are mixed according to defined criteria with materials or products without that set of characteristics

Note 1 to entry: The proportion of the *input* ([3.15](#)) with specified characteristics might only match the initial proportions on average and will typically vary across different *outputs* ([3.19](#)).

Note 2 to entry: The mass balance model establishes the relation between inputs and outputs with specified characteristics and the distribution of those inputs and outputs via an *attribution* ([3.3](#)) model.

Note 3 to entry: For the mass balance model two implementation methods are specified, rolling average percentage method and credit method.

Note 4 to entry: In the mass balance model, the *credit* ([3.10](#)) cannot be traded between different *organizations* ([3.18](#)).

[SOURCE: ISO 22095:2020, 3.3.4, modified — Note 2 to entry has been modified, Notes 3 and 4 to entry have been added.]

3.17

non-proportional attribution

assignment of *credits* ([3.10](#)) to *outputs* ([3.19](#)) irrespective of yields or distribution of outputs

3.18

organization

entity or group of people and facilities with an arrangement of responsibilities, authorities and relationships and identifiable objectives

Note 1 to entry: An organization can encompass multiple (production/geographical) sites.

Note 2 to entry: An organization includes a corporate group defined as a number of consolidated legal entities guided by a parent company.

[SOURCE: ISO 26000:2010,^[9] 2.12, modified — Note 2 to entry has been added.]

3.19

output

material or product that leaves an *organization* (3.18) or part of an organization

Note 1 to entry: Output can be created at any stage of the supply chain.

Note 2 to entry: Output might include other products resulting from production processes.

Note 3 to entry: Product covers material or energy products.

[SOURCE: ISO 14044:2006+A1:2017+A2:2020,^[4] 3.25, modified — The wording and Note 1 to entry have been modified, Note 2 and Note 3 to entry have been added.]

3.20

primary data

quantified value of a *unit* (3.29) *process* (3.21) or an activity obtained from a direct measurement, or a calculation based on direct measurements at the original source

[SOURCE: ISO 14050:2020,^[5] 3.6.34]

3.21

process

set of interrelated or interacting activities that use *inputs* (3.15) to deliver an intended *output* (3.19)

Note 1 to entry: A process can include services.

Note 2 to entry: Technical operations of processes include continuous process, semi-batch, and batch.

Note 3 to entry: A process can also be a discrete process with a discrete time boundary such as production of a fashion collection or a furniture line.

[SOURCE: ISO 9000:2015,^[1] 3.4.1, modified — The word “result” has been replaced by “output”. Notes 1 to 6 to entry have been deleted. Notes 1, 2 and 3 to entry have been added.]

3.22

proportional attribution

assignment of *credits* (3.10) to *outputs* (3.19) according to yields or distribution of the outputs

3.23

requirements setter

person or *organization* (3.18) that specifies the requirements for a particular chain of custody

Note 1 to entry: The organizations active in the chain of custody can also act as the requirements setter.

[SOURCE: ISO 22095:2020, 3.4.3, modified — Note 1 to entry has been added.]

3.24

similar in nature

material, products, or concepts that share e.g. common characteristics, functionalities, qualities, composition or attributes, making them alike in fundamental aspects

3.25

system boundary

boundary based on a set of criteria specifying which processes or sites are part of the system under study

[SOURCE: ISO 14050:2020,^[5] 3.6.8]

3.26**technically feasible**

following an existing and operable route to obtain the *output* (3.19) or parts of the output from the *input(s)* (3.15) with specified characteristics within the *system boundary* (3.25)

3.27**transferrable instrument****transferrable instrument with entitlement to claim (TIEC)**

administrative document (3.1) that is issued, tracked, and retired within a book and claim system, the ownership of which confers the unique right to claim consumption or use of specified characteristics upon retirement

Note 1 to entry: Prior to retirement, TIECs can be bought, sold, or otherwise transferred between *organizations* (3.18).

Note 2 to entry: In some book and claim systems, certificate is used as a synonym for TIEC.

3.28**transportation**

movement of goods from one location to another performed by modes, such as air, rail, road, water, cable, pipeline and space and the field comprises the attributes of infrastructure, vehicles, and operations

[SOURCE: ISO 26683-2:2013, [10](#) 3.30]

3.29**unit**

standard quantity of specified characteristics, by which other quantities can be expressed

4 Differentiation between chain of custody models**4.1 General**

As described in ISO 22095, the mass balance model is a chain of custody model in which materials or products with specified characteristics are mixed with materials or products without some, or all of these characteristics. A claim on a part of the output, corresponding to a proportion of the input, is made as a result of the application of the mass balance model. Two implementation methods are possible according to ISO 22095:2020, 5.4.2.1:

1. the rolling average percentage method, and
2. the credit method.

ISO 22095 describes and sets the key properties of the chain of custody models: identity preserved, segregated, controlled blending, mass balance, and book and claim.

This clause provides a description of the differences between the controlled blending, mass balance, and book and claim models. It is intended to help the standard users determine either which chain of custody model is adequate for their system, or whether they selected the appropriate model for their system.

[Table 1](#) provides a technical description of key differences between chain of custody models.

Table 1 — Technical description of key differences between chain of custody models

Entry	Question	Controlled Blending	Mass balance	Book and claim
1	Is there a TIEC or credit system in place?	No	Depends on the implementation method	Yes
2	What are the applicable system boundaries?	Product or production process	Process, , site, multiple sites, or transportation	Physical region, delineated network, market (ISO 13659, 8.1)
3	Are item-based expectations satisfied?	Yes, for the percentage with specified characteristics	No	No
4	Are the inputs with specified characteristics physically present in the output or parts of the output with specified characteristics any time?	Yes	No	No
5	Can administrative documents representing specified characteristics be transferred between organizations separately from physical material or product?	No	No	Yes
6	Is physical separation of material or product required to ensure the specified characteristics are physically present in the output?	Yes, for the part with the specified characteristics	No	No
7	Is there assurance that the quantities with specified characteristics sold matches (or does not exceed) the quantities of material with specified characteristics purchased?	Yes	Yes, within the balancing period	No, but the claimed quantities with specified characteristics shall not exceed those represented by TIECs available on the system
8	Is it required that the specified characteristics be present in the output in a known proportion?	Yes	No	No
9	Can TIECs or credits be transferred between organizations?	Not applicable	No	Yes

NOTE Item and market-based expectations are defined in ISO 22095:2020, 4.3. Market-based expectations are satisfied under both the mass balance and book and claim model.

4.2 Differences between the mass balance and the controlled blending model

4.2.1 Credits and Transferrable Instruments with Entitlement to Claim (TIEC) (Table 1, entries 1 & 9)

In the mass model depending on the implementation method, a TIEC system may be required, whereas in the controlled blending model, a TIEC system cannot be applied.

4.2.2 System boundary (Table 1, entry 2)

For mass balance the system boundary can be a process, site, multiple sites, and transportation.

In the controlled blending model, the system boundary needs to be defined in such a way that the proportion of specified characteristics in all parts of the outputs can be guaranteed at any time (e.g., process).

4.2.3 Item-based expectations ([Table 1](#), entry 3)

In the mass balance model item-based are not satisfied, because physical presence of specified characteristics in the output is not a requirement.

In contrast, in the controlled blending, item-based expectations are satisfied and a known proportion of specified characteristics within all parts of the final output is guaranteed at any time.

4.2.4 Physical separation of material or products ([Table 1](#), entries 6 & 8)

In the mass balance model, physical separation of materials or products in not required.

In controlled blending, inputs with specified characteristics need to be kept physically separate until they are mixed with other inputs without that set of specified characteristics to ensure the specified characteristics are physically present in the output. Similarly, the outputs with specified characteristics need be kept separate from the outputs without that set of specified characteristics.

4.3 Differences between the mass balance and the book and claim model**4.3.1 Credits and Transferrable Instruments with Entitlement to Claim (TIEC) ([Table 1](#), entries 1 & 9)**

For the credit method of the mass balance, specified characteristics are represented as credits. Credits cannot be transferred between organizations separately from physical material or product, but can be transferred within the mass balance system boundary.

Credits are not used in the rolling average method of the mass balance model.

In the book and claim model, specified characteristics are represented by TIECs. TIECs can be transferred between organizations separately from physical material or product.

4.3.2 System boundary ([Table 1](#), entry 2)

System boundaries for the mass balance model can be defined as a process, site, multiple sites, or transportation.

System boundaries for the book and claim model can be defined as a physical region, delineated network, or market.

4.3.3 Administrative document flow and physical material or product flow ([Table 1](#), entry 5)

In the mass balance model, it is required that the administrative document be connected to the physical flow of material or product when the custody of this material or product is transferred from one organization to another through the supply chain.

In the book and claim model TIECs are issued as administrative documents to represent specified characteristics which can be decoupled from the physical flow of material or product and transferred between organizations separately. However, prior to TIEC issuance, there shall be a connection between physical material or product and the specified characteristics represented by the TIEC.

4.3.4 Material reconciliation ([Table 1](#), entry 7)

The mass balance model requires that quantities with specified characteristics for inputs and outputs are reconciled over a period.

In the book and claim model, the claimed quantity of specified characteristics does not have to be reconciled over a period of time but shall not exceed the quantity of material with specified characteristics represented by TIECs available on the system.

5 Requirements for mass balance chain of custody

5.1 General

As described in ISO 22095, the mass balance model is a chain of custody model in which materials or products with specified characteristics are mixed or co-processed, with materials or products without some or all of these characteristics. Mass balance can also be applied to energy inputs and outputs.

The mixing and co-processing of materials or products with specified characteristics with materials or products without some or all of these characteristics can occur throughout all stages of the supply chain from production and processing to transportation and trading.

Strict documentation management (or administration etc.) shall be maintained where the mass balance model is applied.

Each organization active in the chain of custody at each stage of the supply chain shall maintain its own organizational mass balance (see [Figure 1](#)).

The mass balance system boundary shall be defined within each organization active in the chain of custody. The mass balance system boundary can be defined on process, site, multiple sites or transportation level (see [5.3](#)). The mass balance system shall be under the control of or under a common management system of one organization.

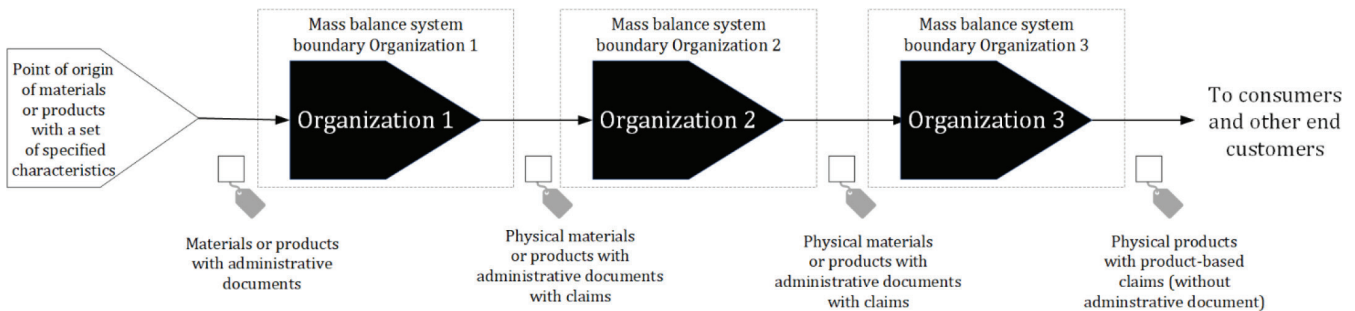


Figure 1 — Mass balance system boundaries in a value chain context

If the custody of the material or products with specified characteristics is transferred between organizations active in the chain of custody, the material or products with specified characteristics leave the system boundary and the physical flow of the material or product shall be connected to the administrative document flow, as described in [Figure 1](#).

Outsourced operations, as described in ISO 22095:2020, 6.11, are part of the organization's mass balance system boundary and are included in the chain of custody of the organization responsible. If materials or products with specified characteristics are transferred between organizations as part of an outsourced operation, they do not leave the system boundary and custody is not transferred between organizations. For outsourced operations a transfer of administrative documents shall not be required.

Organizations applying the mass balance model shall ensure that the claimed total amount of specified characteristics attributed to the outputs is balanced with, or does not exceed the total amount of specific characteristics in the inputs within the balancing period taking into account all losses, according to the conversion factor.

As described ISO 22095:2020, 5.4.1.2, the requirement setter shall consider and document relevant minimum requirements for all inputs with specified characteristics to the chain of custody system based on relevant risks.

NOTE Examples of associated risks include child labour, forced labour, working conditions, environment.

The requirements setter shall establish the process for communicating and transferring mass balance claims throughout the value chain from the beginning of the value chain through at least to the production