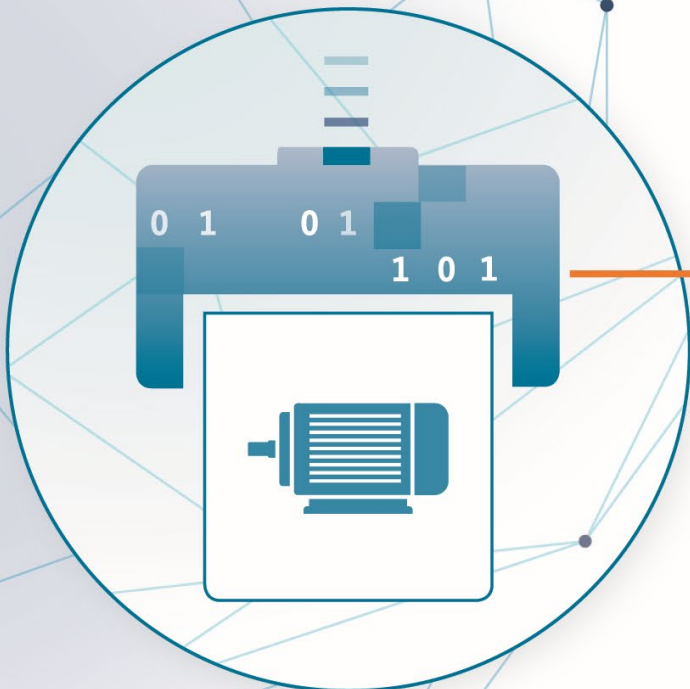SPECIFICATION

Submodel Templates of the Asset Administration Shell

Submodel TECHNICAL DATA

- Max. Rotation Speed = 5000 [1/min]
- Max. Torque = 200 [Nm]
- Cooling Type = BAB657

Submodel OPERATIONAL DATA

- Rotation Speed = 4370 [1/min]
- Torque = 117.4 [Nm]

Submodel DOCUMENTATION

- Title = Operating Manual
- Digital File PDF → /aasx/OperatingManual.PDF
- Document Class ID = 03-02
- Document Class N...

- Serial Numb...

Parameter information of industrial equipment (v0.8)

in cooperation with

PLATTFORM INDUSTRIE 4.0

VDMA Fluid Power

Imprint

Contents

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]. Common terms and abbreviations can be found in [8].

This document is actually a proposal for such a Submodel template specification. It has been jointly worked out by experts of the VDMA working group "digitalization for fluid power systems" together with members of the ECLASS segment group 51, based on collection used experience of industrial users.

The target audience 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 basic parameter information of industrial equipment. This industrial equipment, for example automation devices, is provided by manufacturers and suppliers and used in specific applications by industrial users, e.g. original equipment manufacturers (OEMs), system integrators and producing enterprises (industrial end users). Industrial equipment can be described on type or instance level, including the parameterization of small batches.

Industrial equipment can comprise abilities to monitor and control. In such cases, the internal control system of such equipment needs parameter information to adopt the equipment to the specific application. Often, this parameter information is structured and formatted depending on the requirements of the type of industrial equipment or its communication interfaces, such as industrial field busses. Thus, a variety of formats for parameter information exists.

The aim of this Submodel template is to capture parameter information in specific points of time within the life cycle and for specific interactions between roles of value chain partners. The Submodel template provides an interoperable container for specific parameter information, which comes in varying structure and format.

1.3 Relevant standards and sources of concepts for the Submodel template

1.3.1 Concept repositories

So called concept repositories or (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.

1.4 Relevant existing Submodel specifications

1.4.1 Submodel Digital Nameplate

The Submodel (IDTA-2006) aims at interoperable provision of information which is conveyed also by the nameplate of an industrial equipment. Often, this information is required by regulatory guidelines such as the EU directive 2006/42/EC. It clearly identifies the described asset of the Asset Administration Shell, the manufacturer, order information, markings on the nameplate and further properties, e.g. for explosion safety.

See: https://industrialdigitaltwin.org/en/content-hub/submodels

With respect to the scope of this Submodel template (see 1.2), the information on Digital Nameplate allows identifying, which type of industrial equipment is given and which structure and format of parameter information is applicable.

1.4.2 Submodel Handover documentation

Scope of the Submodel (IDTA-2004) is to increase the interoperability between the parties, who are exchanging asset documentation. These parties can be manufacturer of components, complete machines or operators using these components or machines. The provided documents can contain for example information required for correct design, installation, commissioning, spare parts stocking, operation, cleaning, inspection, maintenance, and repair. In addition, there are legal regulations that stipulate the existence of certain manufacturer documents, such as CE declarations of conformity, ATEX certificates or material certificates. The structure of the Submodel is based on the structure of VDI 2770.

See: https://industrialdigitaltwin.org/en/content-hub/submodels

With respect to the scope of this Submodel template (see 1.2), the information provided by handover documentation allows understanding the meaning of given parameters and values.

2 Approaches

2.1 Use-Cases

The following use-cases are applicable.

no.	Use case	Description
1	Information on default parameters	A machine software is to be designed for an application before the physical device is available. The manufacturer provides the default parameters, e.g. with the AAS for the type of device before procurement.
2	Procurement from manufacturer with specific parameters	A small batch of devices is planned to be used in an application. This application requires paramerization. Instead of repeatedly parameterize each single device during application, the parameter information is handed over to the manufacturer during or close to the procurement of the devices and the manufacturer performs the paramterization e.g. while end-of-line checking the devices.
3	Procurement of replacement	A device gets broken during operation. The operator has a copy of the current parameters. For procurement of replacement device, the operator hands over this information to the manufacturer or supplier, who parameterizes the devices ready to be installed in the application. Note: An extension of this use case is, that the manufacturer or supplier translates the parameter information to another updated or upgraded device type.
4	Replacement during maintenance	A device gets broken during operation. Having a spare device available, the spare device is parameterized during installation in the application. Note: In particular cases, this use case is already achieved by today's technologies ("parameter server", "data storage").
5	Documentation, error reporting, data analysis	The parameters of all devices of a machine are captured for documentation after finalizing the commissioning. The parameters of a specific device are captured to investigate an error within operation together with the manufacturer. The paramters of all devices of a machine are captured before the next generation of the machine is planned and devices need to be re-selected.

2.2 Assets

Asset Administration Shells provide information with respect to well-identified assets. For this document, suitable assets are:

| Asset	Description and applicable use cases
Product types, such as model series of industrial equipements, especially automation devices	Information on default parameters; procurement from manufacturer with specific parameters.
Product instances, such as sold individual products, industrial equipment, especially automation devices	Procurement of replacement; replacement during maintenance; documentation, error reporting, data analysis.

2.3 Information structuring

2.3.1 General

The SubmodelElements described in clause 4 are structured in the following way (see Figure 1). In order to allow attaching multiple sets of parameter information to a specific asset, records for individual sets of parameter information are foreseen.

> Note: Such records could capture multiple versions of parameter information or cover multiple points in time.
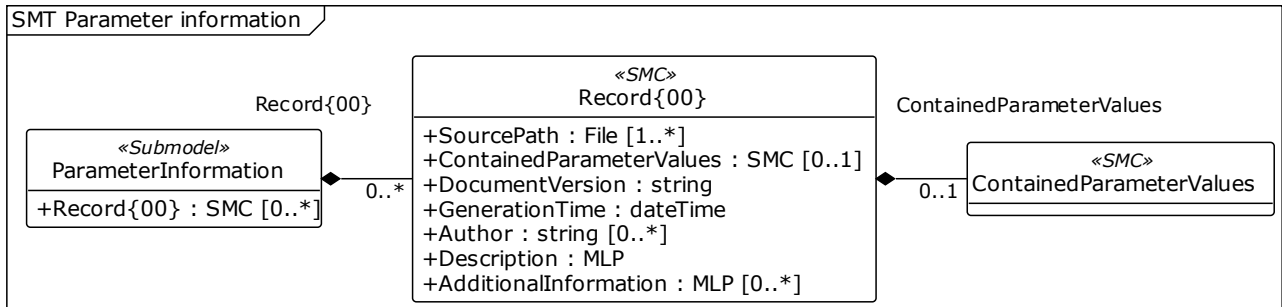
Figure 1 – Elements of the Submodel

2.3.2 Contained parameter values

The provisioned structure contains a collection designated "ContainedParameterValues". In this collecion, the parameter information which is represented as a whole and denoted by SourcePath can also be decomposed into a structure of individual SubmodelElements. This parameter information may be actual parameter values, e.g. default values or values acquired from the industrial equipment. This decomposition could be done by a software functionality, which is able to understand the source file format and is optional. The types and semanticIds of this SubmodelElements need to be determined by the software functionality.

3 Definitions

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4 Element specifications

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4.1 Attributes of Submodel

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90 This Submodel captures multiple records of parameter information.

91

idShort:	ParameterInformation		
Class:	Submodel		
semanticId:	[IRI] https://admin-shell.io/sandbox/vdma/parameter-information/0/8		
Parent:	ParameterInformation		
Explanation:	Provides a container for capturing parameter information in specific points of time within the life cycle.		
[SME type] **idShort**	**semanticId = [idType]value** **Description@en**	**[valueType]** **example**	**card.**
[SMC] Record{00}	[IRI]https://admin-shell.io/sandbox/vdma/parameter-information/record/1/0 Record of parameter information individual set of parameter information -	n/a	0..*

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4.1.1 Attributes of record of parameter information

93

94 This collection captures one individual set of parameter information.

95

idShort:	Record{00}		
Class:	SubmodelElementCollection		
semanticId:	[IRI] https://admin-shell.io/sandbox/vdma/parameter-information/record/1/0		
Parent:	Submodel		
Explanation:	Individual set of parameter information		
[SME type] **idShort**	**semanticId = [idType]value** **Description@en**	**[valueType]** **example**	**card.**
[File] SourcePath	[IRDI]0173-1#02-AAC311#003 source as path info information, related to information technology, where the searched object can be found Note: Defined by provider or user Note: mimeType of the File element shall be sufficiently specified to conclude on format of parameter information.	mimeType: [application/html] /aasx/files/Festo-SPAU-B2_bar-20150122-IODD1.1-en.html	1..*
[Property] DocumentVersion	[IRDI]0173-1#02-AAO100#002 document version alphanumeric character sequence uniquely identifying a document version Note: Versioning scheme to be defined by user.	[string] 1.0.3	
[Property] GenerationTime	[IRDI]0173-1#02-AAO103#002 Generation time	[dateTime] 2022-04-19T12:34:00Z	

	Note: Date and time of creation of the document in UTC according ISO 8601		
[Property] Author	[IRDI]0173-1#02-AAO104#002 author name of the person who generates an item Note: Can designate a person, an organization or a technical process, e.g. an interval based backup.	[string] SAT team	0..*
[MLP] Description	[IRDI]0173-1#02-AAN466#002 description text note Note: Specification of reason, why this information was captured	[-] This is a snapshot from a working device for SAT for product ChocoMind@en	
[MLP] AdditionalInformation	[IRDI]0173-1#02-AAQ680#008 Additional Information Addition to the normal documentation Note: Extensive description of the content and changes of the parameter information.	[-] Please see outliers in sensor signals in [0..1:30min]@en	0..*
[SMC] ContainedParameterValues	[IRI]https://admin-shell.io/sandbox/vdma/parameter-information/contained-parameters/1/0 Contained parameters values Note: This collection holds parameter values in a decomposed structure and standardized format. The information set is a subset of the parameter information given.	n/a	-

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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 the following annex in form of an XML mapping 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 [] 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 type	SubmodelElement type
Property	Property
MLP	MultiLanguageProperty
Range	Range
File	File
Blob	Blob
Ref	ReferenceElement
Rel	RelationshipElement
SMC	SubmodelElementCollection
SME, SubmodelElement	SubmodelElement

- 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 parents 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 ISO639 language code: example@EN.
- The [valueType] is only given for Properties.

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