



Interopera

Digitale Interoperabilität in kollaborativen
Wertschöpfungsnetzwerken der Industrie 4.0

SPECIFICATION

Submodel Computing Platform Resources

1.0

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Submodel Template of the
Asset Administration Shell

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Foreword

In the ever-evolving landscape of technology, computing platform resources have become the lifeblood of innovation, powering the digital world we inhabit. These resources serve as the foundational elements upon which our modern society is built, facilitating the seamless exchange of information, the execution of complex algorithms, and the realization of groundbreaking ideas. As our reliance on digital platforms grows, understanding the significance of computing platform resources is crucial to harnessing their full potential.

This foreword aims to underscore the vital role played by Computing Platform Resources in shaping the future of technology and its myriad applications. Whether it's in the realms of artificial intelligence, data analytics, cloud computing, or scientific research, computing platform resources form the backbone of computational capabilities. They empower researchers, developers, and innovators to push the boundaries of what is possible, enabling the creation of intelligent systems, immersive experiences, and transformative solutions.

In today's fast-paced world, where data-driven decision-making is paramount, the availability and optimization of computing platform resources are pivotal. Scalability, reliability, and efficiency are not just buzzwords; they represent the essence of modern computing infrastructure. From servers and storage systems to networking components and virtualization technologies, these resources enable organizations to deliver services, run applications, and process data with unparalleled speed and accuracy.

This foreword serves as a tribute to the visionaries, engineers, and technologists who work tirelessly to advance the field of Computing Platform Resources. It celebrates their ingenuity and dedication, which drive the continuous evolution of computing capabilities. By embracing the latest technologies and methodologies, we pave the way for a future where computing platform resources empower us to tackle complex challenges, drive innovation, and enhance the quality of life for people around the globe.

We invite readers to explore the world of Computing Platform Resources within the following pages, delving into the intricate details of these essential components. As we embark on this exploration, let us recognize the transformative potential they hold and the limitless possibilities they offer. Together, we can harness the power of Computing Platform Resources to shape a brighter, more connected future.

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 [1-3] 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 [1-6].

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 at interoperable provision of information describing Computing Platform Ressources in regard to the asset of the respective Asset Administration Shell. Central element is the provision of properties [7, ideally interoperable by the means of dictionaries such as ECLASS and IEC CDD (Common Data Dictionary). The purpose of this document is to make selected specifications of Submodels in such manner that information about assets can be exchanged in a meaningful way between partners in a value creation network.

The intended use-case is the provision of a standardized property structure for Computing Platform Ressources which enables a more efficient and interoperable data exchange and communication.

This concept can serve as a basis for standardizing the respective Submodel. The conception is based on existing norms, studies of common practices at enterprises, directives and standards so that a far-reaching acceptance can be achieved.

1.3 Relevant standards and sources of concepts for the Submodel template

According to [3], interoperable properties might be defined by standards, consortium specifications or manufacturer specifications.

So called property dictionaries are used identify information elements (see Terms and Definitions of [6]). Such property dictionaries include:

- ECLASS, see: <https://www.eclasscontent.com/>
- IEC CDD, see: <https://cdd.iec.ch/cdd/iec61987/iec61987.nsf> and <https://cdd.iec.ch/cdd/iec62683/cdddev.nsf>

In this document, properties are aimed to be described by ECLASS.

2 Information set for Submodel Contact Information

While defining Submodels the following three aspects must be considered as suggested in [5]:

Use and economic relevance

Hardware is a necessary success factor, especially when using software or in cloud computing. In future, the requirements and properties of hardware can be exchanged in a digital, machine-readable and standardized manner. This saves costs and time.

Property specification

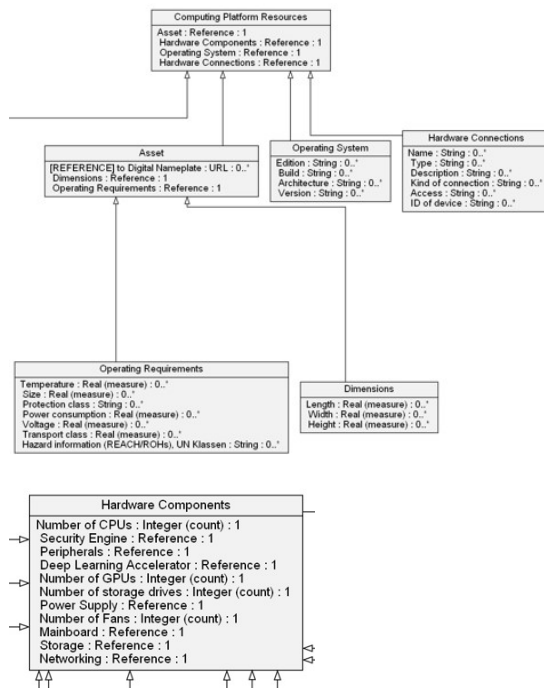
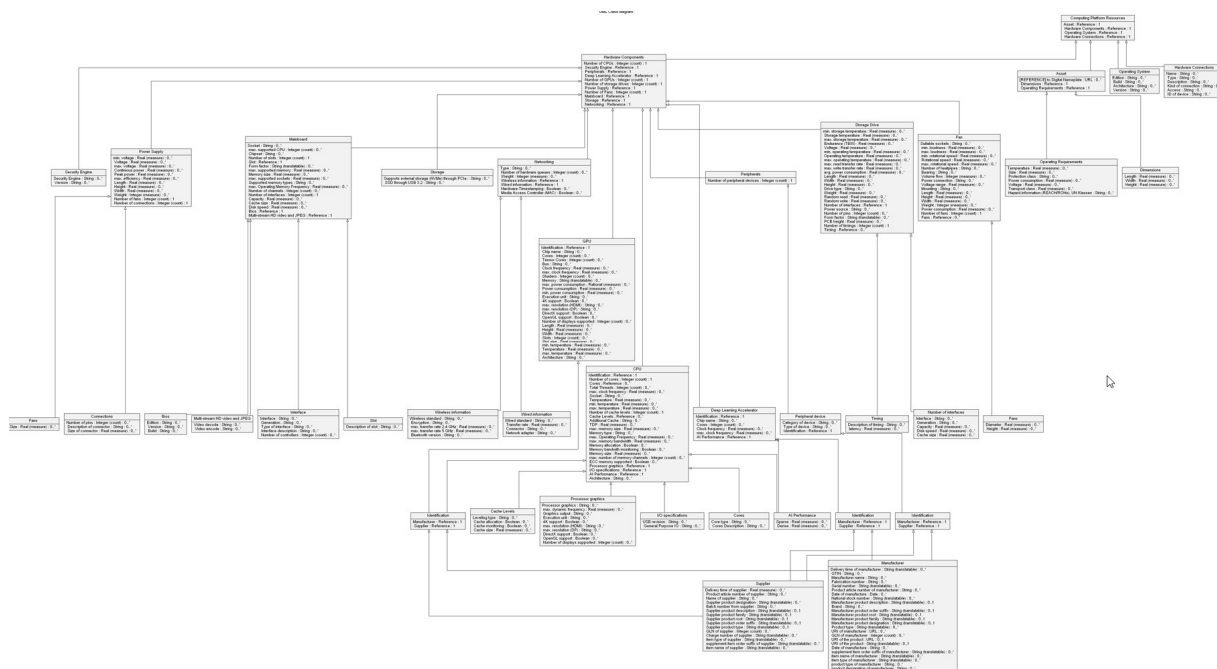
See section 3 Submodel and Collections.

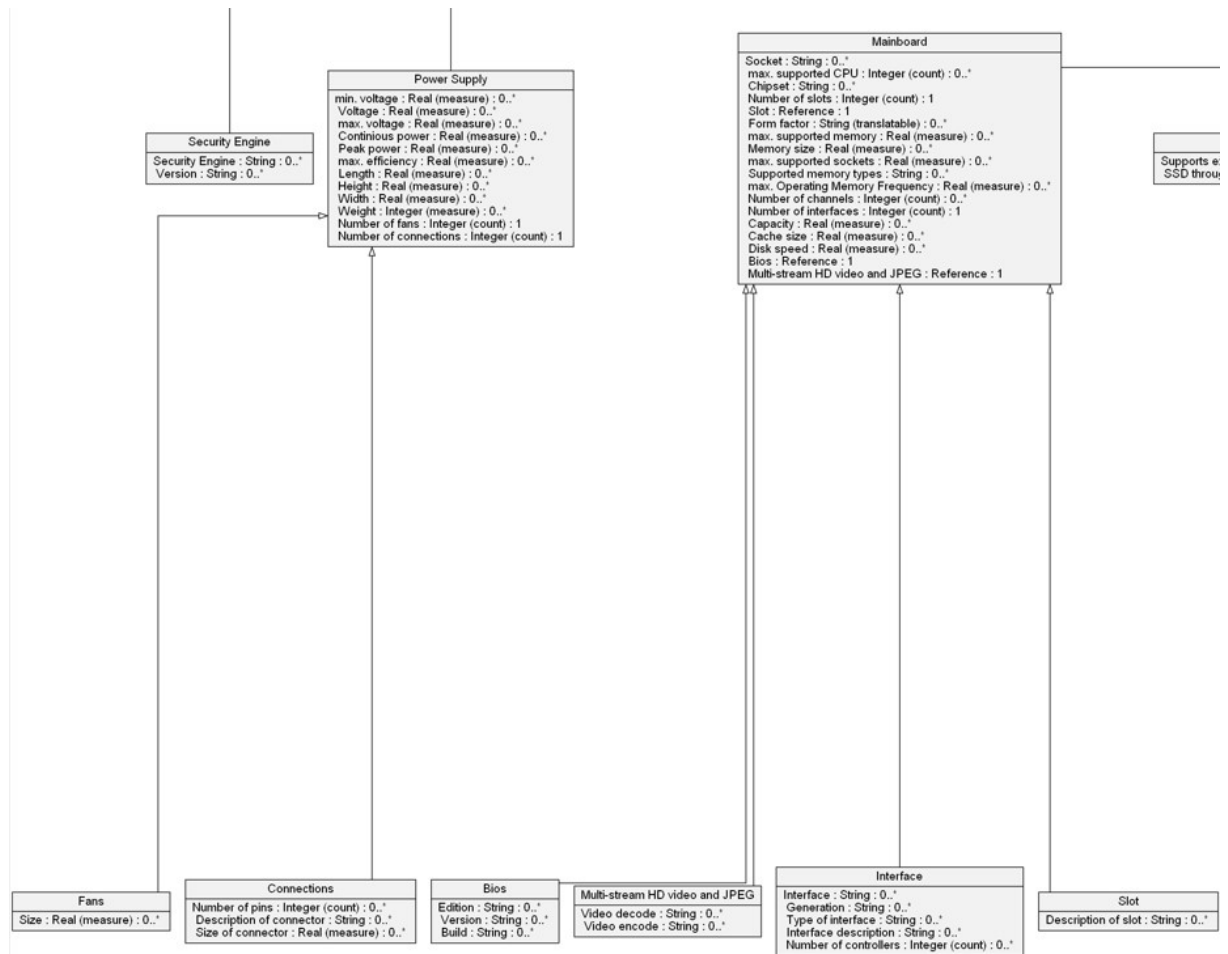
3 Submodel and Collections

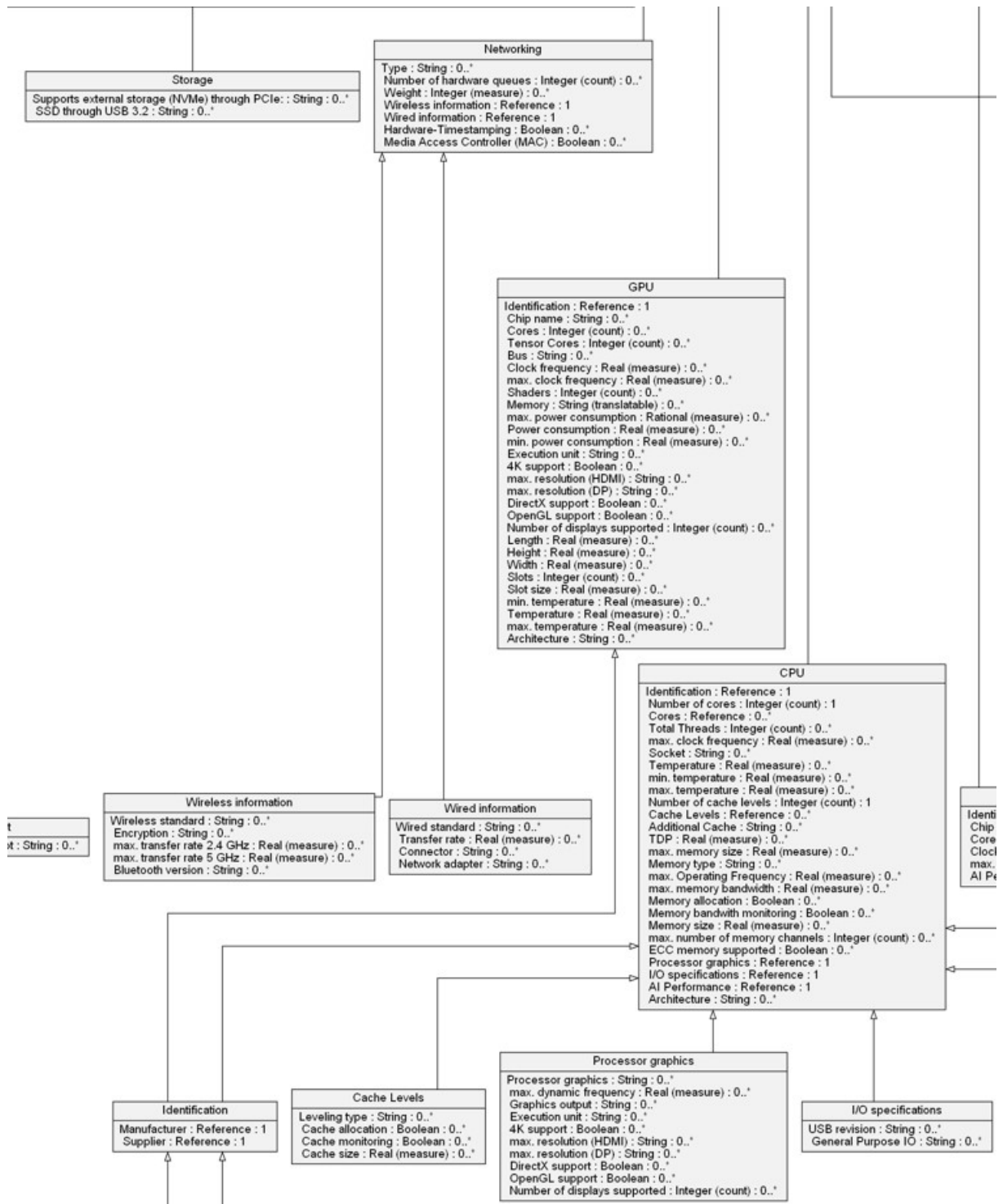
3.1 Properties of the Submodel “Computing Platform Resources”

The figure below shows the UML-diagram defining the relevant properties which need to be set. Table describes the details of the Submodel structure combined with examples.

Figure 1: UML-Diagram for Submodel "Computing Platform Resources"







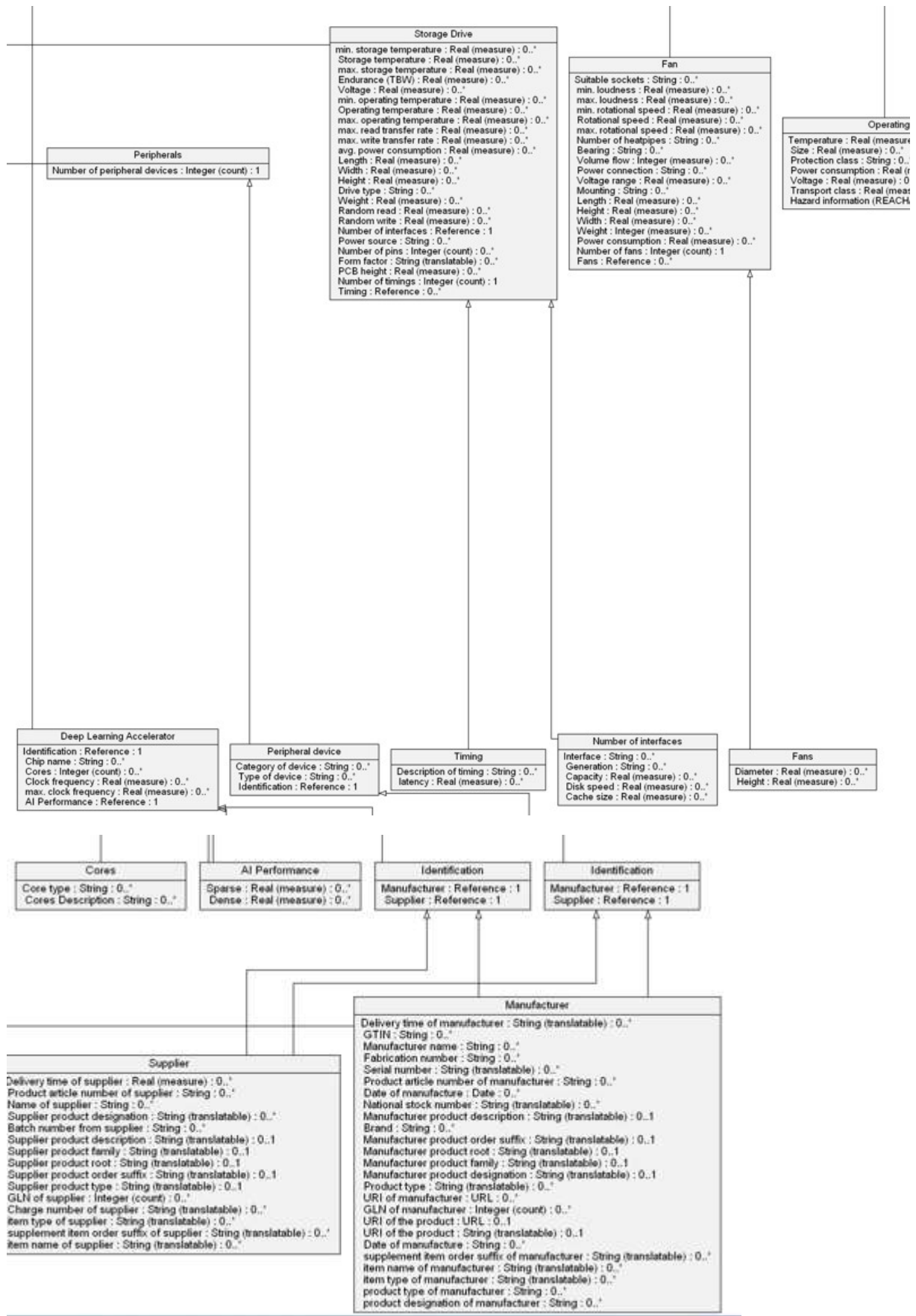


Table 1: Properties of Submodel "Computing Platform Resources"

idShort	Computing Platform Resources		
Class	Submodel		
semanticId	0173-EX-1#01-SIX643#001		
Explanation			
[SME type]	semanticId [idType]value	=	[valueType] card.
idShort	Description@en	Example	
[Property] Asset	[IRDI] 0173-EX-1#02- NKA186#001	[REFERENCE]	1
[Property] Hardware_Components	[IRDI] 0173-EX-1#02- WBE118#001	[REFERENCE]	1
[Property] Operating_System	[IRDI] 0173-EX-1#02- DFH265#001	[REFERENCE]	1
[Property] Hardware_Connections	[IRDI] 0173-EX-1#02- XWY697#001	[REFERENCE]	1

3.2 Properties of the SMC "Hardware Connections"

Figure 1 shows the UML-diagram defining the relevant properties which need to be set. The following table describes the details of the SMC structure combined with examples.

Table 2: Properties of SMC "Hardware Connections"

idShort	Hardware_Connections		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-XWY697#001		
isCaseOf			
AllowDuplic ates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	Example	
[Property] Name	[IRDI] 0173-EX-1#02- YMH872#001	[STRING]	0..*
[Property] Type	[IRDI] 0173-EX-1#02- KWH864#001	[STRING]	0..*
[Property] Description	[IRDI] 0173-EX-1#02- FRI900#001	[STRING]	0..*

[Property] Kind_of_connection	[IRDI] BRC429#001	0173-EX-1#02-	[STRING]	0..*
[Property] Access	[IRDI] BUT978#001	0173-EX-1#02-	[STRING]	0..*
[Property] ID_of_device	[IRDI] LHM003#001	0173-EX-1#02-	[STRING]	0..*
[Property] Name	[IRDI] YMH872#001	0173-EX-1#02-	[STRING]	0..*

3.3 Properties of the SMC “Operating System”

Table 3: Properties of SMC "Operating System"

idShort	<i>Operating_System</i>		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-DFH265#001		
isCaseOf			
AllowDupli cates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	Example	
[Property] Edition	[IRDI] HHX943#001	0173-EX-1#02-	[STRING] 0..*
[Property] Build	[IRDI] ZSP612#001	0173-EX-1#02-	[STRING] 0..*
[Property] Architecture	[IRDI] DQP281#001	0173-EX-1#02-	[STRING] 0..*
[Property] Version	[IRDI] 0173-1#02-AAP003#003 design that partly deviates from the previous		[STRING] 0..*

3.4 Properties of the SMC “Hardware Components”

Table 4: Properties of SMC "Hardware Components"

idShort	<i>Hardware_Components</i>		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-WBE118#001		
isCaseOf			

AllowDuplicates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	Example	
[Property] Number_of_CPUs	[IRDI] 0173-EX-1#02-YDG964#001	[INTEGER_COUNT]	1
[Property] Security_Engine	[IRDI] 0173-EX-1#02-NBG644#001	[REFERENCE]	1
[Property] Peripherals	[IRDI] 0173-EX-1#02-IBR510#001	[REFERENCE]	1
[Property] Deep_Learning_Accelerator	[IRDI] 0173-EX-1#02-ZZR937#001	[REFERENCE]	1
[Property] Number_of_GPUs	[IRDI] 0173-EX-1#02-QET976#001	[INTEGER_COUNT]	1
[Property] Number_of_storage_drives	[IRDI] 0173-EX-1#02-QBI304#001	[INTEGER_COUNT]	1
[Property] Power_Supply	[IRDI] 0173-EX-1#02-BTM226#001	[REFERENCE]	1
[Property] Number_of_Fans	[IRDI] 0173-1#02-AAV899#001 Number	[INTEGER_COUNT]	1
[Property] Mainboard	[IRDI] 0173-EX-1#02-MYI031#001	[REFERENCE]	1
[Property] Storage	[IRDI] 0173-EX-1#02-JXV122#001	[REFERENCE]	1
[Property] Networking	[IRDI] 0173-EX-1#02-ROD960#001	[REFERENCE]	1

3.5 Properties of the SMC “Networking”

Table 5: Properties of SMC "Networking"

idShort	<i>Networking</i>
Class	SubmodelElementCollection
semanticId	0173-EX-1#02-ROD960#001
isCaseOf	
AllowDuplicates	True
Explanation	

[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	Example	
[Property] Type	[IRDI] 0173-EX-1#02-KWH864#001	[STRING]	0..*
[Property] Number_of_hardware_queues	[IRDI] 0173-EX-1#02-QYT336#001	[INTEGER_COUNT]	0..*
[Property] Weight	[IRDI] 0173-1#02-AAG535#002 mass of weight without packaging and transport unit	[INTEGER_MEASURE]	0..*
[Property] Wireless_information	[IRDI] 0173-EX-1#02-URG862#001	[REFERENCE]	1
[Property] Wired_information	[IRDI] 0173-EX-1#02-GMC106#001	[REFERENCE]	1
[Property] Hardware_Timestamping	[IRDI] 0173-EX-1#02-AZA147#001	[BOOLEAN]	0..*
[Property] Media_Access_Controller_MAC_	[IRDI] 0173-EX-1#02-DUC479#001	[BOOLEAN]	0..*

3.6 Properties of the SMC “Wired information”

Table 6: Properties of SMC "Wired information"

idShort	<i>Wired_information</i>		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-GMC106#001		
isCaseOf			
AllowDuplications	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Wired_standard	[IRDI] 0173-EX-1#02-HCS291#001	[STRING]	0..*
[Property] Transfer_rate	[IRDI] 0173-EX-1#02-ZIS071#001	[REAL_MEASURE]	0..*

[Property] Connector	[IRDI] 0173-EX-1#02- DOR927#001	[STRING]	0..*
[Property] Network_adapter	[IRDI] 0173-EX-1#02- WUC989#001	[STRING]	0..*

3.7 Properties of the SMC “Wireless information”

Table 7: Properties of SMC "Wireless information"

idShort	<i>Wireless_information</i>		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-URG862#001		
isCaseOf			
AllowDuplicates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Wireless_standard	[IRDI] 0173-EX-1#02- UNE609#001	[STRING]	0..*
[Property] Encryption	[IRDI] 0173-EX-1#02- FZF328#001	[STRING]	0..*
[Property] max_transfer_rate_2_4_GHz	[IRDI] 0173-EX-1#02- GPD070#001	[REAL_MEASURE]	0..*
[Property] max_transfer_rate_5_GHz	[IRDI] 0173-EX-1#02- JLU316#001	[REAL_MEASURE]	0..*
[Property] Bluetooth_version	[IRDI] 0173-EX-1#02- BXK037#001	[STRING]	0..*

3.8 Properties of the SMC “Storage”

Table 8: Properties of SMC "Storage"

idShort	<i>Storage</i>		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-JXV122#001		
isCaseOf			
AllowDuplicates	True		

Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Supports_external _storage_NVMe_through_PCl_e_	[IRDI] 0173-EX-1#02-BRB139#001	[STRING]	0..*
[Property] SSD_through_USB_3_2	[IRDI] 0173-EX-1#02-EKP820#001	[STRING]	0..*

3.9 Properties of the SMC “Mainboard”

Table 9: Properties of SMC "Mainboard"

idShort	<i>Mainboard</i>		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-MYI031#001		
isCaseOf			
AllowDuplicates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Socket	[IRDI] 0173-EX-1#02-KJU113#001	[STRING]	0..*
[Property] max_supported_CPU	[IRDI] 0173-EX-1#02-BPH188#001	[INTEGER_COUNT]	0..*
[Property] Chipset	[IRDI] 0173-EX-1#02-JJY325#001	[STRING]	0..*
[Property] Number_of_slots	[IRDI] 0173-1#02-ABH628#001 indication of how many slots there are	[INTEGER_COUNT]	1
[Property] Slot	[IRDI] 0173-EX-1#02-WYN622#001	[REFERENCE]	1
[Property] Form_factor	[IRDI] 0173-1#02-BAF253#004 Quotient formed by dividing the effective value of an electric alternating quantity (alternating	[STRING_TRANSLATABLE_]	0..*

	current, alternating voltage) by its mean value (half-wave mean value)		
[Property] max_supported_memory	[IRDI] 0173-EX-1#02-TRH664#001	[REAL_MEASURE]	0..*
[Property] Memory_size	[IRDI] 0173-EX-1#02-ELY443#001	[REAL_MEASURE]	0..*
[Property] max_supported_sockets	[IRDI] 0173-EX-1#02-ZOT781#001	[REAL_MEASURE]	0..*
[Property] Supported_memory_types	[IRDI] 0173-EX-1#02-KXC134#001	[STRING]	0..*
[Property] max_Operating \ _Memory_Frequency	[IRDI] 0173-EX-1#02-XKE638#001	[REAL_MEASURE]	0..*
[Property] Number_of_channels	[IRDI] 0173-EX-1#02-RBK520#001	[INTEGER_COUNT]	0..*
[Property] Number_of_interfaces	[IRDI] 0173-EX-1#02-YYW328#001	[INTEGER_COUNT]	1
[Property] Capacity	[IRDI] 0173-EX-1#02-YMA886#001	[REAL_MEASURE]	0..*
[Property] Cache_size	[IRDI] 0173-EX-1#02-HXY188#001	[REAL_MEASURE]	0..*
[Property] Disk_speed	[IRDI] 0173-EX-1#02-PPE626#001	[REAL_MEASURE]	0..*
[Property] Bios	[IRDI] 0173-EX-1#02-GYJ363#001	[REFERENCE]	1
[Property] Multi_stream_HD \ _video_and_JPEG	[IRDI] 0173-EX-1#02-TEK304#001	[REFERENCE]	1

3.10 Properties of the SMC “Multi stream HD video and JPEG”

Table 10: Properties of SMC "Multi stream HD video and JPEG"

idShort	<i>Multi_stream_HD_video_and_JPEG</i>
----------------	---------------------------------------

Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-TEK304#001		
isCaseOf			
AllowDuplicates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Video_decode	[IRDI] 0173-EX-1#02- LHA906#001	[STRING]	0..*
[Property] Video_encode	[IRDI] 0173-EX-1#02- BQU893#001	[STRING]	0..*

3.11 Properties of the SMC "Bios"

Table 11: Properties of SMC "Bios"

idShort	<i>Bios</i>		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-GYJ363#001		
isCaseOf			
AllowDuplicates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Edition	[IRDI] 0173-EX-1#02- HHX943#001	[STRING]	0..*
[Property] Version	[IRDI] 0173-EX-1#02- TON122#001	[STRING]	0..*
[Property] Build	[IRDI] 0173-EX-1#02- ZSP612#001	[STRING]	0..*

3.12 Properties of the SMC “Slot”

Table 12: Properties of SMC "Slot"

idShort	<i>Slot</i>		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-WYN622#001		
isCaseOf			
AllowDuplicates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Description_of_slot	[IRDI] 0173-EX-1#02- HTL478#001	[STRING]	0..*

3.13 Properties of the SMC “Power Supply”

Table 13: Properties of SMC "Power Supply"

idShort	<i>Power_Supply</i>		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-BTM226#001		
isCaseOf			
AllowDuplicates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] min_voltage	[IRDI] 0173-EX-1#02- PMZ766#001	[REAL_MEASURE]	0..*
[Property] Voltage	[IRDI] 0173-1#02-ABF192#001 scalar quantity equal to the line integral of the electric field strength E along a specific path linking two points a and b	[REAL_MEASURE]	0..*
[Property] max_voltage	[IRDI] 0173-EX-1#02- UXG159#001	[REAL_MEASURE]	0..*

[Property] Continious_power	[IRDI] 0173-EX-1#02- CKE550#001	[REAL_MEASURE]	0..*
[Property] Peak_power	[IRDI] 0173-EX-1#02- CNE511#001	[REAL_MEASURE]	0..*
[Property] max_efficiency	[IRDI] 0173-EX-1#02- NIE256#001	[REAL_MEASURE]	0..*
[Property] Length	[IRDI] 0173-1#02-ABF203#001 horizontal distance between the front and back of an object when standing in its normal position of use or the distance from end to end of a long, thin object	[REAL_MEASURE]	0..*
[Property] Height	[IRDI] 0173-1#02-ABF206#001 vertical distance between the top and bottom of an object when standing in its normal position of use	[REAL_MEASURE]	0..*
[Property] Width	[IRDI] 0173-1#02-ABF204#001 horizontal distance between the left-hand and right-hand extremes of an object when standing in its normal position of use	[REAL_MEASURE]	0..*
[Property] Weight	[IRDI] 0173-1#02-AAG535#002 mass of weight without packaging and transport unit	[INTEGER_MEASURE]	0..*
[Property] Number_of_fans	[IRDI] 0173-EX-1#02- KBH219#001	[INTEGER_COUNT]	1
[Property] Number_of \ _connections	[IRDI] 0173-1#02-AAE484#003 Defintion for the amount of tubings, which can be connected	[INTEGER_COUNT]	1

3.14 Properties of the SMC “Deep Learning Accelerator”

Table 14: Properties of SMC "Deep Learning Accelerator"

idShort	<i>Deep_Learning_Accelerator</i>
Class	SubmodelElementCollection
semanticId	0173-EX-1#02-ZZR937#001
isCaseOf	
AllowDupli cates	True
Explanation	

[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Identification	[IRDI] 0173-EX-1#02-KAV332#001	[REFERENCE]	1
[Property] Chip_name	[IRDI] 0173-EX-1#02-ARH479#001	[STRING]	0..*
[Property] Cores	[IRDI] 0173-EX-1#02-ZYH317#001	[INTEGER_COUNT]	0..*
[Property] Clock_frequency	[IRDI] 0173-EX-1#02-AOC525#001	[REAL_MEASURE]	0..*
[Property] max_clock_frequency	[IRDI] 0173-EX-1#02-FDC079#001	[REAL_MEASURE]	0..*
[Property] AI_Performance	[IRDI] 0173-EX-1#02-LBC705#001	[REFERENCE]	1

3.15 Properties of the SMC “AI Performance”

Table 15: Properties of SMC "AI Performance"

idShort	<i>AI_Performance</i>		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-LBC705#001		
isCaseOf			
AllowDuplicates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Sparse	[IRDI] 0173-EX-1#02-LWH899#001	[REAL_MEASURE]	0..*
[Property] Dense	[IRDI] 0173-EX-1#02-YPE363#001	[REAL_MEASURE]	0..*

3.16 Properties of the SMC “Identification”

Table 16: Properties of SMC "Identification"

idShort	<i>Identification</i>
Class	SubmodelElementCollection

semanticId	0173-EX-1#02-KAV332#001		
isCaseOf			
AllowDuplicates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Manufacturer	[IRDI] 0173-1#02-AAQ373#011 Manufacturer of a device/product who produces it in his own manufacturing plants or in other facilities under contract manufacture and who distributes it under his own name	[REFERENCE]	1
[Property] Supplier	[IRDI] 0173-1#02-AAQ376#010 Company/dealer who purchases the device/product from the manufacturer and sells it under his own name	[REFERENCE]	1

3.17 Properties of the SMC “Supplier”

Table 17: Properties of SMC "Supplier"

idShort	<i>Supplier</i>		
Class	SubmodelElementCollection		
semanticId	0173-1#02-AAQ376#010		
isCaseOf			
AllowDuplicates	True		
Explanation	Company/dealer who purchases the device/product from the manufacturer and sells it under his own name		
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Delivery_time_of_supplier	[IRDI] 0173-1#02-AAM548#004 duration per working days needed by the supplier to deliver the product beginning with the receipt of the order	[REAL_MEASURE]	0..*

[Property] Product_article \ _number_of_supplier	[IRDI] 0173-1#02- AAO736#004 unique product order identifier of the supplier	[STRING]	0..*
[Property] Name_of_supplier	[IRDI] 0173-1#02- AAO735#003 name of supplier which provides the customer with a product or a service	[STRING]	0..*
[Property] Supplier_product_designation	[IRDI] 0173-1#02- AAM551#002 Short description of the product (short text)	[STRING_TRANSLATABLE_]	0..*
[Property] Batch_number_from_supplier	[IRDI] 0173-1#02- AAT106#002 unique combination of numbers and letters that distinguishes a product from other products of a different fabrication process	[STRING]	0..*
[Property] Supplier_product_description	[IRDI] 0173-1#02- AAU730#001 Description of the product, it's technical features and implementation if needed (long text)	[STRING_TRANSLATABLE_]	[0..1
[Property] Supplier_product_family	[IRDI] 0173-1#02- AAU728#001 2nd level of a 3 level supplier specific product hierarchy	[STRING_TRANSLATABLE_]	[0..1
[Property] Supplier_product_root	[IRDI] 0173-1#02- AAU729#001 Top level of a 3 level supplier specific product hierarchy	[STRING_TRANSLATABLE_]	[0..1
[Property] Supplier_product_order_suffix	[IRDI] 0173-1#02- AAW337#001 By the supplier awarded string for the identification of additional attributes, not by a structured supplier item number may be expressed	[STRING_TRANSLATABLE_]	[0..1

<p>[Property] Supplier_product_type</p>	<p>[IRDI] 0173-1#02-AAW336#001 Characteristic to differentiate between different products of a product family or special variants</p>	<p>[STRING_TRANSLATABLE_]</p>	<p>[0..1]</p>
<p>[Property] GLN_of_supplier</p>	<p>[IRDI] 0173-1#02-AAAY813#001 internationally unique identification number for the supplier of the device or the product and for the physical location</p>	<p>[INTEGER_COUNT]</p>	<p>0..*</p>
<p>[Property] Charge_number_of_supplier</p>	<p>[IRDI] 0173-1#02-AAM553#001 Charge number used by the supplier for its product</p>	<p>[STRING_TRANSLATABLE_]</p>	<p>0..*</p>
<p>[Property] item_type_of_supplier</p>	<p>[IRDI] 0173-1#02-AAM549#002 additional information for describing products of a supplier for the purpose of distinguishing between products from a product family or of a special design (variants)</p>	<p>[STRING_TRANSLATABLE_]</p>	<p>0..*</p>
<p>[Property] supplement_item_order \ _suffix_of_supplier</p>	<p>[IRDI] 0173-1#02-AAM550#002 by the supplier issued text for the identification of additional attributes, which can not be expressed by a structured supplier item number</p>	<p>[STRING_TRANSLATABLE_]</p>	<p>0..*</p>
<p>[Property] item_name_of_supplier</p>	<p>[IRDI] 0173-1#02-AAM554#002 by the supplier (or distribution) established brand name for a product where product is a synonym for property, object, or service</p>	<p>[STRING_TRANSLATABLE_]</p>	<p>0..*</p>

3.18 Properties of the SMC “Manufacturer”

Table 18: Properties of SMC "Manufacturer"

idShort	<i>Manufacturer</i>		
Class	SubmodelElementCollection		
semanticId	0173-1#02-AAQ373#011		
isCaseOf			
AllowDuplicates	True		
Explanation	Manufacturer of a device/product who produces it in his own manufacturing plants or in other facilities under contract manufacture and who distributes it under his own name		
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Delivery_time \\ _of_manufacturer	[IRDI] 0173-1#02- AAM555#002 duration per working days needed by the manufacturer to deliver the product beginning with the receipt of the order	[STRING_TRANSLATABLE_]	0..*
[Property] GTIN	[IRDI] 0173-1#02- AAO663#003 internationally unique and unambiguous article number for products and services (Global Trade Item Number)	[STRING]	0..*
[Property] Manufacturer_name	[IRDI] 0173-1#02- AAO677#002 legally valid designation of the natural or judicial person which is directly responsible for the design, production, packaging and labeling of a product in respect to its being brought into circulation	[STRING]	0..*
[Property] Fabrication_number	[IRDI] 0173-1#02- AAO674#004 alphanumeric character sequence assigned to a fabricated product, which allows the date, time and	[STRING]	0..*

	circumstances of fabrication to be traced		
[Property] Serial_number	[IRDI] 0173-1#02-AAM556#002 unique combination of numbers and letters used to identify the device once it has been manufactured	[STRING_TRANSLATABLE_]	0..*
[Property] Product_article_number _of_manufacturer	[IRDI] 0173-1#02-AAO676#003 unique product identifier of the manufacturer	[STRING]	0..*
[Property] Date_of_manufacture	[IRDI] 0173-1#02-AAR972#002 Date from which the production and / or development process is completed or from which a service is provided completely	[DATE]	0..*
[Property] National_stock_number	[IRDI] 0173-1#02-AAN075#003 13-digit numeric code, identifying all the standardized material items of supply as they have been recognized by the United States Department of Defense	[STRING_TRANSLATABLE_]	0..*
[Property] Manufacturer_product _description	[IRDI] 0173-1#02-AAU734#001 Description of the product, it's technical features and implementation if needed (long text)	[STRING_TRANSLATABLE_]	[0..1]
[Property] Brand	[IRDI] 0173-1#02-AAO742#002 Part of the naming for the support and the recognition of the brand position of products and services consisting of words, numbers, letters or other characters. Registered brands and trademarks are indicated with the appropriate protective signs (® or TM)	[STRING]	0..*
[Property] Manufacturer_product \	[IRDI] 0173-1#02-AAU733#001	[STRING_TRANSLATABLE_]	[0..1]

_order_suffix	By the manufacturer awarded string for the identification of additional attributes, not by a structured manufacturer item number may be expressed		
[Property] Manufacturer_product_root	[IRDI] 0173-1#02-AAU732#001 Top level of a 3 level manufacturer specific product hierarchy	[STRING_TRANSLATABLE_]	[0..1
[Property] Manufacturer_product_family	[IRDI] 0173-1#02-AAU731#001 2nd level of a 3 level manufacturer specific product hierarchy	[STRING_TRANSLATABLE_]	[0..1
[Property] Manufacturer_product _designation	[IRDI] 0173-1#02-AAW338#001 Short description of the product (short text)	[STRING_TRANSLATABLE_]	[0..1
[Property] Product_type	[IRDI] 0173-1#02-AAO057#002 Characteristic to differentiate between different products of a product family or special variants	[STRING_TRANSLATABLE_]	0..*
[Property] URI_of_manufacturer	[IRDI] 0173-1#02-ABA669#001 fully qualified domain name of the manufacturer of a product using a universal resource identifier (URI)	[URL]	0..*
[Property] GLN_of_manufacturer	[IRDI] 0173-1#02-AAY812#001 internationally unique identification number for the manufacturer of the device or the product and for the physical location	[INTEGER_COUNT]	0..*
[Property] URI_of_the_product	[IRDI] 0173-1#02-ABH173#001 unique global identification of the product using an universal resource identifier (URI)	[URL]	[0..1

[Property] URI_of_the_product	[IRDI] 0173-1#02-AAY811#001 unique global identification of the product using an universal resource identifier (URI)	[STRING_TRANSLATABLE_]	[0..1
[Property] Date_of_manufacture	[IRDI] 0173-1#02-AAO686#001 Datum as of which a product, procedure, standard or similar entity is valid	[STRING]	0..*
[Property] supplement_item_order \ _suffix_of_manufacturer	[IRDI] 0173-1#02-AAM547#002 by the manufacturer issued string for the identification of additional attributes, which can not be expressed by a structured manufacturer item number	[STRING_TRANSLATABLE_]	0..*
[Property] item_name_of_manufacturer	[IRDI] 0173-1#02-AAM552#002 by the manufacturer (or distribution) set brand name for a product where product is a synonym for property, object, or service	[STRING_TRANSLATABLE_]	0..*
[Property] item_type_of_manufacturer	[IRDI] 0173-1#02-AAN389#002 short name issued by the manufacturer or type detail as an additional detail to the product brand name, coded to be able to distinguish product items of a product family or special variants from each other	[STRING_TRANSLATABLE_]	0..*
[Property] product_type_of_manufacturer	[IRDI] 0173-1#02-AAO681#003 additional information for describing products of a manufacturer for the purpose of distinguishing between products from a product family or of a special design (variants)	[STRING]	0..*
[Property] product_designation \ _	[IRDI] 0173-1#02-AAO682#003	[STRING]	0..*

_of_manufacturer	designation used by the manufacturer for his product		
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3.19 Properties of the SMC “Peripherals”

Table 19: Properties of SMC "Peripherals"

idShort	<i>Peripherals</i>		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-IBR510#001		
isCaseOf			
AllowDuplicates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Number_of_peripheral_devices	[IRDI] 0173-EX-1#02-QNJ625#001	[INTEGER_COUNT]	1

3.20 Properties of the SMC “Security Engine”

Table 20: Properties of SMC "Security Engine"

idShort	<i>Security_Engine</i>		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-NBG644#001		
isCaseOf			
AllowDuplicates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Security_Engine	[IRDI] 0173-EX-1#02-JBG180#001	[STRING]	0..*
[Property] Version	[IRDI] 0173-1#02-AAP003#003 design that partly deviates from the previous	[STRING]	0..*

3.21 Properties of the SMC “Asset”

Table 21: Properties of SMC "Asset"

idShort	Asset		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-NKA186#001		
isCaseOf			
AllowDuplicates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] _REFERENCE_to_Digital_Nameplate	[IRDI] 0173-EX-1#02-NNF243#001	[URL]	0..*
[Property] Dimensions	[IRDI] 0173-EX-1#02-WUF844#001	[REFERENCE]	1
[Property] Operating_Requirements	[IRDI] 0173-EX-1#02-GXM456#001	[REFERENCE]	1

3.22 Properties of the SMC “Operating Requirements”

Table 22: Properties of SMC "Operating Requirements"

idShort	Operating_Requirements		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-GXM456#001		
isCaseOf			
AllowDuplicates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] Temperature	[IRDI] 0173-1#02-ABF137#001 for a physical system exchanging quantities of heat with two bodies, during a reversible cycle, a positive state quantity	[REAL_MEASURE]	0..*

	characterizing each body and proportional to the quantity of heat exchanged with this body		
[Property] Size	[IRDI] 0173-EX-1#02-CKJ511#001	[REAL_MEASURE]	0..*
[Property] Protection_class	[IRDI] 0173-1#02-AAK401#006 indication of the safety class of the object	[STRING]	0..*
[Property] Power_consumption	[IRDI] 0173-1#02-AAQ989#004 highest instantaneous power requirement of the device or component during normal operation	[REAL_MEASURE]	0..*
[Property] Voltage	[IRDI] 0173-1#02-ABF192#001 scalar quantity equal to the line integral of the electric field strength E along a specific path linking two points a and b	[REAL_MEASURE]	0..*
[Property] Transport_class	[IRDI] 0173-EX-1#02-JJH209#001	[REAL_MEASURE]	0..*
[Property] Hazard_information \ _REACH_ROHs_UN_Klassen	[IRDI] 0173-EX-1#02-YMO153#001	[STRING]	0..*

3.23 Properties of the SMC “Dimensions”

Table 23: Properties of SMC "Dimensions"

idShort	<i>Dimensions</i>		
Class	SubmodelElementCollection		
semanticId	0173-EX-1#02-WUF844#001		
isCaseOf			
AllowDuplicates	True		
Explanation			
[SME type]	semanticity = [idType]value	[valueType]	card.
idShort	Description@en	example	

[Property] Length	[IRDI] JQX418#001	0173-EX-1#02-	[REAL_MEASURE]	0..*
[Property] Width	[IRDI] ELT897#001	0173-EX-1#02-	[REAL_MEASURE]	0..*
[Property] Height	[IRDI] YHV556#001	0173-EX-1#02-	[REAL_MEASURE]	0..*

3.24 Additional notes

The following information should be taken into account for a possible extension of the AAS submodel: Only air cooling is defined for cooling, water or nitrogen cooling is excluded.

Annex A: Explanations on used table formats

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.

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 [] from 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

SME type Submodel	Element type
Property	Property
MLP	MultiLanguageProperty
Range	Range
File	File
Blob	Blob
Ref	ReferenceElement
Rel	RelationshipElement
SMC	SubmodelElementCollection

- 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 chosen, 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@de.
- The [valueType] is only given for Properties.

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