IDTA 02018 Maintenance Instructions

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SPECIFICATION

Submodel Template of the Asset Administration Shell

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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

Definition maintenance:
The process of preserving a condition or situation or the state of being preserved.

Distinction between predictive and preventive maintenance:

The main difference between both maintenance concepts is that preventive maintenance is scheduled at regular intervals while predictive maintenance is scheduled as needed (based on asset conditions).

This Submodel template is focused on the handover of preventive maintenance instructions.

Within the product life cycle of components, machines and production facilities (see Figure 1), maintenance is an essential part of maintaining productivity. Preventive maintenance can be planned and is usually carried out at set intervals. For planned maintenance, appropriate preparation for planning and execution is necessary. For this purpose, information is provided by the manufacturer. In reality, this information is often provided in the form of a PDF containing all the necessary information on maintenance, which is then passed on. Component manufacturers pass on their information to the machine/plant builder, who then has the task of creating the maintenance instructions for the machine/plant based on all the information.

The disadvantage of the current solutions: maintenance information often has to be collected manually from various sources/documents and transferred by copy & paste, e.g. into a maintenance software. This process is very resource-intensive and offers room for mistakes.

The intended use case starts here and aims at providing an interoperable Submodel on the topic of maintenance. All required information on maintenance is to be passed on - ideally with the help of dictionaries such as ECLASS and IEC CDD (Common Data Dictionary). While in the current version most of the specified properties have an IRI as semantic identifier, a complete harmonisation of all properties is aimed at for a successor version if possible. The structure by means of SubmodelElementCollections (SMC) is intended to simplify the evaluation and use of the information, especially the spare parts, consumables and tool lists.

This Submodel is not intended for calibrations, or the documentation of maintenance work carried out or calibration values from measurements. However, it can be used as a basis for this.

Important Note:

This Submodel is not suitable for unplanned repair tasks!

1.3 Relevant standards for the Submodel template

The definitions and descriptions of maintenance from the following standards are relevant for this Submodel template.

Table 1: List of used standards

Standard	Description
DIN 31051:2019-06	Fundamentals of maintenance
DIN EN 13306:2018-02	Maintenance – Maintenance terminology

DIN 31051 divides maintenance into the following blocks:

- maintenance
- inspection
- repair
- Improvement.

For this reason, the Maintenance Submodel focuses on maintenance and can also be used in part for inspections. Repair for unplannable faults is not included. In the Submodel, the terms spare part and wear part were combined, without further differentiation.

1.3.1 Reference to DIN EN 13306

The Maintenance Instructions Submodel essentially corresponds to the required maintenance plan that contains the activities, resources and schedules.

An object according to DIN EN 13306 corresponds to an asset in the context of Asset Administration Shells (AAS). The contents of the Submodel are mainly oriented towards preventive or predetermined maintenance.

1.4 Use cases, requirements and design decisions

1.4.1 Use case: Handover of all maintenance information along the value chain.

The use case describes all three roles from the component manufacturer to the system and machine builder to the operator/owner.

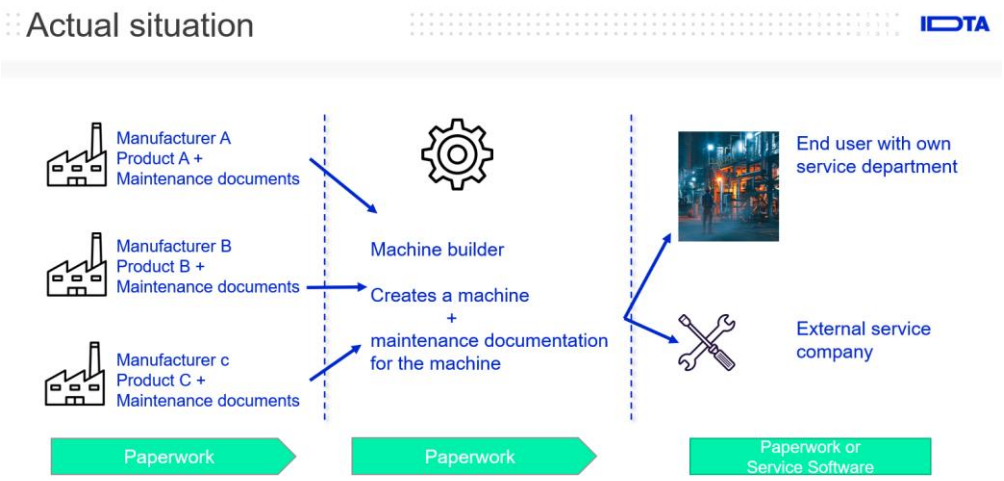

Figure 1: Information flow in the value chain

Maintenance documentation starts with the component manufacturer. The component manufacturer creates maintenance instructions for each of its components. Usually, this creation is in the form of a document, which is a PDF and often a printed version (can also be part of an operating manual). The documents are delivered with the products and thus handed over to the machine and plant builder.

The challenge for system and machine builder is to create their own maintenance instructions for the machine/system based on the documents from the various component manufacturers. As a rule, the instructions for maintaining the components are copied and pasted from the individual documents of the component manufacturers into the maintenance documentation of the machine or system. In addition, this information is supplemented and enriched with the machine/system specific details. Again, this documentation is usually produced as a PDF document or printed instructions and passed on to the Operator/ Owner side.

Operator/owners also have the challenge of creating their own maintenance instructions for maintenance planning across all of their production facilities. In doing so, they fall back on the maintenance documents supplied with the individual plants or machines. As a rule, these are also summarized in their own documents by means of copy and paste and supplemented and enriched with their own details. Particularly in the case of process plants, this information is combined with local specifics. In many plants, for example, approval from the control center is required before maintenance work can be carried out. The operators of the plants usually hand over their maintenance instructions and documents to their own service department or to an outsourced service provider. These then transfer the information to their service software, which is used to schedule the relevant maintenance and document the work performed. This process is also usually carried out manually.

If you look at these individual process steps, you quickly see the potential for savings through interoperable information and data. This is where the Maintenance Instructions Submodel comes into play. By using Asset Administration Shells with the maintenance Submodel along the value chain, manual copy and paste steps that are resource-intensive and error-prone are eliminated. Maintenance Instructions from subordinate components can be easily linked. The Maintenance Instructions Submodel provides the perfect basis for planning maintenance and building the documentation of the maintenance steps on the content.

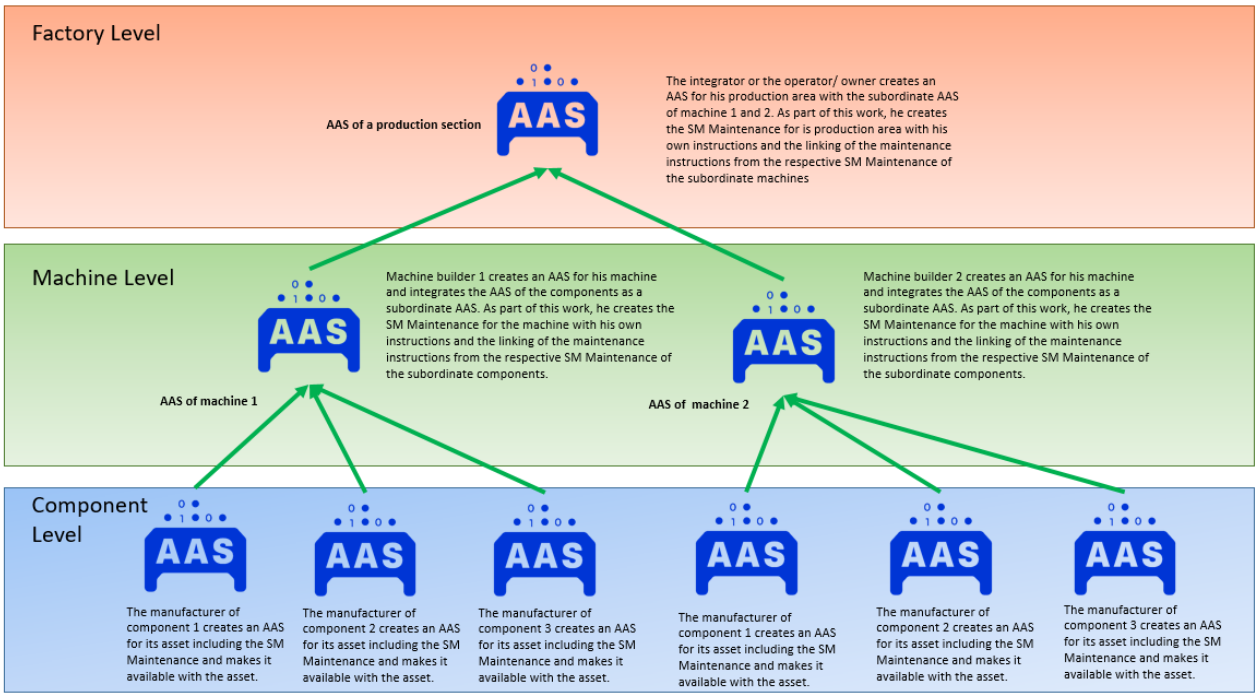

Figure 2: Implemtation of maintenance instructions

Important note:
In practice, maintenance instructions are created by the respective responsible role and handed over to the next level. These instructions are used there to integrate them into their own maintenance instructions. It is not intended that, for example, maintenance instructions from the factory level are supplemented or adapted at the component level in the AAS of the component. Each creator of AAS creates them on their own level within the scope of his domain knowledge.

1.4.2 Design Decisions

1.4.2.1 Property MaintenanceFreeAsset

If the Maintenance Instructions Submodel is missing in an Asset Administration Shell, it is difficult for the user to decide whether the asset is maintenance-free or only the Maintenance Instructions Submodel has been forgotten. On the other hand, manufacturers of maintenance-free components must be able to define an asset as maintenance-free without much effort. For this reason, we have decided to address the issue of maintenance-free with the first property. For assets that are maintenance-free, only a maintenance-free bit has to be set in this property - no further specifications are necessary in this case.
However, this has the consequence that for all other products (which require maintenance) the cardinality always starts with zero. Thus, it is the responsibility of the creator of the Maintenance Instructions Submodel what information he can provide for further use on the subject of maintenance.

1.4.2.2 One Maintenance Instructions Submodel for all 3 roles in the value chain

To ensure the widest possible range of applications, we have decided to develop the Maintenance Instructions Submodel for all users (component manufacturers, machine/system builders and operators) in a uniform manner. A disadvantage of this is that the template of the Maintenance Instructions Submodel is therefore relatively extensive. However, since most of the content is optional, the effort required to create and fill the template should be limited.

1.4.2.3 Collections Spare parts, consumables, tools

The Submodel collections (SMC) spare parts, consumables and tools are used for simplified planning, since all parts are available as a collection in one place. This eliminates the need to evaluate the individual maintenance steps for these contents. In later versions of SM Maintenance Instructions, this information may be outsourced to independent Submodels. Since these are not yet planned, we have decided to bundle the information in the respective Submodel collections.

1.4.2.4 Specification of intervals

For a universal use of the template, the definition of intervals was divided into a value and a unit. This makes it possible to map different intervals in the same way. Example: 60000 km, 48 h, 3 months.

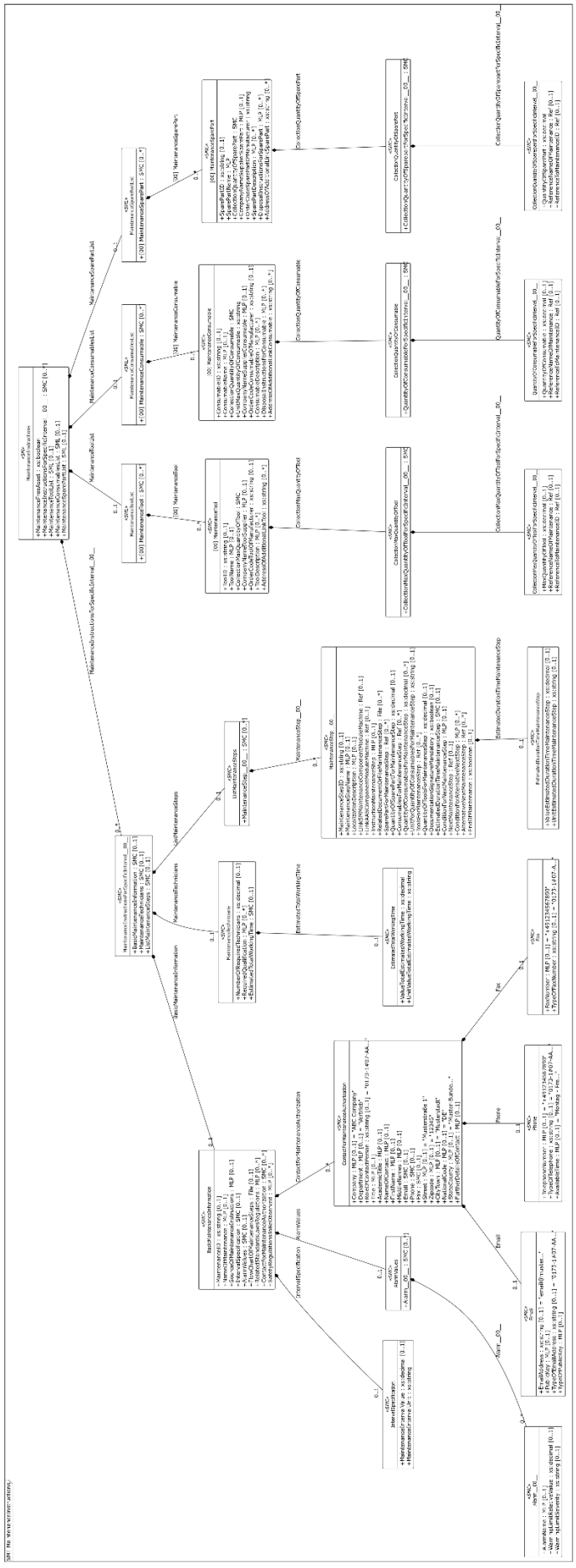

Figure 3: UML diagram for the Maintenance Instructions Submodel

2 Submodel Maintenance Instructions

2.1 Approach

Start by determining if the asset is maintenance free. In case of an asset that needs maintenance, go through the template step by step and fill in the required information within the scope of your domain knowledge. It´s important to note that many entries are optional.

2.2 Elements of the Submodel “Maintenance Instructions”

Figure 3 shows the UML-diagram defining the relevant properties for the Maintenance Instructions Submodel template. Table 2 describes the details of the Submodel structure. The SMC are described in the sections which follow.

Table 2: Elements of Submodel “Maintenance Instructions”

idShort:	MaintenanceInstructions		
Class:	Submodel (SM)		
semanticId:	[IRI] https://admin-shell.io/idta/SubmodelTemplate/MaintenanceInstructions/1/0		
Parent:	Asset Administration Shell, to which the maintenance instructions belongs (type or instance)		
Explanation:	The Submodel defines a set of maintenance instructions and additional details, files or documents related to the maintenance of an asset		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] MaintenanceFreeAsset	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancefreeasset/1/0 Determines whether an asset is maintenance-free or requires maintenance. This excludes the possibility that a manufacturer has forgotten to create the SM Maintenance Instructions and the user has the certainty that the asset is maintenance-free.	[boolean] True	1
[SMC] MaintenanceINstructionsForSpecificInterval__00__	[IRI] https://admin-shell.io/idta/maintenanceinstructionsforspecificinterval/1/0 Collection that includes all the details of a maintenance interval.	n/a	0..*
[SML] MaintenanceToolList	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancetoollist/1/0 Total list of tools required for all maintenance intervals of an asset. Each tool is described/ defined in its own SMC.	n/a	0..1
[SML] MaintenanceConsumablesList	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenanceconsumableslist/1/0	n/a	0..1

	Total list of consumables required for all maintenance intervals of an asset. Each consumable is described/defined in its own SML		
[SML] MaintenanceSparePartList	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancesparepartlist/1/0 Total list of required spare parts for all maintenance intervals of an asset. Each spare part is described/ defined in its own SML.	n/a	0..1

2.3 Elements of SMC“MaintenanceInstructionsForSpecificInterval__00__

Table 3: Elements of SMC “MaintenanceInstructionsForSpecificInterval

idShort:	MaintenanceInstructionsForSpecificInterval__00__		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenanceinstructionsforspecificinterval/1/0		
Parent:	Submodel “MaintenanceInstructions”		
Explanation:	Collection that includes all the details of a maintenance interval		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[SMC] BasicMaintenanceInformation	[IRI] https://admin-shell.io/idta/maintenanceinstructions/basicmaintenanceinformation/1/0 Basic information for this maintenance interval	n/a	0..1
[SMC] MaintenanceTechnicians	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancetechnicians/1/0 Information about the required technicians	n/a	0..1
[SMC] ListMaintenanceSteps	[IRI] https://admin-shell.io/idta/maintenanceinstructions/listmaintenancesteps/1/0 Listing of the individual maintenance steps incl. all required details per maintenance step	n/a	0..1

2.4 Elements of SMC “BasicMaintenanceInformation”

Table 4: Elements of SMC “BasicMaintenanceInformation”

idShort:	BasicMaintenanceInformation		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/basicmaintenanceinformation/1/0		
Parent:	SMC “MaintenanceInstructionsForSpecificInterval__00__”		
Explanation:	Basic information for this maintenance interval		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] MaintenanceID	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenanceid/1/0 ID for this maintenance.	[string] 4711-2	0..1
[MLP] NameOfMaintenance	[IRI] https://admin-shell.io/idta/maintenanceinstructions/nameofmaintenance/1/0 Name for this maintenance.	[langString] Oilchange after 6000 km	0..1
[MLP] SourceOfMaintenanceInstructions	[IRI] https://admin-shell.io/idta/maintenanceinstructions/sourceofmaintenanceinstructions/1/0 Origin of maintenance information - examples: Component manufacturers, machine or plant manufacturers, monitoring authorities.	[langString] GermanEnvAgency	0..1
[SMC] IntervalSpecification	[IRDI] 0173-1#02-AAN911#001 Specification of the maintenance interval.	n/a	0..1
[SMC] AlarmValues	[IRI] https://admin-shell.io/idta/maintenanceinstructions/alarmvalues/1/0 Alarm at reaching the maintenance limit.	n/a	0..1
[File] FlowChartOfMaintenanceSteps	[IRI] https://admin-shell.io/idta/file/flowchartofmaintenancesteps/1/0 Flowchart of a maintenance e.g. as a PDF file. MIME-Type, file name, and file contents given by the File SubmodelElement. Constraint: the MIME-Type needs to match the file type.	MIME-Type = application/pdf value = /aasx/documentation/maintenance_flowchart_EN.PDF	0..1
[MLP] RelatedStandardsLawsRegulations	[IRI] https://admin-shell.io/idta/maintenanceinstructions/relatedstandardslawsregulations/1/0	[langString] TRBS 1112 Part 1 Explosion hazards during and due to maintenance work -	0..*

	Standards, laws and regulations that must be observed during maintenance.	Assessment and protective measures	
[SMC] ContactForMaintenanceAuthorization	[IRI] https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation. Collection of contact details for authorization before maintenance - example of a control room in a factory	n/a	0..*
[MLP] SafetyRegulationsToBeObserved	[IRI] https://admin-shell.io/idta/maintenanceinstructions/safetyregulationstobeobserved/1/0 Safety instructions and regulations that must be observed during maintenance.	[langString] 1. disconnect 2. secure against being switched on again 3. determine the absence of voltage 4. ground and short-circuit (from 1kV systems) 5. cover or isolate adjacent live parts (from 1kV systems)	0..1

2.5 Elements of SMC “IntervalSpecification”

Table 5: Submodel Elements of “IntervalSpecification”

idShort:	IntervalSpecification		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRDI] 0173-1#02-AAN911#001		
Parent:	SMC “BasicMaintenanceInformation”		
Explanation:	Specification of the maintenance interval.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] MaintenanceIntervalValue	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenanceintervalvalue/1/0 Value of the maintenance interval	[decimal] 60000	0..1
[Property] MaintenanceIntervalUnit	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenanceintervalunit/1/0 Interval Unit.	[string] km	0..1

2.6 Elements of SMC “AlarmValues”

Table 6: Elements of SMC “AlarmValues”

idShort:	AlarmValues		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/alarmvalues/1/0		
Parent:	SMC “BasicMaintenanceInformation”		
Explanation:	Collection of the alarms		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[SMC] Alarm__00__	[IRI] https://admin-shell.io/idta/maintenanceinstructions/alarm/1/0 The definition of an alarm value is done in this SMC. Alarm values can be stored, which are used before reaching the maintenance interval or for warning after exceeding. Whereby the definition of the alarm limit is given in % of the interval value to avoid errors due to different units.	n/a	0..*

2.7 Elements of SMC “Alarm__00__”

Table 7: Elements of SMC “Alarm__00__”

idShort:	Alarm__00__		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/alarm/1/0		
Parent:	SMC “AlarmValues”		
Explanation:	Collection of the alarms		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[MLP] AlarmName	[IRI] https://admin-shell.io/idta/maintenanceinstructions/alarmname/1/0 Designation of the alarm.	[langString] Pre-alarm at 300 operating hours	0..1
[Property] WarningLimitRelativeValue	[IRI] https://admin-shell.io/idta/maintenanceinstructions/warninglimitrelativevalue/1/0 For a clear definition of the alarm value, the alarm value is entered as a % of the maintenance interval.	[decimal] 80	0..1
[Property]	[IRI] https://admin-shell.io/idta/maintenanceinstructions/warninglimitseverity/1/0	[string] Warning	0..1

WarningLimitSeverity	Definition (severity) of what the alarm means or what effects it should have. Info, warning, alarm, shutdown		

2.8 Elements of SMC “ContactForMaintenanceAuthorization”

Table 8: Elements of SMC “ContactForMaintenanceAuthorization”

idShort:	ContactForMaintenanceAuthorization		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation		
Parent:	SMC “BasicMaintenanceInformation”		
Explanation:	Collection of contact details for authorization before maintenance		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[MLP] Company	IRDI] 0173-1#02-AAW001#001 name of the company	[langString] ABC Company@en	0..1
[MLP] Department	[IRDI] 0173-1#02-AAO127#003 administrative section within an organisation where a business partner is located	[langString] Vertrieb@de	0..1
[Property] RoleOfContactPerson	[IRDI] 0173-1#02-AAO204#003 function of a contact person in a process enumeration: 0173-1#07-AAS927#001 (administrativ contact), 0173-1#07-AAS928#001 (commercial contact), 0173-1#07-AAS929#001 (other contact), 0173-1#07-AAS930#001 (hazardous goods contact), 0173-1#07-AAS931#001 (technical contact) Note: the above mentioned ECLASS enumeration should be declared as “open” for further addition.	[string] 0173-1#07-AAS931#001 ECLASS enumeration IRDI is preferable. If no IRDI available, custom input as String may also be accepted.	0..1
[MLP] Title	[IRDI] 0173-1#02-AAO208#003 common, formal, religious, or other title preceding a contact person's name	[langString]	0..1
[MLP] AcademicTitle	[IRDI] 0173-1#02-AAO209#003 academic title preceding a contact person's name	[langString]	0..1
[MLP] NameOfContact	[IRDI] 0173-1#02-AAO205#002 surname of a contact person	[langString]	0..1
[MLP] FirstName	[IRDI] 0173-1#02-AAO206#002 first name of a contact person	[langString]	0..1
[MLP] MiddleNames	[IRDI] 0173-1#02-AAO207#002 middle names of contact person	[langString]	0..1

[SMC] Email	[IRDI] 0173-1#02-AAQ836#005 E-mail address and encryption method See separate clause	n/a	0..1
[SMC] Phone	[IRI] https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation/Phone Phone number including type See separate clause	n/a	0..1
[SMC] Fax	[IRDI] 0173-1#02-AAQ834#005 Fax number including type See separate clause	n/a	0..1
[MLP] Street	[IRDI] 0173-1#02-AAO128#002 street name and house number	[langString] Musterstraße 1@de	0..1
[MLP] Zipcode	[IRDI] 0173-1#02-AAO129#002 ZIP code of address	[langString] 12345@de	0..1
[MLP] CityTown	[IRDI] 0173-1#02-AAO132#002 town or city	[langString] Musterstadt@de	0..1
[MLP] NationalCode	[IRDI] 0173-1#02-AAO134#002 code of a country Note: country codes defined accord. to ISO 3166-1	[langString] DE@de	0..1
[MLP] StateCounty	[IRDI] 0173-1#02-AAO133#002 federal state a part of a state	[langString] Muster-Bundesland@de	0..1
[MLP] FurtherDetailsOfContact	[IRDI] 0173-1#02-AAO210#002 additional information of the contact person	[langString]	0..1

2.9 Elements of the SMC “Email”

Table 9: Elements of SMC “Email”

idShort:	Email		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRDI] 0173-1#02-AAQ836#005		
Parent:	SMC “ContactForMaintenanceAuthorization”		
Explanation:	E-mail address and encryption method		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	

[Property] EmailAddress	[IRDI] 0173-1#02-AAO198#002 electronic mail address of a business partner	[string] email@muster-ag.de	0..1
[MLP] PublicKey	[IRDI] 0173-1#02-AAO200#002 public part of an unsymmetrical key pair to sign or encrypt text or messages	[langString]	0..1
[Property] TypeOfEmailAddress	[IRDI] 0173-1#02-AAO199#003 characterization of an e-mail address according to its location or usage enumeration: 0173-1#07-AAS754#001 (office), 0173-1#07-AAS756#001 (secretary), 0173-1#07-AAS757#001 (substitute), 0173-1#07-AAS758#001 (home)	[string] 0173-1#07-AAS754#001	0..1
[MLP] TypeOfPublicKey	[IRDI] 0173-1#02-AAO201#002 characterization of a public key according to its encryption process	[langString]	0..1

2.10 Elements of the SMC “Phone”

Table 10: Elements of SMC “Phone”

idShort:	Phone		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation/Phone		
Parent:	SMC “ContactForMaintenanceAuthorization”		
Explanation:	Phone number including type		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[MLP] TelephoneNumber	[IRDI] 0173-1#02-AAO136#002 complete telephone number to be called to reach a business partner	[langString] +491234567890@de	0..1
[Property] TypeOfTelephone	[IRDI] 0173-1#02-AAO137#003 characterization of a telephone according to its location or usage enumeration: 0173-1#07-AAS754#001 (office), 0173-1#07-AAS755#001 (office mobile), 0173-1#07-AAS756#001 (secretary), 0173-1#07-AAS757#001 (substitute), 0173-1#07-AAS758#001 (home), 0173-1#07-AAS759#001 (private mobile)	[string] 0173-1#07-AAS754#001	0..1
[MLP] AvailableTime	[IRI] https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation/AvailableTime/ Specification of the available time window	[langString] Montag – Freitag 08:00 bis 16:00@de	0..1

2.11 Elements of the SMC “Fax”

Table 11: Elements of SMC “Fax”

idShort:	Fax		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRDI] 0173-1#02-AAQ834#005		
Parent:	SMC “ContactForMaintenanceAuthorization”		
Explanation:	Fax number including type		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[MLP] FaxNumber	[IRDI] 0173-1#02-AAO195#002 complete telephone number to be called to reach a business partner's fax machine	[langString] +491234567890@de	0..1
[Property] TypeOfFaxNumber	[IRDI] 0173-1#02-AAO196#003 characterization of the fax according its location or usage enumeration: 0173-1#07-AAS754#001 (office), 0173-1#07-AAS756#001 (secretary), 0173-1#07-AAS758#001 (home)	[string]	0..1

2.12 Elements of the SMC “MaintenanceTechnicians”

Table 12: Elements of “MaintenanceTechnicians”

idShort:	MaintenanceTechnicians		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancetechnicians/1/0		
Parent:	SMC “BasicMaintenanceInformation”		
Explanation:	Details of the technicians required for maintenance.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] NumberOfRequiredTechnicians	[IRI] https://admin-shell.io/idta/maintenanceinstructions/numberofrequiredtechnicians/1/0 Number of technicians needed for maintenance	[decimal] 2	0..1
[MLP] RequiredQualification	[IRDI] 0173-1#02-BAF831#002 Requirement for the minimum qualification of technicians	[langString] For the described activities, an appropriately qualified specialist is required. Specialists performing these activities must have a level of	0..1

		knowledge that includes relevant national standards and regulations. For activities in potentially explosive atmospheres, further knowledge is required, which is described in the following standards: - IEC/EN 60079-14 (Design, selection and installation of electrical systems) - IEC/EN 60079-17 (Inspection and maintenance of electrical installations) - IEC/EN 60079-19 (Equipment repair, overhaul and regeneration) - IEC/EN 61009-1 (Residual current operated circuit-breakers with built-in overcurrent protection)	
[SMC] EstimatedTotal WorkingTime	[IRI] https://admin-shell.io/idta/maintenanceinstructions/estimatedtotalworkingtime/1/0 Collection to define the expected time needed to perform the maintenance.	n/a	0..1

2.13 Elements of the SMC “EstimatedTotalWorkingTime”

Table 13: Elements of “EstimatedTotalWorkingTime”

idShort:	EstimatedTotalWorkingTime		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/estimatedtotalworkingtime/1/0		
Parent:	SMC “MaintenanceTechnicians”		
Explanation:	Collection to define the expected time needed to perform the maintenance.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] ValueTotalEstimatedWorkingTime	[IRI] https://admin-shell.io/idta/maintenanceinstructions/valuetotalestimatedworkingtime/1/0 Value for the expected working time required for maintenance	[decimal] 42	1
[Property]	[IRI] https://admin-shell.io/idta/maintenanceinstructions/unitvaluetotalestimatedworkingtime/1/0	[string] hour	1

UnitValueTotalEstimatedWorkingTime	Unit for the expected work time required for maintenance		

2.14 Elements of the SMC “ListMaintenanceSteps”

Table 14: Elements of “ListMaintenanceSteps”

idShort:	ListMaintenanceSteps		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/listmaintenancesteps/1/0		
Parent:	SMC “MaintenanceInstructionsForSpecificInterval__00__”		
Explanation:	Listing of the individual maintenance steps incl. all required details per maintenance step.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[SMC] MaintenanceStep__00__	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancestep/1/0 Collection of all details and information about a maintenance site	n/a	0..1

2.15 Elements of the SMC “MaintenanceStep__00__”

Table 15: Elements of SMC “MaintenanceStep__00__”

idShort:	MaintenanceStep__00__		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancestep/1/0		
Parent:	SMC “ListMaintenanceSteps		
Explanation:	In a SMC "MaintenanceStep" all details of a maintenance step are summarized. This includes, among other things: Name of the maintenance step, maintenance instruction or link to a SM Maintenance of a subordinate asset, details about the required tools, consumables or spare parts, as well as the conditions for the next steps.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] MaintenanceStepID	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancestepid/1/0 ID or number of the maintenance step for a clear structuring of the maintenance	[string] ABC@123	0..1
[MLP] MaintenanceStepName	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancestepname/1/0	[langString] Oil service at 6000 km	0..1

	Naming of the maintenance step - example maintenance start.		
[MLP] LocalizationDescription	[IRI] https://admin-shell.io/idta/maintenanceinstructions/localizationdescription/1/0 Indication of the localization of the maintenance	[langString] Building 1 – 3rd floor – section A – left side	0..1
[Ref] LinkSMMaintenanceComponentModuleMachine	[IRI] https://admin-shell.io/idta/ref/linksmmaintenancecomponentmodulemachine/1/0 Link to another SM Maintenance. Example Link to the SM Maintenance of a sensor in a machine. From here, it is possible to jump to the maintenance information of a subordinate component.	n/a	0..1
[Ref] LinkAASComponentModuleMachine	[IRI] https://admin-shell.io/idta/ref/linkaascomponentmodulemachine/1/0 Link to a subordinate AAS. Example Link to the sensors in a machine. From here you can jump to the information of a subordinate component.	n/a	0..1
[MLP] InstructionMaintenanceStep	[IRI] https://admin-shell.io/idta/maintenanceinstructions/instructionmaintenancestep/1/0 Work instruction/ description of a maintenance step as an alternative to jumping to a maintenance information of subordinate components.	[langString] Closing the compressed air valve X1	0..1
[File] RelatedDocumentOrFileMaintenanceStep	[IRI] https://admin-shell.io/idta/file/relateddocumentorfilemaintenancestep/1/0 Linking of supporting documents that belong to this maintenance step. MIME-Type, file name, and file contents given by the File SubmodelElement. Constraint: the MIME-Type needs to match the file type.	MIME-Type = application/pdf value = /aasx/documentation/maintenance_Detail_Step1.PDF	0..1
[Ref] SparePartForMaintenanceStep	[IRI] https://admin-shell.io/idta/ref/sparepartformaintenancestep/1/0 Link to a spare part required in this maintenance step. A list of all the spare parts required for maintenance can be found in the SMC SparePartList of the SM Maintenance	n/a	0..1
[Property] QuantityOfSparePartForMaintenanceStep	[IRI] https://admin-shell.io/idta/maintenanceinstructions/quantityofsparepartformaintenancestep/1/0 Number of spare part required in this maintenance step.	[decimal] 2	0..1
[Ref]	[IRI] https://admin-shell.io/idta/ref/consumablesformaintenancestep/1/0	n/a	0..1

ConsumablesForMaintenanceStep	Link to a required consumable.		
[Property] QuantityOfConsumablesForMaintenanceStep	[IRI] https://admin-shell.io/idta/maintenanceinstructions/quantityofconsumablesformaintenancestep/1/0 Indication of the required number of consumables referenced under ConsumablesForMaintenanceStep for this maintenance step.	[decimal] 20	0..1
[Property] UnitForQuantityOfConsumablesForMaintenanceStep	[IRI] https://admin-shell.io/idta/maintenanceinstructions/unitforquantityofconsumablesformaintenancestep/1/0 Unit of the required number of consumables referenced under ConsumablesForMaintenanceStep for this maintenance step. Examples: Sheet, gram, millilitre	[string] ml	0..1
[Ref] ToolsForMaintenanceStep	[IRI] https://admin-shell.io/idta/ref/toolsformaintenancestep/1/0 Reference to a required tool. A list of all required spare parts for a maintenance can be found in the SMC MaintenanceToolList of the SM Maintenance	n/a	0..1
[Property] QuantityOfToolsForMaintenanceStep	[IRI] https://admin-shell.io/idta/maintenanceinstructions/quantityoftoolsformaintenancestep/1/0 Indication of the required number of the tool referenced under ToolsForMaintenanceStep for this maintenance step.	[decimal] 2	0..1
[Property] DocumentationSignatureMandatory	[IRI] https://admin-shell.io/idta/maintenanceinstructions/documentationsignaturemandatory/1/0 Specifies whether this maintenance step must be documented. O corresponds to no documentation necessary, 1 corresponds to documentation necessary.	[boolean] True	0..1
[SMC] EstimatedDurationTimeMaintenanceStep	[IRI] https://admin-shell.io/idta/maintenanceinstructions/estimatedduration timemaintenancestep/1/0 Estimated duration for this maintenance step.	n/a	0..1
[MLP] ConditionForNextMaintenanceStep	[IRI] https://admin-shell.io/idta/maintenanceinstructions/conditionfornextmaintenancestep/1/0 Condition for the next maintenance step.	[langString] If oil level is above 50 mm	0..1
[Ref] NextMaintenanceStep	[IRI] https://admin-shell.io/idta/ref/nextmaintenancestep/1/0 Reference to the following maintenance step if the condition is fulfilled.	n/a	0..1
[MLP] ConditionForAlternativeNextStep	[IRI] https://admin-shell.io/idta/maintenanceinstructions/conditionforalternativenextstep/1/0 Alternative next step if the previous condition is not fulfilled.	[langString] If oil level is below 50 mm	0..1

[Ref] AlternativeNextMaintenanceStep	[IRI] https://admin-shell.io/idta/ref/alternativenextmaintenancestep/1/0 Reference to the following maintenance step if the condition is not fulfilled.	n/a	0..1
[Property] EndOfMaintenance	[IRI] https://admin-shell.io/idta/maintenanceinstructions/endofmaintenance/1/0 End of maintenance if this was the last maintenance step. 1 = End of maintenance reached	[boolean] True	0..1

2.16 Elements of the SMC "EstimatedWorkingTimeMaintenanceStep"

Table 16: Elements of "EstimatedWorkingTimeMaintenanceStep"

idShort:	EstimatedDurationTimeMaintenanceStep		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/estimateddurationtimemaintenancestep/1/0		
Parent:	SMC "MaintenanceStep__00__"		
Explanation:	Collection to define the expected time needed to perform the maintenance step. For a better definition, the duration is defined with 2 properties - value and unit.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] ValueEstimatedDurationTimeMaintenanceStep	[IRI] https://admin-shell.io/idta/maintenanceinstructions/valueestimateddurationtimemaintenancestep/1/0 Indication of the duration for this maintenance step (value)	[decimal] 30	0..1
[Property] UnitEstimatedDurationTimeMaintenanceStep	[IRI] https://admin-shell.io/idta/maintenanceinstructions/unitestimateddurationtimemaintenancestep/1/0 Time unit for the value of the duration for this wArting step - example hours, days, weeks.	[string] minute	0..1

2.17 Elements of the SML “MaintenanceToolList”

Table 17: Elements of “MaintenanceToolList”

idShort:	MaintenanceToolList		
Class:	SubmodelElementList (SML)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancetoollist/1/0		
Parent:	SM “MaintenanceInstructions”		
Explanation:	Total list of tools required for all maintenance intervals of an asset		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[SMC] MaintenanceTool	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancetool/1/0 Information and details on a tool needed for maintenance.	n/a	0..1

2.18 Elements of the SMC “MaintenanceTool

Table 18: Elements of “MaintenanceTool”

idShort:	MaintenanceTool		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancetool/1/0		
Parent:	SML “MaintenanceToolList”		
Explanation:	The collection contains all the information and details about a tool needed for maintenance. This includes the name, order number, manufacturer and a description.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] ToolID	[IRI] https://admin-shell.io/idta/maintenanceinstructions/toolid/1/0 An ID can be assigned to uniquely identify a tool.	[string] ABC@123	0..1
[MLP] ToolName	[IRI] https://admin-shell.io/idta/maintenanceinstructions/toolname/1/0 A name for the tool can be stored to make the tool more understandable for humans.	[string] ABC@123	0..1
[SMC] CollectionMaxQuantityOfTool	[IRI] https://admin-shell.io/idta/maintenanceinstructions/collectionmaxquantityoftool/1/0 Collection total quantity of tools required for different maintenance intervals.	n/a	0..1

[MLP] CompanyNameToolSupplier	[IRI] https://admin-shell.io/idta/maintenanceinstructions/companynametoolsupplier/1/0 Name of the tool manufacturer e.g. Max Mustermann GmbH	[string] Max Mustermann GmbH	0..1
[Property] OrderCodeToolOfManufacturer	[IRI] 0112/2///61987#ABA950#008 unique combination of numbers and letters issued by the manufacturer that is used to identify the tool for ordering	[string] ABC@123	0..1
[MLP] ToolDescription	[IRI] https://admin-shell.io/idta/maintenanceinstructions/tooldescription/1/0 Detailed description of the tool	[langString] Torx screwdriver size T4, blade length 40 mm, non-insulated blade	0..1
[Property] AddressOfAdditionalLinkTool	[IRDI] 0173-1#02-AAQ326#004 Web site address where information about the tool is given, e.g. link to shop	[string]	0..1

2.19 Elements of the SMC “CollectionMaxQuantityOfTool”

Table 19: Elements of “CollectionMaxQuantityOfTool”

idShort:	CollectionMaxQuantityOfTool		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/collectionmaxquantityoftool/1/0		
Parent:	SMC “MaintenanceTool”		
Explanation:	List of tools required for all maintenance intervals of an asset. The quantity is devied by the different maintenance intervals. Each quantity per maintenance interval is described/ defined in an own SMC.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[SMC] CollectionMaxQuantityOfToolool ForSpecificInterval__00__	[IRI] https://admin-shell.io/idta/maintenanceinstructions/collectionmaxquantityoftoolforspecificinterval/1/0 Collection total quantity of tools required for one specific maintenance intervals.	n/a	0..1

2.20 Elements of the SMC "CollectionQuantityOfToolsForSpecificInterval"

Table 20: Elements of "CollectionQuantityOfToolsForSpecificInterval"

idShort:	CollectionQuantityOfToolsForSpecificInterval		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/collectionmaxquantityoftoolforspecificinterval/1/0		
Parent:	SMC "CollectionMaxQuantityOfTool"		
Explanation:	List of tools required for a specific maintenance intervals of an asset.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] MaxQuantityOfTool	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maxquantityoftool/1/0 Total number of tools required for one specific maintenance interval.	[decimal] 2	0..1
[Ref] ReferenceNameOfMaintenance	[IRI] https://admin-shell.io/idta/maintenanceinstructions/referencenameofmaintenance/1/0 Reference to ID of specific maintenance interval	[URL]	0..1
[Ref] ReferenceToMaintenanceID	[IRI] https://admin-shell.io/idta/maintenanceinstructions/referencenameofmaintenance/1/0 Reference to ID of specific maintenance interval.	[URL]	0..1

2.21 Elements of the SML "MaintenanceConsumablesList"

Table 21: Elements of "MaintenanceConsumablesList"

idShort:	MaintenanceConsumablesList		
Class:	SubmodelElementList (SML)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenanceconsumableslist/1/0		
Parent:	SM "MaintenanceInstructions"		
Explanation:	Total list of consumables required for all maintenance intervals of an asset. Each consumable is described/defined in its own SML.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[SMC]	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenanceconsumable/1/0	n/a	0..1

MaintenanceConsumables	The collection contains all information and details about a consumable required for maintenance. This includes the designation, order number, manufacturer and a description.		

2.22 Elements of the SMC “MaintenanceConsumable”

Table 22: Elements of “MaintenanceConsumable”

idShort:	MaintenanceConsumable		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenanceconsumable/1/0		
Parent:	SML “MaintenanceConsumablesList”		
Explanation:	The collection contains all information and details about a consumable required for maintenance. This includes the designation, order number, manufacturer and a description.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] ConsumableID	[IRI] https://admin-shell.io/idta/maintenanceinstructions/consumableid/1/0 An ID can be assigned to uniquely identify a consumable.	[string] ABC@123	0..1
[MLP] ConsumableName	[IRI] https://admin-shell.io/idta/maintenanceinstructions/consumablename/1/0 A name for the consumable can be stored to name the consumable more understandable for humans.	[string] ABC@123	0..1
[SMC] CollectionQuantityOfConsumable	[IRI] https://admin-shell.io/idta/maintenanceinstructions/collectionquantityofconsumables/1/0 Collection quantity of consumable required for maintenance intervals.	n/a	0..1
[Property] UnitMaxQuantityOfConsumable	[IRI] https://admin-shell.io/idta/maintenanceinstructions/unitmaxquantityofconsumable/1/0 Unit for the total quantity of consumable material required. Example: sheet, millilitre, gram.	[string] ml	0..1
[MLP] CompanyNameSupplierConsumable	[IRI] https://admin-shell.io/idta/maintenanceinstructions/companynamesupplierconsumable/1/0 Name of the consumables manufacturer e.g. Max Mustermann GmbH	[string] Max Mustermann GmbH	0..1
[Property] OrderCodeConsumableOfManufacturer	[IRI] 0112/2///61987#ABA950#008 unique combination of numbers and letters issued by the manufacturer that is used to identify the consumable for ordering	[string] ABC@123	0..1

[MLP] ConsumableDescription	[IRI] https://admin-shell.io/idta/maintenanceinstructions/consumabledescription/1/0 Description of the consumables. Example: Cleaning paper; colour blue; sheet size 380x 380 mm double-ply.	[langString] High-performance high-pressure gear oil, Oil type: mineral, Provides a stable lubricating film and minimizes wear, SAE / Viscosity: 80W, Approvals: API GL4, MB release 235.1, MIL-L 2105.	0..1
[MLP] DisposalInstructionsForConsumable	[IRI] https://admin-shell.io/idta/maintenanceinstructions/disposalinstructionsforconsumable/1/0 Information on the proper disposal of the consumables.	[langString] Disposal by specialist company only. Do not allow to enter drains or water courses. Do not allow to enter subsoil/soil. .	0..1
[Property] AddressOfAdditionalLinkConsumable	[IRID] 0173-1#02-AAQ326#004 Web site address where information about the consumable is given, e.g. link to shop	[string]	0..1

2.23 Elements of the SMC “CollectionQuantityOfConsumable”

Table 23: Elements of “CollectionQuantityOfConsumable”

idShort:	CollectionQuantityOfConsumable		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/collectionquantityofconsumables/1/0		
Parent:	SMC MaintenanceConsumable		
Explanation:	Collection quantity of consumable required for maintenance intervals.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[SMC] QuantityOfConsumableForSpecificInterval	[IRI] https://admin-shell.io/idta/maintenanceinstructions/quantityofconsumableforspecificinterval/1/0 Collection total quantity of consumable required for one specific maintenance intervals.	n/a	0..1

2.24 Elements of the SMC "QuantityOfConsumableForSpecificInterval"

Table 24: Elements of "QuantityOfConsumableForSpecificInterval"

idShort:	QuantityOfConsumableForSpecificInterval		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/quantityofconsumableforspecificinterval/1/0		
Parent:	SMC "CollectionQuantityOfConsumable"		
Explanation:	List of consumable required for a specific maintenance intervals of an asset.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] QuantityOfConsumable	[IRI] https://admin-shell.io/idta/maintenanceinstructions/quantityofconsumable/1/0 Total number of consumble required for specific maintenance interval.	[decimal] 2	0..1
[Ref] ReferenceNameOfMaintenance	[IRI] https://admin-shell.io/idta/maintenanceinstructions/referencenameofmaninatainance/1/0 Reference to name of specific maintenance interval	[URL]	0..1
[Ref] ReferenceToMaintenanceID	[IRI] https://admin-shell.io/idta/maintenanceinstructions/referencenameofmaintenance/1/0 Reference to Maintenance ID of specific maintenance interval	[URL]	0..1

2.25 Elements of the SML "MaintenanceSparePartList"

Table 25: Elements of "MaintenanceSparePartList"

idShort:	MaintenanceSparePartList		
Class:	SubmodelElementList (SML)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancesparepartlist/1/0		
Parent:	SM "MaintenanceInstructions"		
Explanation:	Total list of required spare parts for all maintenance intervals of an asset. Each spare part is described/ defined in its own SML.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**

idShort	Description@en	example	
[SMC] MaintenanceSparePart	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancesparepart/1/0 The collection contains all information and details about a consumable required for maintenance. This includes the designation, order number, manufacturer and a description.	n/a	0..1

2.26 Elements of the SMC “MaintenanceSparePart”

Table 26: Elements of “MaintenanceSparePart”

idShort:	MaintenanceSparePart		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/maintenancesparepart/1/0		
Parent:	SML “MaintenanceSparePartList”		
Explanation:	The collection contains all information and details about a spare part required for maintenance. This includes the designation, order number, manufacturer and a description.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] SparePartID	[IRI] https://admin-shell.io/idta/maintenanceinstructions/sparepartid/1/0 An ID can be assigned to uniquely identify a spare part.	[string] ABC@123	0..1
[MLP] SparePartName	[IRI] https://admin-shell.io/idta/maintenanceinstructions/sparepartname/1/0 A designation of the spare part can be stored to name the spare part more understandable for people.	[string] ABC@123	0..1
[SMC] CollectionQuantityOfSparePart	[IRI] https://admin-shell.io/idta/maintenanceinstructions/collectionquantityofsparepart/1/0 Collection quantity of spare part required for maintenance intervals	n/a	0..1
[MLP] CompanyNameSupplierSparePart	[IRI] https://admin-shell.io/idta/maintenanceinstructions/companynamesuppliersparepart/1/0 Name of the spare parts manufacturer e.g. Max Mustermann GmbH	[string] Max Mustermann GmbH	0..1
[Property] OrderCodeSparePartOfManufacturer	[IRI] 0112/2///61987#ABA950#008 unique combination of numbers and letters issued by the manufacturer that is used to identify the spare part for ordering	[string] ABC@123	0..1

[MLP] SparePartDescription	[IRI] https://admin-shell.io/idta/maintenanceinstructions/sparepartdescription/1/0 Detailed description of the spare part.	[langString] button cell, dimensions: (Ø x H) 20 mm x 3.2 mm, chemical system: lithium, electrical capacity: 230 mAh, IEC: CR2032, voltage: 3 V, rechargeable: no	0..1
[MLP] DisposalInstructionsForSparePart	[IRI] https://admin-shell.io/idta/maintenanceinstructions/disposalinstructionsforsparepart/1/0 Information on the proper disposal of the spare part.	[langString] Used batteries may contain harmful substances or heavy metals that can damage the environment and health. Used batteries must not be disposed of in household waste. Consumers are legally obliged to take batteries to a suitable collection point.	0..1
[Property] AddressOfAdditionalLinkSparePart	[IRDI] 0173-1#02-AAQ326#004 Web site address where information about the consumable is given, e.g. link to shop	[string]	0..1

2.27 Elements of the SMC “CollectionQuantityOfSparePart”

Table 27: Elements of “CollectionQuantityOfSparePart”

idShort:	CollectionQuantityOfSparePart		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/collectionquantityofsparepart/1/0		
Parent:	SMC MaintenanceSparePart		
Explanation:	Collection quantity of spare part required for maintenance intervals.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[SMC] CollectionQuantityOfSparepartForSpecificInterval__00__	[IRI] https://admin-shell.io/idta/maintenanceinstructions/collectionquantityofsparepartforspecificinterval/1/0 Collection quantity of spare parts required for a specific maintenance interval	n/a	0..1

2.28 Elements of the SMC “CollectionQuantityOfSparepartForSpecificInterval__00__”

Table 28: Elements of “CollectionQuantityOfSparepartForSpecificInterval__00__”

idShort:	CollectionQuantityOfSparepartForSpecificInterval{00]		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] https://admin-shell.io/idta/maintenanceinstructions/collectionquantityofsparepartforspecificinterval/1/0		
Parent:	SMC “CollectionQuantityOfSparePart”		
Explanation:	Collection quantity of spare parts required for a specific maintenance interval		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] QuantityOfSparePart	[IRI] https://admin-shell.io/idta/maintenanceinstructions/quantityofsparepart/1/0 Quantity of spare part required for one specific maintenance interval.	[decimal] 2	0..1
[Ref] ReferenceNameOfMaintenance	[IRI] https://admin-shell.io/idta/maintenanceinstructions/referencenameofmaintenance/1/0 Reference to name of specific maintenance interval	[URL]	0..1
[Ref] ReferenceToMaintenanceID	[IRI] https://admin-shell.io/idta/maintenanceinstructions/referencenameofmaintenance/1/0 Reference to Maintenance ID of specific maintenance interval	[URL]	0..1

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 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@EN.
- The [valueType] is only given for Properties.

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