IDTA 02032 Inspection Documents of Steel Products

Version 1.0
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Submodel Template of the
Asset Administration Shell

Submodel Template
IDTA approved

- 100% AAS compliant
- Consistent & interoperable
- Released by the AAS experts

Imprint

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1 General

1.1 About this document

This document is a part of a specification series. Each part specifies the contents of a Submodel template for the Asset Administration Shell (AAS). The AAS is described in [1], [2], [3] and [6]. First exemplary Submodel contents were described in [4], while the actual format of this document was derived by the "Administration Shell in Practice" [5]. The format aims to be very concise, giving only minimal necessary information for applying a Submodel template, while leaving deeper descriptions and specification of concepts, structures and mapping to the respective documents [1] to [6].

The target group of the specification are developers and editors of technical documentation and manufacturer information, which are describing assets in smart manufacturing by means of the Asset Administration Shell (AAS) and therefore need to create a Submodel instance with a hierarchy of SubmodelElements. This document especially details on the question, which SubmodelElements with which semantic identification shall be used for this purpose.

1.2 Scope of the Submodel

This Submodel template aims to standardize the representation and storage of inspection data for steel products within the steel manufacturing and supply industry, specifically adhering to the DIN EN 10204:2004 and DIN EN 10168:2004 standards. DIN EN 10204:2004 defines the various types of inspection documents supplied to the customer, while DIN EN 10168:2004 specifies the required document content for inspection documents of metallic products.

This template is designed for stakeholders such as steel manufacturers, suppliers, and customers, to facilitate seamless exchange and direct usability of inspection data. It covers the lifecycle of steel products from production to delivery, ensuring consistency and reliability in data handling.

The Submodel will manage comprehensive inspection documents, including detailed information about the manufacturer and customer, order data, product specifications, mechanical test results, chemical analysis, and validation information. By providing a uniform structure for data related to steel product inspections, this Submodel enhances traceability, data interoperability, and compliance across the supply chain, ensuring added value and efficiency for both suppliers and customers.

1.3 Relevant standards for the Submodel template

- EN 10204:2004: "Metallic products – Types of inspection documents"
- EN 10168:2004: "Steel products – Inspection documents – List of information and description"

1.4 Use cases, requirements and design decisions

Use Case: Supplier to OEM Data Exchange

In this use case, the supplier manufactures semi-finished steel products such as tubes or coils. Then, the supplier creates a material certificate for the product, documenting essential test data and inspection results. This information is structured and stored using this Submodel template. Upon delivering the product to the OEM, the supplier also provides an Asset Administration Shell (AAS) Submodel (SM) containing the material test data.

The standardized format of the inspection data within the AAS Submodel ensures that the OEM can directly process the data, integrating it into their systems for quality control and production management. By utilizing the Submodel template, both the supplier and the OEM benefit from enhanced traceability and consistent product quality, ultimately reducing rejects and improving efficiency across the supply chain.
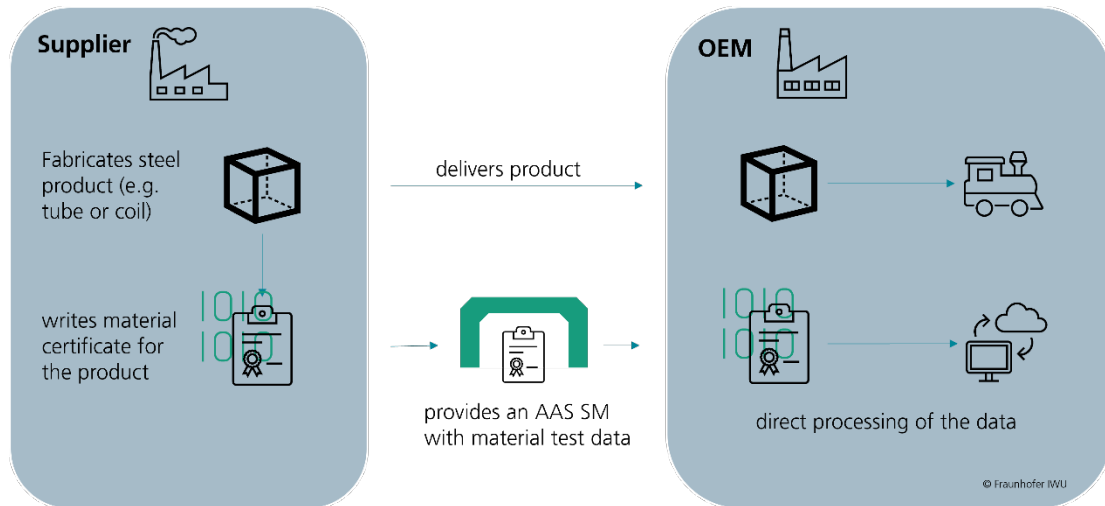
Figure 1: Use Case: Supplier provides data about the product through the AAS SM to the OEM

2 Submodel Inspection Documents

2.1 Approach
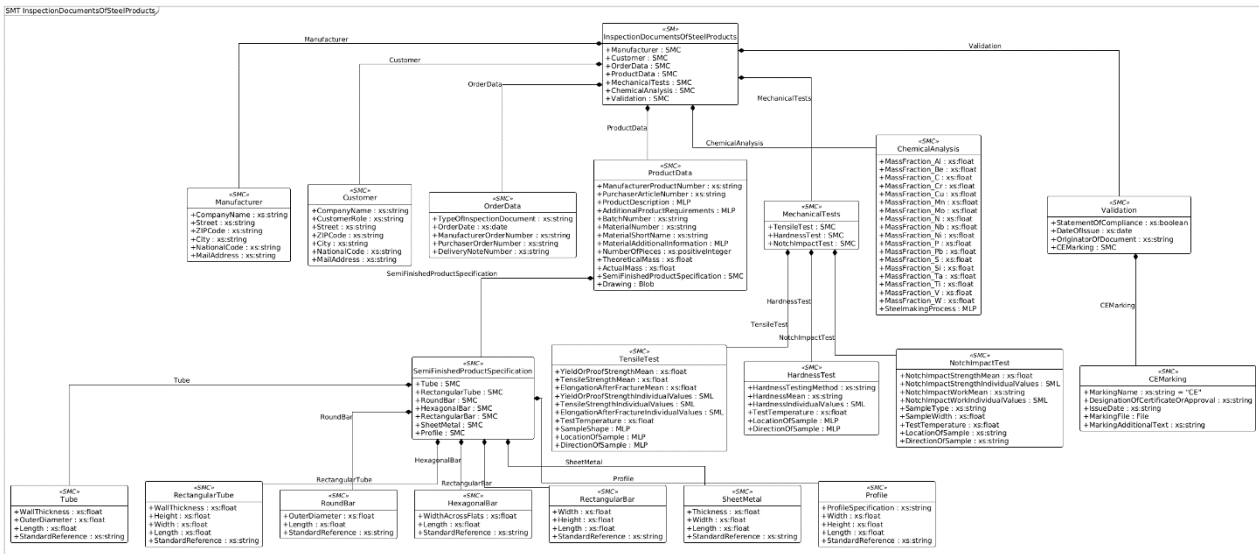
Figure 2: UML Diagram of the Submodel Template

The Submodel "Inspection Documents of Steel Products" contains different top-level SMCs for describing the "Manufacturer", the "Customer", the "OrderData" and the "ProductData". It also provides SMCs for the data of the "MechanicalTests" and "ChemicalAnalysis". Finally, there is a SMC for "Validation", verifying that the product meets the given requirements.

Below these SMCs are multiple types of properties related to the semi-finished product, different kinds of mechanical tests and inside "Validation" another SMC for the "CEMarking".

With these SMCs and their properties an extensive documentation of the products is possible.

2.2 Properties of the Submodel "Inspection Documents of Steel Products"

Table 1: Specification of Submodel "Inspection Documents of Steel Products"

idShort:	InspectionDocumentOfSteelProducts
	Note: the above idShort shall always be as stated.
Class:	Submodel (SM)
semanticId:	[IRI] https://admin-shell.io/idta/SubmodelTemplate/InspectionDocumentsOfSteelProducts/1/0
Parent:	Asset Administration Shell with asset, which is a 3rd party article (the steel product)
Explanation:	Contains all information related to inspection documents of steel products.

[SME type]	semanticId = [idType]value		[valueType]	card.
idShort	Description@en		example	

[SMC] Manufacturer	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/Manufacturer/1/0 The manufacturer is the producer of the product.	n/a	[1]
[SMC] Customer__00__	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/Customer/1/0 The customer is the purchaser of the product.	n/a	[1..*]
[SMC] OrderData	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/OrderData/1/0 OrderData contains relevant information of the order.	n/a	[1]
[SMC] ProductData	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/ProductData/1/0 ProductData contains relevant information of the ordered product.	n/a	[1]
[SMC] MechanicalTests	[IRDI] 0173-1#01-AKG420#020 Collection of results of mechanical tests.	n/a	[0..1]
[SMC] ChemicalAnalysis	[IRDI] 0173-1#01-AKG373#020 Collection of results of the chemical analysis.	n/a	[0..1]
[SMC] Validation	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/Validation/1/0 Validation contains data of the confirmation of compliance of the product.	n/a	[1]

2.3 Properties of the SMC "Manufacturer"

Table 2: Specification of SMC "Manufacturer"

idShort:	Manufacturer		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/Manufacturer/1/0		
Parent:	Submodel "InspectionDocumentsOfSteelProducts"		
Explanation:	Collection of Manufacturer contact information See Submodel "Digital Nameplate for industrial equipment" for reference		
[SME type]	semanticId = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] CompanyName	[IRDI] 0173-1#02-AAO677#003 The name of the manufacturer company.	[String] ABC Company	[1]

[Property]	[IRDI] 0173-1#07-ABL858#002	[String]	[1]
Street	The street of the manufacturer's address.	Example Street 1	
[Property]	[IRDI] 0173-1#07-ABL861#002	[String]	[1]
ZIPCode	The ZIP Code of the manufacturer's address.	12345	
[Property]	[IRDI] 0173-1#07-ABL860#002	[String]	[1]
City	The city the manufacturer is located in.	Example City	
[Property]	[IRDI] 0173-1#07-ABL863#002	[String]	[1]
NationalCode	The national code of the country the manufacturer is located in.	DE	
[Property]	[IRDI] 0173-1#07-ABA042#003	[String]	[0..*]
MailAddress__00__	The email address(es) of the manufacturer.	email@abccompany.com	

2.4 Properties of the SMC "Customer"

Table 3: Specification of SMC "Customer"

idShort:	Customer
Class:	SubmodelElementCollection (SMC)
semanticId:	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/Customer/1/0
Parent:	Submodel "InspectionDocumentsOfSteelProducts"
Explanation:	Collection of Customer contact information and specification of the customer's role See Submodel "Digital Nameplate for industrial equipment" for reference

[SME type]	semanticId = [idType]value	[valueType]	card.
idShort	**Description@en**	**Example**	
[Property]	[IRDI] 0173-1#02-AAO677#003	[String]	[1]
CompanyName	The name of the customer company.	DEF Company	
[Property]	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/CustomerRole/1/0	[String]	[0..*]
CustomerRole		Purchaser, ConsigneeOfCertificate	
	Describes the role of the customer listed in the "Customer" SMC.		
	Allowed Values:		
	Purchaser, Consignee, ConsigneeOfCertificate		
[Property]	[IRDI] 0173-1#07-ABL858#002	[String]	[1]
Street	The street of the customer's address.	Example Street 2	
[Property]	[IRDI] 0173-1#07-ABL861#002	[String]	[1]
ZIPCode	The ZIP Code of the customer's address.	12345	
[Property]	[IRDI] 0173-1#07-ABL860#002	[String]	[1]

City	The city the customer is located in.	Example City	
[Property] NationalCode	[IRDI] 0173-1#07-ABL863#002 The national code of the country the customer is located in.	[String] DE	[1]
[Property] MailAddress__0 0__	[IRDI] 0173-1#07-ABA042#003 The email address(es) of the customer.	[String] email@defcompany.com	[0..*]

2.5 Properties of the SMC "OrderData"

Table 4: Specification of SMC "OrderData"

idShort:	OrderData		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/OrderData/1/0		
Parent:	Submodel "InspectionDocumentsOfSteelProducts"		
Explanation:	Collection of order related data and defines the kind of inspection document		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] TypeOfInspectionDocument	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/KindOfInspectionDocument/1/0 supplemental sematic id:[IRDI] 0173-1#02-AAZ530#003 The TypeOfInspectionDocument property specifies, whether the products meet the requirements based on specific or unspecific tests, in accordance with EN 10204.	[String] 3.1	[1]
[Property] OrderDate	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/OrderDate/1/0 An OrderDate refers to the specific date on which the order was placed.	[Date] 2024-01-01	[1]
[Property] ManufacturerOrderNumber	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/ManufacturerOrderNumber/1/0 ManufacturerOrderNumber is the identifier of the order determined by the manufacturer who receives the order.	[String] 987654321XYZ	[0..1]
[Property] PurchaserOrderNumber	[IRDI] 0173-1#02-ABF517#002 PurchaserOrderNumber is the identifier of the order determined by the purchaser/customer who places an order.	[String] 123456789XYZ	[0..1]
[Property] DeliveryNoteNumber	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/DeliveryNoteNumber/1/0 A DeliveryNoteNumber is a unique identifier assigned to a specific delivery note, which is a document accompanying a shipment of goods.	[String] A1B2C3D4	[0..1]

2.6 Properties of the SMC "ProductData"

Table 5: Specification of SMC "ProductData"

idShort:	ProductData
Class:	SubmodelElementCollection (SMC)
semanticId:	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/ProductData/1/0
Parent:	Submodel "InspectionDocumentsOfSteelProducts"
Explanation:	Collection of product related data

[SME type]	semanticId = [idType]value	[valueType]	card.
idShort	**Description@en**	**example**	
[Property] ManufacturerProductNumber	[IRDI] 0173-1#02-AAO689#002 The ManufacturerProductnumber is the identifier of the product determined by the manufacturer.	[String] AABBCC	[0..1]
[Property] CustomerProductNumber	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/CustomerProductNumber/1/0 The CustomerProductNumber is the identifier of the product determined by the customer.	[String] 112233	[0..1]
[MLP] ProductDescription	[IRDI] 0173-1#02-AAU734#002 Description of the product in human-readable form.	[langString] "Round Bar 24x600 S235"@en	[0..1]
[MLP] AdditionalProductRequirements	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/AdditionalProductRequirements/1/0 The AdditionalProductRequirements contain additional information about the product, which are not included in the ProductDescription property.	[langString] "Polierte Oberfläche"@de	[0..1]
[Property] BatchNumber	[IRDI] 0173-1#02-AAQ196#002 The identifier of the production batch.	[String] 55552222	[0..1]
[Property] MaterialNumber	[IRDI] 0173-1#02-AAZ538#003 The material number according to EN 10027-2.	[String] 1.0144	[0..1]
[Property] MaterialShortName	[IRDI] 0173-1#02-AAZ536#003 The material short name according to EN 10025.	[String] S275J2+N	[0..1]
[MLP] MaterialAdditionalInformation	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/MaterialAdditionalInformation/1/0 The MaterialAdditionalInformation provides supplementary details about the material, adding to the material's short name code symbols.	[langString] "% Mn < 0,05%"@de	[0..1]

[Property] NumberOfPieces	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/NumberOfPieces/1/0 Refers to the ordered amount of pieces of the product.	[PositiveInteger] 10	[0..1]
[Property] TheoreticalMass	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/TheoreticalMass/1/0 The TheoreticalMass typically denotes the calculated or predicted mass of a steel product based on theoretical models, formulas or equations. Unit: kg	[Float] 100.0	[0..1]
[Property] ActualMass	[IRDI] 0173-1#02-AAZ533#002 The weighed mass of the product. Unit: kg	[Float] 98.8	[0..1]
[SMC] SemiFinishedProductSpecification	[IRDI] 0173-1#01-AGO030#002 Collection of different types of semi-finished products.	n/a	[0..1]
[Blob] Drawing__00__	[IRDI] 0173-1#02-AAQ318#002 The technical drawing of the product in PDF format.	n/a	[0..*]

2.7 Properties of the SMC "SemiFinishedProductSpecification"

Table 6: Specification of SMC "SemiFinishedProductSpecification"

idShort:	SemiFinishedProductSpecification		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRDI] 0173-1#01-AGO030#002		
Parent:	SMC "ProductData"		
Explanation:	Collection of different types of semi-finished products. Only one of the specified SMCs may be used for the product, the others should be deleted for reasons of clarity		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[SMC] Tube	[IRDI] 0173-1#01-AGU746#002 Collection of Properties for describing the tube semi-finished product.	n/a	[0..1]
[SMC] RectangularTube	[IRDI] 0173-1#01-AGV504#005 Collection of Properties for describing the rectangular tube semi-finished product.	n/a	[0..1]
[SMC] RoundBar	[IRDI] 0173-1#01-AGV490#005 Collection of Properties for describing the round bar semi-finished product.	n/a	[0..1]

[SMC] HexagonalBar	[IRDI] 0173-1#01-AGV493#005 Collection of Properties for describing the hexagonal bar semi-finished product.	n/a	[0..1]
[SMC] RectangularBar	[IRDI] 0173-1#01-AGV492#005 Collection of Properties for describing the rectangular bar semi-finished product.	n/a	[0..1]
[SMC] SheetMetal	[IRDI] 0173-1#01-AGU743#002 Collection of Properties for describing the sheet metal semi-finished product.	n/a	[0..1]
[SMC] Profile	[IRDI] 0173-1#01-AGU744#002 Collection of Properties for describing a profile semi-finished product.	n/a	[0..1]

2.8 Properties of the SMC "Tube"

Table 7: Specification of SMC "Tube"

idShort:	Tube		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRDI] 0173-1#01-AGU746#002		
Parent:	SMC "SemiFinishedProductSpecification"		
Explanation:	Collection of Properties for describing the tube semi-finished product.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] WallThickness	[IRDI] 0173-1#02-BAG269#006 The wall thickness of the tube. Unit: mm	[Float] 2.5	[1]
[Property] OuterDiameter	[IRDI] 0173-1#02-ABG720#002 The outer diameter of the tube. Unit: mm	[Float] 25.0	[1]
[Property] Length	[IRDI] 0173-1#02-BAA018#008 The length of the tube. Unit: mm	[Float] 753.5	[1]
[Property] StandardReference	[IRDI] 0173-1#02-AAZ523#004 The standard in which the semi-finished product is specified.	[String] EN 10216-5	[0..*]

2.9 Properties of the SMC "RectangularTube"

Table 8: Specification of SMC "RectangularTube"

dShort:	RectangularTube

Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRDI] 0173-1#01-AGV504#005		
Parent:	SMC "SemiFinishedProductSpecification"		
Explanation:	Collection of Properties for describing the rectangular tube semi-finished product.		
[SME type]	semanticId = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] WallThickness	[IRDI] 0173-1#02-BAG269#006 The wall thickness of the tube. Unit: mm	[Float] 2.5	[1]
[Property] Height	[IRDI] 0173-1#02-BAA020#011 The height of the rectangular tube. Unit: mm	[Float] 25.0	[1]
[Property] Width	[IRDI] 0173-1#02-BAF016#007 The width of the rectangular tube. Unit: mm	[Float] 25.0	[1]
[Property] Length	[IRDI] 0173-1#02-BAA018#008 The length of the rectangular tube. Unit: mm	[Float] 753.5	[1]
[Property] StandardReference	[IRDI] 0173-1#02-AAZ523#004 The standard in which the semi-finished product is specified.	[String] DIN EN 10305-5	[0..*]

2.10   Properties of the SMC "RoundBar"

Table 9: Specification of SMC "RoundBar"

idShort:	RoundBar		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRDI] 0173-1#01-AGV490#005		
Parent:	SMC "SemiFinishedProductSpecification"		
Explanation:	Collection of Properties for describing the round bar semi-finished product.		
[SME type]	semanticId = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] OuterDiameter	[IRDI] 0173-1#02-ABG720#002 The outer diameter of the round bar. Unit: mm	[Float] 25.0	[1]
[Property]	[IRDI] 0173-1#02-BAA018#008	753.5	[1]

Length	The length of the round bar. Unit: mm		
[Property] StandardRefere nce	[IRDI] 0173-1#02-AAZ523#004 The standard in which the semi-finished product is specified.	[String] DIN EN 10272	[0..*]

2.11   Properties of the SMC "HexagonalBar"

Table 10: Specification of SMC "HexagonalBar"

idShort:	HexagonalBar		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRDI] 0173-1#01-AGV493#005		
Parent:	SMC "SemiFinishedProductSpecification"		
Explanation:	Collection of Properties for describing the hexagonal bar semi-finished product.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] WidthAcrossFlat s	[IRDI] 0173-1#02-AAA103#008 The width across flats (key width) of the hexagonal bar. Unit: mm	[Float] 10.0	[1]
[Property] Length	[IRDI] 0173-1#02-BAA018#008 The length of the hexagonal bar. Unit: mm	[Float] 753.5	[1]
[Property] StandardRefere nce	[IRDI] 0173-1#02-AAZ523#004 The standard in which the semi-finished product is specified.	[String] EN 10278	[0..*]

2.12   Properties of the SMC "RectangularBar"

Table 11: Specification of SMC "RectangularBar"

idShort:	RectangularBar		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRDI] 0173-1#01-AGV492#005		
Parent:	SMC "SemiFinishedProductSpecification"		
Explanation:	Collection of Properties for describing the rectangular bar semi-finished product.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property]	[IRDI] 0173-1#02-BAA020#011	[Float]	[1]

Height	The height of the rectangular bar. Unit: mm	25.0	
[Property] Width	[IRDI] 0173-1#02-BAF016#007 The width of the rectangular bar. Unit: mm	[Float] 25.0	[1]
[Property] Length	[IRDI] 0173-1#02-BAA018#008 The length of the rectangular bar. Unit: mm	753.5	[1]
[Property] StandardReference	[IRDI] 0173-1#02-AAZ523#004 The standard in which the semi-finished product is specified.	[String] EN 10058	[0..*]

2.13   Properties of the SMC "SheetMetal"

Table 12: Specification of SMC "SheetMetal"

idShort:	SheetMetal
Class:	SubmodelElementCollection (SMC)
semanticId:	[IRDI] 0173-1#01-AGU743#002
Parent:	SMC "SemiFinishedProductSpecification"
Explanation:	Collection of Properties for describing the sheet metal semi-finished product.

[SME type]	semanticId = [idType]value	[valueType]	card.
idShort	**Description@en**	**example**	
[Property] Thickness	[IRDI] 0173-1#02-AAV127#003 The thickness of the sheet metal. Unit: mm	[Float] 0.3	[1]
[Property] Width	[IRDI] 0173-1#02-BAF016#007 The width of the sheet metal Unit: mm	[Float] 400.0	[1]
[Property] Length	[IRDI] 0173-1#02-BAA018#008 The length of the sheet metal. In case of a coil, it is the length of the unrolled sheet. Unit: mm	[Float] 30000.0	[1]
[Property] StandardReference	[IRDI] 0173-1#02-AAZ523#004 The standard in which the semi-finished product is specified.	[String] EN 10051	[0..*]

2.14 Properties of the SMC "Profile"

Table 13: Specification of SMC "Profile"

idShort:	Profile		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRDI] 0173-1#01-AGU744#002		
Parent:	SMC "SemiFinishedProductSpecification"		
Explanation:	Collection of Properties for describing a profile semi-finished product.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] ProfileSpecificati on	[IRDI] 0173-1#02-AAZ528#005 Designation of the profile, e.g. HEM 300, UNP 240, IPE 100	[String] HEM 300	[1]
[Property] Height	[IRDI] 0173-1#02-BAA020#011 The height of the profile. Unit: mm	[Float] 340.0	[1]
[Property] Width	[IRDI] 0173-1#02-BAF016#007 The width of the profile. Unit: mm	[Float] 310.0	[1]
[Property] Length	[IRDI] 0173-1#02-BAA018#008 The length of the profile. Unit: mm	[Float] 753.5	[1]
[Property] StandardReference	[IRDI] 0173-1#02-AAZ523#004 The standard in which the semi-finished product is specified.	[String] DIN 1025-4	[0..*]

2.15 Properties of the SMC "MechanicalTests"

Table 14: Specification of SMC "MechanicalTests"

idShort:	MechanicalTests		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRDI] 0173-1#01-AKG420#020		
Parent:	Submodel "InspectionDocumentsOfSteelProducts"		
Explanation:	Collection of results of mechanical tests.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	

[SMC] TensileTest__00__	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/TensileTest/1/0 The SMC TensileTest refers to a mechanical test commonly performed to assess the strength and ductility of a steel product, in which the steel product is subjected to a controlled pulling force until breakage.	n/a	[0..*]
[SMC] HardnessTest__00__	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/HardnessTest/1/0 The SMC HardnessTest describes a type of mechanical test performed to evaluate the resistance of a steel product to indentation or penetration by another object.	n/a	[0..*]
[SMC] NotchImpactTest__00__	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/NotchImpactTest/1/0 The SMC NotchImpactTest describes a mechanical test used to assess the toughness and impact resistance of a steel product.	n/a	[0..*]

2.16 Properties of the SMC "TensileTest"

Table 15: Specification of SMC "TensileTest"

idShort:	TensileTest		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/TensileTest/1/0		
Parent:	SMC "MechanicalTests"		
Explanation:	Collection of results of tensile tests		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] YieldOrProofStrengthMean	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/YieldOrProofStrengthMean/1/0 The property YieldOrProofStrengthMean refers to the average yield of proof strength of a steel product, which describes the stress at which a steel product begins to deform plastically. Unit: MPa | N/mm²	[Float] 275.0	[0..1]
[Property] TensileStrengthMean	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/TensileStrengthMean/1/0 The property TensileStrengthMean refers to the average value of the tensile strength of a steel product, which describes the stress a material can withstand while being stretched or pulled before breaking. Unit: MPa | N/mm²	[Float] 430.0	[0..1]

[Property] ElongationAfterFractureMean	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/ElongationAfterFractureMean/1/0 The property ElongationAfterFractureMean refers to the average percentage of elongation or strain a steel product undergoes until the point of fracture during a tensile test. Unit: %	[Float] 24.0	[0..1]
[SML] YieldOrProofStrengthIndividualValues	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/YieldOrProofStrengthInidivualValues/1/0 The properties of YieldOrProofStrengthIndividualValues refer to the specific measured values of yield strength or proof strength obtained from individual tests conducted on a steel product. Unit: MPa | N/mm²	[Float] 275.0	[0..1]
[SML] TensileStrengthIndividualValues	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/TensileStrengthIndividualValues/1/0 The properties of TensileStrengthIndividualValues refer to the specific measured values of tensile strength obtained from individual tests conducted on a steel product. Unit: MPa | N/mm²	[Float] 430.0	[0..1]
[SML] ElongationAfterFractureIndividualValues	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/ElongationAfterFractureIndividualValues/1/0 The properties of ElongationAfterFractureIndividualValues refer to the specific measured values of elongation or strain observed in individual samples until the point of breakage during a tensile test. Unit: %	[Float] 24.0	[0..1]
[Property] TestTemperature	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/TestTemperature/1/0 The property TestTemperature refers to the specific temperature at which a test or experiment is conducted. Unit: °C	[Float] 20.8	[0..1]
[MLP] SampleShape	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/SampleShape/1/0 The property SampleShape refers to the physical form or geometry of a steel product used for testing, analysis, or experimentation.	[langString] "DIN 50125 Form B"@de	[0..1]
[MLP] LocationOfSample__00__	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/LocationOfSample/1/0 The property LocationOfSample specifies the location for the sample collection.	[langString] "central"@en	[0..*]

[MLP] DirectionOfSample__00__	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/DirectionOfSample/1/0 The property DirectionOfSample refers to the orientation or specific alignment of a sample taken from a steel product.	[langString] "longitudinal to rolling direction"@en	[0..*]

2.17 Properties of the SMC "HardnessTest"

Table 16: Specification of SMC "HardnessTest"

idShort:	HardnessTest
Class:	SubmodelElementCollection (SMC)
semanticId:	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/HardnessTest/1/0
Parent:	SMC "MechanicalTests"
Explanation:	Collection of results of hardness tests

[SME type]	semanticId = [idType]value	[valueType]	card.
idShort	**Description@en**	**example**	
[Property] HardnessTestingMethod	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/HardnessTestingMethod/1/0 The property HardnessTestingMethod refers to the specific technique or procedure used to assess the hardness of a steel product.	[String] Vickers	[0..1]
[Property] HardnessMean	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/HardnessMean/1/0 The property HardnessMean refers to the average hardness value obtained from multiple measurements or tests conducted. It must be specified according to the standard of the hardness testing method.	[String] 610 HV 10/30	[0..1]
[SML] HardnessIndividualValues	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/HardnessIndividualValues/1/0 The properties of HardnessIndividualValues refer to the specific measured hardness values obtained from individual tests conducted. It must be specified according to the standar of the hardness testing method	[String] 610 HV 10/30	[0..1]
[Property] TestTemperature	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/TestTemperature/1/0 The property TestTemperature refers to the specific temperature at which a test or experiment is conducted. Unit: °C	[Float] 20.8	[0..1]
[MLP] LocationOfSample__00__	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/LocationOfSample/1/0	[langString] "center of the bar's front face"@en	[0..*]

	The property LocationOfSample specifies the location for the sample collection.		
[MLP] DirectionOfSample__00__	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/DirectionOfSample/1/0 The property DirectionOfSample refers to the orientation or specific alignment of a sample taken from a steel product.	[langString] "axial to bar"@en	[0..*]

2.18 Properties of the SMC "NotchImpactTest"

Table 17: Specification of SMC "NotchImpactTest"

idShort:	NotchImpactTest		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/NotchImpactTest/1/0		
Parent:	SMC "MechanicalTests"		
Explanation:	Collection of results of notch impact tests		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] NotchImpactStrengthMean	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/NotchImpactStrengthMean/1/0 The property NotchImpactStrengthMean refers to the average value of the notch impact strength obtained from multiple tests conducted on samples using a notch impact test. This value is the total energy required per unit cross-sectional area. Unit: J/cm²	[Float] 18.0	[0..1]
[SML] NotchImpactStrengthIndividualValues	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/NotchImpactStrengthIndividualValues/1/0 The properties of NotchImpactStrengthIndividualValues refer to the specific measured values of notch impact strength obtained from individual tests conducted on samples using a notch impact test. This value is the total energy required per unit cross-sectional area. Unit: J/cm²	[Float] 18.0	[0..1]
[Property] NotchImpactWorkMean	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/NotchImpactWorkMean/1/0 The property NotchImpactWorkMean refers to the average value of the notch impact work obtained from multiple tests conducted on samples using a notch impact test. This value is the total energy required. Unit: J	[Float] 57.0	[0..1]

[SML] NotchImpactWorkIndividualValues	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/NotchImpactWorkIndividualValues/1/0 The properties of NotchImpactWorkIndividualValues refer to the specific measured values of notch impact work obtained from individual tests conducted on samples using a notch impact test. This value is the total energy required. Unit: J	[Float] 57.0	[0..1]
[Property] SampleType	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/SampleType/1/0 Describes the specific notch impact test specimen type. Typical notches are "V" and "U".	[String] V	[0..1]
[Property] SampleWidth	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/SampleWidth/1/0 The property SampleWidth refers to the width dimension of a sample. Only required if regular sample is not possible. Unit: mm	[Float] 7.5	[0..1]
[Property] TestTemperature	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/TestTemperature/1/0 The property TestTemperature refers to the specific temperature at which a test or experiment is conducted. Unit: °C	[Float] -20.0	[0..1]
[Property] LocationOfSample__00__	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/LocationOfSample/1/0 The property LocationOfSample specifies the location for the sample collection.	[String] "central"@en	[0..*]
[Property] DirectionOfSample__00__	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/DirectionOfSample/1/0 The property DirectionOfSample refers to the orientation or specific alignment of a sample taken from a steel product.	"axial"@en	[0..*]

2.19 Properties of the SMC "ChemicalAnalysis"

Table 18: Specification of SMC "ChemicalAnalysis"

idShort:	ChemicalAnalysis		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRDI] 0173-1#01-AKG373#020		
Parent:	Submodel "InspectionDocumentsOfSteelProducts"		
Explanation:	Collection of results of the chemical analysis.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**

idShort	Description@en	Example	
[MLP] SteelProduction Process	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/SteelProductionProcess/1/0 The property SteelProductionProcess refers to the metallurgic process, e.g. the basic oxygen process or the electric furnace process.	[langString] "Linz-Donawitz-Verfahren"@de"	[0..1]
[Property] MassFraction_XY	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/MassFraction_XY/1/0 Mass fraction of XY in the alloy, measured during chemical analysis. Unit: % **Replace XY with the respective element symbol from the periodic table: Al, Be, C, Cr, Cu, Mn, Mo, N, Nb, Ni, P, Pb, S, Si, Ta, Ti, V, W**	[Float] 12.8	[0..1]

2.20 Properties of the SMC "Validation"

Table 19: Specification of SMC "Validation"

idShort:	Validation
Class:	SubmodelElementCollection (SMC)
semanticId:	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/Validation/1/0
Parent:	Submodel "InspectionDocumentsOfSteelProducts"
Explanation:	Validation contains data of the confirmation of compliance of the product.

[SME type]	semanticId = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] StatementOfCompliance	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/StatementOfCompliance/1/0 The property StatementOfCompliance refers to a formal declaration confirming that a steel product complies with specified requirements, regulations, standards, or contractual obligations.	[Boolean] True	[1]
[Property] DateOfIssue	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/DateOfIssue/1/0 The property DateOfIssue refers to the specific date when an inspection document is officially approved as meeting the defined specifications or standards.	[Date] 2024-01-01	[1]
[Property] OriginatorOfStatement	[IRI] https://admin-shell.io/idta/InspectionDocumentsOfSteelProducts/OriginatorOfStatement/1/0	[String] John Doe	[1]

	The property OriginatorOfStatement refers to the individual, entity, or source responsible for making the StatementOfCompliance.		
[SMC] CEMarking	[IRDI] 0173-1#01-AHD206#001 Contains information about the CE marking of the product.	n/a	[0..*]

2.21 Properties of the SMC "CEMarking"

Table 20: Specification of SMC "CEMarking"

idShort:	CEMarking
Class:	SubmodelElementCollection (SMC)
semanticId:	[IRDI] 0173-1#01-AHD206#001
Parent:	SMC "Validation"
Explanation:	Contains information about the CE marking of the product. See Submodel "Digital Nameplate for industrial equipment" for reference

[SME type]	semanticId = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] MarkingName	[IRI] https://admin-shell.io/zvei/nameplate/2/0/Nameplate/Markings/Marking/MarkingName	[String] CE	[1]
[Property] DesignationOfCertificateOrApproval	[IRDI] 0112/2///61987#ABH783#001 alphanumeric character sequence identifying a certificate or approval. Note: Approval identifier, reference to the certificate number, to be entered without spaces	[String] KEMA99IECE X1105/128	[0..1]
[Property] IssueDate	[IRI] https://admin-shell.io/zvei/nameplate/2/0/ Nameplate/Markings/Marking/IssueDate Date, at which the specified certificate is issued Note: format by lexical representation: CCYY-MM-DD Note: to be specified to the day	[Date] 2024-01-01	[0..1]
[File] MarkingFile	[IRI] https://admin-shell.io/zvei/nameplate/2/0/ Nameplate/Markings/Marking/MarkingFile conformity symbol of the marking	n/a	[1]
[Property] MarkingAdditionalText__00__	[IRI] https://admin-shell.io/zvei/nameplate/2/0/ Nameplate/Markings/Marking/MarkingAdditionalText where applicable, additional information on the marking in plain text, e.g. the ID-number of the notified body involved in the conformity process	[String] 0044	[0..*]

Annex A. Explanations on used table formats

1. General

The used tables in this document try to outline information as concise as possible. They do not convey all information on Submodels and SubmodelElements. For this purpose, the definitive definitions are given by a separate file in form of an AASX file of the Submodel template and its elements.

2. Tables on Submodels and SubmodelElements

For clarity and brevity, a set of rules is used for the tables for describing Submodels and SubmodelElements.

- The tables follow in principle the same conventions as in [5].

- The table heads abbreviate 'cardinality' with 'card'.

- The tables often place two informations in different rows of the same table cell. In this case, the first information is marked out by sharp brackets [] form the second information. A special case are the semanticIds, which are marked out by the format: (type)(local)[idType]value.

- The types of SubmodelElements are abbreviated:

SME type	SubmodelElement type
Property	Property
MLP	MultiLanguageProperty
Range	Range
File	File
Blob	Blob
Ref	ReferenceElement
Rel	RelationshipElement
SMC	SubmodelElementCollection
SML	SubmodelElementList

- If an idShort ends with '__00__', this indicates a suffix of the respective length (here: 2) of decimal digits, in order to make the idShort unique. A different idShort might be choosen, as long as it is unique in the parent's context.
- The Keys of semanticId in the main section feature only idType and value, such as: [IRI]https://admin-shell.io/vdi/2770/1/0/DocumentId/Id. The attributes "type" and "local" (typically "ConceptDescription" and "(local)" or "GlobalReference" and (no-local)") need to be set accordingly; see [6].
- If a table does not contain a column with "parent" heading, all represented attributes share the same parent. This parent is denoted in the head of the table.
- Multi-language strings are represented by the text value, followed by '@'-character and the ISO 639 language code: example@EN.
- The [valueType] is only given for Properties.

Bibliography

[1]   "Recommendations for implementing the strategic initiative INDUSTRIE 4.0", acatech, April 2013. [Online]. Available https://www.acatech.de/publikation/umsetzungsempfehlungen-fuer-das-zukunftsprojekt-industrie-4-0-abschlussbericht-des-arbeitskreises-industrie-4-0/

[2]   "Implementation Strategy Industrie 4.0: Report on the results of the Industrie 4.0 Platform"; BITKOM e.V. / VDMA e.V., /ZVEI e.V., April 2015. [Online]. Available: https://www.bitkom.org/Bitkom/Publikationen/Implementation-Strategy-Industrie-40-Report-on-the-results-of-the-Industrie-40-Platform.html

[3]   "The Structure of the Administration Shell: TRILATERAL PERSPECTIVES from France, Italy and Germany", March 2018, [Online]. Available: https://www.plattform-i40.de/I40/Redaktion/EN/Downloads/Publikation/hm-2018-trilaterale-coop.html

[4]   "Examples of the Asset Administration Shell for Industrie 4.0 Components – Basic Part"; ZVEI e.V., Whitepaper, April 2017. [Online]. Available: ZVEI_WP_Verwaltungschale_Englisch_21.03.17.indd

[5]   "Verwaltungsschale in der Praxis. Wie definiere ich Teilmodelle, beispielhafte Teilmodelle und Interaktion zwischen Verwaltungsschalen (in German)", Version 1.0, April 2019, Plattform Industrie 4.0 in Kooperation mit VDE GMA Fachausschuss 7.20, Federal Ministry for Economic Affairs and Energy (BMWi), Available: https://www.plattform-i40.de/PI40/Redaktion/DE/Downloads/Publikation/2019-verwaltungsschale-in-der-praxis.html

[6]   "Specification of the Asset Administration Shell Part 1: Metamodel (V3.0.1)", Juni 2024, [Online]. Available:Asset Administration Shell Specification - Part 1: Metamodel

[7]   "Semantic IDTAbility: challenges in the digital transformation age"; IEC, International Electronical Commission; 2019. [Online]. Available: https://www.iec.ch/basecamp/semantic-interoperability-challenges-digital-transformation-age

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