



IOGP Report 600-01

Material Digital Passport specification

Revision history

VERSION	DATE	AMENDMENTS
0.0	JANUARY 2024	Issued for Internal Review
0.1	FEBRUARY 2024	Issued for Public Review

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Acknowledgements

This specification has been developed by the Joint Industry Sprint 01, a joint industry initiative sponsored by the Digital Transformation Committee of the International Association of Oil and Gas Producers (IOGP).

The Joint Industry Sprint 01 is composed of the following members, in alphabetical order: Bureau Veritas, Chevron, Eni, ExxonMobil, MatChain, Petronas, Saudi Aramco, Shell, TotalEnergies, Ublearn, and Woodside Energy.

About

This specification defines the requirements necessary to develop a Material Digital Passport system to be used for capturing a digital record of actions pertaining to a procured item in the energy industry supply chain. The goal of the Material Digital Passport is to enable cost reduction that is driven by trusted provenance of the item and by leveraging digitalised workflows.

The intended audience of this specification are stakeholders in the energy sector's supply chain that are involved in the procurement, manufacturing and operation of equipment and commodities, as well as developers of the digital solutions that would implement the Material Digital Passport system.

Introduction

The objective of this specification is to define the minimum requirements necessary to develop a Material Digital Passport (MDP) system, to be used for procured items in the Energy Industry supply chain. This specification is aimed at establishing a standardised methodology for capturing a digital record of actions pertaining to a procured item, ensuring end-to-end traceability across project execution and asset operations. This will enable cost reduction that is driven by trusted provenance of the item and by leveraging digitalised workflows.

In its essence, the Material Digital Passport is an “electronic record” associated to procured items that is used to collect and store digitally a set of tamper-proof information about such items, with guarantees on the provenance and authenticity of the information.

The Material Digital Passport system focuses on collecting information and defining processes that aim to preserve the integrity of the procured item and to reduce the likelihood of material fraud. The energy value chain members may also use the MDP system as a method for collecting and then retrieving additional information, such as data about circular economy metrics, material traceability, items secondary usage, and several additional product specific attributes. While this is a possibility, this specification will not recommend which additional attributes about a procured item may be included in the Material Digital Passport.

The Material Digital Passport system defined in this specification is composed of the following elements:

1. A unique identifier associated to the procured item
2. A data carrier, readable by electronic devices, which is affixed to the item and used to store the unique identifier
3. The set of data that are recorded in the Material Digital Passport
4. A (set of) distributed and web based digital platform(s) used for managing the Material Digital Passport and make its information available to stakeholders
5. An API specification for interoperability of the different digital platforms that manage the Material Digital Passports

This specification provides requirements for each of the above elements, and it includes a reference implementation detailing a possible high-level architecture for the Material Digital Passport eco-system that satisfies these requirements. A reference use case showing a possible application of the MDP system is also included.

1 Scope

The scope of this specification is to define the requirements necessary to develop a Material Digital Passport system to be used for capturing a digital record of actions and information pertaining to a procured item in the energy industry supply chain.

A reference implementation for the high-level architecture and a use case of passport generation and management process is also provided in the specification.

The items covered by this specification can be either bulk material, individual equipment or complex equipment (see the Definitions section), globally referred to as components.

The requirements necessary to define the Material Digital Passport and its supporting digital ecosystem are divided into:

- General Requirements – Section 2.2
- Requirements related to the unique identifier (Identification Code) associated to the components – Section 2.3
- Requirements related to the data carrier to be affixed to the component – Section 2.4
- Requirements related to the information to be included in the Material Digital Passport – Section 2.5 and Appendix A
- Requirements related to the digital platforms used to manage the material digital passports – Section 2.6

2 MDP Requirements

This section contains the requirements for the Material Digital Passport system, divided into General Requirements, MDP's Identification Code Requirements, Data Carrier Requirements, Information Requirements, and Digital Platform Requirements.

An initial informative General Premise (Informative) section is included, describing the stakeholders of the MDP process, their roles in the Material Digital Passport system, and the structure of the components that can be procured with an MDP.

2.1 General Premise (Informative)

2.1.1 MDP Stakeholders

Different stakeholders are identified for the Material Digital Passport ecosystem. The MDP stakeholders have a role in the procurement, manufacturing and operation of a component, and in the creation and maintenance of the Material Digital Passport associated to that component.

The MDP stakeholders are reported in the remaining of this section.

2.1.1.1 Asset Owner

In the context of the Material Digital Passport, the Asset Owner is the company that owns the asset where a component with the MDP will be installed. Overall, it is the end user for a given component.

The Asset Owner is generally responsible to prepare the overall requirements and high-level specification for the asset, which comprises several components. On a project-specific basis, part of this responsibilities may be assigned to the EPC (see 2.1.1.2)

In the context of the Material Digital Passport, typical examples of Asset Owners are International Oil Companies.

2.1.1.2 Engineering, Procurement and Construction Company (EPC)

In the context of the Material Digital Passport, an Engineering, Procurement and Construction company (EPC) is a company that is contracted by the asset owner to perform the detailed engineering of an asset, procure the material necessary for its construction, and carry out its construction. As part of its responsibilities, the EPC mandates the specifications for the components that need to be installed in the asset whether those specifications originate from Asset Owner or EPC itself.

On a project-specific basis, the responsibility of the EPC may be taken in full by a single company, or it may be split among several companies. Some of the responsibilities can also be covered directly by the Asset Owner (see 2.1.1.1).

2.1.1.3 Manufacturer

In the context of the Material Digital Passport, a Manufacturer is a company responsible for manufacturing a component. Manufacturers are distributed along the supply chain in different tiers, with tier-1 (T-1) Manufacturers (suppliers) contracted directly by the EPC, tier-2 (T-2) Manufacturers (sub-suppliers) contracted by tier-1 Manufacturers, and so on down the component supply chain (see Figure 1 for a visual representation). Both OEM (Original Equipment Manufacturers) of Individual Equipment and distributor of complex equipment such as skid that are not necessarily OEM are considered as Manufacturers in this specification.

A Manufacturer can have the role both of component purchaser and of component provider.

In its role as component provider, a tier-n (T-n) Manufacturer receives a requisition for the component (such as a purchase order) and typically a technical specification for the component from the tier-(n-1) Manufacturer, which has in this case the role of component purchaser. A manufacturer can also provide components to a stock reseller (see 2.1.1.4).

In its role of component provider, the Manufacturer is responsible for the detailed design of the considered component, for procuring the sub-components possibly necessary for manufacturing the component, and for manufacturing the component.

2.1.1.4 Stock reseller

In the context of the Material Digital Passport, a stock reseller is a company that purchases components from a manufacturer at any tier of the supply chain and re-sells components to other manufacturers or EPC companies. A stock reseller therefore can provide a component according to a requisition for a component (such as a purchase order) and a technical specification without being responsible for its manufacturing.

2.1.1.5 Verifier company

In the context of the Material Digital Passport, a Verifier company is a company that provides an independent endorsement of claims related to a component property and / or performance. This independent endorsement is normally provided in the form of a certificate or statement of compliance against a defined set of requirements.

The involvement of a Verifier company may happen at different moments of the manufacturing process, and at different moments throughout the component life.

The involvement of a Verifier company is project-specific, and it is normally dictated either by a request from the purchaser or from regulatory requirements for the considered component.

The Verifier company can be contracted either by the component purchaser or by the component provider. The MDP stakeholder responsible for contracting the Verifier company is project-specific and regulated by contractual agreement between the component purchaser and the component provider.

Non-exhaustive examples of a component's claims that may be endorsed by a Verifier company are: claim of compliance with purchasers' specification; claim of compliance with international standards; claim of compliance with national or international regulations; claim of component's environmental metrics such as carbon footprint or environmental product declarations.

2.1.1.6 Operator

In the context of the Material Digital Passport, an Operator company takes care of operating and maintaining an asset and its components after the components have been installed and commissioned.

The responsibility of an Operator can be taken directly by the Asset Owner, depending on the specific project set-up.

2.1.1.7 Digital Platform Provider

In the context of the Material Digital Passport, a Digital Platform Provider is a company responsible for developing and maintaining the IT infrastructure that allows the creation, maintenance and availability of a Material Digital Passport and its information according to the requirements reported in Sec. 2.6 of this Specification.

Several Digital Platform Providers can co-exist, as further detailed in Sec. 3 of this Specification.

2.1.2 Supply Chain Roles and MDP Tasks

Different roles are identified for the MDP stakeholders identified in 2.1.1, and are reported in the remaining of this section. The same stakeholder can have different roles in the Material Digital Passport process.

2.1.2.1 Component purchaser

In the context of the Material Digital Passport, a component purchaser is the stakeholder that provides the requisition for a given component (such as a purchase order) to the provider of that component, typically together with its technical specification.

Component purchasers are either manufacturers (see 2.1.1.3) procuring sub-components, or EPC companies (see 2.1.1.2) procuring components for the asset, or dedicated purchase department of the Asset Owner companies (see 2.1.1.1) managing its warehouse stock, or stock-resellers (see 2.1.1.4) procuring components for their stock reserve.

2.1.2.2 Component provider

In the context of the Material Digital Passport, a component provider is the stakeholder that provide a component to the component purchaser, according to a component requisition (e.g., a purchase order) and technical specification.

Component providers can be manufacturers (see 2.1.1.3) or stock resellers (see 2.1.1.4).

2.1.2.3 Component operator

In the context of the Material Digital Passport, a component operator is the stakeholder that takes care of operating and maintaining the component after it has been installed and commissioned in its destination asset.

Component operators can be asset owners (see 2.1.1.1) or operators (see 2.1.1.6).

2.1.2.4 MDP requester

In the context of the Material Digital Passport, the MDP requester is the stakeholder that requests that a given component is provided with its valid Material Digital Passport.

In general terms, the core MDP requester is the Asset Owner, that requires that the components in the asset are provided with the MDP. This requirement then cascades to the supply chain. However, any component purchaser (see 2.1.2.1) has the faculty to require that a component is provided with an MDP, and can therefore have the role of MDP requester.

Requirements related to the request of MDP are provided in 2.2 and its sub-sections.

2.1.2.5 MDP provider

In the context of the Material Digital Passport, the MDP provider is the stakeholder that is responsible for issuing the MDP for a given component. The MDP provider is not necessarily responsible for providing all data included in the MDP of a given component.

Typically, the MDP provider is the manufacturer of the considered component. However, the MDP provider could also be a stock reseller, or the component purchaser of a stock component (see 2.2.5).

2.1.2.6 MDP data provider

In the context of the Material Digital Passport, the MDP data provider is the stakeholder that is responsible for collecting a given piece of information that is to be included in the Material Digital Passport, and for recording it in the MDP itself.

MDP data provider can be manufacturers, Verifier companies, stock reseller, EPC, and operators, according to the requirements of Sec. 2.5.

2.1.2.7 MDP data verifier

In the context of the Material Digital Passport, the MDP data verifier is the stakeholder that is responsible for verifying the correctness and truthfulness of a piece of information included in the MDP and provided by a MDP data provider.

MDP data verifier can be Verifier companies, or component purchasers, according to the requirements of Sec. 2.5.

2.1.2.8 MDP owner

In the context of the Material Digital Passport, the MDP owner is the stakeholder that currently owns the component associated to the considered MDP.

The MDP owner may be a manufacturer (during the manufacturing phase of the component and before the component is delivered to the Component purchaser, or during the manufacturing of its Parent component), a stock reseller, or an asset owner.

Table 1: Summary of Supply Chain (SC) roles and MDP Tasks for the MDP stakeholders

Stakeholder	SC Role			MDP Tasks							
	Component Purchaser	Component Provider	Component Operator	Request the MDP	Provide the MDP	Create the MDP	Provide Data for the MDP	Verify data for the MDP	Issue the MDP	Own the MDP	Develop and Maintain the MDP Platform (see Sec. 2.6)
Asset Owner	x		x	x		x	x	x		x	
EPC	x			x		x	x	x		x	
Manufacturer	x	x		x	x	x	x	x	x	x	
Stock reseller	x	x		x	x	x	x		x	x	
Verifier company							x	x			
Operator			x				x				
Digital Platform Provider											x

2.1.3 Component Structure

2.1.3.1 Parent component and sub-components

In the context of the Material Digital Passport, a complex equipment is a component that is made of one or more different components, called sub-components, such as other complex equipment, individual equipment, bulk material, or a combination thereof.

A complex equipment composed of one or more sub-components is a *parent component* for those sub-components. A component included in a parent component is a sub-component of that parent component.

2.1.3.2 Component tiers

Components are provided by component providers (see 2.1.2.2) distributed along the different tiers of the supply chain (see 2.1.1.3). A component provided by a tier-n (T-n) component provider is called *tier-n component*.

When $n > 1$, a tier-n component is always a sub-component and therefore is associated to a parent component (see 2.1.3.1).

2.1.3.3 Assets as parent components

A tier-1 component inherently does not have a parent component. Instead, the “parent component” of a tier-1 component is directly the final asset where the component is installed.

2.1.3.4 Component scheme

A schematic representation of the relationship between asset, components and tiers of the supply chain is reported in Figure 1.

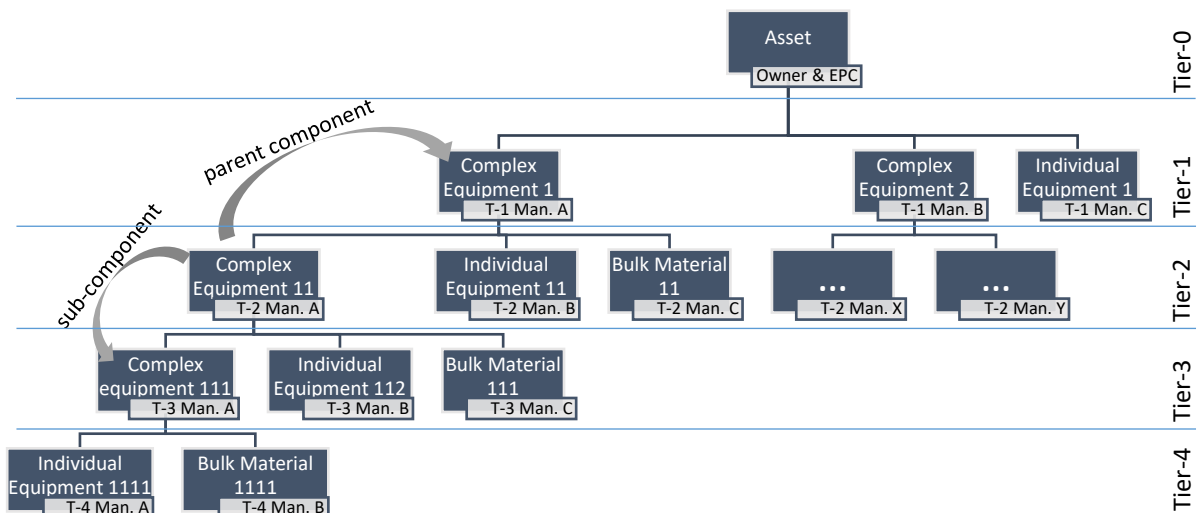


Figure 1 – Component scheme ("Man." stands for "Manufacturer")

2.1.3.5 Batch, sub-batch and parent batch

A batch is a definite amount of material produced during a single manufacturing cycle, and intended to have uniform character and quality (see the Definitions section). Bulk materials are typically produced as a batch.

In the context of the Material Digital Passport, a sub-batch is defined as a group of Bulk Material items belonging to the same batch. The concept of sub-batch is useful for example when, instead of the full production batch, only a sub-set of a given batch of bulk material components is sold by a component provider to a component purchaser that needs those items to manufacture a component.

The batch from which the sub-batch is taken is the parent batch for that sub-batch. Conversely, the considered sub-batch is the “child sub-batch” for that parent batch.

The concept of child sub-batch and parent batch can be applied in cascade, as illustrated in **Figure 2**, meaning that a sub-batch can be both a parent and a child of another sub-batch.

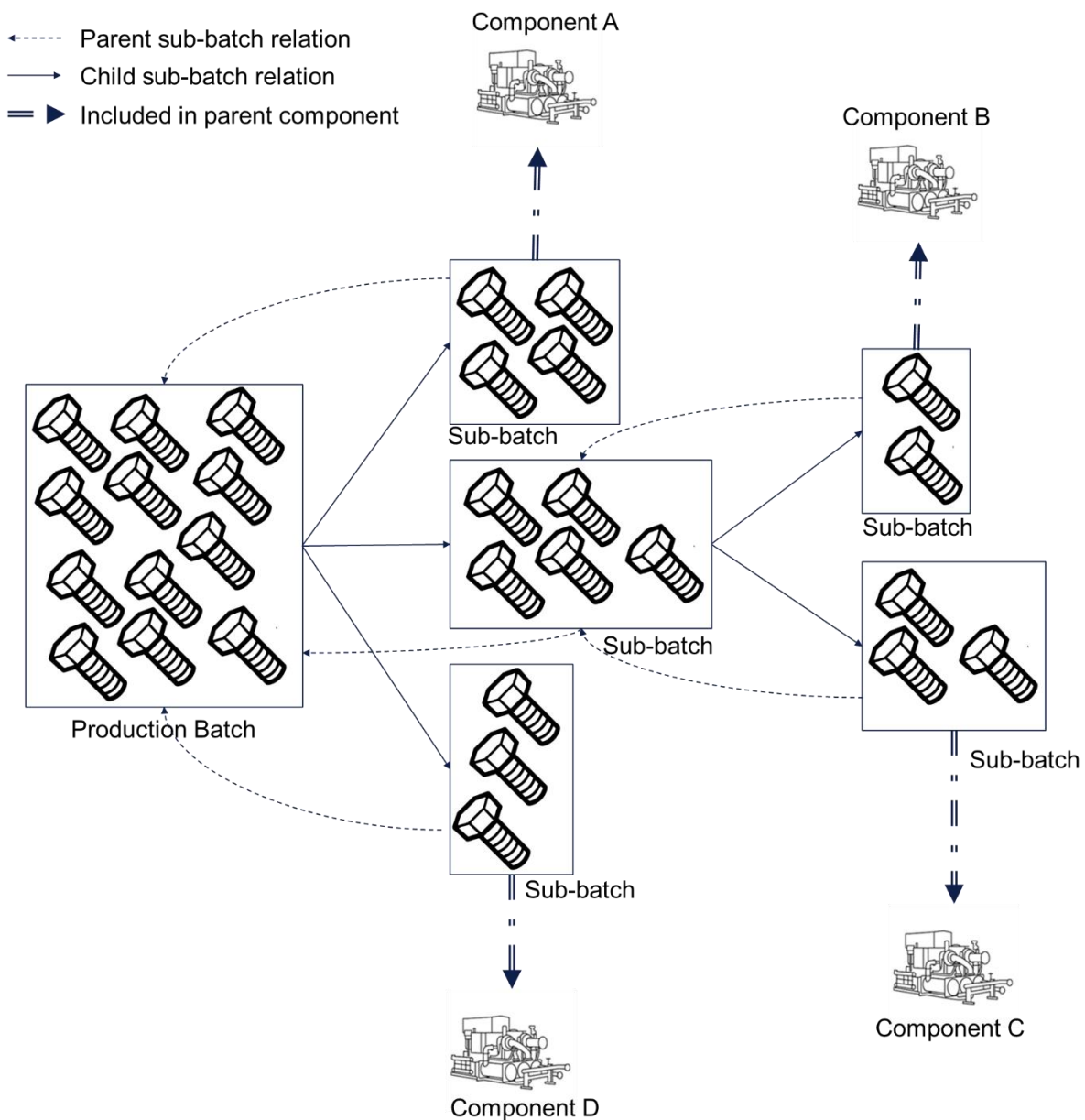


Figure 2 – Scheme of relationships between batches, sub-batches and components

2.1.4 Additional Terminology

A specific terminology has been developed for this specification. Definitions of key terms are reported in this Section, while the full reference can be found in the Definitions section.

2.1.4.1 Component terminology

- Component:** In the context of this specification, a component is either an Individual Equipment, a Complex Equipment or a batch item belonging to Bulk Material category.
- Bulk Material:** In the context of this specification, bulk material refers to physical items that are relevant for the energy industry and are produced in batches having uniform characteristics and qualities. Bulk material components are not identified at individual levels by their manufacturer. Bulk material components are often produced to be stocked rather than manufactured on demand. Fasteners (bolts, nuts, washers), forgings, steel plates, pipes, piping and fittings, small manual valves are examples of bulk material components.
- Complex Equipment:** In the context of this specification, a complex equipment is a technical equipment relevant for the energy industry that is composed of several individual equipment components, bulk material components and possibly other complex equipment components. A complex equipment is individually identified by its manufacturer. A complex equipment is normally manufactured on demand according to specific requirements from the purchaser. Industrial skids such as compressor skids, pump sets, chemical treatment skids, cranes are examples of complex equipment.
- Individual Equipment:** In the context of this specification, an individual equipment is a technical equipment (such as vessels, units, machines, electronic devices and components, assemblies, batteries, components, spare parts) that is relevant for the energy industry and that is individually identified by its manufacturer. Individual equipment components may be either produced for stock or manufactured on demand according to specific requirements from the purchaser. Tagged valves, transformers, pumps, turbines are examples of individual equipment.

2.1.4.2 Types of MDP

- Individual MDP:** A Material Digital Passport covering a single component, typically an Individual Equipment or a Complex Equipment.
- Sub-batch MDP:** A Material Digital Passport that covers more than one component, provided the components covered all belong to the same production batch and that the exact same information can be included in the sub-batch MDP for all items of that sub batch at the time of its issuance. A sub-batch MDP does not need to cover all the items of a given production batch, but it is rather tailored to cover a specific number of items that is traded between stakeholders to finally be installed in a given parent component.

2.1.4.3 MDP Actions and terminology

MDP Platform:	In the context of this specification, any Digital Platform used to generate, maintain, manage access, and upload data of Material Digital Passports developed in accordance with the requirements of this specification.
MDP Creation:	In the context of this specification, the MDP Creation is the act of creating a Material Digital Passport on the MDP Platform through the dedicated functionality made available by the MDP Platform. Once an MDP is created, the MDP data and information can be included in the MDP. Also used as “Create an MDP”.
MDP Issuance:	In the context of this specification, the MDP Issuance is the act of officially issuing a Material Digital Passport through the dedicated functionality made available by the MDP Platform. Once an MDP is issued, static data included in the MDP can no longer be modified, and the MDP can be transferred to new owners. Also used as “Issue an MDP”.
MDP Split:	In the context of this specification, the MDP Split is the act of creating two or more sub-batch MDPs from an existing sub-batch MDP through the dedicated functionality made available by the MDP Platform. Also used as “Split an MDP”.

2.1.4.4 Data terminology

Dynamic data:	In the context of this specification, Dynamic data are data included in the MDP that are modifiable after the MDP Issuance by the authorized stakeholders.
Static data:	In the context of this specification, Static data are data included in the MDP that are not modifiable after the MDP Issuance.
Restricted data:	In the context of this specification, Restricted data refers to MDP data that by default are only visible on the MDP Platform to the MDP owner of the Material Digital Passport, to the MDP Data provider for that data field, and to the MDP Data verifier for that data field.
Unrestricted data:	In the context of this specification, Unrestricted data refers to MDP data that are visible on the MDP Platform to all users.

2.2 General Requirements

This section contains General Requirements related to the MDP system, divided in different sub-sections depending on their context. General requirements are identified with a dedicated code number preceded by “GR-”, e.g., “GR-01”.

2.2.1 MDP of Components

GR-01: The request that a component is provided with a Material Digital Passport shall come from the component purchaser.

GR-02: The request that a component is provided with a Material Digital Passport shall be included in the component requisition (e.g., a purchase order) for that component.

GR-03: Component providers shall have the ability to create a Material Digital Passport for a given component before receiving a component requisition (e.g., a purchase order) with an MDP request for that component.

Guidance Note 1: Generally, the overall requirement that the components included in an asset are provided with a Material Digital Passport comes from the Asset Owner. This request then cascades to the supply chain of the T-n sub-components according to the requirements included in 2.2.2. It is a responsibility of the stakeholder procuring the specific component (i.e., the Component purchaser) to demand the MDP for the component to the Component provider.
End-of-guidance-note.

2.2.2 MDP of Sub-Components

GR-04: If a component is requested to have an MDP, this request shall cascade on its sub-components according as a minimum to the following rules:

- all the sub-components which are provided with a nameplate or with an individual identification number shall be provided with their dedicated MDP;
- all the sub-components belonging to bulk-material classification, both metallic and non-metallic, that are provided with a type 3.1 or 3.2 material certificate according to EN 10204:2004 shall be provided with their dedicated MDP.

GR-05: In addition to the minimum requirements defined by GR-04, a component purchaser shall have the option to request that the any sub-component of the requested component is provided with a dedicated MDP.

Guidance Note 2: through **GR-04**, if an asset owner requests that a T-1 component is provided with its MDP, then the request will cascade to T-2 components. In turns, T-2 components that are to be provided with an MDP will trigger the request for T-3 components' MDP according to the set-out rules. *End-of-guidance-note.*

2.2.3 Links between Components and Subcomponents MDPs

GR-06: Each MDP of a parent component shall include the list of all its sub-components which have an MDP, including the reference to the Identification Code of their MDP (see Sec. 2.3). This list of sub-components is the MDP Bill of Materials (BoM).

GR-07: If a sub-component is a bulk material, the bill of material of the parent component shall include the number of bulk material items included in the parent component.

GR-08: Sub-components of bulk material type coming from different production batches shall be included separately in the Bill of Materials.

Guidance Note 3: this means that if for example 10 bulk material components are needed for a given parent component, where for example 7 components come from a production batch and the remaining 3 come from a different production batch, 2 separate lines are included in the BoM, one referring to the 7 items from the first batch, and the other to the 3 items coming from the second batch. *End-of-guidance-note*

GR-09: Through the Bill of Material of the parent component, it shall be possible to retrieve the web address of the MDP of any sub-component (see also Sec. 2.6.5 and Sec. 2.6.10).

GR-10: Each MDP shall include the Identification Code (see Sec. 2.3) of the MDP of the parent component on which they are installed. For T-1 components, the parent component is the Asset of final installation (see 2.3.4).

Guidance Note 4: **GR-10** ensures that it is not possible that the same sub-component MDP is used for different sub-components, since they are installed in different parent components and this information is included in the sub-component's MDP. This is valid both for individual / complex equipment and for bulk material covered by sub-batches MDP, since a sub-batch MDP can be tailored to cover the exact number of items that are included in the same parent component (see Sec. 2.2.4). *End-of-guidance-note*.

2.2.4 MDP for Batch Components

GR-11: For bulk material which are produced in batches, a single MDP may be issued that covers several items of the same batch. This type of MDP is defined as a "sub-batch MDP".

Guidance Note 5: a sub-batch MDP differs from an individual MDP because it covers more than one item, provided the exact same information can be included in the sub-batch MDP for all included items. A sub-batch MDP does not need to cover all the items of a given production batch, but it is rather tailored to cover a specific amount that is traded between stakeholders to finally be installed in a given parent component. *End-of-guidance-note*

GR-12: A sub-batch MDP shall only be assigned to sub-batch of components belonging to the same production batch that share the same information to be included in the MDP.

GR-13: Each sub-batch MDP shall report how many items of the considered batch are covered by the sub-batch MDP.

GR-14: A sub-batch MDP shall only be referenced in the Bill of Materials of a single parent component.

Guidance Note 6: this means that items covered by the same sub-batch MDP can only be installed in the same parent component. If the sub-batch MDP covers more items than those needed in the considered parent component, the sub-batch MDP needs to be split as described in **GR-16**. *End-of-guidance-note*

GR-15: The number of items covered by a sub-batch MDP that is included in the Bill of Material of a given parent component shall correspond to the number of items of the considered sub-batch that are included in that parent component, as defined by the parent component bill-of-material (see **GR-07**).

GR-16: A sub-batch MDP may be used as basis for issuing additional sub-batch MDPs (“child sub-batch MDPs”), each covering a sub-set of the items covered by the parent sub-batch. The original sub-batch MDP is the “parent sub-batch MDP” for the child sub-batch MDP. The total number of items covered by the newly created child sub-batch MDP shall be equal to the number of items covered by the parent sub-batch MDP.

Guidance Note 7: in this specification, the act of creating two or more child sub-batch MDPs based on a common parent sub-batch is referred as “MDP split”. See also Sec. 2.6.7. *End-of-guidance-note*

GR-17: With reference to the information requirements of Sec. 2.5 and of Appendix A, the Digital nameplate data, the Technical data, the Conformity data and the Environmental data of a child sub-batch MDP shall be identical to the corresponding data of the parent sub-batch MDP.

GR-18: A child sub-batch MDP obtained from a parent sub-batch MDP shall be assigned a new dedicated Identification Code (see Sec. 2.3).

GR-19: A parent sub-batch MDP that has been used to issue child sub-batch MDPs shall not be included in the Bill of Material of a parent component MDP.

Guidance Note 8: **GR-16** allows a provider of bulk material to create a sub-batch MDP for a full batch during manufacturing, and then to sell only a portion of the production batch to a component purchaser. Specifically, based on the parent sub-batch MDP, two child sub-batch MDPs will be issued, one covering the items sold to the component purchaser, and the other covering the items not sold. Due to **GR-19**, the parent sub-batch MDP becomes unusable in any parent component, since it has been split between 2 child MDPs.

This concept can then be iterated to split any sub-batch MDP at any level of the supply chain, see also **Figure 2**. *End-of-guidance-note*

GR-20: A child sub-batch MDP shall include reference to the parent sub-batch MDP.

GR-21: More than one sub-batch MDP may be issued for the same production batch. The total number of items covered by sub-batch MDPs that refer to the same production batch shall not exceed the total amount of items that compose that production batch.

GR-22: The same batch item shall not be covered by more than one sub-batch MDP.

Guidance Note 9: batch items are not identified at individual level and share the same features. Therefore, a single MDP can be issued for more than one item coming from the same batch. It is noted that more than one MDP may be issued for the same batch, for instance when the batch items are used for manufacturing different parent components. Reference to the parent component’s MDP is included in the sub-batch MDP, as per **GR-10**, and the BoM of the parent component will indicate how many items of a given bulk material are necessary for the parent component, as per **GR-07**. In this way, it is ensured that the same batch items covered by a given sub-batch MDP cannot be used in more than one parent component. Thanks to requirement **GR-16** it is always possible to split a sub-batch MDP, to allow only a portion of batch items to be traded and ultimately included in a given parent component. *End-of-guidance-note*.

2.2.5 Issuance of the Material Digital Passport

GR-23: The MDP shall officially be issued by the MDP Provider before the component is delivered to the component purchaser.

Guidance Note 10: an MDP is *created* when the MDP provider first starts providing the MDP data on the MDP Platform (see Sec. 2.6). The *issuance* of the MDP is the

official action performed by the MDP provider to formally issue the MDP once the component is ready for delivery. *End-of-guidance-note*

Guidance Note 11: The MDP should normally be issued by the manufacturer of the component. *End-of-guidance-note*

GR-24: It shall be possible to create and issue an MDP for a given component after its manufacturing process has been completed. It is recommended the MDP is created at the beginning of the manufacturing process.

GR-25: An MDP that is created after the manufacturing process is completed may be issued by the component provider even if it is not the manufacturer.

GR-26: If the MDP provider is different from the manufacturer, additional verification of the MDP data by a Verifier company may be requested by the MDP requester. This shall be agreed between the MDP requester and the MDP provider.

Guidance Note 12: a component provider may be requested to provide a component with its MDP after the manufacturing process has been completed (see also 2.5.3), for example when a stock reseller that have purchased components from their manufacturer without originally requesting the MDP is requested to provide a component with an MDP. In this case, there are two options:

1. the original manufacturer of the component is engaged by the component provider to generate the MDP, provide the required data and issue the MDP;
2. if the original manufacturer cannot issue the MDP, either the component provider or the component purchaser may generate, populate, and issue the MDP.

An MDP that is not issued by the original manufacturer may provide a lower level of confidence in the trustworthiness of the MDP. These MDP are recognizable since the component manufacturer and MDP issuer data field (see Appendix A) do not coincide. *End-of-guidance-note*.

2.3 MDP's Identification Code Requirements

This section includes the requirements related to the Identification Code (IC) of the components that are provided with an MDP, divided in different sub-sections depending on their context. Identification Code requirements are identified with a dedicated code number preceded by "IC-", e.g., "IC-01".

2.3.1 General

IC-01: A dedicated Identification Code shall be assigned to each MDP, including sub-batch MDP.

IC-02: The Identification Code shall be recorded in the Material Digital Passport of the component / sub-batch.

Guidance Note 13: Individual / complex equipment will therefore be associated to an individual IC (the IC of their MDP), while bulk material produced in batch will be assigned to a common IC (the IC of their sub-batch MDP). *End-of-guidance-note.*

2.3.2 IC Uniqueness

IC-03: The Identification Code shall be unique for each Material Digital Passport. The same IC shall not be used for more than one passport.

IC-04: The Identification Code shall accompany its Material Digital Passport for the entire component's life cycle. Once the component reaches its end of life, the IC shall not be re-used on other components.

IC-05: The Identification Code shall be an Identification Link string in compliance with the requirements of Sec. 4 of IEC 61406-1 Identification Link – General requirements, with the exclusion of Sec. 4.1.

Guidance Note 14: an Identification Link string is a unique identifier that has the form of a URL. *End-of-guidance-note*

Guidance Note 15: compliance with Sec. 4.1 is waived in view of the existence of sub-batch MDP. *End-of-guidance-note*

IC-06: The Identification Code of an MDP shall contain an UUID generated in compliance with ISO/IEC 9834-8:2014 "Generation of universally unique identifiers (UUIDs) and their use in object identifiers" as the final part of the <Path> component of the Identification Code. The time-based version of the UUID shall be used. This UUID is the UUID of the MDP.

Guidance Note 16: the Identification Code therefore takes the form of an Identification Link string that includes a UUID. This ensures compliance with IEC 61406-1 while preserving uniformity of identification for components covered by the MDP system. There is no need of a central authority issuing an IC, since time-based UUIDs are guaranteed to be unique. *End-of-guidance-note.*

IC-07: The UUID included in the Identification Code shall be represented through the hexadecimal representation of the UUID according to ISO/IEC 9834-8:2014. Only lowercase letters shall be used.

Guidance Note 17: an example of an Identification Code compliant with this specification is

<https://www.domain-abc.com/4167555e-8ee3-11ee-b9d1-0242ac120002>

where *4167555e-8ee3-11ee-b9d1-0242ac120002* is the UUID generated in compliance with ISO/IEC 9834-8. *End-of-guidance-note*

2.3.3 IC Generation

- IC-08:** The IC shall be generated either by the MDP provider or by the MDP requester.
- IC-09:** For a given asset, an agreement on who is responsible for the IC generation shall be established between the MDP requester and the MDP provider when the component requisition (e.g., a purchase order) is issued.

2.3.4 IC for Assets

- IC-10:** An Identification Code shall be associated to the final installation asset. This is defined as “Asset IC”.
- IC-11:** An Asset IC shall be generated by the Asset Owner.
- IC-12:** The Asset IC shall be reported in the MDP of all components installed in the considered asset.

2.4 Data Carrier Requirements

This section includes the requirements related to data carrier that shall be applied to the components provided with an MDP, divided in different sub-sections depending on their context. Data carrier requirements are identified with a dedicated code number preceded by “DC-”, e.g., “DC-01”.

The scope of the data carrier is to physically mark the component with its IC, in order to realize a link between the component and its Material Digital Passport.

Guidance Note 18: The data carrier requirements laid out in this section do not offer guarantees that an existing data carrier cannot be cloned and applied to a component that is not covered by the MDP associated to the IC embedded in the data carrier. However, such a fraud attempt is easily discovered by checking the tamper-proof data collected in the Material Digital Passport itself (see Sec. 2.5). *End-of-guidance-note.*

2.4.1 General

DC-01: Individual equipment and complex equipment components provided with an MDP shall be physically tagged with a dedicated data carrier.

DC-02: Bulk material components provided with a sub-batch MDP should be physically tagged with a dedicated data carrier whenever geometrically and functionally feasible.

If tagging of the bulk material component is not possible, the data carrier shall be applied to the component packaging.

Guidance Note 19: Tagging bulk material components may not be feasible due to geometrical constraints (e.g., the component is too small to allow the data carrier to be applied to the component) or functional constraints (e.g., applying a tag with the data carrier would compromise the functionality of the component). *End-of-guidance-note.*

DC-03: The data carrier shall be reported in the documentation accompanying the component.

2.4.2 Content of the Data Carrier

DC-04: The data carrier shall contain only the Identification Code of the component and no other data.

Guidance Note 20: Individual equipment and complex equipment components are marked with a unique data carrier. Bulk material components covered by the same sub-batch MDP, when applicable, are marked with the same data carrier. *End-of-guidance-note.*

Guidance Note 21: For how to access the Material Digital Passport of the component marked with the data carrier, reference is made to Sec. 2.6.10. *End-of-guidance-note.*

2.4.3 Data Carrier Application

DC-05: The data carrier shall be applied on the physical component in an easily accessible location.

DC-06: The data carrier shall be applied on the component either by using a dedicated label, or by direct print on the component, or by direct print on the component’s nameplate.

DC-07: The application method of **DC-06** shall be selected in order to guarantee the same expected design life duration as the component on which the data carrier is applied, taking into consideration the operating and design conditions of the component (e.g. operating and design temperature, humidity, exposure to corrosive environment, vibration, etc.).

2.4.4 Data Carrier Symbology

DC-08: The data carrier shall take the form of a 2D symbol as defined in either ISO/IEC 16022 for Data Matrix, or in ISO/IEC 18004 for QR code.

Guidance Note 22: while the use of QR codes as defined in ISO/IEC 18004 is more common, the use of Data Matrix may be preferable due to their lower geometrical footprint for the same content with respect to a QR code. *End-of-guidance-note*

DC-09: The selected 2D symbol shall comply with the requirements of its reference code, i.e., either ISO/IEC 16022 or ISO/IEC 18004.

DC-10: The data carrier shall comply with the requirements of Sec. 5 of IEC 61406-1:2022 Identification Link - Part1: general requirements.

Guidance Note 23: an example of a 2D symbol compliant with IEC 61406-1 standard and embedding a UUID in the <Path> component of the Identification Link string is reported in Figure 3.



Figure 3 – Example of a 2D data carrier for the Material Digital Passport, embedding the Identification Code <https://www.domain-abc.com/4167555e-8ee3-11ee-b9d1-0242ac120002> 4167555e-8ee3-11ee-b9d1-0242ac120002 is a hexadecimal UUID generated as per ISO/IEC 9834-8:2014.

End-of-guidance-note

2.5 Information Requirements

This section includes the requirements related to information that shall be recorded in the Material Digital Passport for components provided with an MDP, divided in different subsections depending on their context. Information requirements are identified with a dedicated code number preceded by “IR-”, e.g., “IR-01”.

The goal is to define the minimum set of data that allow to identify a component and reduce the possibility that the wrong Material Digital Passport can be associated to a component.

2.5.1 Data in the MDP

IR-01: Data defined as mandatory in Appendix A shall be included in the Material Digital Passport of a component.

Guidance Note 24: Both structured and unstructured data may be included in the Material Digital Passport, according to the provisions of Appendix A. *End-of-guidance-note*

IR-02: Data defined as optional in Appendix A may be included in the Material Digital Passport of a component, upon agreement between the MDP requester and the MDP provider.

IR-03: All Mandatory data and agreed optional data shall be included in the Material Digital Passport when the Material Digital Passport is issued.

IR-04: All textual data included in the Material Digital Passport shall be provided in the English language as a minimum.

IR-05: Adequate quality control processes shall be in place to ensure the data included in the Material Digital Passport by the MDP Data Providers are accurate and correct.

2.5.2 Roles and Responsibilities

IR-06: The value(s) of the data field shall be provided by the responsible MDP data provider defined in Appendix A for each data field.

IR-07: Only the authorized MDP data provider shall be able to provide the value of the respective MDP data field.

IR-08: Every time a data field is compiled or modified, the identity of the user that provided the data field value shall be recorded in the MDP.

IR-09: Data included in the MDP may be subject to verification from a data verifier. The data verifier shall be a different stakeholder with respect to the data provider.

Guidance Note 25: the data verification entails that the data verifier confirms the correctness and validity of the data provided by the MDP data provider. This confirmation may be based on independent cross checks of the data with available documentation, independent analysis, physical inspections carried out on the component, review of documentation, or any other applicable method. The verification can be done on the basis of a verification scheme as defined in international standards applicable for the scope, or as agreed with the involved stakeholders. The scope of verification is therefore variable and should be registered in the MDP, see **IR-11**. *End-of-guidance-note*

IR-10: Only the authorized data verifier defined in accordance with Appendix A shall be able to verify the data. The identity of the data verifier shall be recorded.

IR-11: The scope of the data verification should be defined for each verified data. The scope of the data verification shall be recorded in the MDP.

2.5.3 Data Updates over Lifecycle

IR-12: Data in the MDP shall be classified as either Dynamic Data or Static Data in accordance with Appendix A.

IR-13: The value of Static Data shall not be modified over the component life cycle after the MDP is issued. The value of Dynamic Data may be modified after the MDP is issued.

IR-14: For each data field, only the data provider defined in Appendix A at the different time of the product life cycle shall be able to update the value of the Dynamic Data.

IR-15: The date and time of any modifications (data entry or data update) of the MDP data shall be recorded in the Material Digital Passport.

IR-16: The historic values of the modified data shall be recorded in the passport.

2.5.4 Inclusion of Additional Data

IR-17: Additional data with respect to the mandatory and optional data defined by Appendix A may be recorded in the Material Digital Passport. If added, the data shall comply with the requirements **IR-18** to **IR-23**.

IR-18: The additional data to be included in the Material Digital Passport shall be agreed between the MDP requester and the MDP provider.

IR-19: The MDP data provider responsible for providing the additional data shall be identified and agreed between the MDP requester and the MDP provider.

IR-20: The need for data verification shall be agreed between the MDP requester and the MDP provider. The MDP requester may require that the additional data are verified by a Verifier company.

IR-21: For each additional data, the following requirements shall be defined by the MDP requester:

- Description of the data
- Format of the data: format in which the data shall be provided.
- Update of data: defines whether the data shall be static or dynamic, when the data shall be provided and, if applicable, when it shall be updated.
- Responsibilities: who shall be responsible for providing the value of the data, who shall be responsible for logging the value of the data in the MDP, and, if applicable, who shall be responsible for verifying the data.
- Data access rights: defines whether the data shall be Unrestricted (i.e., visible to all MDP Platform users, see Definitions) or Restricted (i.e., only visible to certain MDP Platform users, see Definitions).

IR-22: The use of unstructured data shall be agreed between the MDP requester and the MDP provider. It is recommended to avoid using unstructured data whenever possible.

IR-23: If unstructured data are used for providing document type data, the data should be provided in PDF/A files compliant with ISO 19005 series of standards. Relevant metadata, covering as a minimum the document number, document revision number, and document title should be included.

2.6 Digital Platform Requirements

Material Digital Passport will be created, managed, maintained, and made available by Digital Platform Providers (see 2.1.1.7) to the relevant stakeholders through Digital Platforms (referenced in the following as “MDP Platforms”) accessible on the internet as web portals. This section contains the requirements for such MDP platforms, divided into several sub-sections according to their context. MDP Digital Platform requirements are identified with a dedicated code number preceded by “DP-”, e.g., “DP-01”.

The goal is to define a digital ecosystem where different MDP platforms can coexist, potentially providing additional services that leverage the MDP system (IC, tagging and the platform itself) to their users, while maintaining interoperability both in terms of users being able to log on different platforms and in terms of MDP data being easily transferable between platforms.

2.6.1 General

DP-01: An MDP Platform shall be able to create, issue, maintain and make available to users a Material Digital Passport according to the minimum requirements included in this section.

DP-02: The MDP Platform shall be deployable in the geographical regions where the MDP owners are based.

DP-03: The MDP Platform shall be accessible by all the stakeholders involved (see also Sec. 2.6.2).

Guidance Note 26: Platform accessibility implies the possibility to visualize, insert and record the MDP data of the MDP according to the user’s role (see Sec. 2.6.3).
End-of-guidance-note.

DP-04: The MDP Platform shall comply with the cybersecurity and regulatory requirements applicable in the region where the MDP Platform is deployed.

DP-05: The Information Security Management System (ISMS) of the Digital Platform Provider developing the MDP Platform shall as a minimum be certified against the requirements of ISO/IEC 27001 Information security, cybersecurity and privacy protection – Information security management systems – Requirements.

DP-06: The MDP Platform shall be able to collect metrics related to the use and spread of the Material Digital Passport system and provide openly accessible reports on those metrics.

DP-07: As a minimum, the MDP Platform shall collect the following metrics:

- Total number of MDP that have been created on the MDP Platform, divided as Individual MDP or Sub-batch MDP
- Total number of MDP that have been issued on the MDP Platform
- Total number of MDP users that use the MDP Platform, classified by their roles (see Sec. 2.1.2)
- Number and list of Equipment Classes according to JIP36 classification (see JIP36 Equipment Class in Appendix A) for which at least one MDP has been created on the MDP Platform

DP-08: An MDP Platform developed in accordance to this specification shall be verified for compliance against the requirements laid out in this specification by a recognized Verifier company before turning operational.

2.6.2 Stakeholders' Identity Management

- DP-09:** An MDP Platform shall guarantee access to the platform itself to all involved stakeholders without the need for the users to register on the platform with a dedicated account.
- DP-10:** Access to an MDP Platform shall be granted to MDP stakeholders either through the use of a Decentralized SSI (Self Sovereign Identity) model that leverages Decentralized Identifiers (DID), or through IAM (Identity and Access Management) system like OAuth 2.0. The use of Decentralized Identifiers is recommended.
- DP-11:** Access authentication credentials shall be issued to the stakeholders by recognized credentials issuers.

2.6.3 Users and Roles

- DP-12:** The MDP Platform shall be able to assign roles to users as defined in Sec. 2.1.2.
- Guidance Note 27:** Different roles will have different rights (*reading, writing, validating rights*) to the data of a given Material Digital Passport as per the remaining requirements of this section. *End-of-guidance-note*.
- DP-13:** The MDP Platform shall make it possible to assign more than one user to the same role for a given MDP.
- Guidance Note 28:** Users assigned to the same role constitute a "user group". *End-of-guidance-note*
- DP-14:** The MDP Platform shall make it possible to only assign users belonging to the same Stakeholder company to the MDP owner user group, to the MDP requester user group, and to the MDP provider user group respectively.
- DP-15:** The MDP Platform shall make it possible for the same user to have different roles for different Material Digital Passports.
- DP-16:** The MDP Platform shall ensure that the MDP data classified as unrestricted in Appendix A are visible (reading right) to all MDP Platform users.
- DP-17:** By default, the MDP Platform shall ensure that MDP Data classified as Restricted in Appendix A are visible (reading right) only to the MDP owner users group, to the MDP data provider user group for that data, and to the MDP data verifier users group for that data.
- DP-18:** The MDP Platform shall allow the MDP owner to grant and remove reading right of Restricted data to additional users.
- DP-19:** For a given MDP, the MDP Platform shall ensure that only the users classified as MDP data provider of a given data are able to input and update (writing right) that data in the considered Material Digital Passport.
- DP-20:** For a given MDP, the MDP Platform shall ensure that only the users classified as MDP data verifier of a given data are able to verify that data (validating right) in the considered Material Digital Passport.
- DP-21:** For a given MDP, the following roles shall be assigned to at least one user: MDP owner, MDP requester, MDP provider.
- Guidance Note 29:** if the MDP is created before there is a requisition for a component as per **GR-03**, the MDP requester will be the MDP Provider itself. *End-of-guidance-note*

DP-22: For a given MDP, at least one MDP data provider and, if applicable according to the requirements of Appendix A, at least one MDP data verifier shall be assigned to each data field.

Guidance Note 30: Different data fields may have different MDP data providers and MDP data verifiers. *End-of-guidance-note*

Guidance Note 31: when additional data are included in the MDP as per Sec. 2.5.4, the role of data provider and the need for a data verifier is defined according to the requirements **IR-19** and **IR-20**. *End-of-guidance-note*

DP-23: For a given MDP, the MDP Platform shall automatically assign the initial role of MDP owner to the user creating the MDP (see Sec. 2.6.4).

DP-24: For a given MDP, the MDP Platform shall ensure that the MDP owner is able to assign the role of MDP owner to a new user, subject to approval of the current MDP owner user groups and of the new owner.

Guidance Note 32: It follows from **DP-21** that if the new user assigned to the MDP owner role belongs to a different company than the current MDP owner users group, all current owner shall be replaced by the new owner. *End-of-guidance-note*

DP-25: The MDP Platform shall ensure that the MDP owner is able to modify the users assigned to a role for a given MDP.

2.6.4 Material Digital Passport Creation and Management

DP-26: The MDP Platform shall allow the creation of new Material Digital Passports through a dedicated functionality (“MDP Creation”).

DP-27: When an MDP is created, the MDP Platform shall generate the UUID associated to that MDP according to **IC-06** and **IC-07**.

DP-28: The MDP Platform shall allow to input, update and validate the MDP data as defined in Sec. 2.5 and Appendix A on an MDP created on an MDP Platform.

DP-29: The MDP Platform shall make it possible to input, update and validate the MDP data either through a dedicated Graphical User Interface (GUI), or through Application Programming Interfaces (APIs).

Guidance Note 33: The use of an API allows the flow of data from the ERP or Asset Management System of the MDP Data Provider to the MDP Platform, avoiding the need of manual upload through the MDP Platform’s GUI. The Platform API should implement at least the reference definition provided in Appendix B. *End-of-guidance-note*

DP-30: The MDP Platform shall make it possible to define additional data fields to be recorded and stored on an MDP created on an MDP Platform. Additional MDP data fields shall comply with the requirements of Sec. 2.5.4.

DP-31: The MDP Platform shall manage the MDP Status data field. As a minimum, the following MDP status shall be considered:

- “In creation”
- “Valid”
- “Under Investigation”
- “Retired”

DP-32: The MDP Platform shall automatically set the MDP Status to “In creation” once the MDP is created.

DP-33: The MDP Platform shall automatically set the MDP Status to “Valid” once an MDP is issued according to the requirements of Sec. 2.6.6.

DP-34: The MDP Platform shall make it possible to set the MDP Status to “Under Investigation” either automatically according to predefined rules or manually.

Guidance Note 34: an MDP Status may be set to Under Investigation manually for example if a material fraud of the component is suspected. An MDP status may be set to Under Investigation automatically for example if its certifications are not renewed within the expected time frame, or if an MDP data that require verification has been modified and not yet validated by the MDP Data verifier. *End-of-guidance-note*

DP-35: The MDP Platform shall make it possible only to the MDP owner and to MDP Data Verifiers to manually set the MDP Status to Under Investigation. Details on why the MDP is Under Investigation should be included.

DP-36: The MDP Platform shall make it possible to set the MDP Status to “Retired” either automatically according to predefined rules or manually.

DP-37: The MDP Platform shall make it possible only to the MDP owner or to the Component Operator to manually set the MDP Status to Retired.

Guidance Note 35: an MDP Status may be set to Retired manually for example if a material fraud the component is confirmed. An MDP Status may be set to Retired automatically for example if the component status is set to Decommissioned, or if the MDP is split (see Sec. 2.6.7). *End-of-guidance-note.*

DP-38: The MDP Platform shall make it not possible to set an MDP Status to “In creation” again after issuance.

DP-39: The MDP Platform shall make it possible to set an MDP Status to “Valid” from “Under Investigation” either automatically according to predefined rules or manually.

DP-40: The MDP Platform shall make it not possible to modify an MDP Status after it has been set to “Retired”.

2.6.5 Bill of Materials

DP-41: A Material Digital Passport created on an MDP Platform shall support the Bill of Material functionality that implements the requirements of Sec. 2.2.3, Sec. 2.5 and Appendix A.

Guidance Note 36: through the BoM, the current MDP owner defines the list of sub-components within an MDP, and includes the link to their MDPs. *End-of-guidance-note*

DP-42: The Bill of Materials shall allow synchronization of MDP data from the parent component to its sub-components’ MDP (when available) included in the Bill of Materials, with traceability of the synchronization events. As a minimum the following events shall be triggered automatically:

- When the MDP owner of a Valid Material Digital Passport is modified, the MDP owner of the MDPs of its subcomponents reported in its Bill of Material shall be automatically updated to the MDP owner of their parent component.
- When the Asset of Installation data field (see Appendix A) of a Valid Material Digital Passport is modified, the Asset of Installation of the MDPs of its subcomponents reported in its Bill of Materials shall be automatically updated to the new Asset of Installation of their parent component.

- When the Component Status data field (see Appendix A) of a Valid Material Digital Passport is modified, the Component Status of the MDPs of its subcomponents reported in its Bill of Materials shall be automatically updated to the Component Status of their parent component.
- When the Start of Service Year data field (see Appendix A) of a Valid Material Digital Passport is provided, the Component Status of the MDPs of its subcomponents reported in its Bill of Materials shall be automatically updated to the Start of Service Year of their parent component.

DP-43: The Bill of Materials shall allow consistency checks of MDP data between the parent component and its sub-components. As a minimum, the following consistency check shall be implemented: a sub-component can be included in the BoM of a parent component only if the Identification Code of the Parent Component data field (see Appendix A) of that sub-component correspond to the Identification Code of the parent component.

2.6.6 MDP Issuance

DP-44: The MDP Platform shall support a functionality (“MDP Issuance”) for MDP issuance, which officially issue the MDP as per the requirements of Sec. 2.2.5.

Guidance Note 37: when an MDP is created, it is not yet an MDP officially issued. The MDP is issued through the MDP issuance functionality. *End-of-guidance-note*

DP-45: The MDP issuance shall be irreversible, hashed, traced, and visible to each involved stakeholder.

DP-46: The issuance of an MDP shall be recorded in the MDP Status data field by automatically setting the status to Valid.

DP-47: Only the MDP provider assigned to a given MDP shall be able to issue that MDP.

DP-48: The MDP issuance functionality shall not allow to issue an MDP when mandatory data field and agreed optional data have not been filled in.

DP-49: The MDP issuance functionality shall not allow to issue an MDP if the MDP Status of any of the sub-components reported in its Bill of Material if their MDP is not Valid.

DP-50: The MDP issuance functionality shall not allow to issue an MDP if the Identification Code of the Parent Component data field (see Appendix A) of the sub-components reported in its Bill of Material is not equal to the Identification Code data field of the MDP.

DP-51: The MDP Platform shall make it not possible to modify MDP Data classified as Static Data after the MDP has been issued (see **IR-13**).

2.6.7 Split of sub-batch MDP

DP-52: The MDP Platform shall support a functionality (“MDP Split”) for splitting a parent sub-batch MDP into 2 or more child sub-batch MDPs, as per the requirements of Sec. 2.2.4.

Guidance Note 38: splitting and sub-batch MDP has the double effect of retiring the parent sub-batch MDP and issuing the child sub-batch MDPs. *End-of-guidance-note*

DP-53: The MDP Platform shall only allow to split a sub-batch MDP that has a “Valid” status.

DP-54: The MDP Platform shall automatically set the status of a parent sub-batch MDP that has been split to “Retired”.

- DP-55:** The MDP Platform shall only allow the MDP Owner to split a sub-batch MDP.
- DP-56:** The MDP Platform shall automatically set the MDP Owner of the parent sub-batch that is split as owner of the child sub-batch MDPs that are created through the MDP Split.
- DP-57:** With reference to Appendix A, the MDP Platform shall require the MDP Owner that splits the parent sub-batch to specify the number of items that are to be included in each child sub-batch MDP, and store this information in the respective “MDP Items Number” data field of the child sub-batch MDP.
- DP-58:** The MDP Platform shall ensure that the total number of items covered by the child sub-batch MDPs is equal to the number of items covered by the parent sub-batch MDP that has been split.
- DP-59:** With reference to Appendix A, the MDP Platform shall automatically compile the MDP Owner Company, the MDP Type, the Digital nameplate data, the Technical data, the Conformity data and the Environmental data of a child sub-batch MDP with values identical to the corresponding values of the parent sub-batch MDP that has been split.
- DP-60:** With reference to Appendix A, the MDP Platform shall automatically compile the “Identification Code of the Parent Sub-Batch” data field of the child sub-batch MDPs with the Identification Code of the parent sub-batch MDP that has been split.
- DP-61:** With reference to Appendix A, the MDP Platform shall automatically set the “MDP Issuer” data field of the child sub-batch MDPs as the user that splits the parent sub-batch MDP.
- DP-62:** With reference to Appendix A, the MDP Platform shall automatically set the “Date of Issuance of the MDP” of the child sub-batch MDPs as the date when the parent sub-batch MDP has been split.
- DP-63:** With reference to Appendix A, the MDP Platform shall require the MDP Owner that splits the parent sub-batch MDP to provide input for all data field of the child sub-batch MDP that are not automatically compiled during the MDP Split.

2.6.8 Data Management

- DP-64:** The MDP Platform shall allow to record MDP data either as structured data or unstructured data according to the requirements of Appendix A.
- DP-65:** The upload, input, and update of any file data on the MDP Platform shall trigger the generation of a hash, to create evidence of the event, including the details of the user providing the data and the unified timestamp of the event.
- Guidance Note 39:** Through this hash, the file uploaded may be retrieved and linked to the MDP when distributed data storage solutions are implemented by the MDP Platform. *End-of-guidance-note*
- DP-66:** Any action of writing and editing of MDP data executed on the MDP Platform shall be recorded, including the user performing the action and the unified timestamp, and linked to the data.

The log of the recorded actions should be auditable upon request.

- DP-67:** Any data, once submitted on the MDP Platform, shall be stored in the selected Data Storage solution (see Sec. 2.6.9), where the tamper proofness of the data is guaranteed by its hash.
- DP-68:** The MDP Platform shall implement data consistency checks and policies that comply with the data requirements reported in Appendix A. As a minimum:

- The value of the Identification Code of the Parent Component data field (see A.1.2) cannot be “Not installed” if the Component Status data field (see A.4.4) is set to “In Operation”
- The value of the Start of Service Year data field (see A.4.3) cannot be “Not in service” if the Component Status data field (see A.4.4) is set to “In Operation”
- The value of the Asset of Installation data field (see A.4.2) cannot be “Not Installed” if the Component Status data field (see A.4.4) is set to “In Operation”

2.6.9 Data Storage and Retention

DP-69: The MDP Platform shall ensure the data storage for all required MDP data and related documentation.

Guidance Note 40: different data storage solutions may be selected by different MDP Platforms. *End-of-guidance-note*

DP-70: The information related to a given MDP and stored in the MDP Platform shall be linked to that MDP and hashed.

DP-71: MDP Data and documentation shall remain accessible through the MDP Platform hosting the considered MDP at least until decommissioning of the component.

2.6.10 MDP Web Address

DP-72: Each MDP hosted on an MDP Platform shall be accessible on the Internet through a dedicated URL according to IETF RFC 3986.

DP-73: The URL of the MDP shall contain the UUID associated to the MDP (see **IC-07**) in its <Path> component as the last element of the <Path> component.

Guidance Note 41: for example, for an MDP Platform complying with the *https* <Scheme>, having *www.MDP-Platform-1.com* as <Host> element, and making MDP accessible through the <Path> *MDP/UUID*, the following URL would be used for accessing an MDP having 4167555e-8ee3-11ee-b9d1-0242ac120002 as UUID:

<https://www.MDP-Platform-1.com/MDP/4167555e-8ee3-11ee-b9d1-0242ac120002>

Note that the <Scheme> and <Host> elements of an URL are not case sensitive, while the <Path> element is case sensitive. *End-of-guidance-note*

Guidance Note 42: note that the URL of the MDP on the MDP Platform does not necessarily coincide with the Identification Code that is embedded in the data carrier. See also **DP-74**. *End-of-guidance-note*

DP-74: The Digital Platform Provider shall provide to its users a dedicated application with the following features:

- deployable on commercially available scanning devices used to scan 2D Data Carriers (e.g., smartphones);
- able to scan the data carrier to retrieve the component’s Identification Code encoded in the data carrier itself (see Sec. 2.4.2);
- able to associate the retrieved IC to the URL of the related MDP on its hosting MDP Platform.

Guidance Note 43: the data carrier can be scanned by any available scanning device that is able to scan 2D data bar: this scanning will return the Identification Code associated to the component (e.g., <https://www.domain-abc.com/4167555e-8ee3-11ee-b9d1-0242ac120002>). The result of this scanning may obviously be used to

access the URL embedded in the Identification Code, which for example may be the manufacturer website dedicated to that component.

However, the URL of the Identification Code may not coincide with the URL of the MDP Platform that host the MDP. The dedicated application provided by the Digital Platform Provider in accordance with DP-74 will therefore associate the scanned IC to the current MDP's URL, such as <https://www.MDP-Platform-1.com/MDP/4167555e-8ee3-11ee-b9d1-0242ac120002>. Note that both the Identification Code and the MDP URL share the common UUID of the MDP. *End-of-guidance-note*

2.6.11 MDP Transfer

DP-75: The MDP Platform shall support a functionality for transferring an MDP to a different MDP Platform ("MDP Transfer").

DP-76: The MDP Transfer functionality shall transfer the MDP Data and documentation to the new MDP Platform, including their hash according to Sec. 2.6.8, in agreement with cybersecurity policy, regional privacy policy and any other agreement between the parties.

DP-77: The MDP transfer functionality shall only be available to the MDP Owner.

Guidance Note 44: the need to transfer an MDP can arise for example when the component is sold to a new Owner that uses a different MDP platform for managing MDPs. The MDP Owner may be updated either before or after the transfer of the MDP, subject to agreement between the parties. Alternatively, the need to transfer an MDP may arise when a manufacturer procures a sub-component whose MDP is managed on a different MDP Platform. *End-of-guidance-note*

DP-78: The MDP Platform shall only transfer an MDP when its MDP Status is "Valid".

DP-79: When the MDP Platform transfers an MDP to a new MDP Platform, the MDP of all its sub-components as reported in its Bill of Material shall be transferred as well.

Guidance Note 45: this requirement ensures that requirements **DP-41** and **DP-42** are manageable through the MDP Platform of the parent component. *End-of-guidance-note*

DP-80: The MDP Platform that receive the MDP shall automatically check that the transferred MDP Data correspond to the original MDP by leveraging the hash of the transferred data and automatically set the MDP Status to "Under Verification" when the check is not successful.

DP-81: If a Material Digital Passport is transferred between two MDP Platforms, the MDP should be associated to a Non-Fungible Token (NFT), whose ownership is also transferred to the new owner of the MDP.

Guidance Note 46: when the passport is transferred, the MDP data are transferred between platforms, and at the same time the ownership of the NFT associated to the MDP is also transferred to the new owner of the MDP. *End-of-guidance-note*

DP-82: The NFTs associated to MDPs should be generated by MDP Platforms using Ethereum ERC-721 standard, or any compatible standard.

DP-83: The NFT of an MDP should as a minimum include the information of the Identification Code of the component, the URL of the MDP, and the hash of the MDP data.

3 Reference Implementation

Sec. 3.1 provides a high level architecture of a material digital passport system that complies with the requirements laid out in Sec. 2 of this specification and that can therefore be used as reference for the development of an MDP system based on this specification. A narrative use case is also provided in Sec. 3.2 to further serve as reference to readers.

3.1 High-level Architecture

This Implementation Reference provides a comprehensive guide to implement a secure, distributed, and interoperable system for Material Digital Passport generation. The aim is to establish a robust framework that enhances transparency, trust, and data immutability in managing material-related information across the energy sector.

It is underlined that continuous technological advancements occur in the Information Technology available solutions. It is therefore expected that regular reviews and updates to this reference architecture will be necessary to align with such technological advancements and evolving industry requirements.

The proposed implementation of the Material Digital Passport involves multiple actors in the supply chain, each responsible for inserting their process information into the platform. Users are assigned specific roles and tasks within the process, ensuring a distributed and collaborative approach. All relevant information is stored within the databases of the MDP platform provider, forming the basis for generating Material Digital Passports. Additionally, the MDP may be linked to a Non-Fungible Token (NFT) on a Distributed Ledger Technology (DLT) to establish and authenticate ownership of the component covered by the Material Digital Passport.

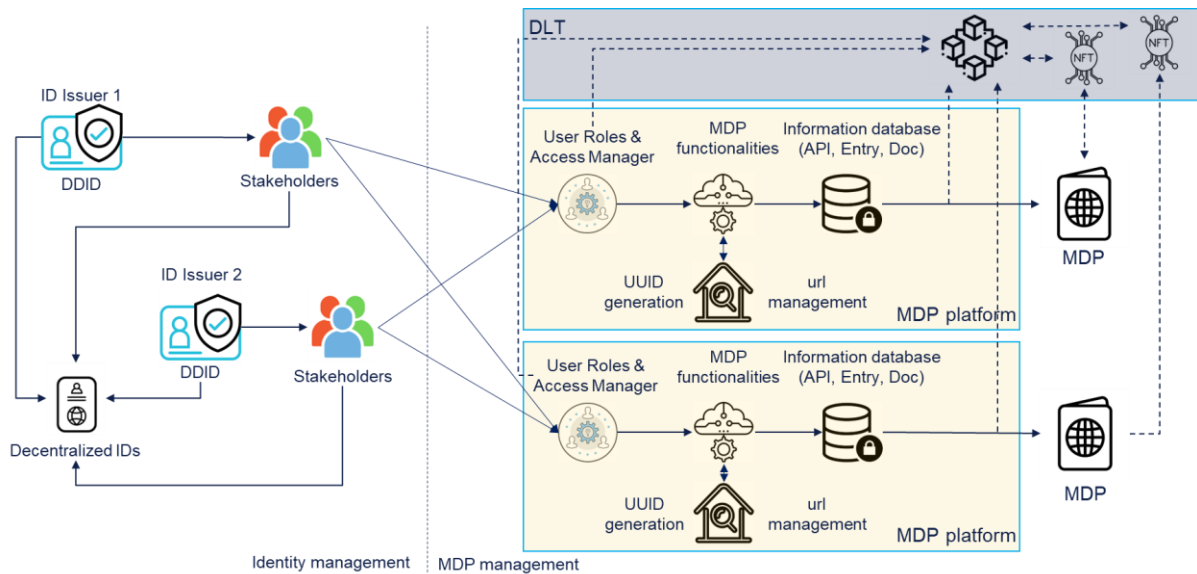


Figure 4 – High level view of the Material Digital Passport reference architecture

Figure 4 reports a simplified schematics about how users, identified by a DID system, get access to the MDP Platform, and insert the required data for which they are responsible according to the users’ role that are managed by the MDP Platform provider. The information provided is used for the definition and maintenance of the MDP. An underlying layer based on a Distributed Ledger Technology (DLT) is present to record the actions taken on an MDP (creation, data update) on a distributed register, thus enhancing the anti-tampering qualities of the MDP ecosystem.

The MDP is also linked to a Non-Fungible Token (NFT) used to facilitate the tamper-proof transfer of MDP ownership between different MDP Platforms, while also providing an immutable proof of ownership of the component covered by the MDP.

More details on the key ingredients of the high-level architecture (namely the Distributed Identities, the MDP Platform and the underlying anti-tampering approach based on the DLT features) are provided in the following subsections.

3.1.1 Digital Identity Providers

The proposed scheme leverages Digital Identity Providers, who rely on a distributed identity model based on decentralized identifiers (DIDs) and verifiable credentials (VC), to identify users. The MDP stakeholders are issued unique digital identities, and these identities shall be recognized across the network and platforms in accordance with requirements of Sec. 2.6.2. The issuance and recognition process ensures that each participant maintains control over their identity, enhancing cryptography and data ownership while promoting trust within the distributed ecosystem.

3.1.2 MDP Platforms Providers

The MDP Platform developed by the Digital Platform Provider serves as a distributed hub that manages the entire lifecycle of the Material Digital Passport. This encompasses overseeing the distributed identity framework, coordinating the data collection process from various actors in the supply chain, and generating MDPs based on the accumulated information. The MDP platform is responsible for generating the MDP UUID and for managing their URLs. The MDP Platform associated the MDPs to NFTs for enhanced ownership verification. In the event of a change in ownership of the component, the MDP platform is responsible for managing secure data sharing between relevant parties, potentially using different MDP platforms.

Several MDP Platform providers can develop bespoke MDP Platforms, as long as interoperability, intended as ability to transfer MDPs between platform and to allow stakeholder's access to the platform, is guaranteed. MDP Platforms can also be used to develop additional services and features based on the existing infrastructure and system developed for the MDP. Furthermore, existing traceability platform can be used for generating MDP, as long as they adhere with this specification.

3.1.2.1 Key Features:

Role-Based Access: in this reference implementation, users within the supply chain are assigned specific roles and tasks according to the requirements of Sec 2.6.3 and to the responsibilities identified in Appendix A, ensuring a structured and collaborative approach.

Distributed Data Storage: In this reference implementation, the information provided from various stakeholders is securely stored within the MDP Platform's databases, forming the basis for MDP generation, according to the requirements of Sec. 2.6.9.

DLT Integration with NFTs: In this reference implementation, MDPs are linked to NFTs implemented on a Distributed Ledger according to a protocol compatible with ERC-721 standard for NFT, in agreement with Sec. 2.6.11. NFTs are used to enhance tamper proof transfer of MDPs between different MDP Platforms, while also providing an immutable proof of ownership of the component covered by the MDP.

Data Sharing and Transfer: In this reference implementation, the MDP platform facilitates secure data sharing, particularly during changes in asset ownership, ensuring a smooth transition while maintaining data integrity and cybersecurity.

3.1.2.2 MDP Platform Functionality Details

As per the requirements of Sec. 2.6, in this reference implementation the MDP Platforms are designed to facilitate seamless data input, secure storage, and efficient retrieval of component-related information. They ensure data integrity, traceability, and accessibility through the association of the MDPs to their Identification Link and related URLs, and robust user and role management.

1. Data Input (Mode and Type)

In the reference implementation, the MDP platforms support flexible data input modes, accommodating manual entry by users and automated data feeds from various actors in the supply chain through the development of dedicated APIs as necessary. The data types comply with the requirements of Appendix A.

Input methods are designed to be user-friendly, promoting easy adoption across different stakeholders.

2. Data Storage and Retention

In this reference implementation, data collected through the MDP platform are securely stored in a secured database with robust backup and redundancy measures. The platforms adhere to data retention policies compliant with industry standards and regulations. Historical values of the data are retained to ensure traceability and historical context, allowing for audits and analysis of component information over time.

3. MDP URL

In this reference implementation, each Material Digital Passport created by the platform is assigned a unique URL as per Sec. 2.6.10. This URL provides a convenient means for accessing and sharing the passport information. The MDP URL is designed to be accessible, shareable, and secure, ensuring that authorized users can retrieve the information contained within the passport.

4. Association of UUID (Asset ID) and URL

In this reference implementation, the MDP platform establishes and maintains a clear association between the component Identification Code and the corresponding MDP URL. This association ensures that users can easily navigate from the asset identifier to the digital passport, fostering efficient data retrieval and validation. The Identification Code serves as a unique reference point for each component tracked within the platform.

5. User and Roles Definition:

In this reference implementation, the MDP platform implements a robust user and role management system. Users are assigned specific roles based on their responsibilities and permissions within the supply chain and in accordance with the requirements of Sec. 2.6.3. Role-based access control ensures that only users having appropriate permissions are able to perform their designated tasks, enhancing security and accountability.

6. Data Management and Type:

In this reference implementation, the MDP platforms accommodate various types of material-related data, such as textual information, numerical values, dates, and pdf files. Data management includes validation checks to ensure the completeness and coherence of input. As per the requirements of Appendix A the MDP Platform employs standardized data structures to maintain consistency in the representation of MDP information across the supply chain.

7. Data Immutability:

To ensure the integrity and immutability of material data, in this reference implementation the MDP platform leverages cryptographic techniques such as hashing and digital signatures.

Once data is entered and validated, it becomes part of an immutable record. Any attempt to alter or tamper with the data is immediately detectable, ensuring that the historical integrity of the MDPs is maintained throughout their lifecycle.

3.1.3 Anti-Tampering Approach

To safeguard the integrity of the Material Digital Passport, an anti-tampering approach of the MDP data is implemented in this reference implementation. Robust cryptographic mechanisms, including digital signatures and hash functions, are employed. Each MDP is digitally signed during its generation, and the signature is securely stored. This signature is subsequently verified throughout the lifecycle of the material, ensuring that any unauthorized tampering is immediately detected.

Data can only be updated by the users assigned to the correct role. Each modification action of the MDP data is tracked by registering the identity of the user who modified the data and the time of the modification. Each modification event of the data triggers a registration on the underlying DLT layer.

3.1.3.1 DLT layer for MDP infrastructure

In this reference implementation, a Distributed Ledger Technology (DLT) is used in a distributed network as an underlying layer for the MDP Platform, in order to improve the reliability and trust in the MDP data without the need of a central authority. The use of a Distributed Ledger Technology facilitates records and verifies data transactions in a decentralized, distributed, and immutable way. It uses cryptographic techniques to ensure the security, integrity, and authenticity of the data.

A DLT is used to enhance the transparency, traceability, and accountability of the MDP lifecycle, from sourcing to disposal, in accordance with the requirements set out in Sec. 2 of this specification. In fact, actions registered by the different stakeholders on an MDP are registered in a distributed, immutable ledger that guarantees that no tampering of the data can be carried out by ill-intentioned actors.

During the MDP creation and subsequent editing, information collected and hosted in the MDP Platform can change. In this reference implementation, these modifications are recorded in a DLT whenever there is a significant event or modification that affects to the component's passport. By leveraging the DLT system, all these updates are recorded, by hashing any operation, the user that carried it out, and the timestamp of the operation.

Specifically, the change and record process can be summarized as follows:

1. The stakeholder who initiates the change (in agreement with own rights assigned by the MDP platform) requests an MDP update from the DLT network, providing the relevant data and evidence.
2. The DLT network validates the request and verifies the data and evidence, using consensus mechanisms and smart contracts (where available).
3. The DLT network updates the MDP and records the change in a new block, which is linked to the previous blocks, forming a secure and immutable chain.
4. The DLT network broadcasts the updated MDP and the new block to all the participants and anyone can access and verify the information.

By following this process, when an MDP is created on the MDP Platform, this is registered in a DLT. Any change in the data of the MDP is registered as well. This forms a proof of immutability of the passport and fulfills the requirements of Sec. 2.6.

In this reference implementation, the DLT layer is leveraged to also associate an MDP to an NFT, which is used to facilitate the transfer of ownership of MDPs between different MDP

Platforms, in compliance with the requirements of Sec. 2.6.11, while also providing an immutable proof of ownership of the component covered by the MDP

In this reference implementation, Decentralized Identification services are leveraged to seamlessly access the DLT layer.

3.2 Reference Use Case

In this section, a use case is described to illustrate the end-to-end process of creation and application of the MDP, focusing on the role of each stakeholder involved in the process. The use case is summarized in **Figure 5**.

3.2.1 Overall Request for the MDP

In this use case, the MDP process starts when the Asset Owner of an Oil and Gas facility (Asset) create the overall Project Specification and assign the Engineering, Procurement and Construction of the asset to an EPC contractor.

The Asset Owner request an MDP for the components in the asset that have an individual identification number, and for bulk material covered by 3.1 or 3.2 certificates. It is agreed that it is responsibility of the EPC to ensure that relevant components are procured with an MDP.

The Asset Owner communicate to the EPC which MDP Platform has to be used for recording the MDP of the asset's components, and communicates the Asset's name and Asset ID to the EPC.

In this use case, among all the asset's components, we focus on a single T-1 component that requires two tiers of the supply chain to be manufactured, and requires verification of compliance of its design against international standards by a Verifier company.

3.2.2 T-1 Component Specifications Preparation

The EPC prepares the specification for the T-1 components to be included in the asset based on the requirements of the Asset Owner, both for individual equipment, complex equipment and bulk materials, as applicable.

For each of these components, the EPC contracts a T-1 Manufacturer. The requirements that T-1 components are provided with an MDP is communicated by the EPC to the Manufacturer, together with the Asset ID and the selected MDP Platform.

For the creation of the MDP, two alternative cases may exist, to be agreed between the parties:

- A. The EPC log in the MDP platform and create the MDP, becoming the MDP Owner. The EPC assign the role of MDP Provider to the T-1 Manufacturer.
- B. The T-1 Manufacturer log in the MDP platform and create the MDP, becoming the MDP Owner. The T-1 Manufacturer assign the role of MDP Provider to itself.

We consider option A in this case: the MDP of the T-1 component ("T-1 MDP") is created by the EPC and the EPC assign the role of T-1 MDP Provider to the T-1 Manufacturer.

The EPC also assign the role of MDP Data provider to itself for the data pertaining to the component purchaser according to Appendix A.

The EPC upload in the Platform the T-1 MDP data pertaining to the component purchaser as per Appendix A.

3.2.3 Start of Manufacturing for T-1 Component

In this use case, the T-1 Manufacturer receive both the purchase order with the request for the MDP, and the technical specification from the EPC.

The T-1 Manufacturer start the engineering of the component and prepares the technical specifications for the T-2 components.

The T-1 Manufacturer access the platform, verifying its ID through the Digital Identity service. The T-1 Manufacturer fill in the MDP the data pertaining to the MDP Provider according to Appendix A. The T-1 Manufacturer creates the Bill of Materials including all sub-components requiring an MDP.

The T-1 manufacturer contracts the T-2 Manufacturers. Depending on the T-2 component and in agreement with the requirements of Sec. 2.2.2, the relevant T-2 components are requested to be provided with an MDP.

For the creation of the MDP of T-2 components, two alternative cases may exist, to be agreed between the parties:

- A. The T-1 Manufacturer log in the MDP platform. and create the component MDP, becoming the MDP Owner. The T-1 Manufacturer assign the role of MDP Provider to the T-2 Manufacturer.
- B. The T-2 Manufacturer log in the MDP platform and create the component MDP, becoming the MDP Owner. The T-2 Manufacturer assign the role of MDP Provider to itself.

We consider option B in this case: the MDP of the T-2 component ("T-2 MDP") will be created by the T-2 Manufacturer.

The T-1 Manufacturer contracts a Verifier company for carrying out the verification activities as per contractual requirements, and assign the role of T-1 MDP data provider to the Verifier company for the data pertaining to the Verifier company according to Appendix A.

3.2.4 Manufacturing for T-2 Component

Focusing on a single T-2 component, the T-2 Manufacturer receive both the purchase order with the request for the MDP, and the technical specification from the T-1 Manufacturer.

The T-2 Manufacturer start the engineering of the component. We consider in this use case that T-3 components do not require an MDP.

The T-2 Manufacturer log in the MDP platform verifying its ID through the Digital Identity service. On the platform, the T-2 Manufacturer generates the T-2 component MDP, becoming the MDP Owner, and assign the role of MDP Provider to itself.

The T-2 Manufacturer assign the role of MDP Data provider to the T-1 Manufacturer for the data pertaining to the component purchaser according to Appendix A.

The T-1 Manufacturer upload in the MDP Platform the MDP data pertaining to the component purchaser as per Appendix A.

The T-2 Manufacturer upload in the MDP Platform the data pertaining to the MDP Provider according to Appendix A.

The T-2 Manufacturer contracts a Verifier company for carrying out the verification activities as per contractual requirements, and assign the role of MDP data provider to the Verifier company for the data pertaining to the Verifier company according to Appendix A.

The Verifier company access the MDP Platform and provides the data pertaining to the Verifier company, possibly verifying other applicable data as per the requirements of Appendix A and contractual agreements.

Once all the data are provided for the T-2 MDP, the manufacturing is completed, and the component is ready for delivery, the T-2 MDP is issued by the T-2 Manufacturer.

The T-2 Manufacturer delivers the T-2 component to the T-1 Manufacturer and transfer the T-2 MDP Ownership to the T-1 Manufacturer.

3.2.5 Completion of Manufacturing for T-1 Component

The T-1 Manufacturer receive the T-2 components and the related T-2 MDPs. The BoM is therefore consolidated in the MDP Platform.

The T-1 Manufacturer complete the manufacturing of the T-1 components. The Verifier company contracted by the T-1 Manufacturer access the MDP Platform and provides the data pertaining to the Verifier company, possibly verifying other applicable data as per the requirements of Appendix A and contractual agreements.

Once all the data are provided for the T-1 MDP, the manufacturing is completed, and the component is ready for delivery to the EPC, the T-1 MDP is issued by the T-1 Manufacturer.

The T-1 Manufacturer delivers the T-1 component to the EPC. The T-1 MDP ownership is already assigned to the EPC since the T-1 MDP has been created by the EPC.

3.2.6 Component Installation and Asset Start-up

The EPC install all the T-1 components in the Asset. If necessary, relevant Dynamic Data in the MDP are updated.

The EPC transfer the MDP ownership of all T-1 components to the Asset Owner. The ownership of all sub-components is automatically transferred in accordance with the requirements of Sec. 2.6.5.

At start-up, during the operations of the Asset, and at decommissioning, the Asset Owner can update the information and the status of the MDP according to the requirements of Appendix A.

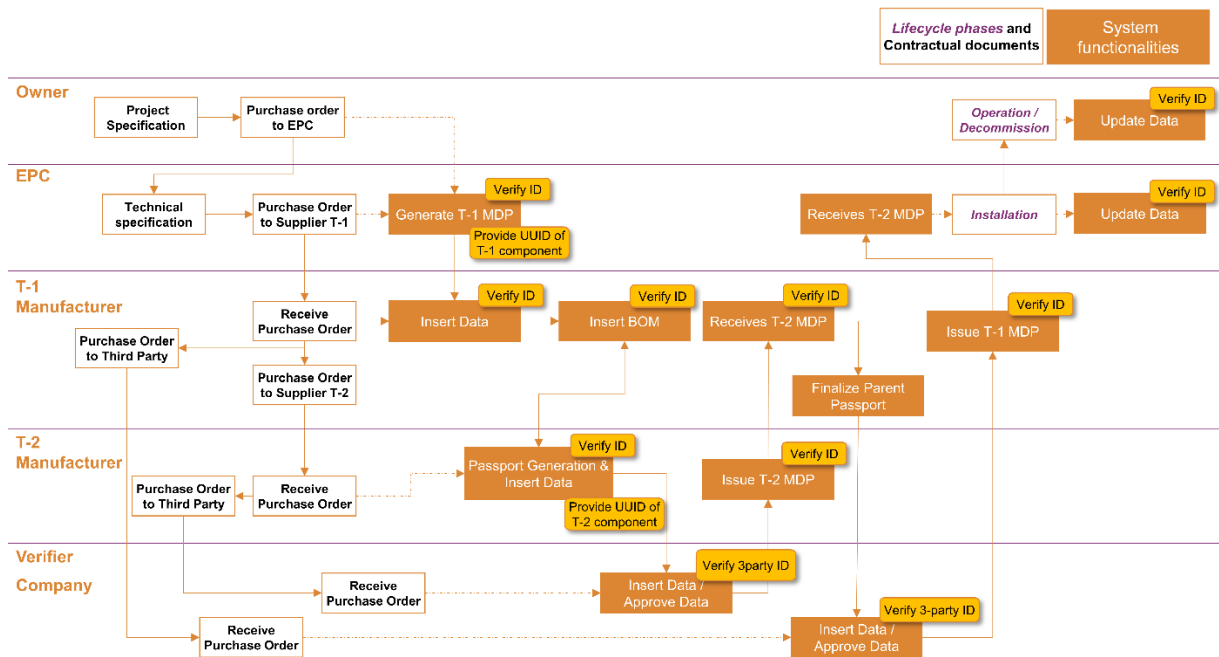


Figure 5 – Schematic of the use case process

Appendix A List of Data to be Included in the Material Digital Passport (Normative)

The data that shall be included in each MDP is summarized in Table 2. For each data field, details are included in the dedicated subsection of this Annex. Specific normative requirements for the data field are included in this Annex, identified with a dedicated code number preceded by “AR-”, e.g., “AR-01”.

Table 2 – Summary list of MDP Data

ID	Class	Data Field	Technical Name for API	Update	Access	Structure	Mandatory	Data provider	Details
D01	MDP data	Identification Code	MDP_IC	Static	Unrestricted	Single data (string)	Mandatory	MDP Provider	A.1.1
D02	MDP data	Identification Code of the Parent component	MDP_ICPC	Dynamic	Restricted	Single data (string)	Mandatory	MDP Requester	A.1.2
D03	MDP Data	Identification Code of the Parent Sub-batch	MDP_ICPSB	Static	Restricted	Single data (string)	Mandatory	Automatic	A.1.3
D04	MDP data	Date of Issuance of the MDP	MDP_Date	Static	Unrestricted	Single data (string - date)	Mandatory	Automatic	A.1.4
D05	MDP data	MDP Status	MDP_Status	Dynamic	Unrestricted	Single data (string)	Mandatory	Automatic / MDP Owner	A.1.5
D06	MDP data	MDP Issuer	MDP_Issuer	Static	Unrestricted	Single data (string)	Mandatory	Automatic	A.1.6
D07	MDP data	MDP Owner Company	MDP_Owner	Dynamic	Unrestricted	Single data (string)	Mandatory	Automatic / MDP Owner	A.1.7
D08	MDP data	MDP Type	MDP_Type	Static	Unrestricted	Single data (string)	Mandatory	MDP Provider	A.1.8
D09	MDP data	MDP Items Number	MDP_Items	Static	Unrestricted	Single data (Integer)	Mandatory	MDP Provider	A.1.9
D10	Digital nameplate	Serial / Batch Number	DN_SerialNumber	Static	Unrestricted	Single data (string)	Mandatory	MDP Provider	A.2.1
D11	Digital nameplate	Product Name	DN_ProductName	Static	Unrestricted	Single data (string)	Mandatory	MDP Provider	A.2.2
D12	Digital nameplate	Product Type	DN_ProductType	Static	Unrestricted	Single data (string)	Mandatory	MDP Provider	A.2.3
D13	Digital nameplate	JIP36 Equipment class	DN_EquipmentClass	Static	Unrestricted	Single data (string)	Mandatory	MDP Provider	A.2.4
D14	Digital nameplate	Manufacturer's registered name	DN_ManufacturerName	Dynamic	Unrestricted	Single data (string)	Mandatory	MDP Provider	A.2.5
D15	Digital nameplate	Manufacturer's address	DN_ManufacturerAddress	Dynamic	Unrestricted	Single data (string)	Mandatory	MDP Provider	A.2.6
D16	Digital nameplate	Year of Manufacturing	DN_ManufacturingYear	Static	Unrestricted	Single data (string)	Mandatory	MDP Provider	A.2.7
D17	Digital nameplate	Country of Manufacturing	DN_ManufacturingCountry	Static	Unrestricted	Data table (strings)	Mandatory	MDP Provider	A.2.8
D18	Technical data	Technical Specification	TD_TechnicalSpecification	Static	Restricted	Data table / PDF/A with metadata	Mandatory	Component purchaser	A.3.1
D19	Lifecycle data	Original purchaser company	LD_OriginalPurchaser	Static	Unrestricted	Single data (string)	Mandatory	MDP Provider	A.4.1
D20	Lifecycle data	Asset of installation	LD_Asset	Dynamic	Unrestricted	Single data (string)	Mandatory	MDP requester / MDP Owner	A.4.2
D21	Lifecycle data	Start of Service Year	LD_StartOfService	Dynamic	Unrestricted	Single data (string)	Mandatory	MDP Provider / MDP Owner / Component operator	A.4.3
D22	Lifecycle data	Component status	LD_ComponentStatus	Dynamic	Unrestricted	Single data (string)	Mandatory	MDP Provider / MDP Owner / Component operator	A.4.4
D23	Bill of material	Bill of material table	BM_BoM	Dynamic	Restricted	Data table	Mandatory	MDP Provider / MDP Owner / Component operator	A.5.1
D24	Conformity data	Declaration of conformity with technical specification	CD_TechnicalSpecification	Static	Unrestricted	Single data	Mandatory	MDP Provider	A.6.1
D25	Conformity data	Declarations of conformity with regulations	CD_Regulation	Dynamic	Unrestricted	Data table	Optional	Component Manufacturer	A.6.2
D26	Conformity data	Independent Validation Statements	CD_ValidationStatements	Dynamic	Unrestricted	Data table	Optional	Appointed Verifier company	A.6.3
D27	Environmental data	Manufacturing Carbon Footprint	ED_CF	Static	Unrestricted	PDF/A with metadata	Optional	MDP Provider	A.7.1
D28	Environmental data	Environmental Product Declaration	ED_EPDP	Static	Unrestricted	PDF/A with metadata	Optional	MDP Provider	A.7.2

In the rest of this Annex, all the Data Field are reported, divided per data class.

For each data field, the following elements are reported:

- **Description:** provides a description of the content of the data field.
- **Format:** where applicable, specifies if the data field has to be provided in a Structured format, or if the Data field may be provided as unstructured data (i.e., in PDF/A compliant format). Where applicable it provides the requested format for the data field and possible restriction on the values assigned to the data field.
- **Update:** specifies whether the data field is static (i.e., it shall not be updated after the first issuance of the MDP) or dynamic (i.e., the data field may be updated after the first issuance of the MDP), and it clarifies when the data shall be initially provided and when it shall be updated.
- **Mandatory:** specifies when the data field is Mandatory (i.e., it shall be included in all MDP) or Optional (i.e., it may be included in the MDP upon agreement between the MDP requester and the MDP provider).
- **Responsibilities** specifies:
 - o who is responsible for providing the data, i.e., the source of the information;
 - o who is responsible for logging the data in the MDP, i.e., the stakeholder that log the information provided by the data provider in the MDP;
 - o if the data field shall be validated or if it may not be validated. If validation is required, it specifies who is responsible for verification.
- **Data access right:** specifies whether the data field is Unrestricted (i.e., the data field is visible to all Stakeholders) or if it is Restricted (i.e., it shall be visible to the Data Provider, Data Verifiers and MDP Owner only)

A.1 MDP Data

A.1.1 D01 Identification Code

A.1.1.1 Description

The Identification Code (IC) is the unique identifier of the Material Digital Passport and its related component or sub-batch, generated in accordance with the requirements of Sec. 2.3.

Guidance Note A1: The Identification Code identifies a single component if the MDP is an Individual MDP (see A.1.8), or a set of uniform component belonging to the same production batch and included in the same parent component if the MDP is a sub-batch MDP (see A.1.8).
End-of-guidance-note

A.1.1.2 Format

The Identification Code is a structured data field.

AR-01: The Identification Code shall be a single data entry, expected as a string of text.

A.1.1.3 Data Update

AR-02: The Identification Code shall be a Static data field (i.e., it shall not be modified over the component' lifecycle).

AR-03: The Identification Code shall be logged in the MDP when the MDP is created.

A.1.1.4 Mandatory

AR-04: The Identification Code shall be a Mandatory data field of the MDP.

A.1.1.5 Responsibilities

AR-05: The value of the UUID portion of the Identification Code data field shall be generated automatically by the MDP Platform. The remaining part of the Identification Code shall be provided by the MDP Provider.

AR-06: The value of the Identification Code data field shall be logged by the MDP Provider.

AR-07: The value of the Identification Code data field may not be verified.

Guidance Note A2: Validation may always be requested by the MDP requester upon agreement with the MDP provider. *End-of-guidance-note*

A.1.1.6 Data access rights

AR-08: Access to the Identification Code data field on the MDP shall be Unrestricted.

A.1.2 D02 Identification Code of the Parent Component

A.1.2.1 Description

The Identification Code of the Parent Component (IC_p) is the unique identifier of the Material Digital Passport of the parent component of the component covered by the considered MDP. The Identification Code of the Parent component is required to ensure that the same MDP cannot be malevolently used as passport of different components.

A.1.2.2 Format

The Identification Code of the Parent Component is a structured data field.

AR-09: The Identification Code of the Parent Component shall be a single data entry, expected as a string of text.

AR-10: For Tier-1 Components, the Identification Code of the Parent Component shall be the Identification Code of the Asset of Installation (see 2.3.4).

AR-11: For Tier-1+n components, the Identification Code of the Parent Component shall be the unique IC of the component in which the component is installed.

AR-12: While the component is not yet installed (see A.4.3.1), the Identification Code of the Parent Component shall be set to "Not installed".

A.1.2.3 Data Update

The Identification Code of the Parent Component is a Dynamic data entry, which may be modified over the component's lifecycle, for example if the component is installed in a new parent component.

AR-13: The Identification Code of the Parent Component shall be first logged in the MDP before it is issued.

AR-14: The value of the Identification Code of the Parent Component data field shall be updated every time the component is installed in a new parent component.

A.1.2.4 Mandatory

AR-15: The Identification Code of the Parent Component shall be a Mandatory data field of the MDP.

A.1.2.5 Responsibilities

First data log at MDP Issuance

AR-16: The initial value of the Identification Code of the Parent Component data field shall be provided by the MDP requester.

AR-17: The initial value of the Identification Code of the Parent Component data field shall be logged in the Material Digital Passport by the MDP Provider.

AR-18: The initial value of the Identification Code of the Parent Component data field shall be verified (validated) by the MDP owner of the parent component.

Subsequent data log

AR-19: Subsequent values of the Identification Code of the Parent Component shall be provided by the MDP owner.

AR-20: Subsequent values of the Identification Code of the Parent Component shall be logged in the MDP by the MDP owner.

AR-21: Subsequent values of the Identification Code of the Parent Component data field shall be verified (validated) by the MDP owner of the parent component.

A.1.2.6 Data access rights

AR-22: Access to the Identification Code of the Parent Component data field on the MDP shall be Restricted.

A.1.3 D03 Identification Code of the Parent Sub-batch

A.1.3.1 Description

When applicable, the Identification Code of the Parent Sub-batch (IC_{PSB}) is the unique identifier of the Material Digital Passport of the parent sub-batch of the child sub-batch items covered by the considered sub-batch MDP. This field is only relevant for sub-batch MDPs that have been created by splitting a parent sub-batch MDP (see Sec. 2.6.7). The Identification Code of the Parent Sub-batch is required to ensure traceability of the original sub-batch from which the new sub-batch has been derived.

A.1.3.2 Format

The Identification Code of the Parent Sub-batch is a structured data field.

AR-23: The Identification Code of the Parent Sub-batch shall be a single data entry, expected as a string of text.

AR-24: For a sub-batch MDP that has been created by splitting a parent sub-batch MDP, the Identification Code of the Parent Sub-batch shall be the Identification Code of the parent sub-batch MDP.

AR-25: For MDPs of individual / complex equipment and for sub-batch MDPs that have not been created by splitting a parent sub-batch MDP, the Identification Code of the Parent Component shall automatically be set to “Not applicable”.

A.1.3.3 Data Update

AR-26: The Identification Code of the Parent Sub-batch shall be a Static data field (i.e., it shall not be modified over the component' lifecycle).

AR-27: The Identification Code of the Parent Sub-batch shall be first logged in the MDP when it is created.

A.1.3.4 Mandatory

AR-28: The Identification Code of the Parent Sub-batch shall be a Mandatory data field of the MDP.

A.1.3.5 Responsibilities

AR-29: The initial value of the Identification Code of the Parent Sub-batch data field shall be automatically logged in the Material Digital Passport by the MDP Platform.

Guidance Note A3: if the MDP is created by splitting a parent sub-batch MDP, then the IC of the parent sub-batch is automatically set by the MDP Platform as the IC of the sub-batch MDP that has been split to create the sub-batch MDPs. Otherwise, the MDP Platform shall automatically set the value to “Not Applicable”. *End-of-guidance-note*

AR-30: The initial value of the Identification Code of the Parent Sub-batch data field may not be verified.

A.1.3.6 Data access rights

AR-31: Access to the Identification Code of the Parent Sub-batch data field on the MDP shall be Restricted.

A.1.4 D04 Date of issuance of the MDP

A.1.4.1 Description

The Date of Issuance of the MDP is the date and time at which the MDP has been issued by the MDP Provider.

A.1.4.2 Format

The Date of Issuance of the MDP is a structured data field.

AR-32: The Date of Issuance of the MDP shall be a single data entry, expected as a string of text, that complies with the extended date format of ISO 8601 YYYY-MM-DDThh:mm:ss±hh (i.e., in UTC with time offset).

A.1.4.3 Data Update

AR-33: The Date of Issuance of the MDP shall be a Static data field (i.e., it shall not be modified over the component' lifecycle).

AR-34: The Date of Issuance of the MDP shall be submitted in the MDP when the MDP is created.

A.1.4.4 Mandatory

AR-35: The Date of Issuance of the MDP shall be a Mandatory data field of the MDP.

A.1.4.5 Responsibilities

AR-36: The value of the Date of Issuance of the MDP shall be provided and logged automatically by the MDP Platform when the MDP is issued through the dedicated functionality (see Sec. 2.6.6).

Guidance Note A4: the Date of Issuance of the MDP is logged automatically by the MDP Platform when the MDP is issued. The action is initiated by the MDP Provider that issues the MDP on the MDP Platform. *End-of-guidance-note*

AR-37: The value of the Date of Issuance of the MDP data field may not be verified.

Guidance Note A5: since the Date of Issuance of the MDP is generated automatically, there is no need to require validation of the data. *End-of-guidance-note*

A.1.4.6 Data access rights

AR-38: Access to the Date of Issuance data field on the MDP shall be Unrestricted.

A.1.5 D05 MDP Status

A.1.5.1 Description

The MDP status is a data field that is used to provide a simple overview of the current status of the Material Digital Passport in terms of its validity.

A.1.5.2 Format

The MDP Status is a structured data field.

AR-39: The MDP Status shall be a single data entry, expected as a string of text.

AR-40: The following values shall be available for the MDP Status, as a minimum:

- "In Creation"
- "Valid"
- "Under Investigation"
- "Retired"

A.1.5.3 Data Update

The MDP Status is a Dynamic data that may be updated over the component's lifecycle.

AR-41: The MDP Status shall automatically be set to "In Creation" when the MDP is created on the MDP Platform.

AR-42: The MDP Status shall automatically be set to "Valid" when the MDP is issued, with all required data logged and verified where applicable.

AR-43: The MDP Status shall be set to "Retired" when the component is decommissioned.

AR-44: The MDP Status shall automatically be set to "Under Investigation" from its "Valid" status when any MDP Data that require verification is modified and not yet verified.

AR-45: The MDP Platform shall allow to manually set the MDP Status to "Under Investigation".

Guidance Note A6: Additional rules for automatically managing the MDP Status may be defined by the MDP Platform. *End-of-guidance-note*

A.1.5.4 Mandatory

AR-46: The MDP Status shall be a Mandatory data field of the MDP.

A.1.5.5 Responsibilities

First data log at MDP Issuance

AR-47: The initial value of the MDP Status data field shall be set as "In Creation" and logged automatically by the MDP Platform when the MDP is created by the MDP Provider. It is expected that the MDP Provider generates the MDP on the MDP Platform.

AR-48: The initial value of the MDP Status data field may not be verified at first log.

Subsequent data log

AR-49: The MDP Owner and, where applicable, the Component Operator shall be responsible for manual updates of the MDP Status over the component lifecycle. The responsibility should be agreed between the MDP Owner and the Component Operator.

AR-50: Subsequent values of the MDP Status data field may not be verified at subsequent data log.

A.1.5.6 Data access rights

AR-51: Access to the MDP Status data field on the MDP shall be Unrestricted.

A.1.6 D06 MDP Issuer

A.1.6.1 Description

The MDP issuer data file reports the identity of the MDP Platform user that issues the MDP.

A.1.6.2 Format

The MDP Issuer is a Structured data field.

AR-52: The MDP Issuer shall be a single data entry, expected as a string of text.

AR-53: The MDP Issuer data field shall automatically record the identity of the stakeholder issuing the MDP, in accordance with 2.6.2.

A.1.6.3 Data Update

AR-54: The MDP Issuer shall be a Static data field (i.e., it shall not be modified over the component' lifecycle).

AR-55: The MDP Issuer shall be logged in the MDP when the MDP is issued.

A.1.6.4 Mandatory

AR-56: The MDP Issuer shall be a Mandatory data field of the MDP.

A.1.6.5 Responsibilities

AR-57: The value of the MDP Issuer data field shall be provided and logged automatically by the MDP Platform when the MDP is issued through the dedicated functionality (see Sec. 2.6.6).

Guidance Note A7: the MDP Issuer is logged automatically by the MDP Platform when the MDP is issued. The action is initiated by the MDP Provider themselves on the MDP Platform. *End-of-guidance-note*

AR-58: The MDP Issuer data field may not be verified.

A.1.6.6 Data access rights

AR-59: Access to the MDP Issuer data field on the MDP shall be Unrestricted.

A.1.7 D07 MDP Owner Company

A.1.7.1 Description

The MDP Owner Company reports the MDP stakeholder that currently owns the related component.

A.1.7.2 Format

The MDP Owner is a Structured data field.

AR-60: The MDP Owner shall be a single data entry, expected as a string of text, in accordance with 2.6.2.

AR-61: The MDP Owner Company reports the registered name of the Company currently owning the component covered by the MDP.

A.1.7.3 Data Update

The MDP Owner is a Dynamic data that may be updated over the component's lifecycle.

AR-62: The MDP Owner shall be automatically assigned when the MDP is created to the stakeholder creating the MDP.

AR-63: The MDP Owner shall be updated every time the component changes ownership.

A.1.7.4 Mandatory

AR-64: The MDP Owner shall be a Mandatory data field of the MDP.

A.1.7.5 Responsibilities

First data log at MDP Creation

AR-65: The initial value of the MDP Owner data field shall be automatically provided and logged by the MDP Platform when the MDP is created by the MDP Provider.

AR-66: The data shall be verified (validated) by the Stakeholder that has been set as MDP Owner

Subsequent data log

AR-67: When a change of ownership of the component occurs, the identity of the new MDP Owner shall be provided by the Component purchaser.

AR-68: When a change of ownership of the component occurs, the MDP Owner data field shall be updated by the current MDP Owner.

AR-69: When a change of ownership of the component occurs, the MDP Owner data field shall be verified (validated) by the Stakeholder that has been set as the new MDP Owner.

A.1.7.6 Data access rights

AR-70: Access to the MDP Owner data field on the MDP shall be Unrestricted.

A.1.8 D08 MDP Type

A.1.8.1 Description

The MDP Type data field records whether the MDP is an Individual MDP (i.e., it is assigned to a single Individual or Complex Equipment), or if it is a sub-batch MDP (i.e., it is assigned to multiple Bulk Material components belonging to the same production batch).

A.1.8.2 Format

The MDP Type is a Structured data field.

AR-71: The MDP Type shall be a single data entry, expected as a string of text.

AR-72: The MDP Type data field shall either have the value “Individual”, or “Sub-Batch”

A.1.8.3 Data Update

AR-73: The MDP Type shall be a Static data field (i.e., it shall not be modified over the component' lifecycle).

AR-74: The MDP Type shall be logged in the MDP before the MDP is issued.

A.1.8.4 Mandatory

AR-75: The MDP Type shall be a Mandatory data field of the MDP.

A.1.8.5 Responsibilities

AR-76: The value of MDP Type data field shall be provided by the MDP Provider.

AR-77: The value of the MDP Type data field shall be logged in the MDP by the MDP Provider.

AR-78: The value of the MDP Type data field may not be verified (validated).

A.1.8.6 Data access rights

AR-79: Access to the MDP Type data field on the MDP shall be Unrestricted.

A.1.9 D09 MDP Items Number

A.1.9.1 Description

The MDP Items Number data field records the number of items that are covered by the given Material Digital Passport. It is equal to 1 when the MDP Type is Individual, and it is equal to the number of items composing the sub-batch that is included in the same parent component when the MDP Type is Sub-batch.

A.1.9.2 Format

The MDP Items Number is a Structured data field.

AR-80: The MDP Items Number shall be a single data entry, expected as an Integer.

AR-81: The MDP Items Number data field shall be equal to 1 for MDP of Type “Individual”.

A.1.9.3 Data Update

AR-82: The MDP Items Number shall be a Static data field (i.e., it shall not be modified over the component' lifecycle).

AR-83: The MDP Items Number shall be logged in the MDP before the MDP is issued.

A.1.9.4 Mandatory

AR-84: The MDP Items Number shall be a Mandatory data field of the MDP.

A.1.9.5 Responsibilities

AR-85: The value of MDP Items Number data field shall be provided by the MDP Provider.

AR-86: The value of the MDP Items Number data field shall be logged in the MDP by the MDP Provider.

AR-87: The value of the MDP Type data field should be verified (validated) by the Component purchaser for the MDP with MDP Type “Sub-Batch”.

A.1.9.6 Data access rights

AR-88: Access to the MDP Items Number data field on the MDP shall be Unrestricted.

A.2 Digital Nameplate

A.2.1 D010 Serial / Batch Number

A.2.1.1 Description

The Component's Serial / Batch Number data field is used to store in the MDP either the serial number assigned by the component's manufacturer to the component (for Individual MDP), or the Batch identification number assigned by the manufacturer to the production batch (for Sub-Batch MDP).

A.2.1.2 Format

The Component's Serial / Batch Number is a Structured data field.

AR-89: The Component's Serial / Batch Number data field shall be a single data entry, expected as a string of text.

A.2.1.3 Data Update

AR-90: The Component's Serial / Batch Number shall be a Static data field (i.e., it shall not be modified over the component' lifecycle).

AR-91: The Component's Serial / Batch Number shall be logged in the MDP before the MDP is issued.

A.2.1.4 Mandatory

AR-92: The Component's Serial / Batch Number shall be a Mandatory data field of the MDP.

A.2.1.5 Responsibilities

AR-93: The value of the Component's Serial / Batch Number data field shall be provided by the MDP provider.

AR-94: The value of the Component's Serial / Batch Number data field shall be logged in the MDP by the MDP provider.

AR-95: The value of the Component's Serial / Batch Number field may be verified either by the Component purchaser or by an assigned Verifier company.

A.2.1.6 Data access rights

AR-96: Access to the Component's Serial / Batch Number data field on the MDP shall be Unrestricted.

A.2.2 D11 Product Name

A.2.2.1 Description

The Product Name data field is used to report in the MDP the name given by the component's manufacturer to the component covered by the MDP.

A.2.2.2 Format

The Product Name is a Structured data field.

AR-97: The Product Name data field shall be a single data entry, expected as a string of text.

AR-98: The value of the Product Name data field shall be the name assigned to the component by the component's manufacturer as reported in the component's documentation.

A.2.2.3 Data Update

AR-99: The Product Name shall be a Static data field (i.e., it shall not be modified over the component's lifecycle).

AR-100: The Product Name shall be logged in the MDP before the MDP is issued.

A.2.2.4 Mandatory

AR-101: The Product Name shall be a Mandatory data field of the MDP.

A.2.2.5 Responsibilities

AR-102: The value of the Product Name data field shall be provided by the MDP provider.

AR-103: The value of the Product Name data field shall be logged in the MDP by the MDP provider.

AR-104: The value of the Product Name data field may be verified either by the Component purchaser or by an assigned Verifier company.

A.2.2.6 Data access rights

AR-105: Access to the Product Name data field on the MDP shall be Unrestricted.

A.2.3 D12 Product Type

A.2.3.1 Description

The Product Type data field is used to report in the MDP the name of the product type given by the component's manufacturer to the component covered by the MDP.

A.2.3.2 Format

The Product Type is a Structured data field.

AR-106: The Product Type data field shall be a single data entry, expected as a string of text.

AR-107: The value of the Product Type data field shall be the name of the product type assigned to the component by the component's manufacturer as reported in the component's documentation.

A.2.3.3 Data Update

AR-108: The Product Type shall be a Static data field (i.e., it shall not be modified over the component's lifecycle).

AR-109: The Product Type shall be logged in the MDP before the MDP is issued.

A.2.3.4 Mandatory

AR-110: The Product Type shall be a Mandatory data field of the MDP.

A.2.3.5 Responsibilities

AR-111: The value of the Product Type data field shall be provided by the MDP provider.

AR-112: The value of the Product Type data field shall be logged in the MDP by the MDP provider.

AR-113: The value of the Product Type data field may be verified either by the Component purchaser or by an assigned Verifier company.

A.2.3.6 Data access rights

AR-114: Access to the Product Type data field on the MDP shall be Unrestricted.

A.2.4 D13 JIP36 Equipment Class

A.2.4.1 Description

The JIP36 Equipment Class data field is used to report in the MDP the standardized equipment class of the component covered by the MDP according to the classification of the Reference Data Library of JIP36 CFIHOS.

A.2.4.2 Format

The JIP36 Equipment Class is a Structured data field.

AR-115: The JIP36 Equipment Class data field shall be a single data entry, expected as a string of text.

AR-116: The value of the JIP36 Equipment Class shall be selected among the Equipment Class defined in the Reference Data Library (RDL) of JIP36 CFIHOS utilizing the most detailed class available for the equipment.

AR-117: Only in the situation where no applicable Equipment Class is found for the component covered by the MDP, the value of the JIP36 Equipment Class shall be set to "Not Available".

A.2.4.3 Data Update

The JIP36 Equipment Class is a Dynamic data that may be updated over the component's lifecycle.

Guidance Note A8: since the JIP36's RDL is constantly updated, there may be the need to update the value of the JIP36 Equipment Class data field. *End-of-guidance-note*

AR-118: The JIP36 Equipment Class shall be logged in the MDP before the MDP is issued.

AR-119: The JIP36 Equipment Class should be updated in the MDP if a more accurate Equipment Class for the considered component is included in the JIP36's RDL.

A.2.4.4 Mandatory

AR-120: The JIP36 Equipment Class shall be a Mandatory data field of the MDP.

A.2.4.5 Responsibilities

First Data Log at MDP Issuance

AR-121: The initial value of the JIP36 Equipment Class data field shall be provided and logged by the MDP provider.

AR-122: The initial value of the JIP36 Equipment Class data field may be verified either by the Component purchaser or by an assigned Verifier company.

Subsequent Data Log

AR-123: The subsequent values of the JIP36 Equipment Class data field shall be provided and logged by either the MDP Owner or the Component Operator.

A.2.4.6 Data access rights

AR-124: Access to the JIP36 Equipment Class data field on the MDP shall be Unrestricted.

A.2.5 D14 Manufacturer's Registered Name

A.2.5.1 Description

The Manufacturer's Registered Name data field is used to record the registered name of the manufacturer of the component covered by the MDP.

A.2.5.2 Format

The Manufacturer's Registered Name is a Structured data field.

AR-125: The Manufacturer's Registered Name data field shall be a single data entry, expected as a string of text.

AR-126: The value of the Manufacturer's Registered Name data field shall be the registered name of the Manufacturer of the component.

A.2.5.3 Data Update

AR-127: The Manufacturer's Registered Name shall be a Dynamic data field (i.e., it may be modified over the component's lifecycle).

Guidance note A9: this data field is dynamic to allow the MDP owner to keep an updated record of the components' manufacturers over the components' lifecycle, by updating the manufacturers' registered name in case they change. *End-of-guidance-note*

AR-128: The Manufacturer's Registered Name shall be logged in the MDP before the MDP is issued.

AR-129: The Manufacturer's Registered Name data field should be updated when the registered name of the manufacturer changes.

A.2.5.4 Mandatory

AR-130: The Manufacturer's Registered Name shall be a Mandatory data field of the MDP.

A.2.5.5 Responsibilities

First data log

AR-131: At the first data log, the value of the Manufacturer's Registered Name data field shall be provided and logged in the MDP by the MDP provider.

AR-132: At the first data log, the value of the Manufacturer's Registered Name data field may be verified either by the Component purchaser or by an assigned Verifier company.

Subsequent data log

AR-133: The subsequent values of the Manufacturer's Registered Name data field shall be provided and logged by either the MDP Owner or the Component Operator.

A.2.5.6 Data access rights

AR-134: Access to the Manufacturer's Registered Name data field on the MDP shall be Unrestricted.

A.2.6 D15 Manufacturer's address

A.2.6.1 Description

The Manufacturer's Address data field is used to record the registered address of the manufacturer of the component covered by the MDP.

A.2.6.2 Format

The Manufacturer's Address is a Structured data field.

AR-135: The Manufacturer's Address data field shall be a single data entry, expected as a string of text.

AR-136: The value of the Manufacturer's Address data field shall be the registered address of the Manufacturer of the component.

A.2.6.3 Data Update

AR-137: The Manufacturer's Address shall be a Dynamic data field (i.e., it may be modified over the component's lifecycle).

Guidance note A10: this data field is dynamic to allow the MDP owner to keep an updated record of the components' manufacturers address over the components' lifecycle, by updating the manufacturers' address in case they change. *End-of-guidance-note*

AR-138: The Manufacturer's Address shall be logged in the MDP before the MDP is issued.

AR-139: The Manufacturer's Address data field should be updated when the registered name of the manufacturer changes.

A.2.6.4 Mandatory

AR-140: The Manufacturer's Address shall be a Mandatory data field of the MDP.

A.2.6.5 Responsibilities

First data log

AR-141: At first data log, the value of the Manufacturer's Address data field shall be provided and logged in the MDP by the MDP provider.

AR-142: At first data log, the value of the Manufacturer's Address data field may be verified either by the Component purchaser or by an assigned Verifier company.

Subsequent data log

AR-143: The subsequent values of the Manufacturer's Address data field shall be provided and logged by either the MDP Owner or the Component Operator.

A.2.6.6 Data access rights

AR-144: Access to the Manufacturer's Address data field on the MDP shall be Unrestricted.

A.2.7 D16 Year of Manufacturing

A.2.7.1 Description

The Year of Manufacturing data field is used to record the year in which the manufacturing of the component covered by the MDP has been completed.

A.2.7.2 Format

The Year of Manufacturing is a Structured data field.

AR-145: The Year of Manufacturing data field shall be a single data entry, expected in the form YYYY according to ISO 8601.

AR-146: The value of the Year of Manufacturing data field shall be the year in which the manufacturing of the component covered by the MDP has been completed.

A.2.7.3 Data Update

AR-147: The Year of Manufacturing shall be a Static data field (i.e., it shall not be modified over the component' lifecycle).

AR-148: The Year of Manufacturing shall be logged in the MDP before the MDP is issued.

A.2.7.4 Mandatory

AR-149: The Year of Manufacturing shall be a Mandatory data field of the MDP.

A.2.7.5 Responsibilities

AR-150: The value of the Year of Manufacturing data field shall be provided by the MDP provider.

AR-151: The value of the Year of Manufacturing data field shall be logged in the MDP by the MDP provider.

AR-152: The value of the Year of Manufacturing data field may be verified either by the Component purchaser or by an assigned Verifier company.

A.2.7.6 Data access rights

AR-153: Access to the Year of Manufacturing data field on the MDP shall be Unrestricted.

A.2.8 D17 Country of Manufacturing

A.2.8.1 Description

The Country of Manufacturing data field is used to record the country in which the component covered by the MDP has been manufactured.

A.2.8.2 Format

The Country of Manufacturing is a Structured data field.

AR-154: The Country of Manufacturing data field shall be composed of two data entries, expected as strings of text.

AR-155: The value of the Country of Manufacturing data field shall be composed of:

- Country name: the name of the country in which the component has been manufactured.
- Country code: the 3-digit country code according to the alpha-3 code of ISO 3166 standard.

A.2.8.3 Data Update

AR-156: The Country of Manufacturing shall be a Static data field (i.e., it shall not be modified over the component' lifecycle).

AR-157: The Country of Manufacturing shall be logged in the MDP before the MDP is issued.

A.2.8.4 Mandatory

AR-158: The Country of Manufacturing shall be a Mandatory data field of the MDP.

A.2.8.5 Responsibilities

AR-159: The value of the Country of Manufacturing data field shall be provided by the MDP provider.

AR-160: The value of the Country of Manufacturing data field shall be logged in the MDP by the MDP provider.

AR-161: The value of the Country of Manufacturing data field may be verified either by the Component purchaser or by an assigned Verifier company.

A.2.8.6 Data access rights

AR-162: Access to the Country of Manufacturing data field on the MDP shall be Unrestricted.

A.3 Technical Data

A.3.1 D18 Technical Specification

A.3.1.1 Description

The Technical Specification data field is used to collect information about the performance requirements of the component covered by the MDP as specified in its technical specification provided by the component purchaser.

A.3.1.2 Format

Guidance Note A11: The content of a component's technical specification is specific to that component. Providing a format for each component possibly covered by the MDP system is beyond the scope of this specification. *End-of-guidance-note*

AR-163: Whenever feasible, the Technical Specification should be provided as structured data conforming to a recognized standardized data format, such as those provided by IOGP's JIP33 specifications.

AR-164: A Technical Specification data field provided as a Structured data field should be composed of a set of data entries, each with several attributes either in the form of string data or numbers.

Guidance Note A12: a structured Technical Specification should be composed of a number of data entries that correspond to a target parameter with which the component should comply. Each data entry should be characterized by several attributes. Thus, the Technical Specification data field is a data table composed of several entries, each with several attributes. It is recommended that each data entry of a structured Technical Specification include:

- Name of the parameter
- Measurement unit of the parameter
- Upper boundary for the parameter value
- Lower boundary for the parameter value

End-of-guidance-note

AR-165: The Technical Specification may be provided as unstructured data in the form of pdf file(s). If unstructured data are used, they shall be provided as PDF/A files compliant with ISO 19005 series of standards.

AR-166: If the technical specification is provided as a PDF/A file, the following metadata shall as a minimum be included in the Technical Specification data field:

- Document code
- Document revision number
- Document date of issuance, in the format YYYY-MM-DD according to ISO 8601 standard
- Document title

AR-167: The data format for the Technical Specification data field shall be agreed between the Component Purchaser and the MDP provider.

AR-168: If the component is not manufactured according to a Technical Specification, then the Technical Specification data field shall be a string of text reporting "Not Applicable – Component not manufactured according to a Technical Specification".

Guidance Note A13: this is typical for off-the-shelf components. *End-of-guidance-note*

A.3.1.3 Data Update

AR-169: The Technical Specification shall be a Static data field (i.e., it shall not be modified over the component' lifecycle).

AR-170: The Technical Specification shall be logged in the MDP before the MDP is issued.

A.3.1.4 Mandatory

AR-171: The Technical Specification shall be a Mandatory data field of the MDP.

A.3.1.5 Responsibilities

AR-172: The value of the Technical Specification data field shall be provided by the Component purchaser.

AR-173: The value of the Technical Specification data field shall be logged either by the Component purchaser or by the MDP Provider.

AR-174: The value of the Technical Specification shall be verified (validated) by the Component purchaser.

A.3.1.6 Data access rights

AR-175: Access to the Technical Specification data field on the MDP shall be Restricted.

A.4 Lifecycle Data

A.4.1 D19 Original Purchaser Company

A.4.1.1 Description

The Original Purchaser Company data field is used to record the identity of the company that originally purchased the component covered by the MDP.

A.4.1.2 Format

The Original Purchaser Company is a Structured data field.

AR-176: The Original Purchaser Company data field shall be a single data entry, expected as a string of text.

AR-177: The value of the Original Purchaser Company data field shall be the registered name of the Component Purchaser that originally commissioned and purchased the component.

A.4.1.3 Data Update

AR-178: The Original Purchaser Company shall be a Static data field (i.e., it shall not be modified over the component' lifecycle).

AR-179: The Original Purchaser Company shall be logged in the MDP before the MDP is issued.

A.4.1.4 Mandatory

AR-180: The Original Purchaser Company shall be a Mandatory data field of the MDP.

A.4.1.5 Responsibilities

AR-181: The value of the Original Purchaser Company data field shall be provided by the original Component Purchaser.

AR-182: The value of the Original Purchaser Company data field shall be logged in the MDP by the MDP provider.

AR-183: The value of the Original Purchaser Company data field shall be verified (validated) by the original Component purchaser.

A.4.1.6 Data access rights

AR-184: Access to the Original Purchaser Company data field on the MDP shall be Unrestricted.

A.4.2 D20 Asset of Installation

A.4.2.1 Description

The Asset of Installation data field is used to record the asset in which the component covered by the MDP is currently installed.

A.4.2.2 Format

The Asset of Installation is a Structured data field.

AR-185: The Asset of Installation data field shall be composed of two data entries, expected as a string of text.

AR-186: The value of the Asset of Installation data field shall be composed of:

- **Asset name:** the name of the asset in which the component is currently installed.
- **Asset IC:** the Identification Code of the Asset (see 2.3.4).

If the component is not yet installed in an asset, the value of the Asset Name shall be set to “Not Installed”, and the Asset IC as “N/A”.

Guidance Note A14: when the MDP is issued the component is normally not installed, but the destination asset may already be known. In this case, it is recommended that the asset of installation is reported in the MDP. *End-of-guidance-note*

A.4.2.3 Data Update

AR-187: The Asset of Installation is a Dynamic data field, which shall be updated every time the component is installed in a new asset (also as part of a parent component).

AR-188: The initial value of the Asset of Installation shall be logged at the issuance of the MDP.

A.4.2.4 Mandatory

AR-189: The Asset of Installation shall be a Mandatory data field of the MDP.

A.4.2.5 Responsibilities

First data log at MDP issuance

AR-190: The initial value of the Asset of Installation data field shall be provided by the MDP Requester.

AR-191: When the Asset of Installation is not known at the time of MDP Issuance (e.g., for Stock components), the value of the Asset Name shall be set to “Not Installed” and the value of the Asset IC to “N/A”.

AR-192: The initial value of the Asset of Installation data field shall be logged in the MDP by the MDP provider.

AR-193: The initial value of the Asset of Installation data field shall be verified (validated) by the Asset Owner.

Subsequent data log

AR-194: The subsequent values of the Asset of Installation data field shall be provided and logged by the MDP Owner.

AR-195: The subsequent values of the Asset of Installation data field shall be verified (validated) by the Asset Owner.

A.4.2.6 Data access rights

AR-196: Access to the Asset of Installation data field on the MDP shall be Unrestricted.

A.4.3 D21 Start of Service Year

A.4.3.1 Description

The Start of Service Year data field is used to record the year in which the component has been put in service for the first time.

A.4.3.2 Format

The Start of Service Year is a Structured data field.

AR-197: The Start of Service Year data field shall be a single data entry, expected as a string.

AR-198: When the Component Status (see A.4.4) has not been set to “In Service”, the value of the Start of Service Year shall be “Not in service”.

AR-199: When the Component Status (see A.4.4) is set to “In Service”, the value of the Start of Service Year data field shall be the year in which the component has been put in service for the first time, in the form YYYY according to ISO 8601 conventions.

A.4.3.3 Data Update

AR-200: The Start of Service Year is a Dynamic data field, since it is modified after the MDP is issued. The Start of Service Year data field shall be updated only once, when the component is put in service for the first time (also as part of a parent component).

A.4.3.4 Mandatory

AR-201: The Start of Service Year shall be a Mandatory data field of the MDP.

A.4.3.5 Responsibilities

First data log at MDP issuance

AR-202: The initial value of the Start of Service Year data field shall be automatically logged at the issuance of the MDP as “Not in service”.

AR-203: The initial value of the Start of Service Year data field may not be verified.

Subsequent data log

AR-204: The subsequent values of the Start of Service Year data field shall be provided and logged by either the MDP Owner or the Component Operator.

AR-205: The subsequent values of the Start of Service Year data field may be verified (validated) by the Asset Owner.

Guidance Note A15: It is assumed that a component will be put in service when installed in an asset. *End-of-guidance-note*

A.4.3.6 Data access rights

AR-206: Access to the Start of Service Year data field on the MDP shall be Unrestricted.

A.4.4 D22 Component Status

A.4.4.1 Description

The Component Status data field is used to record the operational status of the component covered by the MDP.

A.4.4.2 Format

The Component Status is a Structured data field.

AR-207: The Component Status data field shall be a single data entry, expected as a string.

AR-208: The value of the Component Status data field shall be one of the following:

- Manufactured and not in operation
- In operation
- Decommissioned

A.4.4.3 Data Update

AR-209: The Component Status is a Dynamic data field, which shall be updated when the component or its parent component is put in operation, when the component or its parent component is decommissioned, and when the component or its parent component is momentarily removed from operation.

AR-210: The initial value of the Component Status shall be logged at the issuance of the MDP.

A.4.4.4 Mandatory

AR-211: The Component Status shall be a Mandatory data field of the MDP.

A.4.4.5 Responsibilities

First data log at MDP issuance

AR-212: The initial value of the Component Status data field shall be provided by the MDP provider.

AR-213: The initial value of the Component Status data field shall be logged in the MDP by the MDP provider.

AR-214: The initial value of the Component Status data field may not be verified.

Subsequent data log

AR-215: The subsequent values of the Component Status data field shall be provided and logged by either the MDP Owner or the Component Operator.

AR-216: The subsequent values of the Component Status data field may be verified (validated) by the Asset Owner.

Guidance Note A16: It is assumed that a component will be put in operation when installed in an asset. *End-of-guidance-note*

A.4.4.6 Data access rights

AR-217: Access to the Component Status data field on the MDP shall be Unrestricted.

A.5 Bill of Materials

A.5.1 D23 Bill of Materials table

A.5.1.1 Description

The Bill of Materials is a table containing the list of the subcomponent of the component covered by the MDP that are in turn provided with a Material Digital Passport. The Bill of Materials is used to access the MDP of the sub-components and it is updated to keep track of the currently installed sub-components.

A.5.1.2 Format

The Bill of Materials is a structured data field having the form of a table.

AR-218: The Bill of Materials shall be a table of string data with a number of rows equal to the number of sub-components with an MDP plus one header row.

AR-219: For each row, as a minimum the following data (columns) shall be reported, with their name included in the header:

- **Index number:** a progressive number assigned to the different sub-components – numeric value
- **Sub-component IC:** Identification Code of the MDP of the sub-component – string
- **Items Number:** Number of items of that sub-component included in the component (1 for sub-components having an Individual MDP, >1 for sub-component covered by a sub-batch MDP) – numeric value
- **MDP URL:** Current URL of the sub-component MDP – string of text

A.5.1.3 Data Update

AR-220: The Bill of Materials is a Dynamic data field, which shall be updated every time a sub-component is added or removed to the parent component.

AR-221: The initial values of the Bill of Materials data field shall be logged at the issuance of the MDP.

A.5.1.4 Mandatory

AR-222: The Bill of Materials shall be a Mandatory data field of the MDP.

A.5.1.5 Responsibilities

First data log at MDP issuance

AR-223: The initial values of the Bill of Materials data field shall be provided by the MDP Provider.

AR-224: The initial values of the Bill of Materials data field shall be logged in the MDP by the MDP provider.

AR-225: The initial values of the Bill of Materials data field may be verified (validated) by the Component Purchaser and / or by a Verifier company.

Subsequent data log

AR-226: The subsequent values of the Bill of Materials data field shall be provided and logged by either the MDP Owner or the Component Operator.

AR-227: The subsequent values of the Bill of Materials data field may be verified (validated) by the Asset Owner.

A.5.1.6 Data access rights

AR-228: Access to the Bill of Materials data field on the MDP shall be Restricted.

A.6 Conformity Data

A.6.1 D24 Declaration of conformity with technical specification

The Declaration of Conformity with Technical Specification data field is used to record in the MDP the declaration from the Component provider that the component complies with the requirements of the Technical Specification.

A.6.1.1 Format

AR-229: The Declaration of conformity with technical specification is a structured data, composed of several attributes, each expected as a string. The attributes shall as a minimum include:

- **Technical specification:** either reference to the Technical Specification against which compliance is declared (see A.3.1), or “Not Applicable” if the component is not manufactured according to a Technical Specification (see **AR-168**) – string value
- **Declaration:** either a string of text that states compliance with the regulation, or , or “Not Applicable” if the component is not manufactured according to a Technical Specification (see **AR-168**) – string value
- **Verifier company scope:** either a string declaring if a Verifier company has been involved in validating conformance with the technical specification, with details on the validation scope, or “Not Applicable” if the component is not manufactured according to a Technical Specification (see **AR-168**) – string value
- **Date:** date of the declaration – string value in the format of YYYY-MM-DD as per ISO 8601 standard
- **Declarer:** Name of the individual issuing the declaration – string value

A.6.1.2 Data Update

AR-230: The Declaration of conformity with technical specification shall be a Static data field (i.e., it shall not be modified over the component' lifecycle).

AR-231: The Declaration of conformity with technical specification shall be logged in the MDP before the MDP is issued.

A.6.1.3 Mandatory

AR-232: The Declaration of conformity with technical specification shall be a Mandatory data field of the MDP.

A.6.1.4 Responsibilities

AR-233: The Declaration of conformity with technical specification data field shall be provided and logged by the MDP provider.

AR-234: The Declaration of conformity with technical specification data field may be verified (validated) by the Component purchaser and / or by a Verifier company.

AR-235: The need for validation shall be agreed between the MDP Provider and the Component purchaser.

A.6.1.5 Data access rights

AR-236: Access to the Declaration of conformity with technical specification data field on the MDP shall be Unrestricted.

A.6.2 D25 Declarations of conformity with regulations

A.6.2.1 Description

The Declaration of Conformity with Regulations data field is used to record in the MDP the declarations from the manufacturer that the component complies with the specified regulations.

A.6.2.2 Format

AR-237: The Declaration of conformity with regulations is a structured data, expected as a table of string data. The data table shall be composed of one or more entries (rows). For each data entry, the following attributes (columns) shall as a minimum be provided (additional attributes may be required to comply with specific regulation's requirements):

- **Index number:** a progressive number assigned to the different declarations – numeric value
- **Regulation:** Clear reference to the regulation to which compliance is stated – string value
- **Declaration:** A string of text that states compliance with the regulation – string value
- **Date:** date of the declaration – string value in the format of YYYY-MM-DD as per ISO 8601 standard
- **Declarer:** Name of the individual issuing the declaration – string value
- **Validity:** Expiration date, if applicable – string value in the format of YYYY-MM-DD as per ISO 8601 standard

Guidance Note A17: some regulations may require renewal of conformity, e.g., carried out by notified bodies. *End-of-guidance-note*

A.6.2.3 Data Update

AR-238: The Declaration of conformity with regulation is a Dynamic data field, which should be updated when a conformity declaration expires, if applicable.

Guidance Note A18: conformity with regulations may require renewal of conformity, e.g., carried out by notified bodies, therefore the declaration of conformity may need renewal of validation. *End-of-guidance-note*

AR-239: When required, the Declaration of conformity with regulations shall be logged in the MDP before the MDP is issued.

A.6.2.4 Mandatory

AR-240: The Declaration of conformity with regulations is an Optional (project-specific) data field of the MDP.

AR-241: The regulations included in the Declaration of conformity with regulations are specific to the component and the installation. They shall be agreed between the Component purchaser and the Component provider.

A.6.2.5 Responsibilities

First data log at MDP issuance

AR-242: When required, the Declaration of conformity with regulations data field shall be provided and logged by the authorized representative of the Manufacturer, in conformance with the requirement of the regulations where applicable.

AR-243: When required, the Declaration of conformity with regulations may require to be verified (validated) by the authorized Verifier companies (notified bodies). Additional verification may be requested by the component purchaser. The need for validation and the specific declaration(s) subject to validation shall be agreed between the Manufacturer and the Component purchaser at time of purchase.

Subsequent data log

AR-244: It shall be a responsibility of the MDP owner to ensure that expiring declarations are renewed (verified again) by the authorized Verifier companies.

A.6.2.6 Data access rights

AR-245: Access to the Declaration of conformity with regulations data field on the MDP shall be Unrestricted.

A.6.3 D26 Independent Validation Statements

A.6.3.1 Description

The Independent Validation Statements data field is used to record in the MDP the verification and certification statements provided by Verifier companies and related to product compliance with international standards and guidelines.

A.6.3.2 Format

AR-246: The Independent Validation Statements is a structured data field, expected as a table of string data.

AR-247: The Independent Validation Statements shall be a data table composed of one or more entries (rows). For each data entry, the following attributes (columns) shall as a minimum be provided:

- **Index number:** a progressive number assigned to the different assessments – numeric value
- **Reference standard:** Reference to the standard against which the assessment is carried out, including year of revision – string value
- **Verifier company:** registered name of the Verifier company issuing the statement – string value
- **Scope:** a text detailing the scope of the Verifier company verification – string value
- **Guidance Note A19:** this attribute may include details on the Verifier company scope such as it the validation activities have been a verification against limited sections of the standard, or if a full certification has been carried out according to the standardized certification scheme, etc. *End-of-guidance-note*
- **Validation Statement:** a string of text detailing the result of the validation activities – string value
- **Date:** Date: date of the statement – string value in the format of YYYY-MM-DD as per ISO 8601 standard
- **Issuer:** Name of the individual issuing the statement – string value
- **Validity:** Expiration date, if applicable – string value in the format of YYYY-MM-DD as per ISO 8601 standard

Guidance Note A20: some certification scheme may require renewal of the related certificates by the body issuing the statement. *End-of-guidance-note*

A.6.3.3 Data Update

AR-248: The Independent Validation Statements with regulation is a Dynamic data field, which shall be updated when a statement expires.

Guidance Note A21: the statement may need to be renewed if an expiration date is set. *End-of-guidance-note*

AR-249: When required, the Independent Validation Statements shall be logged in the MDP before the MDP is issued.

A.6.3.4 Mandatory

AR-250: The Independent Validation Statements is an Optional (project-specific) data field of the MDP.

AR-251: The Independent Validation Statements that are included in the Declaration of conformity with regulations are specific to the component and the installation. They shall be agreed between the Component purchaser and the Component provider.

A.6.3.5 Responsibilities

First data log at MDP issuance

AR-252: When required, the Independent Validation Statements data field shall be provided and logged by the selected Verifier company.

Subsequent data log

AR-253: It shall be a responsibility of the MDP owner to ensure that expiring declarations are renewed by the authorized Verifier companies.

A.6.3.6 Data access rights

AR-254: Access to the Independent Validation Statements data field on the MDP shall be Unrestricted.

A.7 Environmental Data

A.7.1 D27 Manufacturing Carbon Footprint

A.7.1.1 Description

The Manufacturing Carbon Footprint data field is used to report the Carbon Footprint Study Report (CFP Study Report) as defined by ISO 14067 of the considered component.

A.7.1.2 Format

AR-255: The Carbon Footprint data field is an unstructured data field in the form of pdf file, provided in a PDF/A format compliant with ISO 19005 series of standards.

The following metadata shall as a minimum be included in the Carbon Footprint data field:

- Document code
- Document revision number
- Document date of issuance, in the format YYYY-MM-DD according to ISO 8601 standard
- Document title

AR-256: The Manufacturing Carbon Footprint data field shall report the CFP Study Report for the component developed in accordance with ISO 14067.

A.7.1.3 Data Update

AR-257: The Manufacturing Carbon Footprint shall be a Static data field (i.e., it shall not be modified over the component' lifecycle).

Guidance Note A22: for the MDP, the focus on environmental impact is during the manufacturing stage, with a cradle to gate approach. There is therefore no need to update the metric over the component life cycle. *End-of-guidance-note*

AR-258: The Manufacturing Carbon Footprint shall be logged in the MDP before the MDP is issued.

A.7.1.4 Mandatory

AR-259: The Manufacturing Carbon Footprint is an Optional (project-specific) data field of the MDP. The need for including the Manufacturing Carbon Footprint data field in the MDP shall be agreed between the Component Purchaser and the MDP Provider.

A.7.1.5 Responsibilities

AR-260: The Manufacturing Carbon Footprint shall be provided and logged by the MDP provider.

AR-261: The Manufacturing Carbon Footprint may be validated (verified) by a Verifier company. The need for validation shall be agreed between the MDP Provider and the Component purchaser.

A.7.1.6 Data access rights

AR-262: Access to Manufacturing Carbon Footprint data field shall be Unrestricted.

A.7.2 D28 Environmental Product Declaration

A.7.2.1 Description

The Environmental Product Declaration data field is used to report the Environmental Product Declaration (EPD) of the component covered by the MDP, as defined by ISO 14025.

A.7.2.2 Format

AR-263: When available, the Environmental Product Declaration shall be provided as a machine readable EPD.

AR-264: The Environmental Product Declaration may be provided as unstructured data in the form of a pdf file, compliant with the PDF/A format according to ISO 19005 series of standards.

When the Environmental Product Declaration is provided as a PDF/A file, the following metadata shall as a minimum be included in the Environmental Product Declaration data field:

- Document code
- Document revision number
- Document date of issuance, in the format YYYY-MM-DD according to ISO 8601 standard
- Document title

AR-265: The data format for the Environmental Product Declaration data field shall be agreed between the Component purchaser and the MDP provider.

A.7.2.3 Data Update

AR-266: The Environmental Product Declaration shall be a Static data field (i.e., it shall not be modified over the component' lifecycle).

AR-267: The Environmental Product Declaration shall be logged in the MDP before the MDP is issued.

A.7.2.4 Mandatory

AR-268: The Environmental Product Declaration is an Optional (project-specific) data field of the MDP. The need for including the Environmental Product Declaration data field in the MDP shall be agreed between the Component Purchaser and the MDP Provider.

A.7.2.5 Responsibilities

AR-269: The value of the Environmental Product Declaration data field shall be provided and logged by the MDP Provider.

AR-270: The value of the Environmental Product Declaration should be verified (validated) by the Verifier company that verified the Environmental Product Declaration document.

A.7.2.6 Data access rights

AR-271: Access to the Environmental Product Declaration data field on the MDP shall be Unrestricted.

Appendix B Reference API for MDP Data (Informative)

This Appendix reports a high-level reference implementation of a standardized API to be used as reference for enabling interoperability of access, creation and update of Material Digital Passports across several MDP platforms.

GET Read

[Open request](#)

```
{{base_url}}/:{{uuid}}
```

Returns available MDP data (standard and platform-specific) from the target platform for the requested UUID.

Authorization OAuth 2.0

This request is using an authorization helper from collection MDP standard API

Path Variables

```
{{uuid}}
```

Example

Read

Request

HTTP

GET / HTTP/1.1

Host: :{{uuid}}

200 OK

Response

- Body
- Headers (1)

json

```
{
  standard: [
    ...
  ],
  custom: [
    ...
  ]
}
```

POST Create

[Open request](#)

```
{{base_url}}
```

Request creation of a MDP based on JIS-01 standard MDP data, and custom (platform-specific) data. Should return the UUID for this MDP.

Authorization OAuth 2.0

This request is using an authorization helper from collection MDP standard API

Body raw (json)

```
json
{
  standard: [...
  ],
  custom: [...
  ]
}
```

Example

Create

Request

HTTP

POST / HTTP/1.1

Host: {{base_url}}

Content-Length: 57

```
{
  standard: [...
  ],
  custom: [...
  ]
}
```

200 OK

Response

- Body
- Headers (1)

```
json
{
  uuid: ...
}
```

PUT Update

[Open request](#)

```
{{base_url}}/:{uuid}}
```

Updates a given MDP referenced by UUID. Only updated fields are passed in the body.

Authorization OAuth 2.0

This request is using an authorization helper from collection MDP standard API

Path Variables

{{uuid}}

Body raw (json)

json

```
{
  standard: [...
],
  custom: [...
]
}
```

Example

Update

Request

HTTP

```
PUT /:{uuid} HTTP/1.1
```

```
Host: {{base_url}}
```

```
Content-Length: 57
```

```
{
  standard: [...
],
  custom: [...
```

]

}

200 OK

Response

- Body
- Headers (1)

No response body

This request doesn't return any response body.

PATCH Approve

[Open request](#)

```
{{base_url}}/:{uuid}}
```

Provides an electronic signature (defined according to [RFC 7515 - JSON Web Signature](#)) for all or part of the MDP specified by JSON pointer (defined according to [RFC 6901 - JSON Pointer](#)).

The signature must include the "jku" header to point at the URL of the public key used to generate this signature for further verification. It can use the "kid" header to indicate the key version used at signing.

The payload may be extended by the approver to add information about the verification process and findings.

The MDP platform should verify that the payload defined by this pointer matches the encoded JWS payload, and if so verify the signature, and if so record the signature in the MDP together with the extended payload and the approver DID.

There can be several signatures for any given payload, and there can be several signatures inside a given payload.

Authorization OAuth 2.0

This request is using an authorization helper from collection MDP standard API

Path Variables

```
{{uuid}}
```

Bodyraw (json)

View More

```
json
```

```
{
  "pointer": "...",
  "signature":
  "eyJ0eXAiOiJKV1QiLA0KICJhbGciOiJIUzI1NiJ9.eyJpc3MiOiJqb2UiLA0KICJleHAiOiJlZzMDA4MTkzODAsDQogImh0dHA6Ly9leGFtcGxlLmNvbS9pc19yb290Ijp0cnVlfQ.dBjftJeZ4CV
  P-mB92K27uhbUJU1p1r_wW1gFWFOEjXk"
}
```

Example

Approve

Request

View More

HTTP

PATCH /:{{uuid}} HTTP/1.1

Host: {{base_url}}

Content-Length: 224

```
{
  "pointer": "",
  "signature":
  "eyJ0eXAiOiJKV1QiLA0KICJhbGciOiJIUzI1NiJ9.eyJpc3MiOiJqb2UiLA0KICJleHAiOiJlZz
  MDA4MTkzODAsDQogImh0dHA6Ly9leGFtcGxlLmNvbS9pc19yb290Ijp0cnVlfQ.dBjftJeZ4CV
  P-mB92K27uhbUJU1p1r_wW1gFWFOEjXk"
}
```

200 OK

Response

- Body
- Headers (1)

No response body

This request doesn't return any response body.

Glossary

Definitions

Asset: In the context of this specification, an asset is an industrial installation relevant to the energy industry that is composed of several components. Refineries, offshore platforms, power plants, transportation and distribution pipelines, compression stations are all examples of assets.

Asset Owner: see Sec. 2.1.1.1.

Batch: definite amount of material produced during a single manufacturing cycle, and intended to have uniform character and quality. Also “production batch” or “lot”. [SOURCE: ISO Guide 30:2015, 01-01-59]

Bill of Material: for a given component, the bill of material is the list of sub-components that are included in the component itself.

Bulk Material: in the context of this specification, bulk material refers to physical items that are relevant for the energy industry and are produced in batches having uniform characteristics and qualities. Bulk material components are not identified at individual levels by their manufacturer. Bulk material components are often produced to be stocked rather than manufactured on demand. Fasteners (bolts, nuts, washers), forgings, steel plates, pipes, piping and fittings, small manual valves are examples of bulk material components.

Child sub-batch: in the context of this specification, a child sub-batch is defined in relationship with a parent sub-batch. A child sub-batch is a sub-batch composed of a sub-set of items belonging to the same parent sub-batch. See also Sec. 2.1.3.5.

Complex Equipment: in the context of this specification, a complex equipment is a technical equipment relevant for the energy industry that is composed of several individual equipment components, bulk material components and possibly other complex equipment components. A complex equipment is individually identified by its manufacturer. A complex equipment is normally manufactured on demand according to specific requirements from the purchaser. Industrial skids such as compressor skids, pump sets, chemical treatment skids, cranes are examples of complex equipment.

Component: in the context of this specification, a component is either an Individual Equipment, a Complex Equipment or a batch item belonging to Bulk Material category.

Component Operator: see Sec. 2.1.2.3

Component Provider: See Sec. 2.1.2.2.

Component Purchaser: See Sec. 2.1.2.1.

Data carrier: device or medium used to store data as a relay mechanism in an AIDC system. Bar code, OCR character string and RF tag are examples of data carriers. [SOURCE: ISO/IEC 19762:2016, 01-01-59]

Digital Platform Provider: see Sec. 2.1.1.7

Dynamic data: in the context of this specification, Dynamic data are data included in the MDP that are modifiable after the MDP Issuance by the authorized stakeholders.

Engineering, Procurement and Construction company: see Sec. 2.1.1.2

Identification Code: in the context of this specification, the identification code is a unique alphanumeric string that is associated to a Material Digital Passport and is used for uniquely identifying the passport and the related component. See also Sec. 2.3.

Individual Equipment: in the context of this specification, an individual equipment is a technical equipment (such as vessels, units, machines, electronic devices and components, assemblies, batteries, components, spare parts) that is relevant for the energy industry and that is individually identified by its manufacturer. Individual equipment components may be either produced for stock or manufactured on demand according to specific requirements from the purchaser. Tagged valves, transformers, pumps, turbines are examples of individual equipment.

Individual MDP: a Material Digital Passport covering a single component, typically an Individual Equipment or a Complex Equipment.

Manufacturer: see Sec. 2.1.1.3.

MDP Creation / Create an MDP: in the context of this specification, the MDP Creation is the act of creating a Material Digital Passport on the MDP Platform through the dedicated functionality made available by the MDP Platform. Once an MDP is created, the MDP data and information can be included in the MDP.

MDP Data Provider: see Sec. 2.1.2.6.

MDP Data Verifier: see Sec 2.1.2.7.

MDP Issuance / Issue an MDP: in the context of this specification, the MDP Issuance is the act of officially issuing a Material Digital Passport through the dedicated functionality made available by the MDP Platform. Once an MDP is issued, static data included in the MDP can no longer be modified, and the MDP can be transferred to new owners.

MDP Owner: see Sec. 2.1.2.8

MDP Platform: in the context of this specification, any Digital Platform used to generate, maintain, manage access, and upload data of Material Digital Passports developed in accordance with the requirements of this specification.

MDP Provider: see Sec. 2.1.2.5.

MDP Requester: see Sec. 2.1.2.4.

MDP Split / Split an MPD: in the context of this specification, the MDP Split is the act of creating two or more sub-batch MDPs from an existing sub-batch MDP through the dedicated functionality made available by the MDP Platform.

Operator: see Sec. 2.1.1.6

Parent component: in the context of this specification, a parent component is defined in relationship to a sub-component, and it represents the component in which the considered sub-component is installed. See also Sec. 2.1.3.1.

Parent Sub-batch: in the context of this specification, a parent sub-batch is defined in relationship to a child sub-batch. A parent sub-batch is the sub-batch from which a child sub-batch is obtained. See also Sec. 2.1.3.5.

Restricted: in the context of this specification, *Restricted* refers to MDP data that by default shall only be visible on the MDP Platform to the MDP owner of the Material Digital Passport, to the MDP Data provider for that data field, and to the MDP Data verifier for that data field.

Stock reseller: see Sec. 2.1.1.4

Sub-component: in the context of this specification, a sub-component is a component that is installed as a building block inside another component (which in turn is the parent component of the sub-component). See also Sec. 2.1.3.1.

Sub-batch: in the context of this specification, a sub-batch is a sub-set of items belonging to the same production batch. The concept of sub-batch is useful in situations when only a sub-set of the production batch is sold to a component purchaser and installed in the same component. See also Sec. 2.1.3.5.

Sub-batch MDP: a Material Digital Passport that covers more than one component, provided the components covered all belong to the same production batch and that the exact same information can be included in the Material Digital Passport for all items at the time of issuance. A sub-batch MDP does not need to cover all the items of a given production batch, but it is rather tailored to cover a specific number of items that is traded between stakeholders to finally be installed in a given parent component.

Static data: in the context of this specification, Static data are data included in the MDP that are not modifiable after the MDP Issuance.

Symbology: standard means of representing data in optically machine-readable form. Each symbology specification sets out its particular rules of composition or symbol architecture. [SOURCE: ISO/IEC 19762:2016, 02-01-02]

Tier: in the context of this specification, a tier refers to a specific level of the energy industry supply chain. Tier-0 (T-0) is the top level, corresponding to the asset, while increasing numbers correspond to deeper level of the supply chain, with tier-1 corresponding to the main components in the asset, tier-2 to their sub-components, tier-3 to the subcomponents of tier-2, and so on. See also 2.1.3 and **Figure 1**.

Unrestricted: in the context of this specification, *Unrestricted* refers to MDP data that shall be visible on the MDP Platform to all users.

User: in the context of this specification, any physical person accessing an MDP Platform.

Verifier company: see Sec. 2.1.1.5

Acronyms

API	Application Programming Interface
BoM	Bill of Material
DDID	Distributed Digital Identities
DID	Decentralized IDentifier
DLT	Distributed Ledger Technology
EPC	Engineering, Procurement and Construction
EPD	Environmental Product Declaration
ERC	Ethereum Request for Comment
ERP	Enterprise Resource Planning
GUI	Graphical User Interface
GUID	Global Unique IDentifier
IAM	Identity and Access Management
IC	Identification Code
IEC	International Electrotechnical Commission
IETF	Internet Engineering Task Force
IL	Identification Link, as defined in IEC 61406-1
IOGP	International Association of Oil & Gas Producers
ISO	International Standardization Organization
JIP33	Joint Industry Programme 33 from IOGP
JIP36	Joint Industry Programme 36 from IOGP
MDP	Material Digital Passport
OEM	Original Equipment Manufacturer
RDL	Reference Data Library (RDL) of JIP36
RFC	Request For Comments
SC	Supply Chain
SSI	Self-Sovereign Identity
T-n	Tier-n
UUID	Universal Unique IDentifier
URL	Uniform Resource Locator
VC	Verifiable Credentials

References

- [1] ISO/IEC 9834-8:2014, Generation of universally unique identifiers (UUIDs) and their use in object identifiers
- [2] ISO/IEC 16022:2006, Information Technology – Automatic Identification and data capture techniques – Data Matrix bar code symbology specification
- [3] ISO/IEC 18004:2015, Information Technology – Automatic Identification and data capture techniques – QR code bar code symbology specification
- [4] IEC 61406-1:2022 Identification Link - Part1: general requirements
- [5] ISO/IEC 27001:2022 Information security, cybersecurity and privacy protection – Information security management systems – Requirements
- [6] IOGP JIP36 "Capital Facilities Information HandOver Specification (CFIHOS)", available online at <https://www.jip36-cfihos.org/>
- [7] IOGP JIP33 "Standardizing Procurement Specifications", available online at <https://www.iogp-jip33.org/>
- [8] ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- [9] ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification
- [10] ISO 19005 Document management – Electronic document file format for long-term preservation
- [11] ISO 8601-1:2019 Date and time – Representations for information interchange – Part 1: Basic rules
- [12] ERC-721 *Non-Fungible Token Standard*
- [13] IETF RFC 6749 *The OAuth 2.0 Authorization Framework*