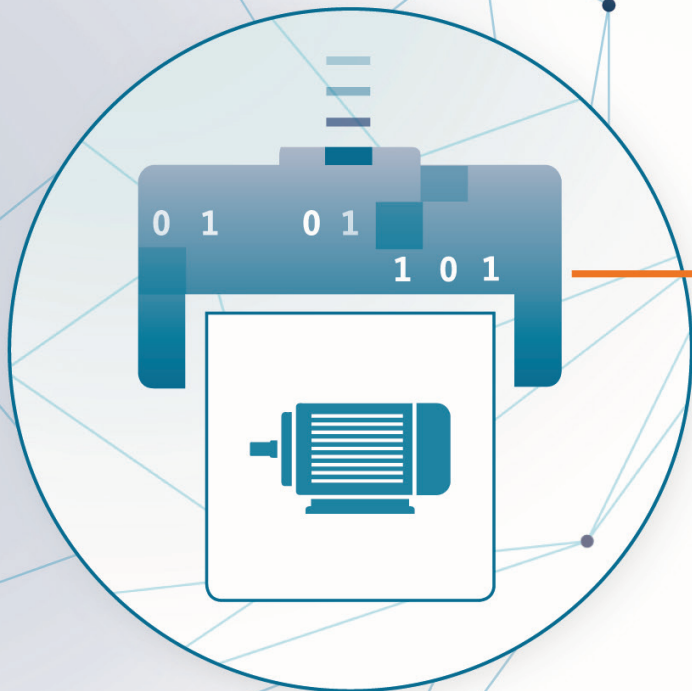



SPECIFICATION


# Submodel Templates of the Asset Administration Shell




- Serial Number = 1234567890

**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 Name = Operating Manual

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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 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 contact information 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. It targets equipment for process industry and factory automation by defining standardized meta data.

The intended use-case is the provision of a standardized property structure for contact information, which can effectively accelerate the preparation for asset maintenance.

This concept can serve as a basis for standardizing the respective submodel. The conception is based on studies of common practices at enterprises.

Beside standardized submodel this template also introduces standardized SubmodelElementCollections (SMC) in order to improve the interoperability while modelling aspects of contact information within other submodels.

## 2 Information set for Submodel “ContactInformations”

The Submodel template was motivated by the prior ZVEI project “Digital Nameplate”. A brief introduction about the project is given in Annex C. While defining submodels the following three aspects must be considered as suggested in [5]:

### **Use and economic relevance**

The submodel “ContactInformations” is designed for service issues, e.g. maintenance or malfunction. The submodel should show the available communication channels to reach the correct service provider without ambiguity. Beside manufacturers authorised partners may serve as service provider and contact for spare parts orders as well. In this way inquiries for repair services or spare parts can reach the right service contact directly and efficiently.

### **Possible functions and interactions**

When a service issue occurs, customer can contact the responsible department of the manufacturer or an authorized service provider by using the communication channels specified in the submodel. The properties for physical address and language availability can enable a rapid filtering of the wide range of all provided contacts. Furthermore, the specification of the time availability in contact channels like telephone or online communication helps customers to locate the right service contacts depending on the time when the issue occurs.

### **Property specification**

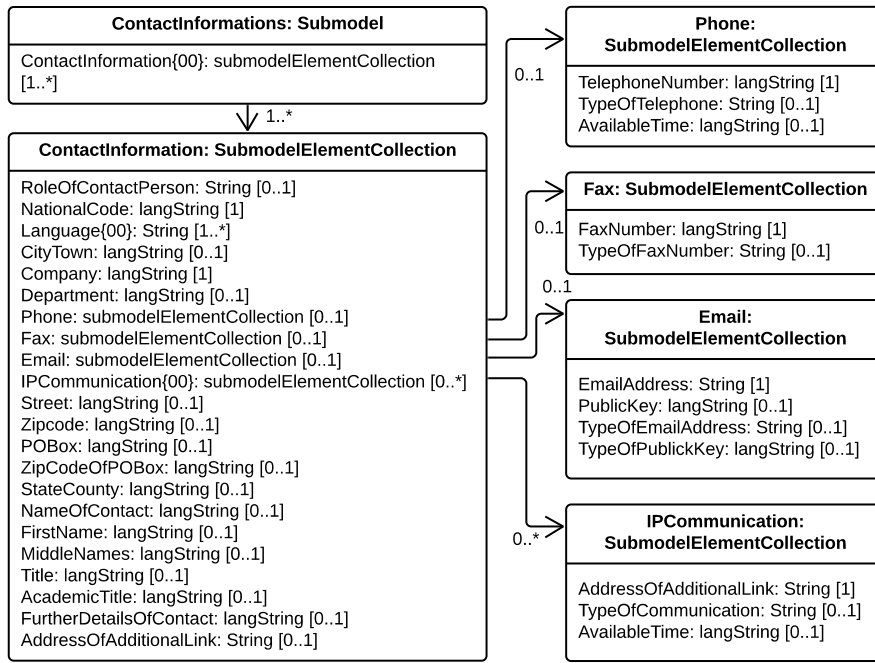
See clause 3 “Submodel and collections”.

# 3 Submodel and collections

## 3.1 Properties of the Submodel “ContactInformations”

Figure 1 shows the UML-diagram defining the relevant properties which need to be set. Table 1 describes the details of the submodel structure combined with examples.

Figure 1 UML-Diagram for submodel "ContactInformation"



<b>idShort:</b>	ContactInformations Note: the above idShort shall always be as stated.		
<b>Class:</b>	Submodel		
<b>semanticId:</b>	[IRI] https://admin-shell.io/zvei/nameplate/1/0/ContactInformations		
<b>Parent:</b>	Asset Adminsitration Shell with asset, which is a 3rd party article		
<b>Explanation:</b>	The Submodel “ContactInformations” is the collection for various contact information.		
<b>[SME type]</b>	<b>semanticId = [idType]value</b>	<b>[valueType]</b>	<b>card.</b>
<b>idShort</b>	<b>Description@en</b>	<b>example</b>	
[SubmodelElementCollection] ContactInformation{00}	[IRI] https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ ContactInformation The SMC “ContactInformation” contains information on how to contact the manufacturer or an authorised service provider, e.g. when a maintenance service is required	n/a	[1..*]

### 3.2 Properties of the SMC “ContactInformation”

Figure 1 shows the UML-diagram defining the relevant properties which need to be set. Table 2 describes the details of the SMC structure combined with examples.

**Table 2 Properties of SMC "ContactInformation"**

<b>idShort:</b>	ContactInformation Note: the above idShort shall always be as stated.		
<b>Class:</b>	SubmodelElementCollection		
<b>semanticId:</b>	[IRI] https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation		
<b>isCaseOf</b>	[IRDI] 0173-1#02-AAQ837#005		
<b>AllowDuplicates</b>	True		
<b>Parent:</b>	Submodel “ContactInformations”		
<b>Explanation:</b>	The SMC “ContactInformation” contains information on how to contact the manufacturer or an authorised service provider, e.g. when a maintenance service is required		
<b>[SME type]</b>	<b>semanticId = [idType]value</b>	<b>[valueType]</b>	<b>card.</b>
<b>idShort</b>	<b>Description@en</b>	<b>example</b>	
[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] <sup>1</sup> NationalCode	[IRDI] 0173-1#02-AAO134#002 code of a country Note: country codes defined accord. to DIN EN ISO 3166-1	[langString] <sup>1</sup> DE@DE	[1]
[Property] Language{00}	[IRI] https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation/Language isCaseOf: [IRDI] 0173-1#02-AAO895#003 Available language Note: language codes defined accord. to ISO 639-1 Note: as per ECLASS definition, Expression and representation of thoughts, information, feelings, ideas through characters	[String] DE	[1..*]

<sup>1</sup> Recommendation: property declaration as MLP is required by its semantic definition. As the property value is language independent, users are recommended to provide maximal 1 string in any language of the user’s choice.

## 8 | SUBMODEL TEMPLATE SPECIFICATION

[MLP] CityTown	[IRDI] 0173-1#02-AAO132#002 town or city Note: mandatory property according to EU Machine Directive 2006/42/EC.	[langString] Musterstadt@DE	[0..1]
[MLP] Company	[IRDI] 0173-1#02-AAW001#001 name of the company	[langString] ABC Company@EN	[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]
[SubmodelElementCollection] Phone	[IRI] https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation/Phone Phone number including type See separate clause	n/a	[0..1]
[SubmodelElementCollection] Fax	[IRDI] 0173-1#02-AAQ834#005 Fax number including type See separate clause	n/a	[0..1]
[SubmodelElementCollection] Email	[IRDI] 0173-1#02-AAQ836#005 E-mail address and encryption method See separate clause	n/a	[0..1]
[SubmodelElementCollection] IPCommunication{00}	[IRI] https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation/IPCommunication IP-based communication channels, e.g. chat or video call See separate clause	n/a	[0..*]
[MLP] Street	[IRDI] 0173-1#02-AAO128#002 street name and house number	[langString] Musterstraße 1@DE	[0..1]
[MLP] <sup>1</sup> Zipcode	[IRDI] 0173-1#02-AAO129#002 ZIP code of address	[langString] <sup>1</sup> 12345@DE	[0..1]
[MLP] POBox	[IRDI] 0173-1#02-AAO130#002 P.O. box number	[langString] PF 1234@DE	[0..1]
[MLP] <sup>1</sup> ZipCodeOfPOBox	[IRDI] 0173-1#02-AAO131#002 ZIP code of P.O. box address	[langString] <sup>1</sup> 12345@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] 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]
[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] FurtherDetailsOfContact	[IRDI] 0173-1#02-AAO210#002 additional information of the contact person	[langString]	[0..1]
[Property] AddressOfAdditionalLink	[IRDI] 0173-1#02-AAQ326#002 web site address where information about the product or contact is given	[String]	[0..1]

### 3.3 Properties of the SMC “Phone”

Figure 1 shows the UML-diagram defining the relevant properties which need to be set. Table 3 describes the details of the SMC structure combined with examples.

**Table 3 Properties of SMC "Phone"**

<b>idShort:</b>	Phone		
<b>Class:</b>	SubmodelElementCollection		
<b>semanticId:</b>	[IRI] <a href="https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation/Phone">https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation/Phone</a>		
<b>isCaseOf</b>	[IRDI] 0173-1#02-AAQ833#005		
<b>Parent:</b>	SMC “ContactInformation”		
<b>Explanation:</b>	Phone number including type		
<b>[SME type]</b>	<b>semanticId = [idType]value</b>	<b>[valueType]</b>	<b>card.</b>
<b>idShort</b>	<b>Description@en</b>	<b>example</b>	
[MLP] <sup>1</sup> TelephoneNumber	[IRDI] 0173-1#02-AAO136#002 complete telephone number to be called to reach a business partner	[langString] <sup>1</sup> +491234567890@DE	[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]
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### 3.4 Properties of the SMC “Fax”

Figure 1 shows the UML-diagram defining the relevant properties which need to be set. Table 4 describes the details of the SMC structure combined with examples.

**Table 4 Properties of SMC "Fax"**

<b>idShort:</b>	Fax		
<b>Class:</b>	SubmodelElementCollection		
<b>semanticId:</b>	[IRDI] 0173-1#02-AAQ834#005		
<b>Parent:</b>	SMC “ContactInformation”		
<b>Explanation:</b>	Fax number including type		
<b>[SME type]</b>	<b>semanticId = [idType]value</b>	<b>[valueType]</b>	<b>card.</b>
<b>idShort</b>	<b>Description@en</b>	<b>example</b>	
[MLP] <sup>1</sup> FaxNumber	[IRDI] 0173-1#02-AAO195#002 complete telephone number to be called to reach a business partner's fax machine	[langString] <sup>1</sup> +491234567890@ DE	[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] 1	[0..1]

### 3.5 Properties of the SMC “Email”

Figure 1 shows the UML-diagram defining the relevant properties which need to be set. Table 5 describes the details of the SMC structure combined with examples.

**Table 5 Properties of SMC "Email"**

<b>idShort:</b>	Email		
<b>Class:</b>	SubmodelElementCollection		
<b>semanticId:</b>	[IRDI] 0173-1#02-AAQ836#005		
<b>Parent:</b>	SMC “ContactInformation”		
<b>Explanation:</b>	E-mail address and encryption method		
<b>[SME type]</b>	<b>semanticId = [idType]value</b>	<b>[valueType]</b>	<b>card.</b>

idShort	Description@en	example	
[Property] EmailAddress	[IRDI] 0173-1#02-AAO198#002 electronic mail address of a business partner	[String] email@muster- ag.de	[1]
[MLP] <sup>1</sup> PublicKey	[IRDI] 0173-1#02-AAO200#002 public part of an unsymmetrical key pair to sign or encrypt text or messages	[langString] <sup>1</sup>	[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]

### 3.6 Properties of the SMC “IPCommunication”

Figure 1 shows the UML-diagram defining the relevant properties which need to be set. Table 6 describes the details of the SMC structure combined with examples.

**Table 6 Properties of SMC "IPCommunication"**

<b>idShort:</b>	IPCommunication{00}		
<b>Class:</b>	SubmodelElementCollection		
<b>semanticId:</b>	[IRI] <a href="https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation/IPCommunication/">https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation/IPCommunication/</a>		
<b>Parent:</b>	SMC “ContactInformation”		
<b>Explanation:</b>	IP-based communication channels, e.g. chat or video call		
<b>[SME type]</b>	<b>semanticId = [idType]value</b>	<b>[valueType]</b>	<b>card.</b>
idShort	Description@en	example	
[Property] AddressOfAdditionalLink	[IRDI] 0173-1#02-AAQ326#002 web site address where information about the product or contact is given	[String]	[1]
[Property] TypeOfCommunication	[IRI] <a href="https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation/IPCommunication/TypeOfCommunication">https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation/IPCommunication/TypeOfCommunication</a> characterization of an IP-based communication channel	[String] Chat Video call	[0..1]
[MLP] AvailableTime	[IRI] <a href="https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation/AvailableTime/">https://admin-shell.io/zvei/nameplate/1/0/ContactInformations/ContactInformation/AvailableTime/</a> Specification of the available time window	[langString] Montag – Freitag 08:00 bis 16:00@DE	[0..1]

## 4 Usage as SubmodelElementCollection

Due to the fact that contact information can be re-used in various contexts beside service issues, the specified SMC “ContactInformation” in section 3 can be used within other submodels. In this way the parent submodel can utilize standardized means of providing contact information, while the specific context of contact information remains identifiable through the parent submodel.

# 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 pieces of information 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

- 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 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 properties 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.

## Annex B. ZVEI Project Digital Nameplate

The project “Digital Nameplate” was initiated by ZVEI management circle for Industry 4.0 mirror committee “Strategy and use cases”. The project scope includes the conception of a digital nameplate based on AAS and the implementation as a demonstrator. The aim of the project is on the one hand to inform political decision-makers about the urgency to adjust legal boundaries for industrial product markings, on the other hand to save resources by replacing product documentation in paper format through digitalization while improving the service quality for customers at the same time.

The relevant results of the ZVEI project Digital Nameplate are transferred to this AAS submodel "Nameplate". The following functions are available within the project scope: the Digital Nameplate helps to identify the asset and its manufacturer. The Digital Nameplate can be accessed with common web browsers of diverse terminal equipments with display, e.g. smartphone, tablet or PC. An explicit programme or a mobile application shall not be mandatory for the usage of Digital Nameplate. The Digital Nameplate can be accessed by scanning the URL coded in a 2D code with an optical scan device such as a smartphone or a tablet. The following functions are available within the project scope:

- Nameplate information

User can browse through product information which is compliant with EU Machine Directive 2006/42/EC. The information includes but is not limited to manufacturer name, address, machine marking and machine type.

- Approval/ certificate information

User gets digital information about certificates and safety-related instructions that are compliant with VDI standard 2770. Beside the access to mandatory certificates, markings and safety-related information, user shall also have access to other optional certificates and markings.

- Service information

In case maintenance services are required, user can retrieve service information of the manufacturer. The information includes but is not limited to service hotline, service point, service contact, handbook for troubleshooting and maintenance guide. In addition, user can place orders for a product replacement, spare part or consumables from the manufacturer or a certified business partner. Relevant information for the order will be provided by appropriate submodels of the AAS.

- Identification

User can identify an asset by means of a Digital Nameplate uniquely. While defining submodels focus must be placed on the harmonization with existing models which are based on industry-wide consensus and listed as below:

- OPC UA Device Interface IEC 62451 Part 100 (OPC Foundation and "Field Level Communication", VDMA)
- Fieldbus e.g. Profibus and Profinet, SERCOS
- FDI (Field Device Integration) / FDT (Field Device Tool)
- NAMUR Core Model
- IO Link / IODD
- Auto-ID
- Antrieb 4.0

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