IDTA

buildingSMART Germany

GUIDELINE

BIM building model for the integration of machines, building services and external devices using the Asset Administration Shell

An instruction manual for connecting and using digital BIM models with the Digital Twin of Industry 4.0 – the Asset Administration Shell (AAS).

May 2025

Imprint

Publisher

Industrial Digital Twin Association
Lyoner Strasse 18
60528 Frankfurt am Main
Germany
www.industrialdigitaltwin.org

Version history

Date	Version	Changes made
May 2025	based on German Version 1.1	Release of English Version

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1 About this document

The document provides instructions on how to sustainably optimise digital building management. Specifically, it deals with the integration of Building Information Modelling (BIM) with Asset Administration Shells (AAS). The BIM model describes the building, while the AAS is responsible for the technical components and systems installed in the building. By linking the static BIM models (for example in IFC format) with the dynamic product information provided in real time by the AAS, a comprehensive Digital Twin is created that covers the entire life cycle of a building. As the correct product data is automatically available at all times, the integration already improves planning. During operation and maintenance, documentation and updates to maintain secure digital operation are particularly advantageous. Online data from intelligent IoT devices is used for real-time monitoring and enables predictive maintenance.

The integration effort is worth it: Compared to conventional approaches, the connection of the BIM model with AAS leads to significantly more efficient planning, lower operating costs, increased sustainability and improved collaboration between the parties involved and their systems.

2 BIM building planning and Digital Twin

Ideally, the digital transformation of the construction industry takes into account the entire life cycle of the building - from the initial design, planning, construction and acceptance through to operation and dismantling. Digital methods and tools are used in all phases to make processes more effective and to break new ground towards an economical and sustainable building.

Building Information Modelling (BIM) has proven to be the optimal method for construction planning and execution. BIM, standardised in accordance with DIN EN ISO 19650, significantly improves communication and coordination between the various stakeholders in the life cycle of a building. Digital building modelling is based on the open Industry Foundation Classes (IFC) format from building-SMART International. It offers all project participants a standardised technical basis for the exchange of digital model information. The IFC format is an open international standard (DIN EN ISO 16739) that is manufacturer-neutral (and therefore not proprietary). A large number of software applications for a wide range of applications, such as crossdiscipline joint design planning or collision checking, now have corresponding interfaces for manufacturerneutral exchange.

The Asset Administration Shell (AAS for short) is a central concept for data structuring and management of the Digital Twin in the context of Industry 4.0. The Asset Administration Shell in accordance with DIN EN IEC 63278 serves as the basis for applications and services along the life cycle of devices and machines. It not only enables the digital representation of physical objects and their properties, it also allows data on these objects to be retrieved in real time in an open standard. The corresponding information is thematically summarised in submodels with standardised "machine-readable" semantics. In this way, the AAS contributes to an essential aspect of a Digital Twin, the linking with its physical twin.

Companies can use AAS data to realise what is known as interoperable data exchange and make all information about their products available securely and in machine-readable form across the supply chain. This enables products and processes to be better understood, optimised and made more efficient. For example, suitable sub-models are available for information on the CO_2 footprint or a balance of all materials.

An open standard for the information models (= submodels, SM) contained in the Asset Administration Shell is required so that the Asset Administration Shell can be read interoperably, i.e. by different participants and across the life cycle of the asset (from development and physical creation through to use and disposal). It is currently being continuously expanded as part of the Industrial Digital Twin Association (IDTA) (Figure 1). The SMs each have delimited description areas, such as information on the type plate, documentation or the organisation of products in hierarchical structures.

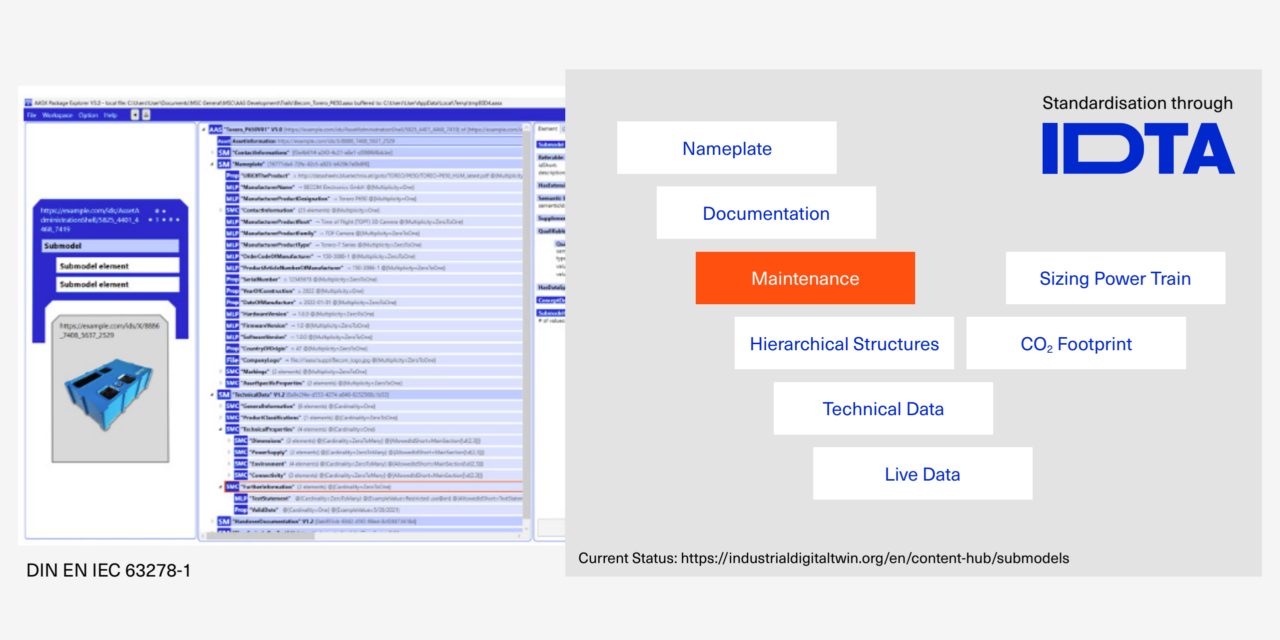

Figure 1: Example of an Asset Administration Shell and typical standardised submodels of the IDTA

What the BIM process achieves in construction is similar to the objectives of the AAS for industrial assets. Therefore, the AAS and the buildingSMART International (bSI) standards share fundamental concepts and functions. The AAS represents the Digital Twin of an industrial asset, while the bSI standards support the Digital Twin of buildings. Both standards focus on a structured representation of data and promote the integration and exchange of information between different systems and platforms. Standardised data formats and protocols are used for this purpose. The resulting machine readability and definition saves costs and improves the basis for decision-making. The main conceptual difference between BIM and AAS lies in the temporal representation.

The BIM model represents the building at a specific point in time, while the AAS provides the data over the entire asset life cycle and makes it dynamically usable, for example to determine maintenance intervals based on individual device usage at the respective location.

Due to their different origins and development paths, BIM and AAS standards currently still exist largely independently of each other. For example, planning in the BIM process usually focuses on the structural elements of the building, such as walls, columns, other components and rooms. Although technical building equipment (TBE) products are also mapped, this is usually only done statically, i. e. without details and dynamic information on the products installed in the building.

The responsibility of the BIM model often ends with the transition to building operation, because in this case it is an “as-built” model that no longer represents the continuous changes to a building and, in particular, dynamic data that is relevant for ongoing operation.

In contrast, the AAS makes it possible to maintain the Digital Twin of an asset, whether machine, building services or software, over the entire life cycle. The Asset Administration Shell documents current information on the machines, control systems, sensors and actuators installed in the buildings, for example the measurement and control technology. Hosted on AAS servers, the AAS submodels and their contents can be read out automatically. The AAS server is therefore a “living object”. It manages changes to the product, the documentation and the life cycle data.

The data structure includes both static information, such as details of the manufacturer or performance characteristics, and dynamic data, such as the measured values recorded by a sensor or the operating hours of a drive in sub-models defined for this purpose.

AAS can be retrieved from the server using a unique identifier. Read and write permissions can be customised, ensuring universal and controlled access to all relevant asset information. This promotes interoperability between different systems and significantly improves the efficiency and quality of construction and operating processes. In the instructions, “asset” stands for all elements (technical building equipment, IoT devices, sensors, actuators, machines, etc.) that are stored in the AAS.

3 Aim of the instruction

These instructions provide approaches for merging the potential and concepts of BIM and AAS. The aim is to link elements of the BIM model with assets in the AAS on the basis of defined scenarios (Figure 2).
In addition to the technical aspects of implementing the link, the following chapters illustrate how this link is created conceptually during the planning and construction of a building.

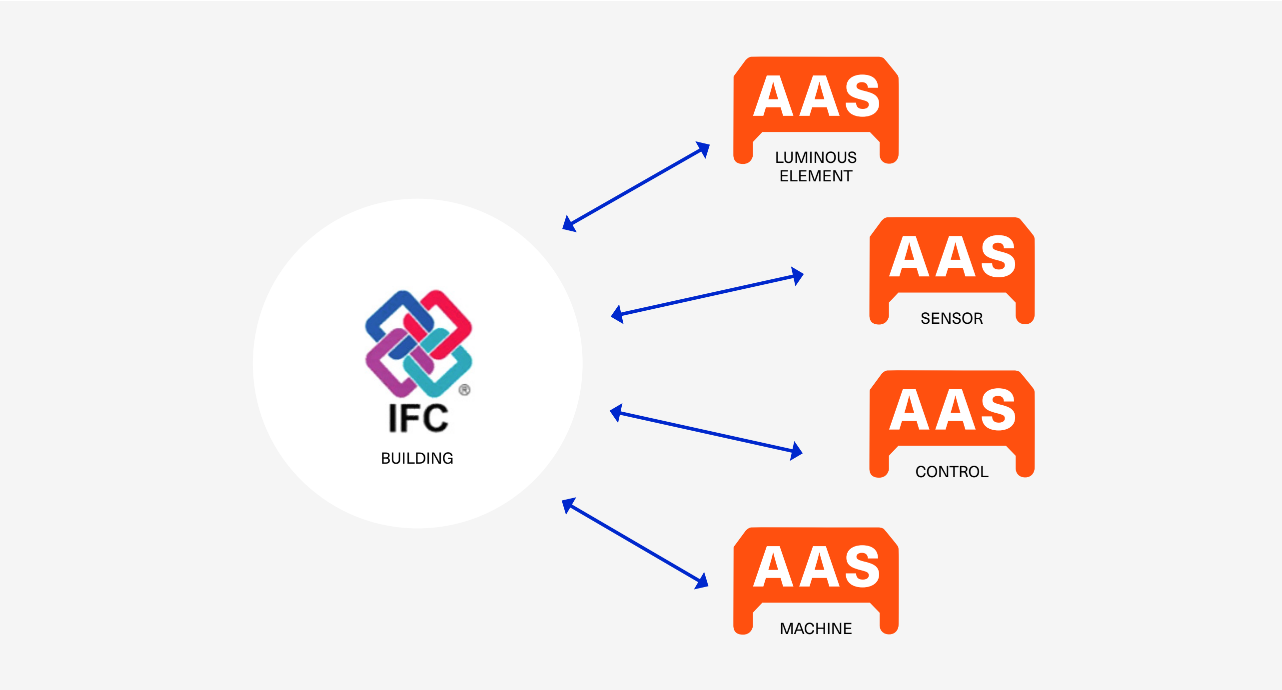

Figure 2: The aim of the instruction is the data integration of IFC and AAS

Each of the two technologies already offers its own advantages for digital construction and operations management. The IFC data format and AAS both form an open, collaborative and non-profit basis that is supported by the organisations buildingSMART International and the Industrial Digital Twin Association. The combination of BIM and AAS enables a holistic approach across the entire life cycle of a building and promotes interoperability between different software platforms and systems.

The BIM model can represent a defined status of the building (e.g. “as-built”), but can also provide current data on the installed assets such as IoT devices.

The convergence of information technology (IT) and operation technology (OT) in the construction sector is revolutionising the way we work (Figure 3). BIM is changing the way we plan, build and operate. IoT is changing what is planned, built and operated. By integrating BIM and IoT, we can manage and optimise systems such as building services, electrical, heating, ventilation, air conditioning (HVAC) and plumbing more efficiently, leading to improved operations and cost savings.

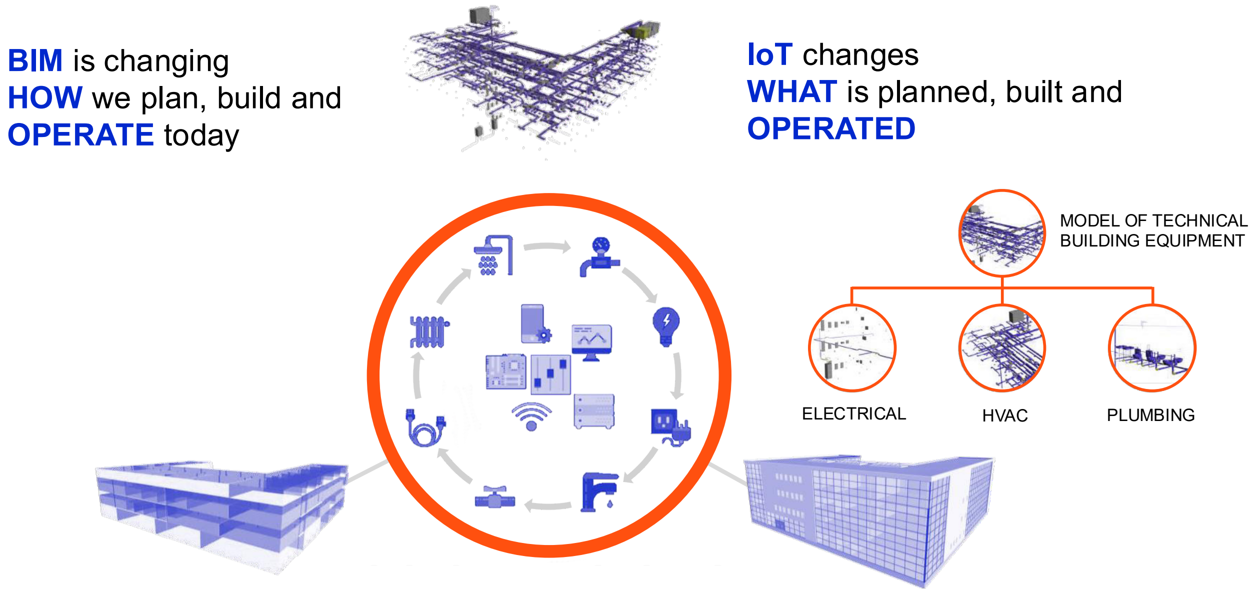

Figure 3: IT / OT convergence in the construction sector

In order to maximise the benefits of the interaction between BIM and the AAS, the necessary data must be referenced (Figure 4). In the figure, the AAS is a data source used to provide the current status of asset information in order to ensure that no outdated information leads to possible confusion due to copying in the BIM context.
Two types of Asset Administration Shells are usually used to provide the data:

1. The **type AAS** contains the information and technical documentation on the type of an asset, identified by a unique product type. This data is comparable with information from product catalogues, for example:
   - technical product descriptions;
   - technical data such as performance parameters, dimensions, connections, power supply or Environmental Product Declaration (EPD);
   - general test certificates and attestations.

2. In addition to general information on the product type, the **instance AAS** contains specific data on an individual asset, identified by a unique serial number. The instance AAS documents characteristic information such as:
   - specific individual designs / parameterisation;
   - management of maintenance and updates to assets:
   - storage of application data (such as photovoltaic output).

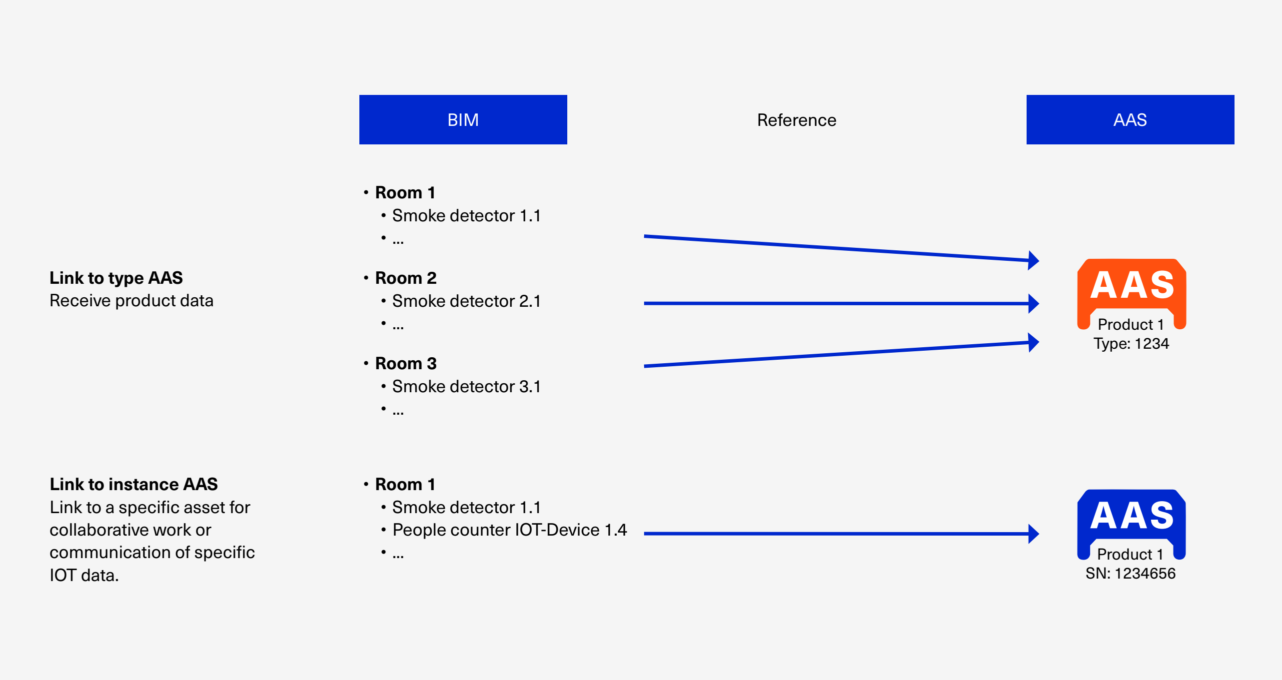

Figure 4: Referencing from the BIM model to the elements in the AAS

4 Interaction over the life cycle of the building and its BIM

The interaction between BIM and AAS extends over the life cycle of the building or the BIM model that survives the building (Figure 5). The key areas here are the planning, construction, utilisation and dismantling of parts for the conversion or demolition of the building.

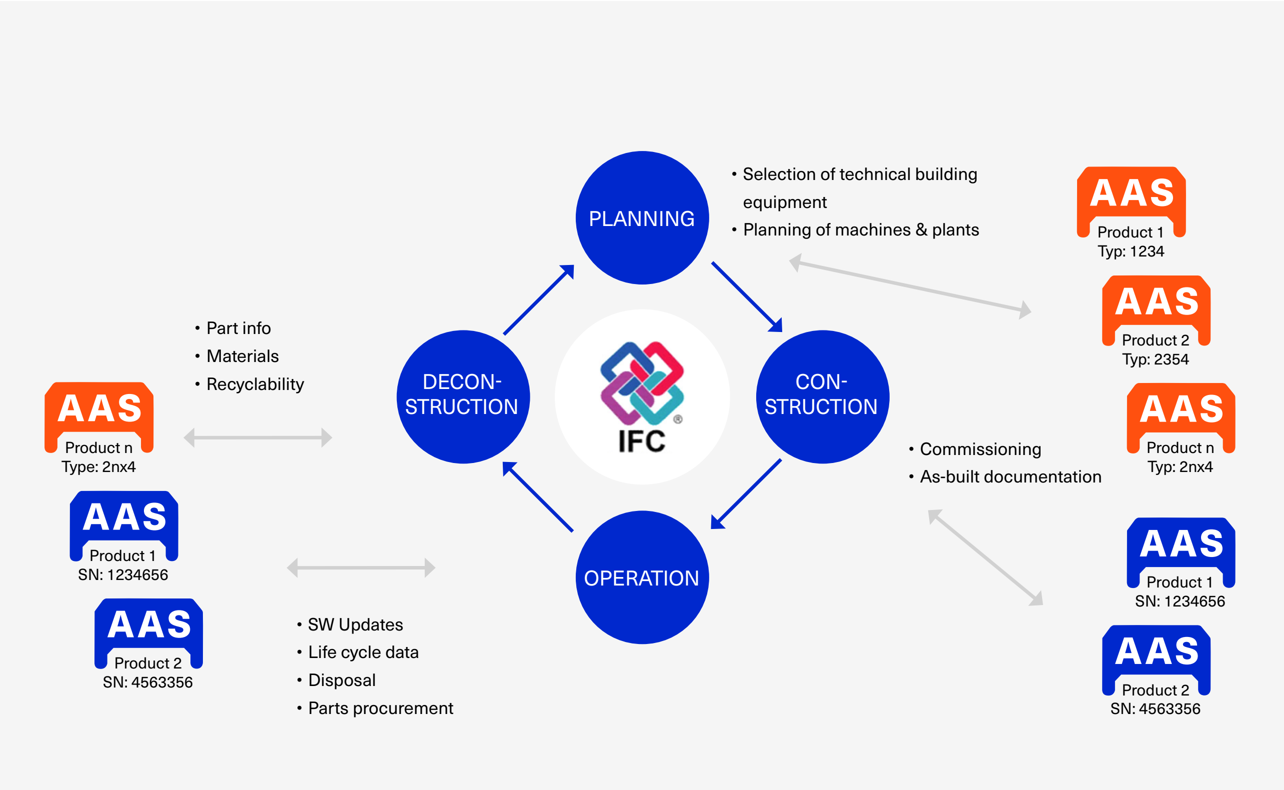

Figure 5: Interaction of BIM with AAS over the life cycle of the building

4.1 AAS as a data supplier for planning

The previous standardised submodels of the AAS mainly concern static data. This includes the nameplate, technical data, the CO_2 footprint and the documentation. This means that all data required for planning, such as dimensions, effective range, connections, etc., is available at all times for technical building equipment planning planning with the corresponding AAS. Data can be easily queried and compared. Once the components have been selected, a link is all that is needed to transfer the data to the contractors. Changes to the technical building equipment actually used are managed in the BIM; the technical building equipment data remains in the Asset Administration Shell. At this time, the link is primarily the respective type AAS of the products.

However, the integration of machines into buildings or factories is more complex than the building services planning. Particularly with large machines, close coordination between the planner and the machine supplier is necessary in order to harmonise the structural requirements. Examples of the necessary exchange of information include

- Floor load / foundations
- Accessibility, safety and escape routes
- Supply with media (electricity, water, compressed air, hydraulics, etc.)

- Connection to the IT network
- Heat generation and exhaust air
- Noise and noise insulation
- Certificates, attestations or
- EPD data (GWP, CO_2 etc.).

As the machine / system being synchronised is usually an already defined machine / system, the instance AAS is primarily used for this purpose.

4.2 Construction and operation

For the construction and commissioning of the building, it is necessary to have access to the latest software versions in addition to the technical data of the devices. The administration shell can also be used for this purpose.

If building equipment and machines are installed in the building, they should be maintained individually. It therefore makes sense to switch from the type AAS of the assets to the instance AAS from the first as-built model. This makes it possible for stakeholders (supplier and user, maintenance company) to maintain and retrieve product data, such as maintenance work carried out, updates installed and changes to the product, system or machine, throughout the life cycle.

However, not only static information and functions are used for real-time monitoring and process control, but also runtime data. This allows anomalies or errors to be quickly identified and diagnosed. Specific requirements and data models can be structured and managed efficiently using sub-modular approaches. In this context, the AAS is suitable for operating hour counters and the registration of accumulated values such as energy consumption and output. High-frequency data, if required, should only be stored in the AAS for a limited time range.

This means that a broad database is available for every asset with instance AAS, which provides transparent and equal information on everything from usage and maintenance to repairs.

When replacing an asset, for example when replacing a defective part of technical building equipment, the linking of the BIM model is redirected to the new instance AAS.

4.3 Deconstruction and disposal

Information can be left in the instance AAS for replaced, defective or end-of-life assets. It is crucial that the information about the substances contained is accessible to the asset‘s disposers. This also meets the key requirements of the future digital product passport (DPP).

The type AAS is usually sufficient for the disposal of the product. The respective instance AAS must be maintained for complete tracking of the asset until disintegration.

5 The Digital Twin in practice: linking the building twin with the product twin for operation and maintenance

5.1 Overview

Digital Twins, especially building lifecycle twins (BLTs), are revolutionising the construction and maintenance industry. By integrating BIM with Digital Twin technologies, companies can transform static structures into dynamic, autonomous units. The combination of building twins (focussed on the construction process) and product twins (focussed on individual components) enables improved planning, operational efficiency and a customised maintenance strategy.

5.2 Building twin

A building twin is a digital image of the building that encompasses the entire construction process. It contains all the architectural and structural information as well as mechanical, electrical, sanitary / plumbing, the technical building equipment components and information on technical building systems. This twin is used to plan and design the construction. The visualisation and simulation of construction processes helps to detect conflicts and identify and solve potential problems before they occur. The building twin can also be used to monitor the construction phases in real time to ensure that schedules and budgets are adhered to. At the same time, it contributes to better quality control. Continuous monitoring ensures that the construction process fulfils predefined standards, regulations and specifications.

5.3 Product twin

Product twins represent individual components within the building, such as components of HVAC systems, security systems, lifts or lighting systems. As their digital counterparts, they enable up-to-date and retrievable documentation of the corresponding product at any time. If they are equipped with IOT functionality, they provide detailed insights into the performance, status and operating parameters. They also enable the prediction of potential failures and the proactive planning of maintenance activities to reduce downtime and repair costs. This continuous monitoring and adjustment improves the performance and efficiency of individual building systems.

5.4 Linking the building twin with the product twin

Linking a building twin with a product twin for operation and maintenance offers considerable advantages. It takes place in several steps: Firstly, the data of the building and product twin is consolidated. This establishes a common data environment (CDE). This ensures a seamless data flow and enables all parties involved to access the data, especially for maintenance management (MMS) and asset management systems (AMS). The MMS / AMS is populated via the as-built model, whereby the links to the respective asset administration shells are resolved by the systems. User manual, maintenance manual, drawings, certificates and maintenance intervals can therefore be integrated automatically. Live data can be read out and integrated either directly via the AAS or via the portal access described above.

By using the combined data, building operation can be sustainably optimised. Real-time monitoring enables adjustments to be made that improve energy efficiency and occupant comfort, for example in energy management. By linking the HVAC system with the live data from the digital building twin, the HVAC system can regulate itself accordingly based on occupancy patterns and weather conditions.

At the same time, the use of data analyses and machine learning algorithms enables predictive maintenance, which predicts when which components need to be serviced. This approach minimises unplanned outages and extends the service life of building systems. The Digital Twin of a lift system, for example, can monitor usage patterns and wear and tear and predict when maintenance is required before a fault occurs.

Life cycle management supports the management of the entire life cycle of a building and its components – from planning to demolition. The Digital Twin contains a historical log that is useful for renovation or future construction projects. To this end, the Digital Twin stores a building's data on all past maintenance activities. It is intended to help with the planning of future upgrades and ensure compliance with safety regulations.

5.5 Advantages of the Asset Administration Shell in operation

- Sustainability: The increased efficiency leads to lower energy consumption and lower CO_2 emissions.
- Cost savings: Predictive maintenance and optimised operation reduce both repair and energy costs.
- Improved comfort: Optimised control of the building systems creates a more pleasant environment for residents.
- Data-based decision making: Access to comprehensive data helps to make informed decisions regarding building and maintenance operations.

5.6 Application in the building industry

The digital construction twin contains all relevant CAD data, floor plans, asset locations, rules and key performance indicators (KPIs). It is mainly used in the planning and construction phase. It helps to create accurate and detailed models that contain all the information required for the construction process.

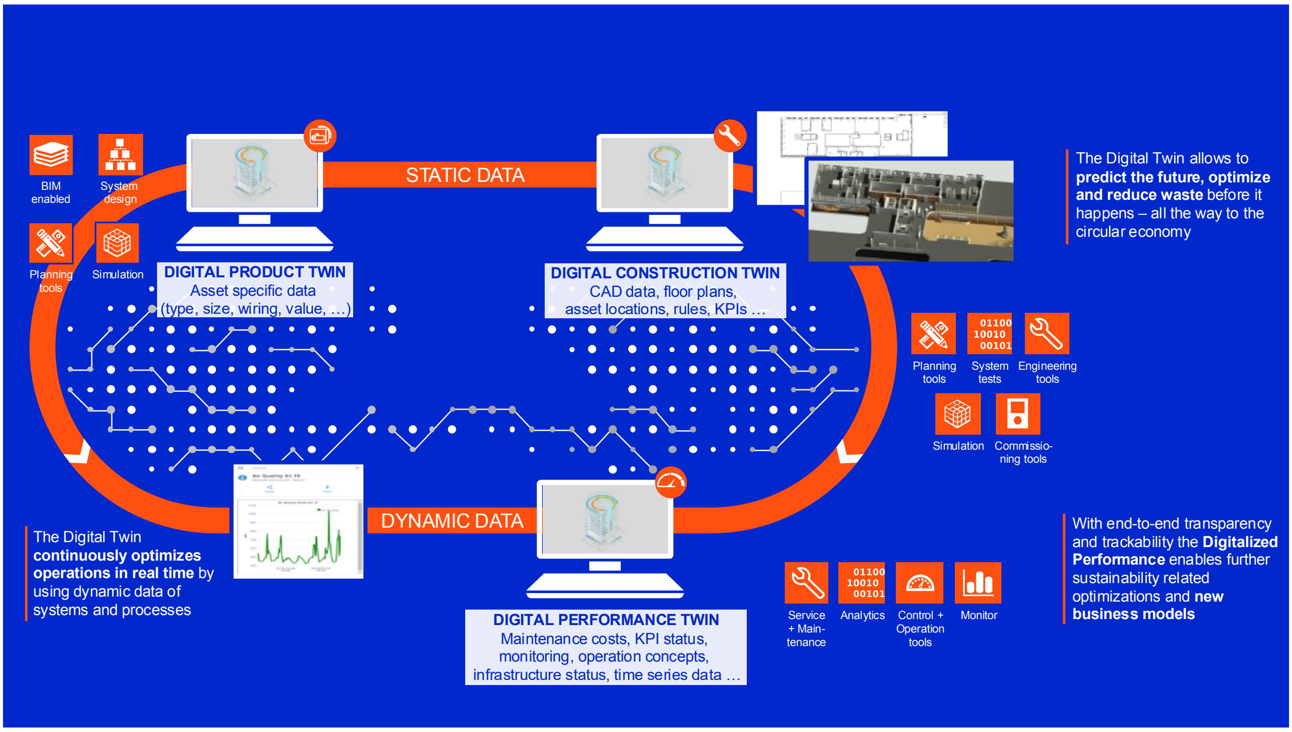

Figure 6: Advantages of Digital Twin technology in the construction industry

6 Application example / recommendation

The concepts and ideas described so far form a good basis for combining the two disciplines of building twin and product twin. The following section describes what this integration can look like in practice. It should be noted that in standard market applications, the functions described here may represent a future expansion of the information models. The described process of asset model linking and data transfer may also differ in detail for each user.

The process of planning, construction and operation shown is idealised and serves to simplify the presentation of the processes. The allocation of roles and responsibilities is largely omitted. The focus of these instructions is on the results and the process steps. In practice, who actually carries these out depends on a large number of ancillary conditions that have to be defined within a project.

6.1 Preparation

The aim is to create a link between the elements of the Building Twin BIM model and the Product Twin product information stored in the AAS. This connection usually takes place in three steps:

1. Assignment of a product type in an early planning phase,
2. Connection to a specific product in the detailed planning phase,
3. Connection to the instance of the previously planned product installed in the building, if required.

The detailing of the information and, if applicable, the geometry is increased from phase to phase or is concretised. The transition from the virtual to the real product takes place in phase 3.

6.1.1 ERP system preparation

These products should not be managed in the BIM model, but in a separate ERP system (e.g. SAP). This is where all technical information on the installed components is managed, maintained and linked to other systems and elements. A unique identifier (asset-ID) is assigned manually here. It is used as an address to set the different elements in relation to each other. The ID is used to reference other elements of the building. The address can refer to both material things, such as individual sensors, assemblies or machines, and non-material things, such as rooms or zones.

6.1.2 Preparation AAS

The aim is for the AAS to act as a “data supplier” for the BIM model. For this reason, the AAS must provide all the necessary data. Since the BIM defines unique semantic descriptions for parameters that are not consolidated with classic semantic definitions of the AAS (ECLASS, IEC CDD), it makes sense to use a separate AAS submodel for this purpose. Such a model maps the data requirements of the IFC characteristics (property sets, PSet for short) and at the same time references the respective semantic descriptions. Figure 7 shows a section of a possible submodel.

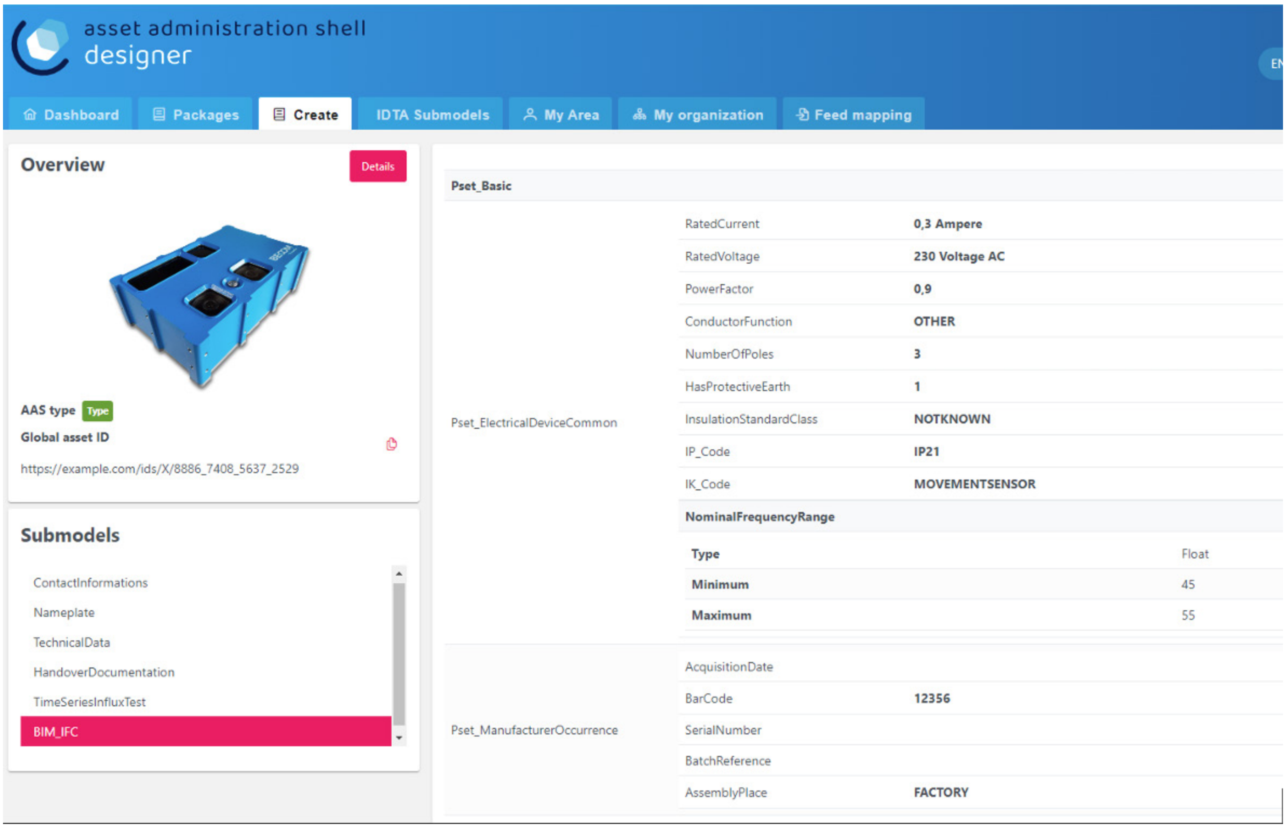

Figure 7: Example AAS with submodel for PSet data

Typical PSets that are mapped in such a submodel are, for example:

- PSet_ElectricalDeviceCommon;
- PSet_ManufacturerOccurrence;
- PSet_SensorTypeCommon;
- PSet_ServiceLife;
- PSet_Warranty;
- PSet_ManufacturerTypeInformation.

Depending on the asset type, optional PSets such as "SensorLightCommon" may also be required. The reference from the IFC element to the data in the AAS is made via a separate AAS PSet called AAS_PSet_Connector. It contains characteristics for identifying the corresponding AAS entity, the version used and the type of AAS. An overview of the PSet characteristics can be found in the appendix.

6.1.3 Preparation BIM model

It is recommended to provide a corresponding IFC element for each planned asset. This can also mean defining simple placeholder elements (ifcProxy), especially at the start of planning. The placeholder elements can be concretised in the course of planning, both from the data and from the geometric detailing.

The assets are integrated either in the form of independent partial or specialised models or can be embedded directly in the corresponding overall models. This offers a high degree of flexibility with regard to the specific project requirements and enables structured and clear model management.

Data redundancy between the BIM model and the AAS should always be avoided. The central data of the assets is accessed via the AAS, while the connection to the respective BIM object is referenced. However, it may be necessary for practical work in the BIM model, duplicate certain attributes in the BIM. However, this should be kept to a minimum in order to avoid redundancies and the resulting inconsistencies. It is advisable to only maintain the information that is essential for the respective application in the BIM model. It also makes sense to regularly synchronise the BIM data from the AAS, especially with regard to short-lived asset properties such as current software versions and updates. An overview of the PSet features can be found in the appendix.

6.2 Planning process

The central element of the planning is the BIM model in the IFC data format of the building. Ideally, it is provided directly via a common data environment (CDE) so that it can be used by everyone involved in the project.

Before planning and detailing in the BIM model, the relevant assets must be declared in the model.
As modelling and asset definition are often carried out by different roles and at different times, indirect time-independent communication via the BCF format (BIM Collaboration Format) is an option. This involves defining the assets in the model and inserting the BCF comments with the corresponding asset IDs.
This data is later transferred and imported into the model. The asset IDs are the unique identifiers assigned in the IT system. They are simply transferred to the BIM model in this step.

The actual planning process begins with the selection of a lead product, which is later replaced by a specific product as the level of detail increases. As different components exist during the planning process that (should) fulfil the same functions, it makes sense to assign a unique component type to each one.
The component type can be used to summarise similar components with similar characteristics and requirements.

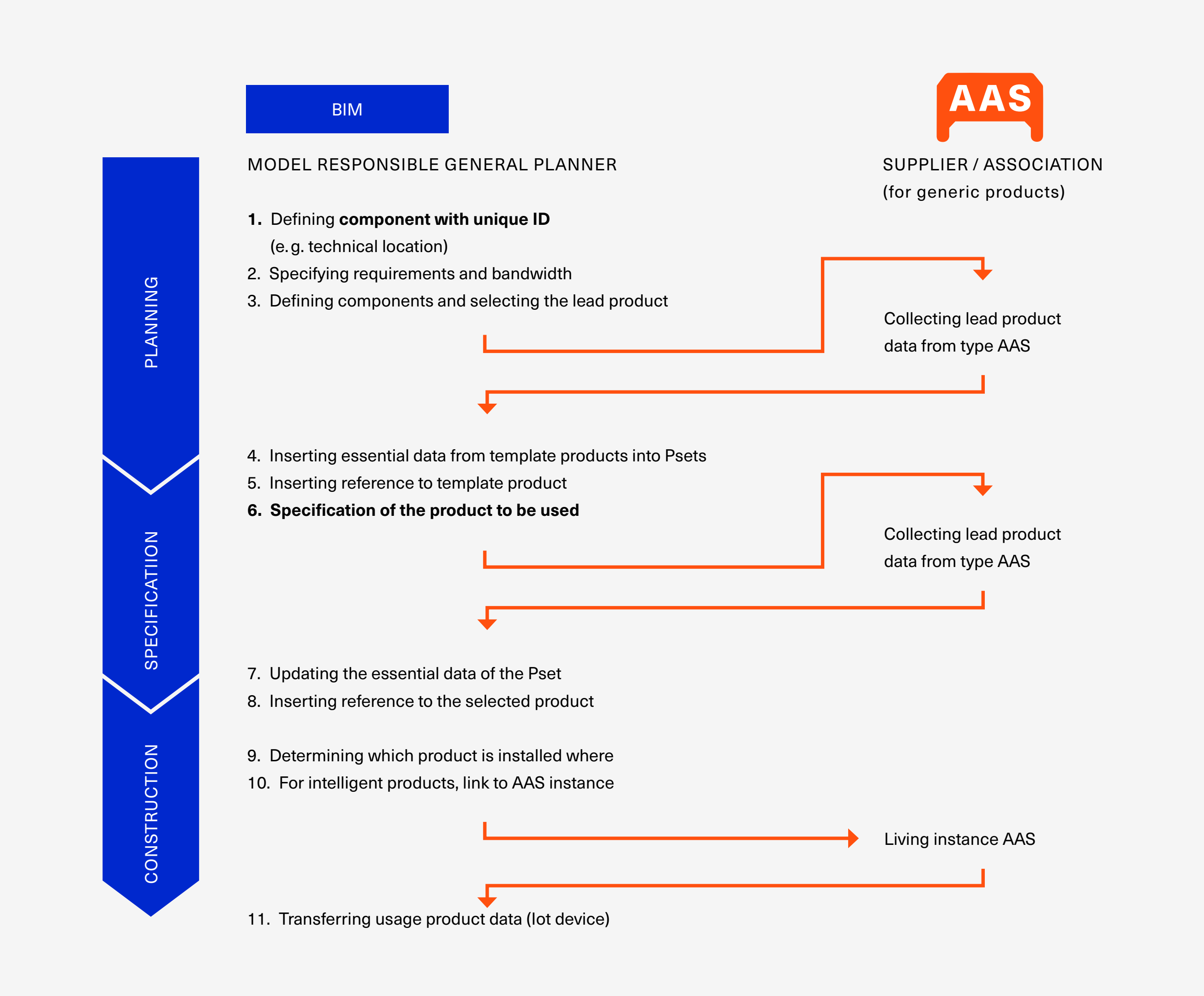

Figure 8: Overview of the integration process of AAS data into the BIM process

In the next step (Figure 8, step 2), the requirements and the range of products are specified. Based on this, the type AAS of the lead product is accessed. This can be done either via a browser or directly from the planning software, but direct access has the advantage that information from the AAS can be transferred directly and more easily, and data loss can be reduced. It is the task of the software manufacturer to make this interface directly accessible from the planning tools. If no standard implementations are available for access, customised tools must be developed to automate access and query data directly. Corresponding API documentation is available.

The BIM model is then enriched (Figure 8, from step 4). The information on the master products, which is retrieved from the AAS, is written to the IFC elements of the BIM model. This is also done indirectly via BCF format. The ID and other information of the lead product (see appendix) are taken from the AAS and attached to the IFC component as a BCF issue. After returning the BCF file to the model creator, the model creator adapts the model and enriches the model elements with the information contained in the BCF issues.

The building SMART format of the Information Delivery Specification (IDS) is ideal for transferring requirements regarding the data on an element. Here, for example, the client can define the features that are expected of an IoT asset. The IDS of the assets forms the basis for transmitting detailed information about the products that need to be customised to the manufacturer. It specifically defines which data is expected for which element.

In further planning, the generic type is replaced by a specific product (Figure 8, steps 7 and 8). This is done in the same way as the product or type selection of the lead product. Further information can be added from the AAS. It is also possible to transfer a specific BIM object from the AAS. If the manufacturer has also created an object for the product data, this can replace the generic object and be used in the BIM model. It is important to ensure that the specific object adopts the reference information for the AAS.

For complex assemblies and systems in particular, it is becoming increasingly apparent that referencing individual components is not the optimal approach. Instead, it is advisable to combine components into groups (equipment sets) and refer from them to the components of the AAS. An equipment set provides a level of abstraction for complex assemblies such as switchgear. Instead of considering individual components of the switchgear (fuses, contactors, circuit breakers, control devices, terminals, etc.) in isolation, an equipment set is used that summarises these components as a functional unit. The complexity of the modelling is reduced as the AAS only has to manage the set as a whole. This not only ensures a better overview of operation, maintenance and optimisation, but also makes planning and standardisation far more efficient, as the sets are reusable and can be used in different projects. This approach simplifies the management of complex systems, especially when it comes to automating building operations.

6.3 Further steps

If the asset is an intelligent component (for example a people counter with an IoT connection), the instance AAS also comes into play. It contains current or historical data that it can make available to the BIM model. In this case, it is important that the data from the BIM model can be used as the basis for integrating / configuring sensors as part of smart building automation. For example, a central building control system configured with BIM knows which sensors are in which room. The people counter mentioned above therefore displays current data in the control room on the user interface. Alternatively, a mobile app allows the sensor data to be displayed by scanning the “QR / DMC code of the room” or directly on the sensor.

7 Summary

The connection between BIM / IFC and AAS brings numerous advantages for planning, construction and optimised operational management.

7.1 Data consistency between the BIM and product information systems

The fact that you can rely on a BIM model also means that the data used in it is up to date. This also applies to the data of the products specified in it. However, the highly dynamic market and the increased requirements for the integration of devices mean that product properties change at ever shorter intervals. Without updates, rigid data transfer to the BIM model automatically leads to rapid obsolescence of the model. As manufacturers maintain changes to the properties, functions and documentation of their products in AAS, linking the BIM model to the relevant AAS of the product offers the ideal opportunity to keep the BIM model up to date without any effort. It is even possible to automatically update data that has already been transferred (PSet data).

7.2 Efficient decision-making processes and collaboration

Digital collaboration means using a Common Data Environment (CDE) for decision-making and data exchange in a project. Connecting the building planning twin with the machine twin during the planning phase enables a consistent exchange of requirements and properties such as floor load, space requirements, media supply, machine volumes and comparison with the structural conditions. This promotes holistic and safe planning of machines in a building. The integration of IoT Twins provides a solid basis for the engineering of building automation. Product details such as power requirements, operating range and interfaces are for design as part of the AAS. Both create additional trust and ultimately increase the quality of the collaboration and the building.

7.3 Efficient data processes

If IoT devices and systems are already assigned to the elements of the IFC model at planning time and later updated with the “as-built” products, a seamless flow of information is created. There is no need to transfer data at the end of each phase, data loss and errors are avoided: this ensures high data quality.

Commissioning in particular benefits from high data quality at the end of the planning and installation phase, because if all the information about the products is available, the technician has to research less data on site, which enables time and cost-efficient commissioning.

7.4 Overall visualisation and evaluation in the context of the building

This makes it possible to use the IFC data format in operation to visualise the position of devices in the building and to prepare data in a visually appealing way.

Example: If a sensor sounds an alarm, it can be located directly. At the same time, the technician or the emergency services are shown the direct link to the source of the fault. Critical areas that need to be crossed can be identified and individually authorised.

7.5 Sustainability and digitalisation

During planning, it is possible to carry out a comprehensive inventory of the building, including the planned technical equipment. Building data (from the BIM model) is analysed and evaluated together with detailed information from the IoT devices (AAS). This is an indispensable building block, especially for resourceefficient sustainable planning. In operation, this enables the data to be used to efficiently control systems such as energy management and HVAC. In addition to the pure observation of data from the AAS, the use of location data enables better classification of the data and thus deeper insights into processes in order to leverage optimisation potential.

Example: The planners can arrange the workstations in an office in such a way that each desk has optimum air quality, natural lighting conditions and as little noise as possible. For this purpose, the technical features and the position of the technical building equipment can be combined with the geometric models and the location of the office furniture and the room geometry and used for optimisation.

8 Appendix

8.1 Property sets

The characteristics of the property sets are defined according to IFC4 ADD2. The characteristics from the various PSets that are relevant from the author‘s point of view are specified in the tables. Further characteristics or property sets can be added if required (e.g. for special sensor types or product types).

The characteristics shown should be present in an IFC model on the element. They do not replace the additional information provided by the AAS for the respective asset.

8.1.1 Property sets according to IFC4 ADD 2 TC 1 (extract)

"... the standard property sets defined in IFC4 ADD2, which are filled with information from AAS."

Examples can be found in Tables 1 to 6.

Property DE	Property EN	Description
Pset_ElectricalDeviceCommon (IFC4)		
Schutzart	IKCode	The IK code according to DIN EN IEC 62262 is a numerical classification for the degree of protection of enclosures for electrical equipment against external mechanical influences.
IPCodeSchutzart	IP_Code	IP code Degree of protection according to DIN EN IEC 60529 against ingress of water, dust, etc.
Nennspannung	RatedVoltage	The voltage for which a device is designed. Unit [V]
Nennstrom	RatedCurrent	The current for which a device is designed. Unit [A]
SchutzleiterVorhanden	HasProtectiveEarth	Indicates whether the electrical device has a protective conductor connection (=TRUE) or not (=FALSE).
StandardSchutzklassen	InsulationStandardClass	Protection classes against electric shock

Table 1: PSet_ElectricalDeviceCommon

Property DE	Property EN	Description
PSet_ManufacturerOccurrence (IFC4)		
Beschaffungsdatum	AcquisitionDate	The acquisition date corresponds to the delivery date of the product.

Table 2: PSet_ManufacturerOccurrence

PSet_SensorTypeCommon (IFC4)

Referenz	Reference	Status or phase of the building component, especially when building in existing structures. "New" new component as an addition, "existing" existing component that is retained, "demolished" component that is demolished, "temporary" component and other construction elements that are temporarily installed (e. g. such as supports)
Status	Status	

Tabelle 3: PSet_SensorTypeCommon

PSet_Warranty (IFC4)

GewaehrleisterErrichter	PointOfContact	The organisation that should be contacted for action under the guarantee
GewaehrleistungEnde	WarrantyEndDate	The date on which the warranty expires
GewaehrleistungStart	WarrantyStartDate	The date on which the warranty begins

Table 4: PSet_Warranty

PSet_ManufacturerTypeInformation (IFC4)

Artikelnummer	ArticleNumber	Item number of the product
GlobalTradeItemNumber	GlobalTradeItemNumber	Carries GS1 product code or EAN number of the installed product
Hersteller	Manufacturer	Manufacturer who produced the product

Table 5: PSet_ManufacturerTypeInformation

Property DE	Property EN	Description
PSet_ServiceLife (IFC4)		
Lebensdauer	ServiceLifeDuration	
MeanTimeBetweenFailure	MeanTimeBetweenFailure	

Table 6: PSet_ServiceLife

8.1.2 AAS property set

The property set “AAS_PSet_Connector” contains additional properties for referencing the asset stored in the AAS.

Eigenschaft DE	Eigenschaft EN	Beschreibung
AAS_PSet_IoT		
AASAddresse	AASAddress	The unique URL or reference ID of the asset in the AAS
AASTyp	AASType	Type of AAS
AbholdatumDaten	FetchDate	Timestamp of the last data update from the AAS
AASVersionsnummer	AASVersionNumber	Version number of the AAS in relation to the last data update

Table 7: AAS_PSet_Connector for each type AAS and instance AAS

About buildingSMART Germany

buildingSMART Germany is the competence network for the digital design, construction and operation of buildings. As part of the international buildingSMART community, we are interdisciplinary, user- and practiceorientated. Around 800 companies, research and higher education institutions, public authorities and institutions as well as private individuals from all areas of the construction and property industry are members of buildingSMART Germany. They are united by the desire to help shape digitalisation successfully. To this end, buildingSMART members work on a voluntary basis to develop open and manufacturer-neutral standards for digital methods and tools and bring this work to a global level via buildingSMART International. At the regional level, buildingSMART members are organised in regional groups and use local and regional networks to promote the broad exchange of knowledge and experience. In this way, buildingSMART is actively globally, nationally and regionally in developing reliable and user-friendly framework conditions and standards for the successful digitalisation of the construction and real estate industry in Germany.

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About IDTA

The Industrial Digital Twin Association e.V. (IDTA) was founded in September 2020 on the initiative of Plattform Industrie 4.0 and 23 organisations from the electrical and digital industry, mechanical engineering, the software sector, and end users.

The IDTA is the first point of contact for the standardised Digital Twin and offers all industrial organisations a platform for participation. The aim is to establish the Digital Twin for components, machines, plants and entire factories as an open source technology and to develop it further together with industry.

The core technology for the implementation is the Asset Administration Shell (AAS), that enables quick and easy access to data over the entire life cycle thanks to standardised software structure, interfaces and semantics using current security mechanisms. The AAS has already enabled, among other things, the realisation of a digital nameplate, the simple provision of the CO_2 footprint of an asset or the comprehensive asset management in production plants.

The AAS is internationally standardised in IEC 63278 and is a central component of the Manufacturing-X projects, which describe the data space of the future industrial supply chain.

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