



<AutomationML/>

**The Glue for Seamless
Automation Engineering**

**Application Recommendation:
AutomationML in Asset
Administration Shells**

Document Identifier: AR AMLinAAS, V 1.0

State: May 2024

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Version 1.0.0, May 2024

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Table of contents

Table of contents	3
List of figures	4
Introduction	5
1.1 Motivation.....	5
1.2 Scope	6
1.3 References.....	6
2 Basics.....	7
2.1 AutomationML (AML)	7
2.2 Asset Administration Shell (AAS)	8
3 Integration concepts.....	10
3.1 Key techniques for the integration between AAS and AML	10
3.2 Basic concept.....	11
3.3 Property related extension: publishing of AML attributes within an AAS model	12
3.4 Object related extension: publishing AML elements within an AAS model	14
4 AAS Submodel definition	16
5 Practical Example	20
5.1 AutomationML project file	20
5.2 AAS file for integration without existing submodel.....	25
5.3 AAS file for integration with existing Submodels	30

List of figures

Figure 1: Integration structure as defined in [DMH2023]	5
Figure 2: InternalElement Structure	7
Figure 3: AutomationML example project	8
Figure 4: Abstracted representation of the structure of an asset administration shell.....	9
Figure 5: Integration structure (without existing submodels)	10
Figure 6: Integration structure (with existing submodels)	10
Figure 7: Basic integration structure	11
Figure 8: First extension of the integration structure (without existing submodels).....	12
Figure 9: First extension of the integration structure (with existing submodels).....	12
Figure 10: Second extension of the integration structure (without existing submodels)	14
Figure 11: Second extension of the integration structure (with existing submodels)	14
Figure 12: AAS Submodel class diagram	16

Introduction

1.1 Motivation

As part of Industry 4.0, different interoperability technologies for representing, provision, and utilizing information about assets within production system are under development. Among them, AutomationML, OPC UA and AAS are the most prominent. They follow the principles of object-oriented data modelling and are applied in different phases of the asset life cycle and different use cases. In their respective historical origins, their respective areas of application and focus are different - today, the areas of application are partly complementary, but also partly overlapping. The interplay between these technologies has not yet been defined. In order to avoid re-modelling of the same data, double standardisation, double software development and complex management of data consistency between those models, a technical approach how these technologies seamlessly work together is required. The industry and several working groups ask for a recommendation and specification on how AML, OPC UA and AAS should interact. [DMH2023]

To avoid this problem the responsible standardization organizations AutomationML e.V., OPC Foundation, IDTA and VDMA have developed and published an integration structure for the different information representation and provision technologies as shown in Figure 1 [DMH2023].

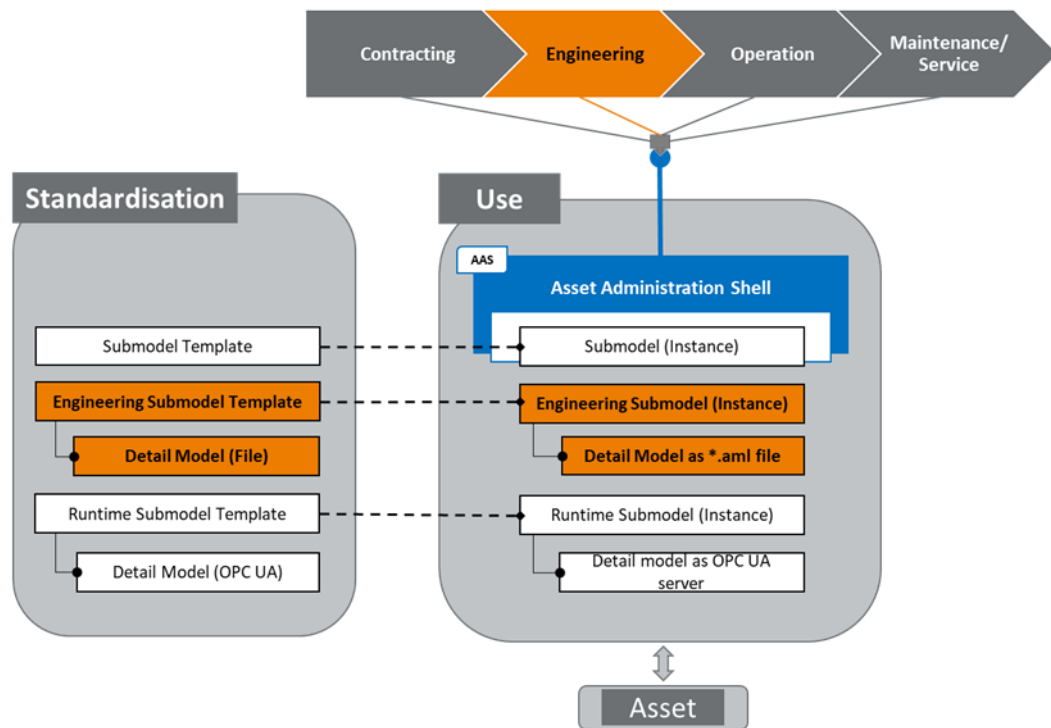


Figure 1: Integration structure as defined in [DMH2023]

The main intention of this integration structure is to ensure

- Separation of concerns with respect to information representation and provision within and across the different life cycle phases of the considered assets,
- Efficient and effective utilization of the benefits of the different technologies,
- avoiding of reinventing models, methods and software ecosystems,
- enabling efficient data management across the life cycle of and asset.

The resulting architecture recommends to apply AASX as methodology to represent and provide life cycle crossing information, AutomationML for engineering information, and OPC UA for runtime information. For each life cycle crossing purpose submodel templates shall be defined that provide the related information from engineering, runtime or life cycle crossing domains.

1.2 Scope

This application recommendation focusses on the integration of AAS and AutomationML and specifies its technical implementation.

To achieve this, the AutomationML technology as well as the structure of the asset administration shell are reviewed and integration capabilities are named.

Consequently, a basic integration structure with two main extensions for different purposes are presented and an illustrative example is given.

Finally, methodology is proposed usable to identify elements of an AutomationML project to be represented in an asset administration shell.

1.3 References

The following documents are referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- [DMH2023] R. Drath, C. Mosch, S. Hoppe, A. Faath, E. Barnstedt, B. Fiebiger, W. Schlögl: Diskussionspapier – Interoperabilität mit der Verwaltungsschale, OPC UA und AutomationML: Zielbild und Handlungsempfehlungen für industrielle In-teroperabilität, <https://www.automationml.org/wpcontent/uploads/2023/04/Diskussionspapier-Zielbild-und-Handlungsempfehlungenfuer-industrielle-Interoperabilitaet-5.3.pdf>.
- [AML2018] AutomationML association: Part 1 – Architecture and General Requirements, Version 2.1.0, July 2018, <https://www.automationml.org/wp-content/uploads/2021/11/Whitepaper-AutomationML-Edition-2.1.zip>
- [AML2022] AutomationML association: Part 2 – Semantics libraries, Edition 2, October 2022, https://www.automationml.org/wp-content/uploads/2023/08/AML_Whitepaper_Part2_Semantics-Libraries.zip
- [DIN2016] DIN Spec 91345: Reference Architecture Model Industry 4.0 (RAMI 4.0), Beuth publisher, April 2016, https://www.iec.ch/dyn/www/f?p=103:38:508042177081439:::FSP_ORG_ID,FSP_APEX_PAGE,FSP_PROJECT_ID:1250,20,23819.
- [IEC2017] International Electrotechnical Commission: IEC 62890 - Life-cycle management for systems and products used in industrial-process measurement, control and automation, Beuth publisher, April 2017.
- [PI2022] Plattform Industrie 4.0: Details of the Asset Administration Shell - Part 1 - The exchange of information between partners in the value chain of Industrie 4.0, https://www.plattform-i40.de/IP/Redaktion/EN/Downloads/Publikation/Details_of_the_Asset_Administration_Shell_Part1_V3.pdf, Mai 2022.
- [IDTA2023] Industrial Digital Twin Association: Specification of the Asset Administration Shell Part 1: Metamodel, April 2023, https://industrialdigitaltwin.org/content-hub/aasspecifications/idta_01001-3-0_metamodel.

2 Basics

2.1 AutomationML (AML)

AutomationML is a free, neutral and standardized data modelling language including a dedicated file format. It has been initiated in 2006 by the Daimler AG in the domain of manufacturing industry. It aims for modelling various engineering information of different domains and is standardized in the IEC62714.

AutomationML has a lean and distributed file architecture. It combines existing established XML data formats which are proven in use for their specific domain. The AutomationML standard does not define any new file format, instead it defines how the sub data formats are interconnected. This is why the normative part of the IEC62714-1:2018 document consists of 32 pages only. The data formats for the following modelling domains are:

- object topologies: CAEX according to IEC62424
- geometries and kinematics: COLLADA 1.4.1 and 1.5.0 (ISO/PAS 17506:2012)
- discrete behaviour: PLCopen XML 2.0 and 2.0.1

CAEX according to IEC62424 forms the base of AutomationML. It stores object oriented engineering information, e.g. a plant hierarchy structure. Each AutomationML object is represented by an CAEX object with special rules [AML2018] and can reference external files that contain geometry, kinematics, logics information and even any "other" data as Word/Excel/PDF/binary file. This enables cross domain modelling and is designed for future extension.

AutomationML object hierarchies form the core of AutomationML. An AutomationML object is a data representation of any asset given as *InternalElement* within an *InstanceHierarchy*. It can model physical assets, e.g., a motor, a robot, a tank; or abstract assets as a function block or a folder. AutomationML allows to combine those objects to systems, since every physical or logical system is characterized by internal elements (objects) which may contain further internal elements, and all elements may have interfaces, attributes and connections with each other. Finally, AutomationML allows to model any plant topology, communication topology, process topology, resource topology etc. The same mechanisms can be used to model the topology of a single device: its inner topology, the signals, related behaviour, and can reference all related documents for the device. In the result, AutomationML allows to define a powerful information model that is nothing less than a comprehensive self-description of the related device.

Each AutomationML object is represented as *InternalElement* contained in an *InstanceHierarchy*. It can form *InternalElement* based hierarchies, can contain properties as *Attributes* and capabilities to be linked to other *InternalElements* as *Interfaces*. In addition, it will contain semantic references as *Roles* and a reference to a copy template as *SystemUnitClass*, see Figure 2.

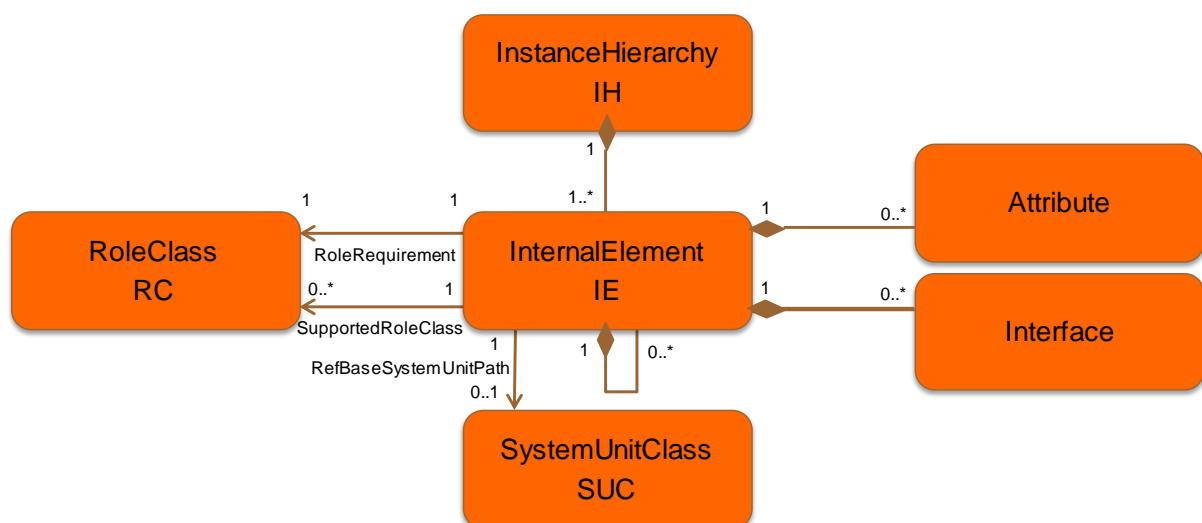


Figure 2: InternalElement Structure

An example of an AutomationML object model is given in Figure 3. Here, an *InstanceHierarchy* is represented containing the information of an engineering project with two automation devices linked by a wire. Each automation device contains sets of properties defined within different views named Blau, Grün and Rot for neutrality reasons. They can represent for example different engineering discipline related views.

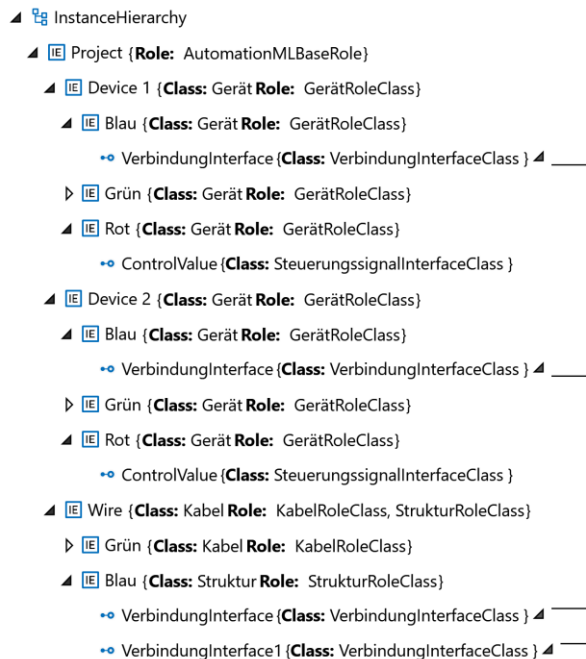


Figure 3: AutomationML example project

AutomationML is especially designed for the modelling of distributing complex, hierarchical engineering data and technical systems with detailed object types and instances. It is designed for complex iterative exchange of engineering data supporting dedicated engineering related features like versioning, tracing, multi-language support, and a container format for combining multiple files into a package. Meanwhile, AutomationML has reached industrial application in a wide range of applications, e.g. in virtual commissioning, in data synchronization across multiple engineering tool platforms, in the modelling of communication networks, in the extended modelling of PCE requests, in the modelling of electrical or pneumatical interfaces or in the comprehensive modelling of any automation components.

2.2 Asset Administration Shell (AAS)

Within the Reference Architecture Model Industry 4.0 [DIN2016] the Industry 4.0 component has been envisioned as element of future manufacturing systems. This Industry 4.0 component consists of two main elements, the related asset (usually a cyber-physical system with relevance of the production system) and the asset administration shell representing the asset in the digital world and providing access to it.

Main aim of the asset administration shell is to provide all information on an asset, that are available at a certain time point, to an authorized user following the ideas of IEC 62890 [IEC2017]. Therefore, the asset administration shell provides a structure defined in [PI2022], [IDTA2023] and represented in an abstracted way in Figure 4.

In addition to a data set applied to give identification information on the related asset each asset administration shell will reference a set of *Submodels*, each intended to cover information required for a certain use case along the life cycle of the asset. Each *Submodel* can contain information elements as *SubmodelElements* of different nature. The most relevant *SubmodelElements* with respect to this application recommendation are the following.

A *Property* (Prop) is a *SubmodelElements* presenting a technical, economical, or other property of the asset.

A *ReferenceElement* (Ref) is a *SubmodelElements* presenting a reference to an information element within or outside of the asset administration shell.

A *File* is a *SubmodelElement* presenting a reference to a file.

A *RelationshipElement* (Rel) is a *SubmodelElement* presenting the relation between two referenceable elements of an AAS.

A *SubmodelElementCollection* (SMC) is a *SubmodelElement* presenting a set of *SubmodelElements*

A *SubmodelElementList* (SML) is a *SubmodelElement* resenting a list of *SubmodelElements*.

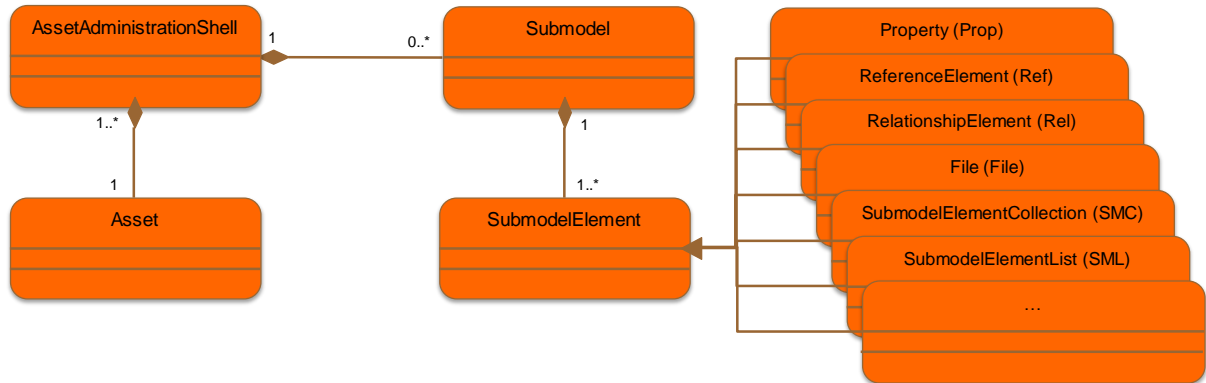


Figure 4: Abstracted representation of the structure of an asset administration shell.

As technical realisation of an asset administration shell [PI2022] proposes different formats including AASX, AML and OPC UA node sets. Following [DMH2023] in this application recommendation only AASX will be considered as storage format for an asset administration shell. For all other types of technical implementations of an asset administration shell (especially type 2 and its REST-API the following specifications shall apply correspondingly.

3 Integration concepts

3.1 Key techniques for the integration between AAS and AML

The integration of AutomationML coded engineering information in an asset administration shell is based on a basic integration and two extensions given in blue, green and brown in Figure 5 and Figure 6. The key techniques for the integration of AAS and AML are

- (1) AAS references an AML file
- (2) AAS references elements within an AML file (IE, SUC, IH, SUCL)
- (3) AAS publishes AML attributes
- (4) Modelling of relations between AAS elements and AML elements

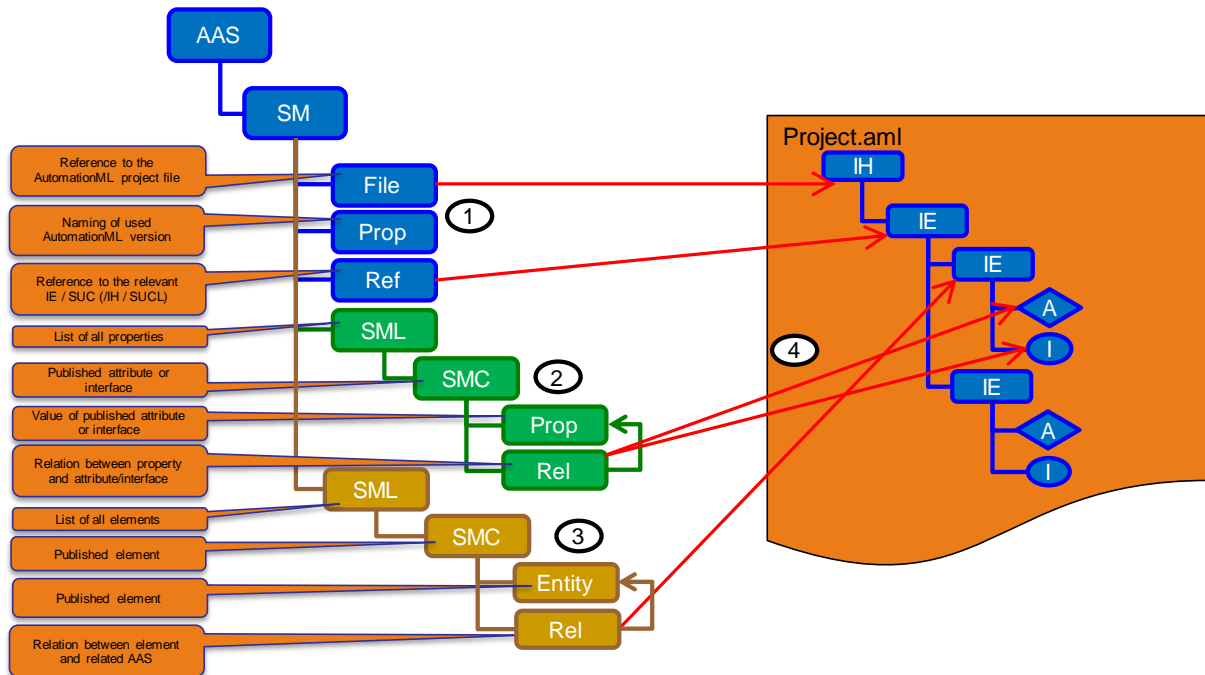


Figure 5: Integration structure (without existing submodels)

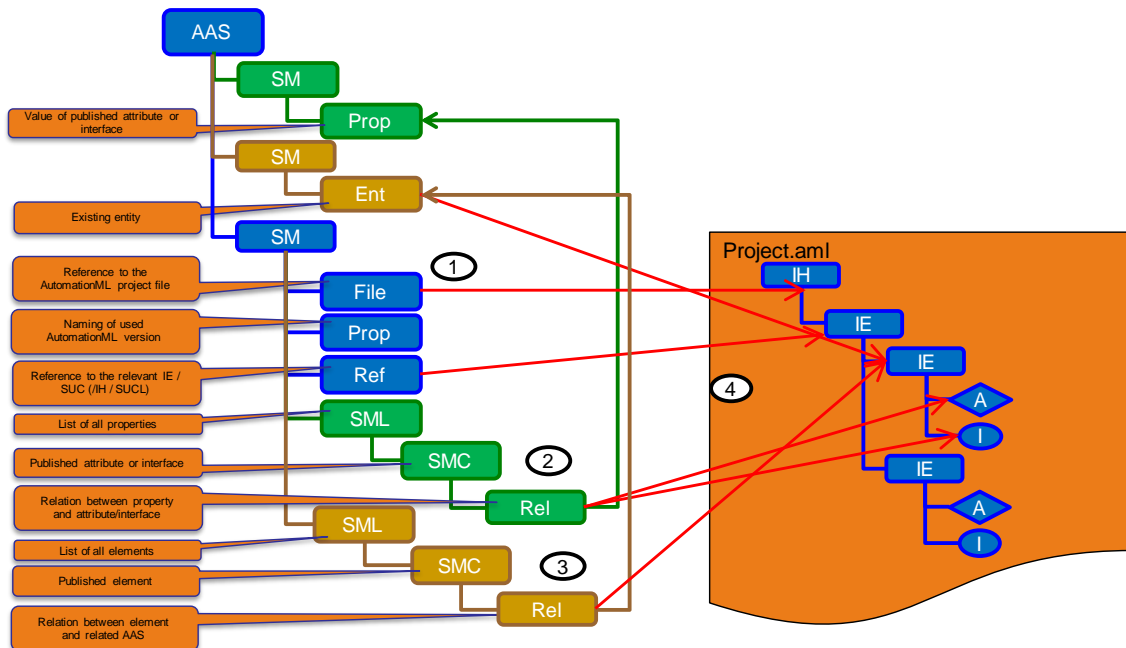


Figure 6: Integration structure (with existing submodels)

Within the different key techniques *SemanticIDs* are applied to identify the named AAS elements as AutomationML related. For reasons of interoperability these *SemanticIDs* can also be given as *Supplemental SemanticIDs*.

3.2 Basic concept

The basic integration structure of AutomationML coded engineering information in an asset administration shell is depicted in Figure 7 and given in blue and indicated by (1) in Figure 5. It is intended to enable the publication of AutomationML coded data on an asset in the asset administration shell.

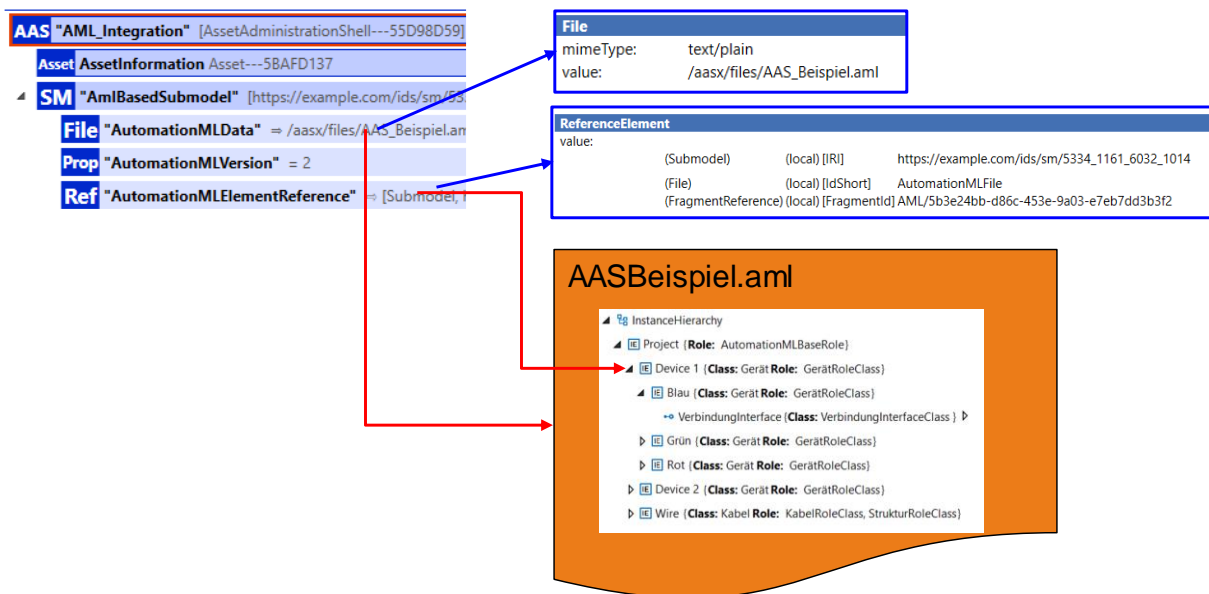


Figure 7: Basic integration structure

This integration structure is based on a *Submodel* containing three elements, a *File SubmodelElement*, a *Property SubmodelElement* and a *ReferenceElement SubmodelElement*.

The *Submodel*

- (1) shall be named appropriately and
- (2) shall contain as *SemanticID* a *GlobalReference* that indicates the origin and intended use of the *Submodel*
- (3) and starts with https://www.automationml.org/AutomationML_AAS_SemanticIDs/Submodel/.

The *File SubmodelElement* is intended to give the reference to the AutomationML project and

- (4) shall be named *AutomationMLData*,
- (5) shall contain as *SemanticID* a *GlobalReference* with the value https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/FileReference, and
- (6) shall reference the AutomationML project file.

The *Property SubmodelElement* is intended to give the AutomationML version that the reference AML data follows and

- (7) shall be named *AutomationMLVersion*,
- (8) shall contain as *SemanticID* a *GlobalReference* with the value https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/VersionNumber, and
- (9) shall have the values 1 (i.e. CAEX 2.15) or 2 (i.e. CAEX 3.0).

The *ReferenceElement SubmodelElement* is intended to give the reference to the AutomationML element hosting the engineering information of the asset and

- (10) shall be named *AutomationMLElementReference*,
- (11) shall contain as *SemanticID* a *GlobalReference* with the value https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/ElementReference, and

- (12) shall have a *ModelReference* as value with
- Submodel* references to the *File SubmodelElement*,
 - File* has the content *AutomationMLFile* and
 - FragmentReference* contains *AML/UUID* of the Element of interest in the AutomationML File.

If the complete InstanceHierarchy of the referenced AutomationML project file is relevant the *ReferenceElement SubmodelElement* can be omitted.

3.3 Property related extension: publishing of AML attributes within an AAS model

The first extension of the basic concept is dedicated to publish additional attributes related to an asset from AutomationML coded engineering information in an asset administration shell is depicted in the neutral form Figure 8 and given in green and indicated by (3) in Figure 5.

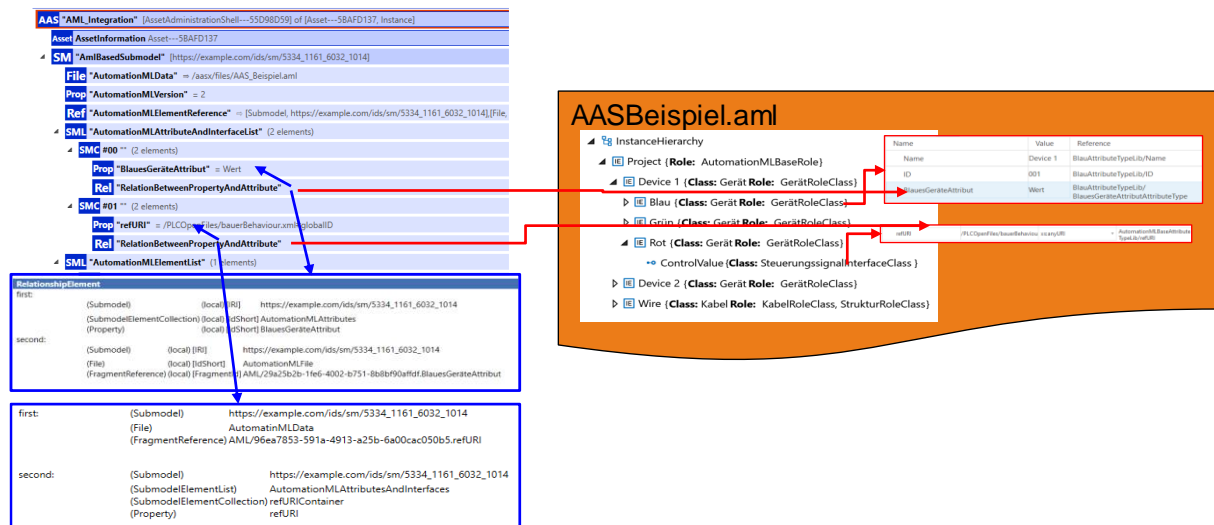


Figure 8: First extension of the integration structure (without existing submodels)

If the property to be published is already available in the asset administration shell in another Submodel (like the Nameplate Submodel) the resulting structure is depicted in Figure 9 and given in green and indicated by (3) in Figure 6.

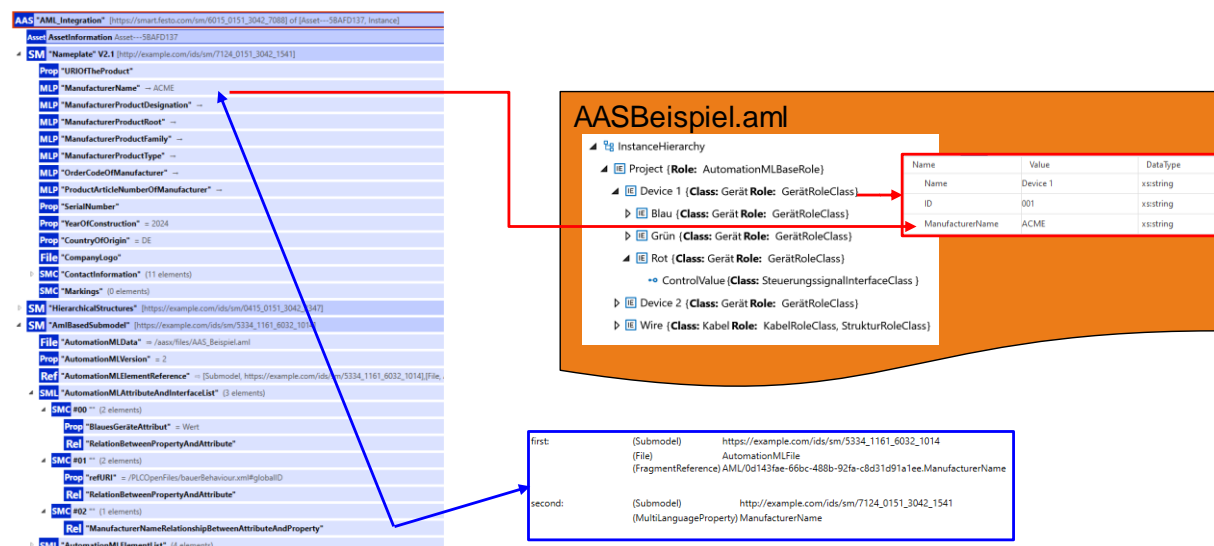


Figure 9: First extension of the integration structure (with existing submodels)

Publishing of interfaces is executed by publishing the refURI attribute of the interface.

The first extension of the integration structure is based on a *SubmodelElementList SubmodelElement* containing *SubmodelElementCollection SubmodelElements* that contain a *Property SubmodelElement* and a *RelationshipElement SubmodelElement*.

The *SubmodelElementList SubmodelElement* is intended to contain a list of AutomationML attributes to be published and

- (1) shall be named *AutomationMLAttributeAndInterfaceList* and
- (2) shall contain as *SemanticID* a *GlobalReference* with the value https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/AttributeAndInterfaceList.

The *SubmodelElementCollection SubmodelElement* is intended to represent the information on an attribute or interface with name "NAME" and

- (3) shall contain as *SemanticID* a *GlobalReference* with the value https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/AttributeContainer.

The *Property SubmodelElement* is intended to give the value of the AutomationML attribute or the AutomationML interface with name "NAME" and

- (4) shall be named "NAME" and
- (5) shall contain as *SemanticID* a *GlobalReference* with the value https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/AutomationMLAttribute.

If the value of a published AutomationML attribute is given within a *Property SubmodelElement* of another (already existing) *Submodel* within this asset administration shell, the *Property SubmodelElement* can be omitted.

The *RelationshipElement SubmodelElement* is intended to give the relation between the *Property SubmodelElement* and the corresponding AutomationML attribute or interface with name "NAME" and

- (6) shall be named *RelationBetweenPropertyAndAttribute*,
- (7) shall contain as *SemanticID* a *GlobalReference* with the value https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/ElementReference, and
- (8) shall have a content with
 - a. a first element as *ExternalReference* with
 - i. *Submodel* references to the *File SubmodelElement*,
 - ii. *File* has the content *AutomationMLFile* and
 - iii. *FragmentReference* contains *AML/UUID."NAME"*, and
 - b. a second element as *ModelReference* with
 - in case the AutomationML attribute is given within a *Property SubmodelElement* of the AutomationML related *Submodel*
 - iv. *Submodel* references to the *File SubmodelElement*,
 - v. *SubmodelElementList AutomationMLAttributeList*
 - vi. *SubmodelElementCollection "NAME"_container* and
 - vii. *Property "NAME"*
 - in case the AutomationML attribute is given within a *Property SubmodelElement* of another (already existing) *Submodel*
 - viii. *Submodel* references to the related *Submodel*,
 - ix. *Entity* references the relevant element structure within the *Submodel*.

The ownership of an attribute is defined by the sequence of the content of the Relationship element.

(Case 1) If the owner is the AutomationML project it is named in the *first* part of the content. In this case the value given in the *Property* element shall be synchronised to the AutomationML attribute.

(Case 2) If the owner is the Asset Administration Shell it is named in the *first* part of the content. In this case the value given in the AutomationML attribute shall be synchronised to the *Property* element.

3.4 Object related extension: publishing AML elements within an AAS model

The second extension of the basic concept that is dedicated to publish additional AutomationML coded engineering information in an asset administration shell is depicted in Figure 10 and given in brown and indicated by (2) in Figure 5.

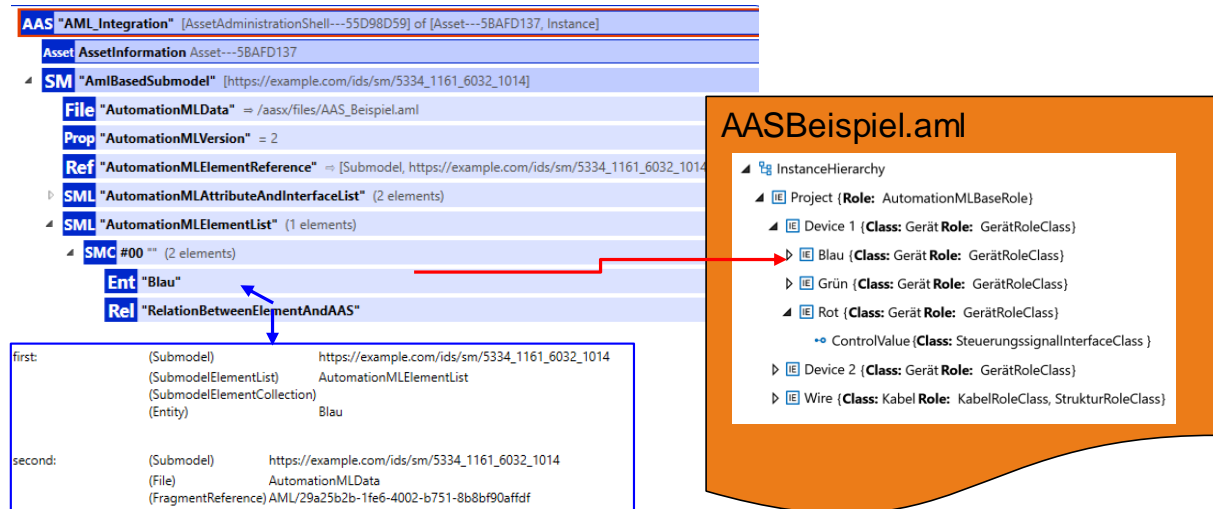


Figure 10: Second extension of the integration structure (without existing submodels)

If the AutomationML to be published is already available as entity element in the asset administration shell in another Submodel (like the BOM Submodel) the resulting structure is depicted in Figure 11 and given in brown and indicated by (2) in Figure 6.

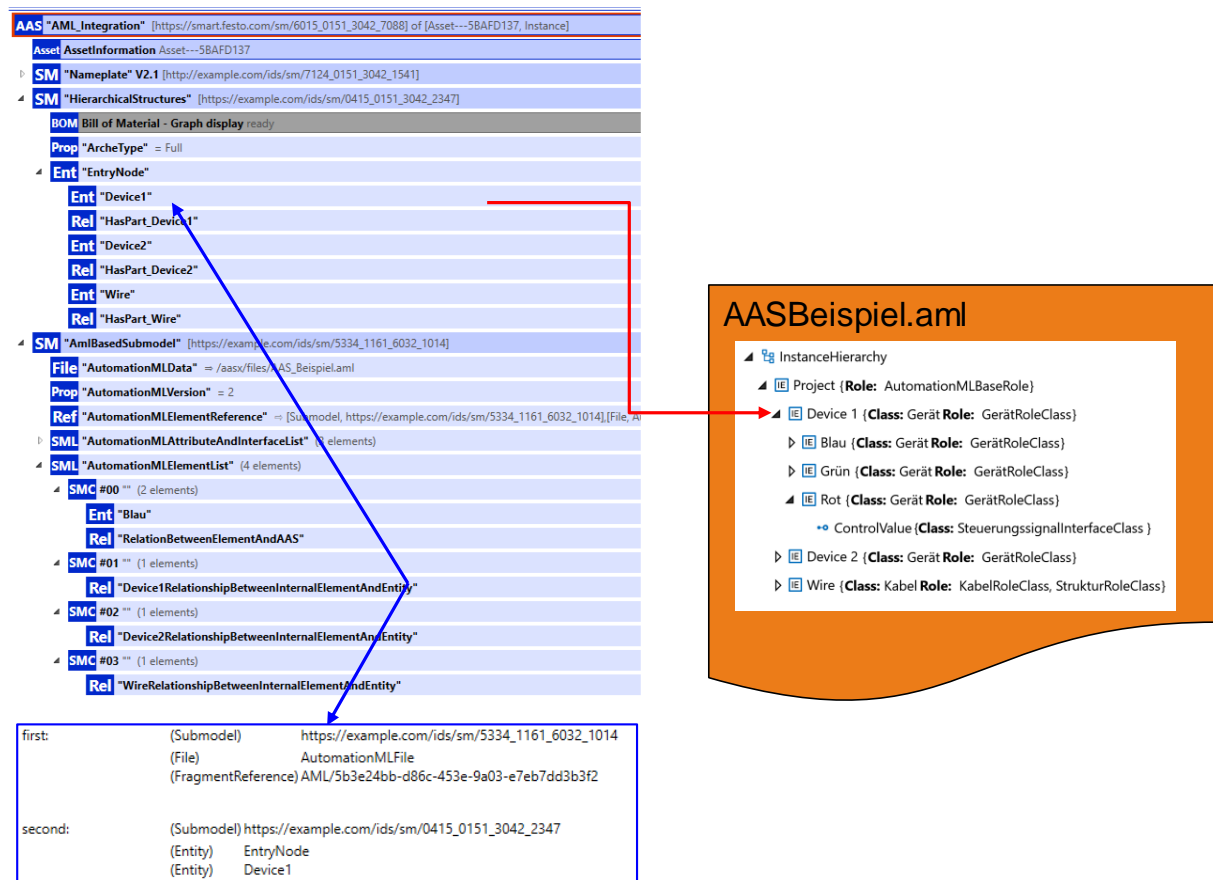


Figure 11: Second extension of the integration structure (with existing submodels)

The second extension of the integration structure is based on a *SubmodelElementList* *SubmodelElement* containing *SubmodelElementCollection* *SubmodelElements* that contain an *Entity* *SubmodelElement* and a *RelationshipElement* *SubmodelElement*.

The *SubmodelElementList* *SubmodelElement* is intended to contain a list of AutomationML elements to be published and

- (1) shall be named *AutomationMLElementList* and
- (2) shall contain as *SemanticID* a *GlobalReference* with the value
https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/ElementList.

The *SubmodelElementCollection* *SubmodelElement* is intended to represent the information on an element with name "NAME" and

- (3) shall contain as *SemanticID* a *GlobalReference* with the value
https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/ElementContainer.

The *Entity* *SubmodelElement* is intended to represent the AutomationML element with name "NAME" and

- (4) shall be named "NAME".

If there is an already existing *Entity* element in an already existing *Submodel* representing the asset behind the AutomationML element the *Reference* *SubmodelElement* can be omitted.

The *RelationshipElement* *SubmodelElement* is intended to give the relation between the *Reference* *SubmodelElement* and the corresponding Asset Administration Shell to the AutomationML element, if it exists, and

- (5) shall be named *RelationBetweenElementAndAAS*,
- (6) shall contain as *SemanticID* a *GlobalReference* with the value
https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/AASRelation, and
- (7) shall have a content with
 - c. a first element as *ExternalReference* with
 - x. *Submodel* references to the *File* *SubmodelElement*,
 - xi. *File* has the content *AutomationMLFile* and
 - xii. *FragmentReference* contains *AML/UUID*, and
 - d. a second element as *ModelReference* with
 - in case the AutomationML element is given within an *Entity* *SubmodelElement* of the AutomationML related *Submodel*
 - xiii. *Submodel* references to the *File* *SubmodelElement*,
 - xiv. *SubmodelElementList* *AutomationMLAttributeList*
 - xv. *SubmodelElementCollection* "NAME"_container and
 - xvi. *Entity* "NAME"
 - in case the AutomationML element is given within an *Entity* *SubmodelElement* of another (already existing) *Submodel*
 - xvii. *Submodel* references to the related *Submodel*,
 - xviii. *Entity* references the relevant element structure within the *Submodel*.

4 AAS Submodel definition

Within the following section the template structure for an AAS Submodel Template resulting from definition within section 3 is given following the requirements of IDTA standards.

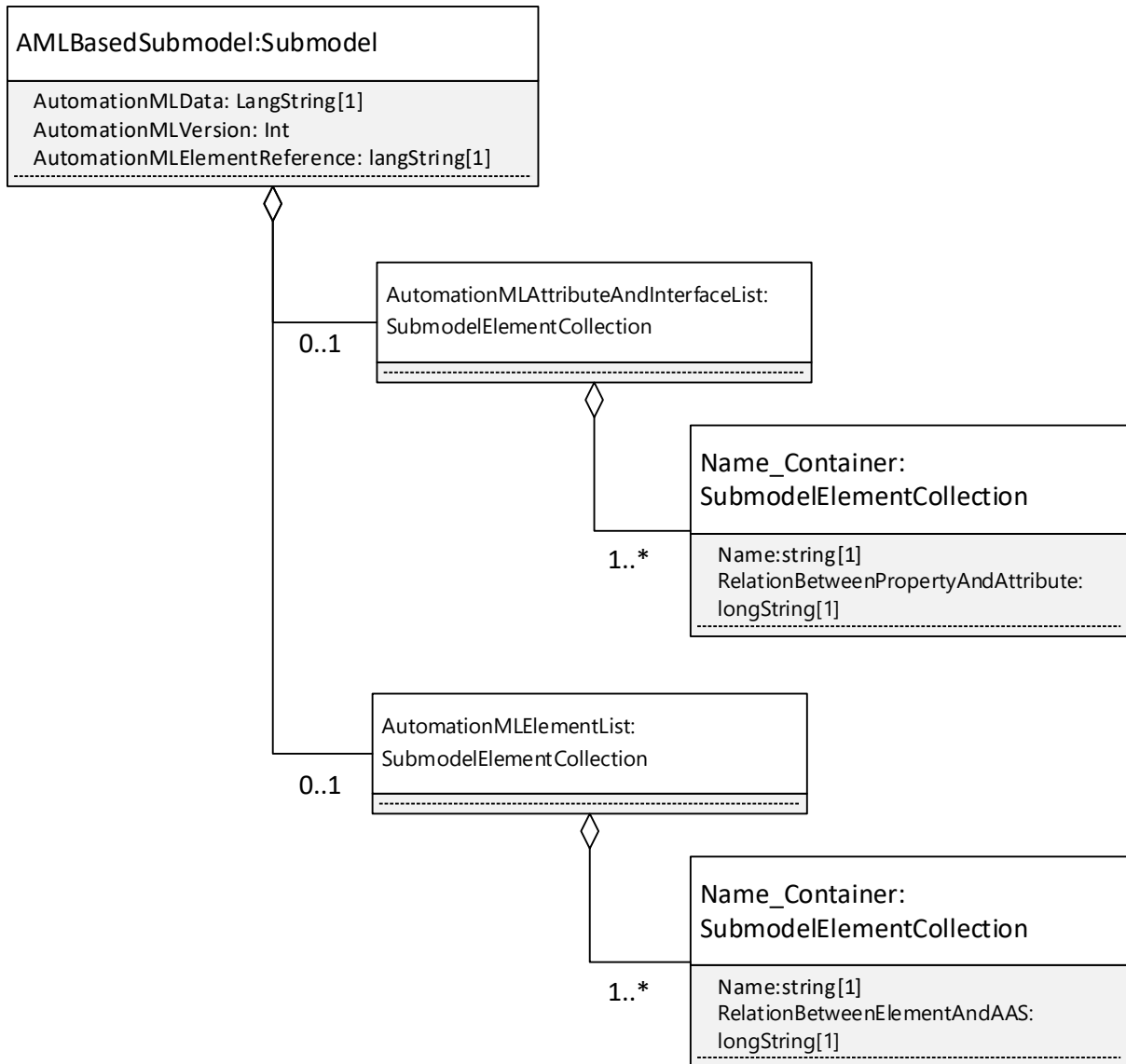


Figure 12: AAS Submodel class diagram

idShort:	AmlBasedSubmodel		
Class:	Submodel (SM)		
semanticId:	https://www.automationml.org/AutomationML_AAS_SemanticIDs/Submodel/Generic		
Parent:	Asset Administration Shell, to which the AutomationML project shall be associated to		
Explanation:	The Submodel defines a set of information required to integrate an AutomationML project properly within an asset administration shell.		
[SME type]	semanticId = [idType]value	[valueType]	card.
idShort	Description@en	example	

[File] AutomationMLData	[GlobalReference] https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/FileReference Each File describes an AutomationML project (see IEC 62714), which is associated to the particular Asset Administration Shell.	/aasx/files/AAS_Beispiel.aml	1
[Prop] AutomationMLVersion	[GlobalReference] https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/VersionNumber Each property element gives the AutomationML version that the included AML file follows. This should be either 1 (i.e. CAEX 2.15) or 2 (i.e. CAEX 3.0)	2	1
[Ref] AutomationMLElementReference	[GlobalReference] https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/ElementReference Each reference element give the reference to the AutomationML element hosting the engineering information of the asset.	(Submodell) https://example.com/ids/sm/5334_1161_6032_1014 (File) AutomationMLFile (FragmentReference) AML/5b3e24bb-d86c-453e-9a03-e7eb7dd3b3f2	0..1

idShort:	AutomationMLAttributeAndInterfaceList
Class:	SubmodelElementList (SML)
semanticId:	https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/AttributeAndInterfaceList
Parent:	AmlBasedSubmodel
Explanation:	The SubmodelElementList lists all AutomationML attributes to be published within the related submodel.

idShort:	#xx		
Class:	SubmodelElementCollection (SMC)		
semanticId:	https://www.automationml.org/AutomationML_AAS_SemanticIds/General/AttributeContainer		
Parent:	AutomationMLAttributeAndInterfaceList		
Explanation:	The SubmodelElementCollection represents one published attribute with its value and the related reference to the AutomationML attribute in the AutomationML project..		
[SME type]	semanticId = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Prop] Name	[GlobalReference] https://www.automationml.org/AutomationML_AAS_SemanticIds/General/AutomationMLAttribute Each Property describes an AutomationML attribute (see IEC 62714), which is associated to the particular Asset Administration Shell and gives its name as shortID and its value.	Wert	0..1

[Ref] RelationBetweenPropertyAndAttribute	[GlobalReference] https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/AttributeRelation Each reference element give the relation between the property element of the SMC and the related AutomationML attribute.	(Submodell) https://example.com/ids/sm/5334_1161_6032_1014 (File) AutomationMLFile (FragmentReference) AML/29a25b2b-1fe6-4002-b751-8b8bf90affdf.BlauesGeräteAttribut (Submodell) https://example.com/ids/sm/5334_1161_6032_1014 (SubmodelElementList) AutomationMLAttributesAndInterfaces (SubmodelElementCollection) #00 (Property) BlauesGeräteAttribut	1
--	--	---	---

idShort:	AutomationMLElementList
Class:	SubmodelElementList (SML)
semanticId:	https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/ElementList
Parent:	AmlBasedSubmodel
Explanation:	The SubmodelElementList lists all AutomationML elements to be published within the related submodel.

idShort:	#xx
Class:	SubmodelElementCollection (SMC)
semanticId:	https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/AttributeContainer
Parent:	AutomationMLElementList
Explanation:	The SubmodelElementCollection represents one published element and the related reference to the AutomationML element in the AutomationML project..

[SME type]	semanticId = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Entity] Name	[GlobalReference] https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/ElementReference Each Entity describes an AutomationML element (see IEC 62714), which is associated to the particular Asset Administration Shell and gives its name as shortID.	Wert	0..1
[Ref] RelationBetweenElementAndAAS	[GlobalReference] https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/AASRelation	(Submodell) https://example.com/ids/sm/5334_1161_6032_1014	1

	Each reference element give the relation between the Entity element of the SMC and the related AutomationML element.	(SubmodelElementList) AutomationMLElementList (SubmodelElementCollection) #00 (Entity) Blau (Submodell) https://example.com/ids/sm/5334_1161_6032_1014 (File) AutomationMLFile (FragmentReference) AML/29a25b2b-1fe6-4002-b751-8b8bf90affdf	
--	--	---	--

5 Practical Example

Within the following section the integration examples to the AutomationML Project are presented.

5.1 AutomationML project file

This subsection represents the AutomationML project file given in Figure 3.

```
<CAEXFile SchemaVersion="3.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns="http://www.dke.de/CAEX"
  xsi:schemaLocation="http://www.dke.de/CAEX CAEX_ClassModel_V.3.0.xsd" FileName="AAS Beispiel.aml">
  <AdditionalInformation DocumentVersions="Recommendations" />
  <SuperiorStandardVersion>AutomationML 2.10</SuperiorStandardVersion>
  <SourceDocumentInformation OriginName="AutomationML Editor" OriginID="916578CA-FE0D-474E-A4FC-9E1719892369"
    OriginVersion="6.1.7.0" LastWritingDateTime="2024-03-18T11:14:50.2399582+01:00" OriginProjectID="unspecified"
    OriginProjectTitle="unspecified" OriginRelease="6.1.7.0" OriginVendor="AutomationML e.V."
    OriginVendorURL="www.AutomationML.org" />
  <InstanceHierarchy Name="InstanceHierarchy">
    <Version>0</Version>
    <InternalElement Name="Project" ID="0d143fae-66bc-488b-92fa-c8d31d91a1ee">
      <InternalElement Name="Device" ID="1" IDRef="5b3e24bb-d86c-453e-9a03-e7eb7dd3b3f2">
        RefBaseSystemUnitPath="DiamantSystemUnitClassLib/Gerät">
          <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/Name">
            <Value>Device 1</Value>
          </Attribute>
          <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/ID">
            <Value>001</Value>
          </Attribute>
          <Attribute Name="ManufacturerName" AttributeDataType="xs:string">
            <Value>ACME</Value>
          </Attribute>
          <InternalElement Name="Blau" ID="29a25b2b-1fe6-4002-b751-8b8bf90affd" RefBaseSystemUnitPath="BlauSystemUnitClassLib/Gerät">
            <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/Name">
              <Value>Device 1</Value>
            </Attribute>
            <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/ID">
              <Value>001</Value>
            </Attribute>
            <Attribute
              RefAttributeType="BlauAttributeTypeLib/BlauesGeräteAttribut" AttributeDataType="xs:string">
              <Value>Wert</Value>
            </Attribute>
            <ExternalInterface Name="VerbindungInterface" ID="e83a4f17-e16c-4b9e-ba0a-918eb40d9fac">
              RefBaseClassPath="BlauInterfaceClassLib/VerbindungInterfaceClass">
                <Attribute Name="refURI" AttributeDataType="xs:anyURI" RefAttributeType="AutomationMLBaseAttributeTypeLib/refURI">
                  <Value>PLCOpenFiles/bauerBehaviour.xml#globalID</Value>
                </Attribute>
              </ExternalInterface>
            <RoleRequirements RefBaseRoleClassPath="BlauRoleClassLib/GerätRoleClass" />
          </InternalElement>
          <InternalElement Name="Grün" ID="e191c203-79fc-4393-91c2-a3403b5d543d" RefBaseSystemUnitPath="GrünSystemUnitClassLib/Gerät">
            <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/Name">
              <Value>Device 1</Value>
            </Attribute>
            <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/ID">
              <Value>001</Value>
            </Attribute>
            <RoleRequirements RefBaseRoleClassPath="GrünRoleClassLib/GerätRoleClass" />
          </InternalElement>
          <InternalElement Name="Rot" ID="c92d62eb-0e82-4be9-bf95-e1033c8f71e6" RefBaseSystemUnitPath="RotSystemUnitClassLib/Gerät">
            <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="RotAttributeTypeLib/Name">
              <Value>Device 1</Value>
            </Attribute>
            <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="RotAttributeTypeLib/ID">
              <Value>001</Value>
            </Attribute>
            <ExternalInterface Name="ControlValue" ID="96ea7853-591a-4913-a25b-6a00cac050b5">
              RefBaseClassPath="RotInterfaceClassLib/SteuerungssignalInterfaceClass" />
            <RoleRequirements RefBaseRoleClassPath="RotRoleClassLib/GerätRoleClass" />
          </InternalElement>
          <RoleRequirements RefBaseRoleClassPath="BlauRoleClassLib/GerätRoleClass" />
          <RoleRequirements RefBaseRoleClassPath="GrünRoleClassLib/GerätRoleClass" />
          <RoleRequirements RefBaseRoleClassPath="RotRoleClassLib/GerätRoleClass" />
        </InternalElement>
      </InternalElement>
      <InternalElement Name="Device" ID="2" IDRef="1570f45d-5ad5-4d14-a384-9b11ced599b5">
        RefBaseSystemUnitPath="DiamantSystemUnitClassLib/Gerät">
          <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/Name">
            <Value>Device 2</Value>
          </Attribute>
          <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/ID">
            <Value>002</Value>
          </Attribute>
          <InternalElement Name="Blau" ID="85467aa9-1f59-486d-8d74-b5995e7a71c1" RefBaseSystemUnitPath="BlauSystemUnitClassLib/Gerät">
            <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/Name">
```

```

    <Value>Device 2</Value>
  </Attribute>
  <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/ID">
    <Value>002</Value>
  </Attribute>
  <Attribute
    Name="BlauesGeräteAttribut"
    RefAttributeType="BlauAttributeTypeLib/BlauesGeräteAttributAttributeType">
    <Value>anderer Wert</Value>
  </Attribute>
  <ExternalInterface
    Name="VerbindungInterface"
    RefBaseClassPath="BlauInterfaceClassLib/VerbindungInterfaceClass" />
    <RoleRequirements RefBaseRoleClassPath="BlauRoleClassLib/GerätRoleClass" />
  </InternalElement>
  <InternalElement Name="Grün" ID="e90f3b09-4b6f-46d7-905e-120bc58c99db" RefBaseSystemUnitPath="GrünSystemUnitClassLib/Gerät">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/Name">
      <Value>Device 2</Value>
    </Attribute>
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/ID">
      <Value>002</Value>
    </Attribute>
    <RoleRequirements RefBaseRoleClassPath="GrünRoleClassLib/GerätRoleClass" />
  </InternalElement>
  <InternalElement Name="Rot" ID="0b1c0b16-7600-4c77-beaf-6db629a8813d" RefBaseSystemUnitPath="RotSystemUnitClassLib/Gerät">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="RotAttributeTypeLib/Name">
      <Value>Device 2</Value>
    </Attribute>
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="RotAttributeTypeLib/ID">
      <Value>002</Value>
    </Attribute>
    <ExternalInterface
      Name="ControlValue"
      RefBaseClassPath="RotInterfaceClassLib/SteuerungssignalInterfaceClass" />
      <RoleRequirements RefBaseRoleClassPath="RotRoleClassLib/GerätRoleClass" />
    </InternalElement>
    <RoleRequirements RefBaseRoleClassPath="BlauRoleClassLib/GerätRoleClass" />
    <RoleRequirements RefBaseRoleClassPath="GrünRoleClassLib/GerätRoleClass" />
    <RoleRequirements RefBaseRoleClassPath="RotRoleClassLib/GerätRoleClass" />
  </InternalElement>
  <InternalElement
    Name="Wire"
    RefBaseSystemUnitPath="DiamantSystemUnitClassLib/Kabel">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/Name">
      <Value>Kabelchen</Value>
    </Attribute>
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/ID">
      <Value>003</Value>
    </Attribute>
  </InternalElement>
  <InternalElement Name="Grün" ID="a16001c7-97e9-4925-92cb-3dce38af3cee" RefBaseSystemUnitPath="GrünSystemUnitClassLib/Kabel">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/Name">
      <Value>Kabelchen</Value>
    </Attribute>
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/ID">
      <Value>003</Value>
    </Attribute>
    <Attribute
      Name="GrünesKabelAttribut"
      RefAttributeType="GrünAttributeTypeLib/GrünesKabelAttributAttributeType">
      <Value>nocheinWert</Value>
    </Attribute>
    <ExternalInterface
      Name="SteckerInterface"
      RefBaseClassPath="GrünInterfaceClassLib/SteckerInterfaceClass" />
      <RoleRequirements RefBaseRoleClassPath="GrünRoleClassLib/KabelRoleClass" />
    </InternalElement>
  </InternalElement>
  <InternalElement
    Name="Blau"
    RefBaseSystemUnitPath="BlauSystemUnitClassLib/Struktur">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/Name">
      <Value>Kabelchen</Value>
    </Attribute>
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/ID">
      <Value>003</Value>
    </Attribute>
    <Attribute
      Name="BlauesStrukturAttribut"
      RefAttributeType="BlauAttributeTypeLib/BlauesStrukturAttributAttributeType">
      <Value>noch ein anderer Wert</Value>
    </Attribute>
    <ExternalInterface
      Name="VerbindungInterface"
      RefBaseClassPath="BlauInterfaceClassLib/VerbindungInterfaceClass" />
    </InternalElement>
    <ExternalInterface
      Name="VerbindungInterface1"
      RefBaseClassPath="BlauInterfaceClassLib/VerbindungInterfaceClass" />
      <RoleRequirements RefBaseRoleClassPath="BlauRoleClassLib/StrukturRoleClass" />
    </InternalElement>
    <RoleRequirements RefBaseRoleClassPath="GrünRoleClassLib/KabelRoleClass" />
    <RoleRequirements RefBaseRoleClassPath="BlauRoleClassLib/StrukturRoleClass" />
  </InternalElement>
  <InternalLink RefPartnerSideA="e83a4f17-e16c-4b9e-ba0a-918eb40d9fac" RefPartnerSideB="236e3ffb-a790-47ac-81de-7c512c27608f"
    Name="Link" />
  <InternalLink RefPartnerSideA="c0c5f6e2-ebf8-4a92-ac0a-f43add13446a" RefPartnerSideB="30ccc8a8-4a94-425d-bef5-e2e9338eb8fc"
    Name="InternalLink" />
  <RoleRequirements RefBaseRoleClassPath="AutomationMLBaseRoleClassLib/AutomationMLBaseRole" />

```

```

</InternalElement>
</InstanceHierarchy>
<InterfaceClassLib Name="AutomationMLInterfaceClassLib">
  <Description>Standard Automation Markup Language Interface Class Library</Description>
  <Version>2.10.0</Version>
  <InterfaceClass Name="AutomationMLBaseInterface">
    <InterfaceClass Name="Order" RefBaseClassPath="AutomationMLBaseInterface">
      <Attribute Name="Direction" AttributeDataType="xs:string" RefAttributeType="AutomationMLBaseAttributeTypeLib/Direction" />
    </InterfaceClass>
    <InterfaceClass Name="Port" RefBaseClassPath="AutomationMLBaseInterface">
      <Attribute Name="Direction" AttributeDataType="xs:string" RefAttributeType="AutomationMLBaseAttributeTypeLib/Direction">
        <Constraint Name="AllowedValues">
          <NominalScaledType>
            <RequiredValue>In</RequiredValue>
            <RequiredValue>Out</RequiredValue>
            <RequiredValue>InOut</RequiredValue>
          </NominalScaledType>
        </Constraint>
      </Attribute>
      <Attribute Name="Cardinality" RefAttributeType="AutomationMLBaseAttributeTypeLib/Cardinality">
        <Attribute Name="MinOccur" AttributeDataType="xs:unsignedInt" />
        <Attribute Name="MaxOccur" AttributeDataType="xs:unsignedInt" />
      </Attribute>
      <Attribute Name="Category" AttributeDataType="xs:string" RefAttributeType="AutomationMLBaseAttributeTypeLib/Category" />
    </InterfaceClass>
    <InterfaceClass Name="PPRConnector" RefBaseClassPath="AutomationMLBaseInterface" />
    <InterfaceClass Name="ExternalDataConnector" RefBaseClassPath="AutomationMLBaseInterface">
      <Attribute Name="refURI" AttributeDataType="xs:anyURI" RefAttributeType="AutomationMLBaseAttributeTypeLib/refURI" />
    </InterfaceClass>
    <InterfaceClass Name="COLLADAInterface" RefBaseClassPath="ExternalDataConnector" />
    <InterfaceClass Name="PLCopenXMLInterface" RefBaseClassPath="ExternalDataConnector" />
    <InterfaceClass Name="ExternalDataReference" RefBaseClassPath="ExternalDataConnector">
      <Attribute Name="MIMEType" AttributeDataType="xs:string" RefAttributeType="AutomationMLBaseAttributeTypeLib/MIMEType" />
    </InterfaceClass>
    </InterfaceClass>
    <InterfaceClass Name="Communication" RefBaseClassPath="AutomationMLBaseInterface">
      <InterfaceClass Name="SignalInterface" RefBaseClassPath="Communication" />
    </InterfaceClass>
  </InterfaceClassLib>
  <InterfaceClassLib Name="BlauInterfaceClassLib">
    <Version>0</Version>
    <InterfaceClass Name="VerbindungInterfaceClass" RefBaseClassPath="AutomationMLInterfaceClassLib/AutomationMLBaseInterface" />
  </InterfaceClassLib>
  <InterfaceClassLib Name="GrünInterfaceClassLib">
    <Version>0</Version>
    <InterfaceClass Name="SteckerInterfaceClass" RefBaseClassPath="AutomationMLInterfaceClassLib/AutomationMLBaseInterface/Port" />
  </InterfaceClassLib>
  <InterfaceClassLib Name="RotInterfaceClassLib">
    <Version>0</Version>
    <InterfaceClass
      RefBaseClassPath="AutomationMLInterfaceClassLib/AutomationMLBaseInterface/Communication/SignalInterface" />
      Name="SteuerungssignalInterfaceClass"
    </InterfaceClassLib>
  <RoleClassLib Name="RotRoleClassLib">
    <Version>0</Version>
    <RoleClass Name="GerätRoleClass" RefBaseClassPath="AutomationMLBaseRoleClassLib/AutomationMLBaseRole/Resource">
      <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="RotAttributeTypeLib/Name" />
      <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="RotAttributeTypeLib/ID" />
    </RoleClass>
  </RoleClassLib>
  <RoleClassLib Name="GrünRoleClassLib">
    <Version>0</Version>
    <RoleClass Name="GerätRoleClass" RefBaseClassPath="AutomationMLBaseRoleClassLib/AutomationMLBaseRole/Resource">
      <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/Name" />
      <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/ID" />
    </RoleClass>
    <RoleClass Name="KabelRoleClass" RefBaseClassPath="AutomationMLBaseRoleClassLib/AutomationMLBaseRole/Structure">
      <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/Name" />
      <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/ID" />
      <Attribute
        Name="GrünesKabelAttributAttributeType"
        RefAttributeType="GrünAttributeTypeLib/GrünesKabelAttributAttributeType" />
        AttributeDataType="xs:string"
      </Attribute>
      <ExternalInterface
        Name="SteckerInterface"
        RefBaseClassPath="GrünInterfaceClassLib/SteckerInterfaceClass" />
        ID="054cb355-5ecf-4caa-81f0-b79df79c46e5"
      </ExternalInterface>
    </RoleClass>
  </RoleClassLib>
  <RoleClassLib Name="AutomationMLBaseRoleClassLib">
    <Description>Automation Markup Language base role class library</Description>
    <Version>2.10.0</Version>
    <RoleClass Name="AutomationMLBaseRole">
      <RoleClass Name="Group" RefBaseClassPath="AutomationMLBaseRole">
        <Attribute Name="AssociatedFacet" AttributeDataType="xs:string" RefAttributeType="AutomationMLBaseAttributeTypeLib/AssociatedFacet" />
      </RoleClass>
      <RoleClass Name="Facet" RefBaseClassPath="AutomationMLBaseRole" />
      <RoleClass Name="Resource" RefBaseClassPath="AutomationMLBaseRole" />
      <RoleClass Name="Product" RefBaseClassPath="AutomationMLBaseRole" />
      <RoleClass Name="Process" RefBaseClassPath="AutomationMLBaseRole" />
    </RoleClassLib>
  </InterfaceClassLib>

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<RoleClass Name="Structure" RefBaseClassPath="AutomationMLBaseRole">
  <RoleClass Name="ProductStructure" RefBaseClassPath="Structure" />
  <RoleClass Name="ProcessStructure" RefBaseClassPath="Structure" />
  <RoleClass Name="ResourceStructure" RefBaseClassPath="Structure" />
</RoleClass>
<RoleClass Name="ExternalData" RefBaseClassPath="AutomationMLBaseRole" />
</RoleClass>
</RoleClassLib>
<RoleClassLib Name="BlauRoleClassLib">
  <Version>0</Version>
  <RoleClass Name="GerätRoleClass" RefBaseClassPath="AutomationMLBaseRoleClassLib/AutomationMLBaseRole/Resource">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/Name" />
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/ID" />
    <Attribute
      Name="BlauesGeräteAttributAttributeType"
      AttributeDataType="xs:string"
      RefAttributeType="BlauAttributeTypeLib/BlauesGeräteAttributAttributeType" />
    <ExternalInterface
      Name="VerbindungInterface"
      ID="602c558b-a004-446b-92a8-31e515f515a3"
      RefBaseClassPath="BlauInterfaceClassLib/VerbindungInterfaceClass" />
  </RoleClass>
  <RoleClass Name="StrukturRoleClass" RefBaseClassPath="AutomationMLBaseRoleClassLib/AutomationMLBaseRole/Structure">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/Name" />
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/ID" />
    <Attribute
      Name="BlauesStrukturAttributAttributeType"
      AttributeDataType="xs:string"
      RefAttributeType="BlauAttributeTypeLib/BlauesStrukturAttributAttributeType" />
    <ExternalInterface
      Name="VerbindungInterface"
      ID="5a1851f1-74b1-4bdb-bdd6-e5fc9f641f57"
      RefBaseClassPath="BlauInterfaceClassLib/VerbindungInterfaceClass" />
  </RoleClass>
</RoleClassLib>
<SystemUnitClassLib Name="DiamantSystemUnitClassLib">
  <Version>0</Version>
  <SystemUnitClass Name="Gerät" ID="c834e5c1-4b68-47f3-a0c0-4f9d55b511a0">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/Name" />
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/ID" />
    <InternalElement Name="Blau" ID="4ac15a01-e48c-42ba-ada6-0266f0005fba" RefBaseSystemUnitPath="BlauSystemUnitClassLib/Gerät">
      <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/Name" />
      <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/ID" />
      <Attribute
        Name="BlauesGeräteAttribut"
        AttributeDataType="xs:string"
        RefAttributeType="BlauAttributeTypeLib/BlauesGeräteAttributAttributeType">
        <Value>Wert</Value>
      </Attribute>
    <ExternalInterface
      Name="VerbindungInterface"
      ID="81fa01c4-6613-4bed-863e-fcfd6071a72c"
      RefBaseClassPath="BlauInterfaceClassLib/VerbindungInterfaceClass">
      <Attribute Name="refURI" AttributeDataType="xs:anyURI" RefAttributeType="AutomationMLBaseAttributeTypeLib/refURI">
      <Value>/PLCOpenFiles/bauerBehaviour.xml#globalID</Value>
      </Attribute>
    </ExternalInterface>
    <RoleRequirements RefBaseRoleClassPath="BlauRoleClassLib/GerätRoleClass" />
  </InternalElement>
  <InternalElement Name="Grün" ID="6d2a9b75-c6bd-49fa-b133-5a9764e50501" RefBaseSystemUnitPath="GrünSystemUnitClassLib/Gerät">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/Name" />
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/ID" />
    <RoleRequirements RefBaseRoleClassPath="GrünRoleClassLib/GerätRoleClass" />
  </InternalElement>
  <InternalElement Name="Rot" ID="84df7e3e-74b9-4372-b469-276d444476eb" RefBaseSystemUnitPath="RotSystemUnitClassLib/Gerät">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="RotAttributeTypeLib/Name" />
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="RotAttributeTypeLib/ID" />
    <ExternalInterface
      Name="ControlValue"
      ID="1d6b03ed-e0a6-4c26-8f01-129974929821"
      RefBaseClassPath="RotInterfaceClassLib/SteuerungssignalInterfaceClass" />
    <RoleRequirements RefBaseRoleClassPath="RotRoleClassLib/GerätRoleClass" />
  </InternalElement>
  <SupportedRoleClass RefRoleClassPath="RotRoleClassLib/GerätRoleClass" />
  <SupportedRoleClass RefRoleClassPath="BlauRoleClassLib/GerätRoleClass" />
  <SupportedRoleClass RefRoleClassPath="GrünRoleClassLib/GerätRoleClass" />
</SystemUnitClass>
<SystemUnitClass Name="Struktur" ID="09b62455-cfc5-442f-81b3-8e6023489907">
  <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/Name" />
  <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/ID" />
  <InternalElement Name="Blau" ID="7eb208a1-2735-4606-a803-998934c1809f" RefBaseSystemUnitPath="BlauSystemUnitClassLib/Struktur">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/Name" />
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/ID" />
    <Attribute
      Name="BlauesStrukturAttribut"
      AttributeDataType="xs:string"
      RefAttributeType="BlauAttributeTypeLib/BlauesStrukturAttributAttributeType" />
    <ExternalInterface
      Name="VerbindungInterface"
      ID="9e5fbbcb-ccce-4a51-993e-e6213f43f3a1"
      RefBaseClassPath="BlauInterfaceClassLib/VerbindungInterfaceClass" />
    <RoleRequirements RefBaseRoleClassPath="BlauRoleClassLib/StrukturRoleClass" />
  </InternalElement>
  <SupportedRoleClass RefRoleClassPath="BlauRoleClassLib/StrukturRoleClass" />
</SystemUnitClass>
<SystemUnitClass Name="Kabel" ID="1d647e14-c996-4353-81b9-067592581b51">
  <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/Name" />
  <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/ID" />
  <InternalElement Name="Grün" ID="c990eaff-8d06-4381-bdb2-d43486e84d9d" RefBaseSystemUnitPath="GrünSystemUnitClassLib/Kabel">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/Name" />
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/ID" />
    <Attribute
      Name="GrünesKabelAttribut"
      AttributeDataType="xs:string"
      RefAttributeType="GrünAttributeTypeLib/GrünesKabelAttributAttributeType" />
  </InternalElement>

```

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    <ExternalInterface
      Name="SteckerInterface"
      ID="e80e8b55-ba9d-4e47-995f-9747786c8c1d"
      RefBaseClassPath="GrünInterfaceClassLib/SteckerInterfaceClass" />
    <RoleRequirements RefBaseRoleClassPath="GrünRoleClassLib/KabelRoleClass" />
  </InternalElement>
</InternalElement Name="Blau" ID="d4c49261-32c0-4d38-82de-ee7cc27a9636" RefBaseSystemUnitPath="BlauSystemUnitClassLib/Struktur">
  <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/Name" />
  <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/ID" />
  <Attribute
    Name="BlauesStrukturAttribut"
    AttributeDataType="xs:string"
    RefAttributeType="BlauAttributeTypeLib/BlauesStrukturAttributAttributeType" />
  <ExternalInterface
    Name="VerbindungInterface"
    ID="98a20598-54c9-4448-a1c7-af62959b63a2"
    RefBaseClassPath="BlauInterfaceClassLib/VerbindungInterfaceClass" />
  <RoleRequirements RefBaseRoleClassPath="BlauRoleClassLib/StrukturRoleClass" />
</InternalElement>
<SupportedRoleClass RefRoleClassPath="GrünRoleClassLib/KabelRoleClass" />
<SupportedRoleClass RefRoleClassPath="BlauRoleClassLib/StrukturRoleClass" />
</SystemUnitClass>
</SystemUnitClassLib>
<SystemUnitClassLib Name="BlauSystemUnitClassLib">
  <Version>0</Version>
  <SystemUnitClass Name="Gerät" ID="bd89d9f8-b1be-4f10-a0b8-091c0d15655e">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/Name" />
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/ID" />
    <Attribute
      Name="BlauesGeräteAttribut"
      AttributeDataType="xs:string"
      RefAttributeType="BlauAttributeTypeLib/BlauesGeräteAttributAttributeType" />
  <ExternalInterface
    Name="VerbindungInterface"
    ID="677facba-bf7e-4991-a236-da365864291b"
    RefBaseClassPath="BlauInterfaceClassLib/VerbindungInterfaceClass" />
  <SupportedRoleClass RefRoleClassPath="BlauRoleClassLib/GerätRoleClass" />
</SystemUnitClass>
</SystemUnitClassLib>
<SystemUnitClass Name="Struktur" ID="10fccca4-5822-4548-a78a-4b23c483b9ec">
  <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/Name" />
  <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="BlauAttributeTypeLib/ID" />
  <Attribute
    Name="BlauesStrukturAttribut"
    AttributeDataType="xs:string"
    RefAttributeType="BlauAttributeTypeLib/BlauesStrukturAttributAttributeType" />
  <ExternalInterface
    Name="VerbindungInterface"
    ID="0cea96e4-cf3c-45ae-8627-1c7ccca8959d"
    RefBaseClassPath="BlauInterfaceClassLib/VerbindungInterfaceClass" />
  <SupportedRoleClass RefRoleClassPath="BlauRoleClassLib/StrukturRoleClass" />
</SystemUnitClass>
</SystemUnitClassLib>
<SystemUnitClassLib Name="GrünSystemUnitClassLib">
  <Version>0</Version>
  <SystemUnitClass Name="Gerät" ID="{CBD49CB2-A5D5-48cd-BEF9-9EBF91F00580}">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/Name" />
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/ID" />
    <SupportedRoleClass RefRoleClassPath="GrünRoleClassLib/GerätRoleClass" />
  </SystemUnitClass>
  <SystemUnitClass Name="Kabel" ID="f8914dab-6241-49ad-8c2b-5af1d658e7cc">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/Name" />
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="GrünAttributeTypeLib/ID" />
    <Attribute
      Name="GrünesKabelAttribut"
      AttributeDataType="xs:string"
      RefAttributeType="GrünAttributeTypeLib/GrünesKabelAttributAttributeType" />
  <ExternalInterface
    Name="SteckerInterface"
    ID="fc77a69b-9398-4182-959f-3c05db2a3422"
    RefBaseClassPath="GrünInterfaceClassLib/SteckerInterfaceClass" />
  <SupportedRoleClass RefRoleClassPath="GrünRoleClassLib/KabelRoleClass" />
</SystemUnitClass>
</SystemUnitClassLib>
<SystemUnitClassLib Name="RotSystemUnitClassLib">
  <Version>0</Version>
  <SystemUnitClass Name="Gerät" ID="{6ABC1036-19C6-4e49-AC78-0A0B6A5DE841}">
    <Attribute Name="Name" AttributeDataType="xs:string" RefAttributeType="RotAttributeTypeLib/Name" />
    <Attribute Name="ID" AttributeDataType="xs:string" RefAttributeType="RotAttributeTypeLib/ID" />
    <SupportedRoleClass RefRoleClassPath="RotRoleClassLib/GerätRoleClass" />
  </SystemUnitClass>
</SystemUnitClassLib>
<AttributeTypeLib Name="AutomationMLBaseAttributeTypeLib">
  <Description>Standard Automation Markup Language Attribute Type Library</Description>
  <Version>2.10.0</Version>
  <AttributeType Name="Direction" AttributeDataType="xs:string">
    <Constraint Name="AllowedValues">
      <NominalScaledType>
        <RequiredValue>In</RequiredValue>
        <RequiredValue>Out</RequiredValue>
        <RequiredValue>InOut</RequiredValue>
      </NominalScaledType>
    </Constraint>
  </AttributeType>
  <AttributeType Name="Cardinality">
    <Attribute Name="MinOccur" AttributeDataType="xs:unsignedInt" />
    <Attribute Name="MaxOccur" AttributeDataType="xs:unsignedInt" />
  </AttributeType>
  <AttributeType Name="Category" AttributeDataType="xs:string" />
  <AttributeType Name="refURI" AttributeDataType="xs:anyURI" />
  <AttributeType Name="AssociatedFacet" AttributeDataType="xs:string" />
  <AttributeType Name="ListType" />
  <AttributeType Name="OrderedListType" />
  <AttributeType Name="LocalizedAttribute" AttributeDataType="xs:string" />
  <AttributeType Name="AssociatedExternalValue">

```

```

<Attribute Name="refCAEXAttribute" />
<Attribute Name="refURI" RefAttributeType="AutomationMLBaseAttributeTypeLib/refURI" />
<Attribute Name="Direction" RefAttributeType="AutomationMLBaseAttributeTypeLib/Direction" />
</AttributeType>
<AttributeType Name="MIMEType" AttributeDataType="xs:string" />
<AttributeType Name="DocLang" AttributeDataType="xs:string" />
</AttributeTypeLib>
<AttributeTypeLib Name="BlauAttributeTypeLib">
<Version>0</Version>
<AttributeType Name="Name" AttributeDataType="xs:string" />
<AttributeType Name="ID" AttributeDataType="xs:string" />
<AttributeType Name="BlauesGeräteAttributAttributeType" AttributeDataType="xs:string" />
<AttributeType Name="BlauesStrukturAttributAttributeType" AttributeDataType="xs:string" />
</AttributeTypeLib>
<AttributeTypeLib Name="GrünAttributeTypeLib">
<Version>0</Version>
<AttributeType Name="Name" AttributeDataType="xs:string" />
<AttributeType Name="ID" AttributeDataType="xs:string" />
<AttributeType Name="GrünesAktorAttributAttributeType" AttributeDataType="xs:string" />
<AttributeType Name="GrünesControllerAttributAttributeType" AttributeDataType="xs:string" />
<AttributeType Name="GrünesGeräteAttributAttributeType" AttributeDataType="xs:string" />
<AttributeType Name="GrünesKabelAttributAttributeType" AttributeDataType="xs:string" />
<AttributeType Name="GrünesSensorAttributAttributeType" AttributeDataType="xs:string" />
</AttributeTypeLib>
<AttributeTypeLib Name="RotAttributeTypeLib">
<Version>0</Version>
<AttributeType Name="Name" AttributeDataType="xs:string" />
<AttributeType Name="ID" AttributeDataType="xs:string" />
<AttributeType Name="AktorC_AttributAttributeType" AttributeDataType="xs:string" />
<AttributeType Name="AktorD_AttributAttributeType" AttributeDataType="xs:string" />
<AttributeType Name="ATG_AttributAttributeType" AttributeDataType="xs:string" />
<AttributeType Name="RotesAktorAttributAttributeType" AttributeDataType="xs:string" />
<AttributeType Name="RotesControllerAttributAttributeType" AttributeDataType="xs:string" />
<AttributeType Name="RotesGeräteAttributAttributeType" AttributeDataType="xs:string" />
<AttributeType Name="RotesSensorAttributAttributeType" AttributeDataType="xs:string" />
<AttributeType Name="SensorA_AttributAttributeType" AttributeDataType="xs:string" />
<AttributeType Name="SensorB_AttributAttributeType" AttributeDataType="xs:string" />
</AttributeTypeLib>
</CAEXFile>

```

5.2 AAS file for integration without existing submodel

This subsection represents the AAS file for the neutral integration as given in Figure 7, Figure 8, and Figure 10.

```

<environment xmlns="https://admin-shell.io/aas/3/0">
<assetAdministrationShells>
<assetAdministrationShell>
<idShort>AML_Integration</idShort>
<id>AssetAdministrationShell---55D98D59</id>
<assetInformation>
<assetKind>Instance</assetKind>
<globalAssetId>Asset---5BAFD137</globalAssetId>
</assetInformation>
<submodels>
<reference>
<type>ModelReference</type>
<keys>
<key>
<type>Submodel</type>
<value>https://example.com/ids/sm/5334_1161_6032_1014</value>
</key>
</keys>
</reference>
</submodels>
</assetAdministrationShell>
</assetAdministrationShells>
<submodels>
<submodel>
<idShort>AmlBasedSubmodel</idShort>
<id>https://example.com/ids/sm/5334_1161_6032_1014</id>
<kind>Instance</kind>
<semanticId>
<type>ExternalReference</type>
<keys>
<key>
<type>GlobalReference</type>
<value>https://www.automationml.org/AutomationML_AAS_SemanticIds/Submodel/Generic</value>
</key>
</keys>
</semanticId>
<submodelElements>
<file>

```

```

<idShort>AutomationMLData</idShort>
<semanticId>
  <type>ExternalReference</type>
  <keys>
    <key>
      <type>GlobalReference</type>
      <value>https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/FileReference</value>
    </key>
  </keys>
</semanticId>
<embeddedDataSpecifications />
<value>/aasx/files/AAS_Beispiel.aml</value>
<contentType>text/plain</contentType>
</file>
<property>
  <category>PARAMETER</category>
  <idShort>AutomationMLVersion</idShort>
  <description>
    <langStringTextType>
      <language>en</language>
      <text>The AML version that the included AML file follows. This should be either 1 (i.e. CAEX 2.15) or 2 (i.e. CAEX 3.0).</text>
    </langStringTextType>
  </description>
  <semanticId>
    <type>ExternalReference</type>
    <keys>
      <key>
        <type>GlobalReference</type>
        <value>https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/VersionNumber</value>
      </key>
    </keys>
  </semanticId>
  <embeddedDataSpecifications />
  <valueType>xs:positiveInteger</valueType>
  <value>2</value>
</property>
<referenceElement>
  <idShort>AutomationMLElementReference</idShort>
  <description>
    <langStringTextType>
      <language></language>
      <text>Reference to the AutomationML element hosting the engineering information of the asset</text>
    </langStringTextType>
  </description>
  <semanticId>
    <type>ExternalReference</type>
    <keys>
      <key>
        <type>GlobalReference</type>
        <value>https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/ElementReference</value>
      </key>
    </keys>
  </semanticId>
  <embeddedDataSpecifications />
  <value>
    <type>ModelReference</type>
    <keys>
      <key>
        <type>Submodel</type>
        <value>https://example.com/ids/sm/5334_1161_6032_1014</value>
      </key>
      <key>
        <type>File</type>
        <value>AutomationMLFile</value>
      </key>
      <key>
        <type>FragmentReference</type>
        <value>AML/5b3e24bb-d86c-453e-9a03-e7eb7dd3b3f2</value>
      </key>
    </keys>
  </value>
</referenceElement>
<submodelElementList>
  <idShort>AutomationMLAttributeAndInterfaceList</idShort>
  <description>
    <langStringTextType>
      <language>en</language>
      <text>List of AutomationML attributes to be published.</text>
    </langStringTextType>
  </description>
  <semanticId>
    <type>ExternalReference</type>
    <keys>
      <key>
        <type>GlobalReference</type>
        <value>https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/AttributeAndInterfaceList</value>

```

```

    </key>
  </keys>
</semanticId>
<orderRelevant>false</orderRelevant>
<type>ValueListElement</type>SubmodelElementCollection</type>ValueListElement>
<value>
  <submodelElementCollection>
    <idShort></idShort>
    <description>
      <langStringTextType>
        <language>en</language>
        <text>Collection of AutomationML Attributes to be published as properties</text>
      </langStringTextType>
    </description>
    <semanticId>
      <type>ExternalReference</type>
      <keys>
        <key>
          <type>GlobalReference</type>
          <value>https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/AttributeContainer</value>
        </key>
      </keys>
    </semanticId>
    <embeddedDataSpecifications />
  </value>
  <property>
    <idShort>BlauesGeräteAttribut</idShort>
    <description>
      <langStringTextType>
        <language>en</language>
        <text>Value of an AutomationML attribute </text>
      </langStringTextType>
    </description>
    <semanticId>
      <type>ExternalReference</type>
      <keys>
        <key>
          <type>GlobalReference</type>
          <value>https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/AutomationMLAttribute</value>
        </key>
      </keys>
    </semanticId>
    <embeddedDataSpecifications />
    <valueType>xs:string</valueType>
    <value>Wert</value>
  </property>
  <relationshipElement>
    <idShort>RelationBetweenPropertyAndAttribute</idShort>
    <description>
      <langStringTextType>
        <language>en</language>
        <text>Relation between related property SubmodelElements and corresponding AutomationML attribute.</text>
      </langStringTextType>
    </description>
    <semanticId>
      <type>ExternalReference</type>
      <keys>
        <key>
          <type>GlobalReference</type>
          <value>https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/AttributeRelation</value>
        </key>
      </keys>
    </semanticId>
    <first>
      <type>ExternalReference</type>
      <keys>
        <key>
          <type>Submodel</type>
          <value>https://example.com/ids/sm/5334_1161_6032_1014</value>
        </key>
        <key>
          <type>File</type>
          <value>AutomationMLData</value>
        </key>
        <key>
          <type>FragmentReference</type>
          <value>AML/29a25b2b-1fe6-4002-b751-8b8bf90affdf.BlauesGeräteAttribut</value>
        </key>
      </keys>
    </first>
    <second>
      <type>ModelReference</type>
      <keys>
        <key>
          <type>Submodel</type>
          <value>https://example.com/ids/sm/5334_1161_6032_1014</value>

```

```

    </key>
    <key>
      <type>SubmodelElementList</type>
      <value>AutomationMLAttributesAndInterfaces</value>
    </key>
    <key>
      <type>SubmodelElementCollection</type>
      <value>#00</value>
    </key>
    <key>
      <type>Property</type>
      <value>BlauesGeräteAttribut</value>
    </key>
  </keys>
</second>
</relationshipElement>
</value>
</submodelElementCollection>
<submodelElementCollection>
  <idShort></idShort>
  <displayName>
    <langStringNameType>
      <language></language>
      <text>ControlValue_Container</text>
    </langStringNameType>
  </displayName>
  <description>
    <langStringTextType>
      <language>en</language>
      <text>Collection of AutomationML Interfaces to be published as properties</text>
    </langStringTextType>
  </description>
  <semanticId>
    <type>ExternalReference</type>
    <keys>
      <key>
        <type>GlobalReference</type>
        <value>https://www.automationml.org/AutomationML_AAS_SemanticIds/General/AttributeContainer </value>
      </key>
    </keys>
  </semanticId>
  <value>
    <property>
      <idShort>refURI</idShort>
      <description>
        <langStringTextType>
          <language>en</language>
          <text>Value of an AutomationML interface</text>
        </langStringTextType>
      </description>
      <semanticId>
        <type>ExternalReference</type>
        <keys>
          <key>
            <type>GlobalReference</type>
            <value>https://www.automationml.org/AutomationML_AAS_SemanticIds/General/AutomationMLAttribute</value>
          </key>
        </keys>
      </semanticId>
      <valueType>xs:string</valueType>
      <value>PLCOpenFiles/bauerBehaviour.xml#globalID</value>
    </property>
    <relationshipElement>
      <idShort>RelationBetweenPropertyAndAttribute</idShort>
      <description>
        <langStringTextType>
          <language>en</language>
          <text>Relation between related property SubmodelElements and corresponding AutomationML interface.</text>
        </langStringTextType>
      </description>
      <semanticId>
        <type>ExternalReference</type>
        <keys>
          <key>
            <type>GlobalReference</type>
            <value>https://www.automationml.org/AutomationML_AAS_SemanticIds/General/AttributeRelation</value>
          </key>
        </keys>
      </semanticId>
      <first>
        <type>ExternalReference</type>
        <keys>
          <key>
            <type>Submodel</type>
            <value>https://example.com/ids/sm/5334_1161_6032_1014</value>
          </key>

```

```

    <key>
      <type>File</type>
      <value>AutomatinMLData</value>
    </key>
    <key>
      <type>FragmentReference</type>
      <value>AML/96ea7853-591a-4913-a25b-6a00cac050b5.refURI</value>
    </key>
  </keys>
</first>
<second>
  <type>ModelReference</type>
  <keys>
    <key>
      <type>Submodel</type>
      <value>https://example.com/ids/sm/5334_1161_6032_1014</value>
    </key>
    <key>
      <type>SubmodelElementList</type>
      <value>AutomationMLAttributesAndInterfaces</value>
    </key>
    <key>
      <type>SubmodelElementCollection</type>
      <value>#01</value>
    </key>
    <key>
      <type>Property</type>
      <value>refURI</value>
    </key>
  </keys>
</second>
</relationshipElement>
</value>
</submodelElementCollection>
</value>
</submodelElementList>
<submodelElementList>
  <idShort>AutomationMLElementList</idShort>
  <description>
    <langStringTextType>
      <language>en</language>
      <text>List of relevant AutomationML Subelements</text>
    </langStringTextType>
  </description>
  <semanticId>
    <type>ExternalReference</type>
    <keys>
      <key>
        <type>GlobalReference</type>
        <value>https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/ElementList</value>
      </key>
    </keys>
  </semanticId>
  <type>ValueListElement</type>
  <value>
    <submodelElementCollection>
      <idShort></idShort>
      <description>
        <langStringTextType>
          <language>en</language>
          <text>Collection of AutomationML Elements to be considered as relevant</text>
        </langStringTextType>
      </description>
      <semanticId>
        <type>ExternalReference</type>
        <keys>
          <key>
            <type>GlobalReference</type>
            <value>https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/ElementContainer</value>
          </key>
        </keys>
      </semanticId>
    </value>
    <entity>
      <idShort>Blau</idShort>
      <description>
        <langStringTextType>
          <language>en</language>
          <text>Reference to the AutomationML element hosting the engineering information of the asset</text>
        </langStringTextType>
      </description>
      <semanticId>
        <type>ExternalReference</type>
        <keys>
          <key>
            <type>GlobalReference</type>

```

```

        <value>https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/ElementReference</value>
    </key>
</keys>
</semanticId>
<entityType>SelfManagedEntity</entityType>
</entity>
<relationshipElement>
    <idShort>RelationBetweenElementAndAAS</idShort>
    <description>
        <langStringTextType>
            <language>en</language>
            <text>Relation between related AutomationML element in Submodel and corresponding AAS</text>
        </langStringTextType>
    </description>
    <semanticId>
        <type>ExternalReference</type>
        <keys>
            <key>
                <type>GlobalReference</type>
                <value>https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/AASRelation</value>
            </key>
        </keys>
    </semanticId>
    <first>
        <type>ModelReference</type>
        <keys>
            <key>
                <type>Submodel</type>
                <value>https://example.com/ids/sm/5334_1161_6032_1014</value>
            </key>
            <key>
                <type>SubmodelElementList</type>
                <value>AutomationMLElementList</value>
            </key>
            <key>
                <type>SubmodelElementCollection</type>
                <value>#00</value>
            </key>
            <key>
                <type>Entity</type>
                <value>Blau</value>
            </key>
        </keys>
    </first>
    <second>
        <type>ExternalReference</type>
        <keys>
            <key>
                <type>Submodel</type>
                <value>https://example.com/ids/sm/5334_1161_6032_1014</value>
            </key>
            <key>
                <type>File</type>
                <value>AutomationMLData</value>
            </key>
            <key>
                <type>FragmentReference</type>
                <value>AML/29a25b2b-1fe6-4002-b751-8b8bf90affdf</value>
            </key>
        </keys>
    </second>
</relationshipElement>
</value>
</submodelElementCollection>
</value>
</submodelElementList>
</submodelElements>
</submodel>
</submodels>
<conceptDescriptions />
</environment>

```

5.3 AAS file for integration with existing Submodels

This subsection represents the AAS file of the integration version with existing Submodels as given in Figure 7, Figure 9 and Figure 11.

```

<environment xmlns="https://admin-shell.io/aas/3/0">
    <assetAdministrationShells>
        <assetAdministrationShell>
            <idShort>AML_Integration</idShort>
            <id>https://smart.festo.com/sm/6015_0151_3042_7088</id>
            <assetInformation>

```

```

<assetKind>Instance</assetKind>
<globalAssetId>Asset--5BAFD137</globalAssetId>
</assetInformation>
<submodels>
  <reference>
    <type>ModelReference</type>
    <keys>
      <key>
        <type>Submodel</type>
        <value>http://example.com/ids/sm/7124_0151_3042_1541</value>
      </key>
    </keys>
  </reference>
  <reference>
    <type>ModelReference</type>
    <keys>
      <key>
        <type>Submodel</type>
        <value>https://example.com/ids/sm/0415_0151_3042_2347</value>
      </key>
    </keys>
  </reference>
  <reference>
    <type>ModelReference</type>
    <keys>
      <key>
        <type>Submodel</type>
        <value>https://example.com/ids/sm/5334_1161_6032_1014</value>
      </key>
    </keys>
  </reference>
</submodels>
</assetAdministrationShell>
</assetAdministrationShells>
<submodels>
  <submodel>
    <idShort>AmlBasedSubmodel</idShort>
    <id>https://example.com/ids/sm/5334_1161_6032_1014</id>
    <kind>Instance</kind>
    <semanticId>
      <type>ExternalReference</type>
      <keys>
        <key>
          <type>GlobalReference</type>
          <value>https://www.automationml.org/AutomationML_AAS_SemanticIds/Submodel/Generic</value>
        </key>
      </keys>
    </semanticId>
    <submodelElements>
      <file>
        <idShort>AutomationMLData</idShort>
        <semanticId>
          <type>ExternalReference</type>
          <keys>
            <key>
              <type>GlobalReference</type>
              <value>https://www.automationml.org/AutomationML_AAS_SemanticIds/General/FileReference</value>
            </key>
          </keys>
        </semanticId>
        <embeddedDataSpecifications />
        <value>/aasx/files/AAS_Beispiel.aml</value>
        <contentType>text/plain</contentType>
      </file>
      <property>
        <category>PARAMETER</category>
        <idShort>AutomationMLVersion</idShort>
        <description>
          <langStringTextType>
            <language>en</language>
            <text>The AML version that the included AML file follows. This should be either 1 (i.e. CAEX 2.15) or 2 (i.e. CAEX 3.0).</text>
          </langStringTextType>
        </description>
        <semanticId>
          <type>ExternalReference</type>
          <keys>
            <key>
              <type>GlobalReference</type>
              <value>https://www.automationml.org/AutomationML_AAS_SemanticIds/General/VersionNumber</value>
            </key>
          </keys>
        </semanticId>
        <embeddedDataSpecifications />
        <valueType>xs:positiveInteger</valueType>
        <value>2</value>
      </property>
    </submodelElements>
  </submodel>
</submodels>

```

```

<referenceElement>
  <idShort>AutomationMLElementReference</idShort>
  <description>
    <langStringTextType>
      <language></language>
      <text>Reference to the AutomationML element hosting the engineering information of the asset</text>
    </langStringTextType>
  </description>
  <semanticId>
    <type>ExternalReference</type>
    <keys>
      <key>
        <type>GlobalReference</type>
        <value>https://www.automationml.org/AutomationML_AAS_SemanticIDs/General/ElementReference</value>
      </key>
    </keys>
  </semanticId>
  <embeddedDataSpecifications />
  <value>
    <type>ModelReference</type>
    <keys>
      <key>
        <type>Submodel</type>
        <value>https://example.com/ids/sm/5334_1161_6032_1014</value>
      </key>
      <key>
        <type>File</type>
        <value>AutomationMLFile</value>
      </key>
      <key>
        <type>FragmentReference</type>
        <value>AML/5b3e24bb-d86c-453e-9a03-e7eb7dd3b3f2</value>
      </key>
    </keys>
  </value>
</referenceElement>
<submodelElementList>
  <idShort>AutomationMLAttributeAndInterfaceList</idShort>
  <description>
    <langStringTextType>
      <language>en</language>
      <text>List of AutomationML attributes to be published.</text>
    </langStringTextType>
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