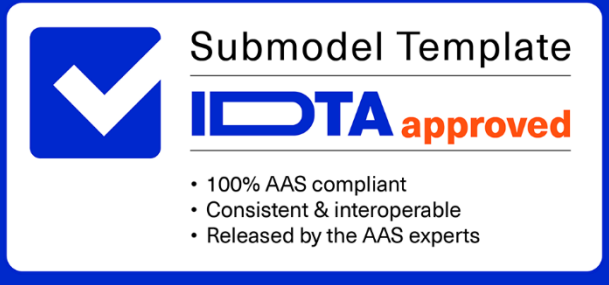
IDTA 02066 Process Variables for Manufacturing Key Performance Indicators

Version 1.0
April 2026

SPECIFICATION

Submodel Template of the
Asset Administration Shell



Imprint

Publisher
Industrial Digital Twin Association
Lyoner Strasse 18
60528 Frankfurt am Main
Germany
https://www.industrialdigitaltwin.org/

Version history

Date	Version	Comment
15.04.2026	1.0	Release of the official Submodel template published by IDTA.

Contents

Figures

Tables

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 Submodel Elements. This document especially details the question of which Submodel Elements with which semantic identification shall be used for this purpose.

1.2 Scope of the Submodel

In industrial production environments normally heterogeneous landscapes of production systems exist, furthermore named as machines. These landscapes facilitate high flexibility in production processes due to varied production capabilities that can be combined in a modular way. However, the control and optimization of the production flow by Manufacturing Operations Management (MOM) and its subsystem, the Manufacturing Execution System (MES), gets complicated if heterogeneous machinery is used. However, Manufacturing Key Performance Indicators (KPIs), like Overall Equipment Effectiveness (OEE), play a crucial role in assessing and optimizing the MOM. To calculate the KPI, defined process variables for all available machines are required, which in turn can be derived from the combination of user-defined machine signals.

Such important process variables can be, if the machine is producing, in error mode or in idle. This process variables result from the logical combination of multiple machine signals, which is custom for every machine type. For one machine it could be the combination of the signals

- automatic mode is active together with
- override <> 0 and
- program is running and
- start cycle

For another machine it could be the combination of the signals

- automatic mode is active together with
- program is running and
- override = 100% and
- spindle drive = 100% and
- NC ready

MES vendors must analyze every machine type regarding the communication interface, the meaning of the signals and the communication protocol with which the signals will be transferred to the MES to derive the typical process variables, which are defined and standardized in the ISO 22400-2. After deriving the process variables for single machines, the OEE can be calculated. The process described often requires collaboration between the MES vendor, the operator, and the machine manufacturer, which leads to complex coordination and a need for consultation due to different departments with their own terminology and concepts, as well as the fact that the customer may be entering new territory when integrating into an MES for the first time.

The Submodel “Process Variables for Manufacturing KPI Calculation” (PVM) defines an initial set of specified process variables, based on ISO 22400-2, which are required by the MES. The current values of the process variables should be provided via the Submodel, so that other applications can use them, e.g., to

automatically compute Manufacturing KPIs for heterogeneous machinery. The Submodel is intended to be used as a standalone Submodel as well as in combination with already published Submodels, specifically the Asset Interface Description [7] and Asset Interface Mapping Configuration Submodel [8]. The developed solution considers the existence of different communication protocols and PLCs but provides a standardized information model for process variables a MES or other systems require. Furthermore, this Submodel is designed to be extensible and to serve as a foundation for computing Manufacturing KPIs beyond its initial scope.

1.3 Relevant standards for the Submodel template

1.3.1 Relevant standards for Submodel design

VDMA 66412-1 – Data for Production Indicators

Part 1 of the VDMA 66412 specifies the process variables which must be provided by the machinery to the MES to facilitate the computation of KPIs, also defined in the VDMA 66412-1 (national standard) or the ISO 22400-2 (international standard).

ISO 22400-2 – Automation systems and integration – KPIs for manufacturing operations management

The ISO 22400-2 internationally defines and describes, like the German VDMA 66412-1, the KPIs for manufacturing operations management with their required process variables as well as the formulas to calculate the defined manufacturing KPIs. The process variables are grouped into time, logistical and quality process variables. The PVM Submodel uses in a first version a subset of time and quality process variables.

OPC UA for Machinery – OPC 40001

The OPC 40001 series provides a harmonized OPC UA model for machinery, designed to simplify integration with higher-level systems such as MES, SCADA, and analytics platforms. Part 1 defines the basic building blocks, including machine identification, machinery item state, and operation mode, which form the foundation for exposing time- and state-based process variables. Additional parts extend the model with process values, job and quantity information, and energy data. Appendix C.2 of OPC 40001-1 [9] provides an example mapping that relates machine states and operation modes to ISO 22400-2 KPI time elements. OPC 40001 therefore provides standardized machine-side process variables for manufacturing KPI computation as defined in VDMA 66412-1 and ISO 22400-2, without defining the KPIs or formulas themselves.

1.3.2 Relevant standards for Submodel usage

To automatically calculate the process variables for Manufacturing KPIs, there are several requirements (Req.) which need to be satisfied.

Req. 1: To calculate the required value of a process variable up-to-date data from a machine is needed.

Req. 2: In practice every machine has a different data model, hence a way to map machine signals to the defined process variables is needed.

Req. 3: To provide interoperability the process variables for Manufacturing KPI Calculation need to be defined and annotated with semantics.

Req. 4: Software systems like MES should support automatic configuration based on information provided by AAS Submodels.

The combination of these requirements provides an end-to-end integration between machines and MES, to get the relevant process variables.

To fulfil the requirements, the concept adopts a modular approach with three AAS submodels. This is the PVM Submodel itself, together with the Asset Interfaces Description (AID) Submodel and the Asset Interfaces Mapping Configuration (AIMC) Submodel. The intention is to strictly divide the responsibilities of each Submodel and thus enables the modular usage of Submodels.

The AID Submodel provides an interface description of the machine's controller and thus allows the collection of real time data (Req. 1) through an external application, configured by the AID Submodel. The AIMC Submodel allows the mapping of multiple single machine signals (described by the AID Submodel) to the process variables (described in this Submodel) (Req. 2). The PVM Submodel defines a subset of the defined process variables from ISO 22400-2 which are most important for a MES. The process variables are semantically described by an open-source ontology[1], which models the ISO 22400-2 (Req. 3). The combined usage of the three mentioned Submodels allows an automatic configuration of a MES to provide process variables for Manufacturing KPI calculation (Req. 4). The following two sections briefly summarize the necessary Submodel templates to better understand the concept.

Submodel Template 02017-1-0 - Asset Interfaces Description

This Submodel template statically describes the available communication interfaces, with its in- and outputs and the communication protocol of an asset, e.g., a machine. The current version provides the description of assets that communicate via MQTT, Modbus and HTTP/REST. Among others the next version will provide the description for OPC UA.

Submodel Template 02027-1-0 – Asset Interfaces Mapping Configuration

This Submodel template describes statically the mapping of in- and outputs from the AID Submodel to other Submodels of an AAS. So far, the current version provides a one-to-one mapping without further computations. In discussion with the working group of the AIMC Submodel template extensions are planned, in which the modelling of combinations, calculations and transformations of variables as well as the mapping of the computation result to other Submodels will be possible. An application is capable of automatically computing the defined rules and writing the result to the mapped Submodel Elements.

Together with the AIMC working group the terms "combination and calculation" and "transformation" are defined as following:

Combination and Calculation:

- Multiple signals will be used as input for the computation, but every signal delivers only one value.
- Combination/calculation of the given input signals to one output signal.
- This could be done by mathematical methods or boolean logic.
- Example: If "door is closed" and "override >= 80%" and "program start" then "machine is in run"

Transformation:

- Transform one input signal from one unit to another.
- Or apply an offset to an input signal.
- Example: Transform from Fahrenheit to Celsius.

Definition: In this context, the wording of in- and output signals is used to differ between the variables that are read from the AID Submodel (input) and the variables that are written as results to other Submodels (output) like the PVM Submodel.

Definition: In the future, a third computation type, called "aggregation", is foreseen. This reads one signal with multiple values to calculate a new signal, like the average pressure over a defined time. However, the modeling of an aggregation in the AAS is complex and could be an extension of a third version of the AIMC Submodel.

1.4 Use cases

1.4.1 Standardized onboarding of machines

The main use case of the PVM Submodel is to standardize the onboarding process of a machine to an MES with the help of AAS. The current onboarding process is structured as follows:

Step 1: Get information about the type of machine controller (PLC), the communication protocol and the interface of the controller, respectively the offered machine data and its structure.

[1] https://github.com/hsu-aut/IndustrialStandard-ODP-ISO22400-2

Step 2: Discuss which variables need to be combined, calculated or transformed to get the necessary data for the MES.

Step 3: Model the resulting rules inside the MES.

Step 4: Connect to the real machine, read the machine data, compute the rules and save the results.

Step 5: Validate the results with stakeholders. In practice this often means repeating step 2 to 4.

Today, steps 1 to 3 are made more difficult due to non-standardized information or data models, lack of information and the heterogeneity of machinery. The goal is to standardize these steps and offer this information in a machine-readable manner to a MES, so that it can be used in an automated manner. Section 1.7 shows a usage example for this Submodel together with already published Submodels.

1.4.2 Calculation of Overall Equipment Effectiveness

Another key use case of the Submodel is to enable a standardized and reliable calculation of Overall Equipment Effectiveness (OEE) across different systems. OEE is one of the most widely used KPIs in manufacturing because it provides a compact, standardized measure of equipment performance by combining availability, performance, and quality into a single, comparable metric. Manufacturers rely on OEE to identify losses, benchmark equipment and sites, and drive continuous improvement. However, reliably calculating OEE in practice remains difficult due to inconsistent data sources, proprietary and heterogeneous machine interfaces, and bespoke KPI definitions that vary across vendors and IT systems. In addition, many manufacturers modify or reinterpret the standard OEE definition to match their specific processes or organizational priorities, which further complicates comparability and interoperability across sites and tools.

This Submodel defines a standardized set of process variables, based on ISO 22400-2, to which machine or system interfaces can be mapped. Any application that consumes this Submodel, whether a MES, analytics platform, or dashboard, can reuse the same data and calculate OEE in a consistent and interoperable manner. When combined with the AIMC Submodel, the relationships between machine signals and process variables become explicit, making the KPI calculation transparent, traceable, and reusable across different tools and environments.

The result is greater interoperability, improved data quality, and the ability to reuse both the Submodel and its data across different tools and environments. Instead of reinventing OEE logic for every machine or software product, manufacturers gain a reusable, plug-and-play KPI foundation that scales across production lines, sites, and vendors.

1.4.3 Use of process variables for other calculations

ISO 22400-2 is often associated exclusively with OEE, but the standard supports a much broader range of manufacturing use cases because it defines a complete set of time, quantity, and quality-related process variables and KPIs for manufacturing operations. These variables can be reused in many contexts beyond simply calculating OEE. Manufacturers can apply ISO 22400-2 to monitor performance, analyze production losses, improve energy and resource efficiency, and optimize production planning and scheduling. Some of these use cases require time-series data, meaning that the Submodel data needs to be recorded in a historian or similar storage system to enable (historical) analysis and long-term KPI evaluation. By applying the standardized KPI definitions and process variables across different equipment and software systems, manufacturers eliminate ambiguous interpretations, enable cross-system comparability, and establish a shared foundation for continuous improvement. The result is improved transparency, interoperability, and trust in KPI-based decision-making across the organization.

1.5 Recommendations

The following mentioned Submodels and applications are recommendations to provide an automatic configuration of a MES. It is allowed to use other data sources than the mentioned to automatically configure a MES. However, this is only recommended when there are low level requirements regarding interoperability.

Asset Interface Description Submodel

This Submodel is recommended to get information about the communication interface of a machine, to which a later service can connect. In the best case this Submodel will be delivered by the machine manufacturer.

Asset Interfaces Mapping Configuration Submodel

This Submodel is recommended to define the necessary logic to come from multiple machine signals to process variables, e.g., for the MES. It can be defined by the machine operator, the interest group of the linked output Submodel or both.

Service for rule computation

The PVM Submodel contains a set of process variables, defined in the ISO 22400-2 with their current values. To provide the current process variable values, a service is required, which computes the rules defined in the AIMC Submodel and transfers the results into the PVM Submodel. This service could be implemented by the MES itself or by a more general AAS service because the AIMC Submodel could map multiple output Submodels.

1.6 Design decisions

1.6.1 Distinct responsibilities

To calculate the process variables in the Submodel, the modelling of the logic, which connects the machine signals to process variables, is necessary. This is a use case which is not only required by this Submodel but also by other future Submodels. Due to this, it was decided to outsource the modelling of logic to a central Submodel which is up to now responsible for the information transfer between Submodels. What is meant is the extension of the AIMC Submodel with transformation rules which is already in work at the time of publication of this specification However, to use this Submodel, it comes along with a dependency. This dependency results from the combination of the AID, AIMC and the PVM Submodel to provide the full functionality towards interoperable an automized configuration of systems like a MES.

1.6.2 Further Submodel Extensions

It was decided to use a subset of the process variables defined in ISO 22400-2 which is relevant for a MES at the beginning. The usage of the Submodel should show, if these selected variables are sufficient for 80% of the use cases. If not, later extensions can be easily made when the same ontology of the ISO 22400-2[2] is used, and the structure of a single process variable is kept.

1.6.3 Used Data Types and Units

Data Types

xs:duration

For time process variables the data type “xs:duration” is used because with this data type durations from seconds up to years can be described. The schema for duration is specified by the world wide web consortium[3].

The expression of xs:duration is the following:

-?P[0-9]+Y?([0-9]+M)?([0-9]+D)?(T([0-9]+H)?([0-9]+M)?([0-9]+(\.[0-9]+)?S)?)?

The single abbreviations are explained in Table 1.

[2] https://github.com/hsu-aut/IndustrialStandard-ODP-ISO22400-2

[3] https://www.w3.org/TR/xmlschema11-2/#duration

Table 1: Parts of the schema for xs:duration [4]

Abbreviation	Description
P	The duration designator.
nY	n is an unsigned integer that represents the number of years.
nM	n is an unsigned integer that represents the number of months.
nD	n is an unsigned integer that represents the number of days.
T	The date and time separator.
nH	n is an unsigned integer that represents the number of hours.
nM	n is an unsigned integer that represents the number of minutes.
nS	n is an unsigned decimal that represents the number of seconds. If a decimal point appears, it must be followed by one to twelve digits that represent fractional seconds.

Figure 1 shows an example, which sets the current value of the actual personnel work time to 7 hours and 30 minutes.

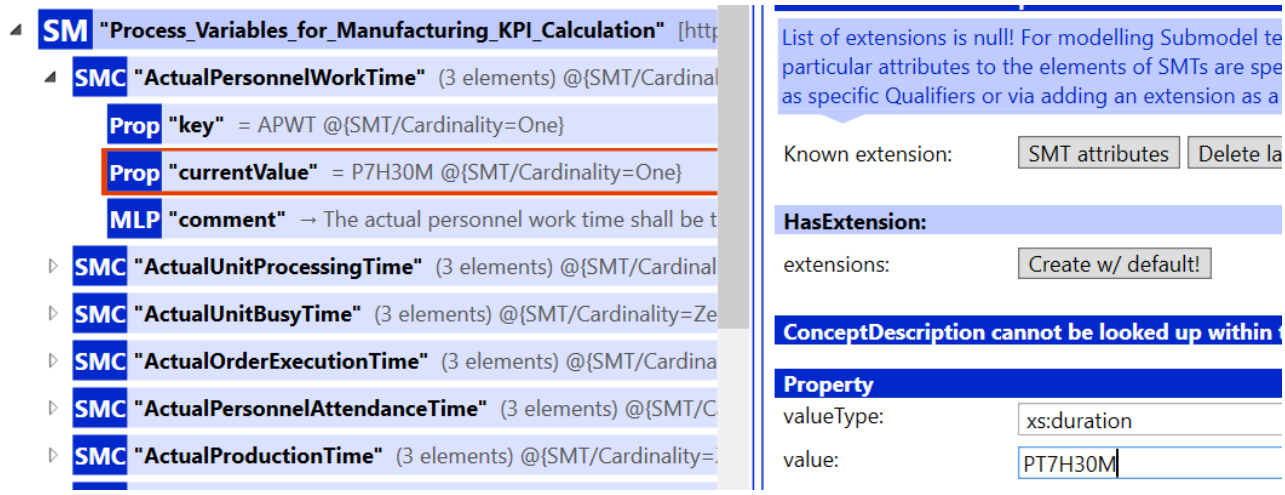


Figure 1: Example usage of data type xs:duration

xs:decimal

For quality process variables like the count of good or inspected parts as well as of rework or produced quantity the data type xs:decimal is used. With this data type piece goods as well as bulk goods, e. g. kilograms, can be described.

However, the unit of the quality process variables can be different and thus not predefined. For example, one machine produces parts that are counted in kilograms, while another machine produces piece goods that are counted individually. Considering this customization, the Submodel template comes with a set of common units which are described with the help of concept descriptions.

Units

While time process variables have the same unit, which is the time, quality process variables can have different units, e.g. the amount in pieces, kilogram, liter etc. Due to the reason that semanticId is used to semantically describe the SubmodelElement *currentValue,* the concept of the *supplementalSemanticId* in connection with Concept Descriptions is used to semantically add the unit. For this, the Submodel template contains six predefined units, which are extendible:

[4] https://www.ibm.com/docs/en/i/7.1.0?topic=types-xsduration

- Amount in pieces
- Kilogram
- Square meter
- Meter
- Liter
- Cubic meter

Figure 2 shows as an example the process variable *GoodQuantity* in piecewise amount. Therefore, the *supplementalSemanticId* of *Amount* is added to the SubmodelElement *currentValue*.

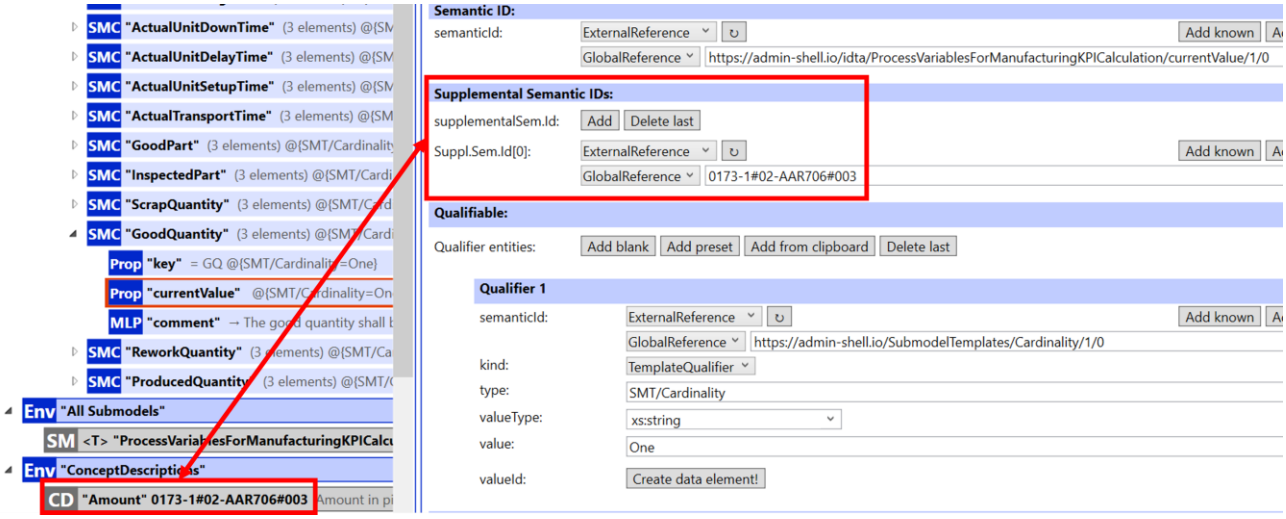


Figure 2: Example to use concept descriptions to add a unit

1.7 Usage Example

The following example shows the implementation concept to realize the use case to onboard a machine to a MES. Figure 3 shows the Submodels needed. However, to understand the concept of the connection between AID, AIMC and the PVM Submodel, only this three Submodels are explained in detail. The Digital Nameplate Submodel and Asset Location Submodel are used to describe the static meta data of the machine.

Figure 3: Usage Example for Use Case - Machine Onboarding

Figure 4 illustrates a more detailed view behind the application of the use case. The data structure of an asset's communication endpoint, e.g., a PLC, will be defined by the machine vendor in the AID Submodel of the machine's AAS. The AIMC Submodel, contains the rules for combination, calculation or transformation of the variables modelled in the AID Submodel. This will be done by linking the machine data from the AID Submodel as input and the computed results to the output Submodels (pictured as "any SM"), which will be in this case the PVM Submodel. The definition of the rules and the mapping can be done by the machine builder, machine user, the MES vendor or a mixture of it, which are called interest group in Figure 4.

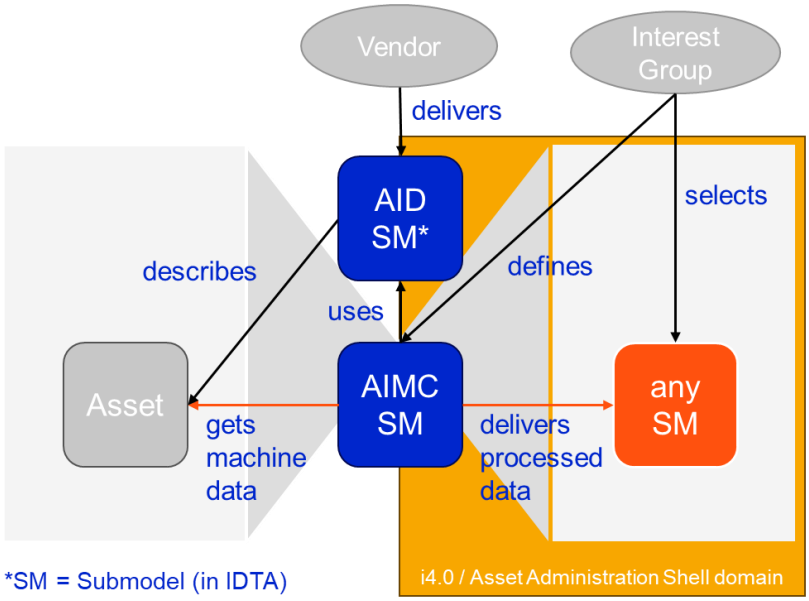


Figure 4: General usage concept of the PVM Submodel

A more technical view of the steps which need to be fulfilled when using AAS for a standardized onboarding of machines into a MES is shown in Figure 5. To provide the current data for the MES an external service is introduced which takes steps one to five. Step six is executed by the MES.

Step 1: Get all AID Submodels for existing machine twins.

Step 2: Read for every Submodel the specified machine controller interface, generate a client and connect to the controller.

Step 3: Retrieve all AIMC Submodels for machine twins that also have an AID Submodel.

Step 4: Take the current values of the controller interfaces, which are mapped in the AIMC Submodel, as input data and compute the rules.

Step 5: Write the results into the PVM Submodel.

Step 6: The result of steps 1 to 5 is a clear description of the status from the machine's perspective. However, in order to calculate the key figures correctly, business information is also required that is not available to the machine. This is particularly necessary for interpreting machine downtimes. A downtime during the planned shift time is evaluated differently than a downtime during shift breaks. It also makes a difference whether a job is running on the machine or not.

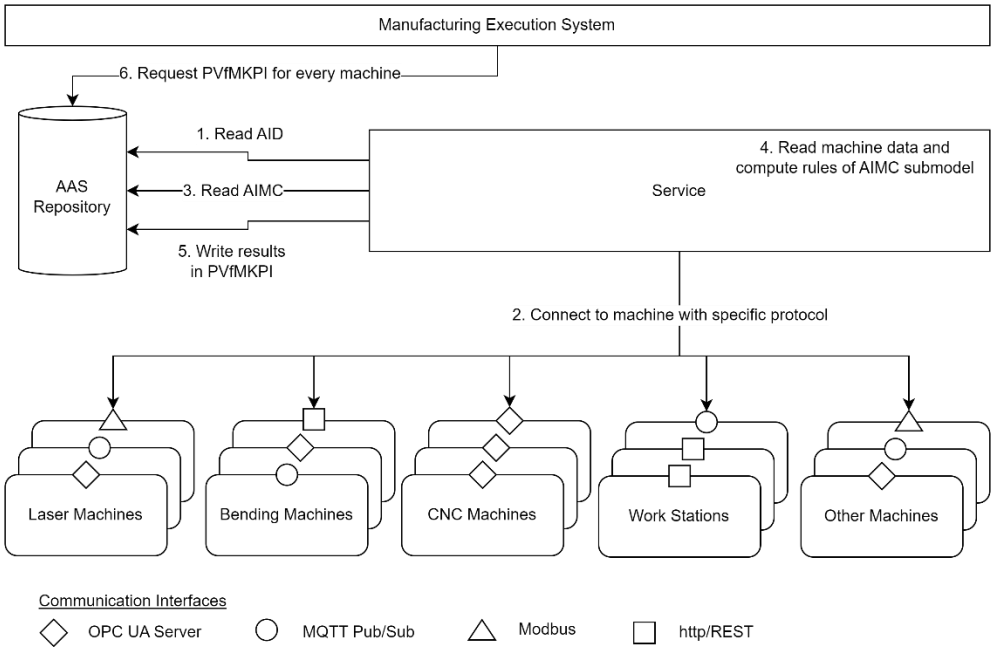


Figure 5: Technical architecture for standardized machine onboarding

AID Submodel

The AID Submodel can be used by an application, e.g. MES, to connect to assets and retrieve the actual values of the machine's signals to use it as an input for the calculation of the process variables of the PVM Submodel.

Figure 6 shows an example of a machine with an OPC UA server inside. For each OPC UA node, the key, data type, and title are described. Furthermore, the SMC "forms" contains the hyperlink, here defined by namespace (ns) and node id (s), as well as the browse path, if needed.

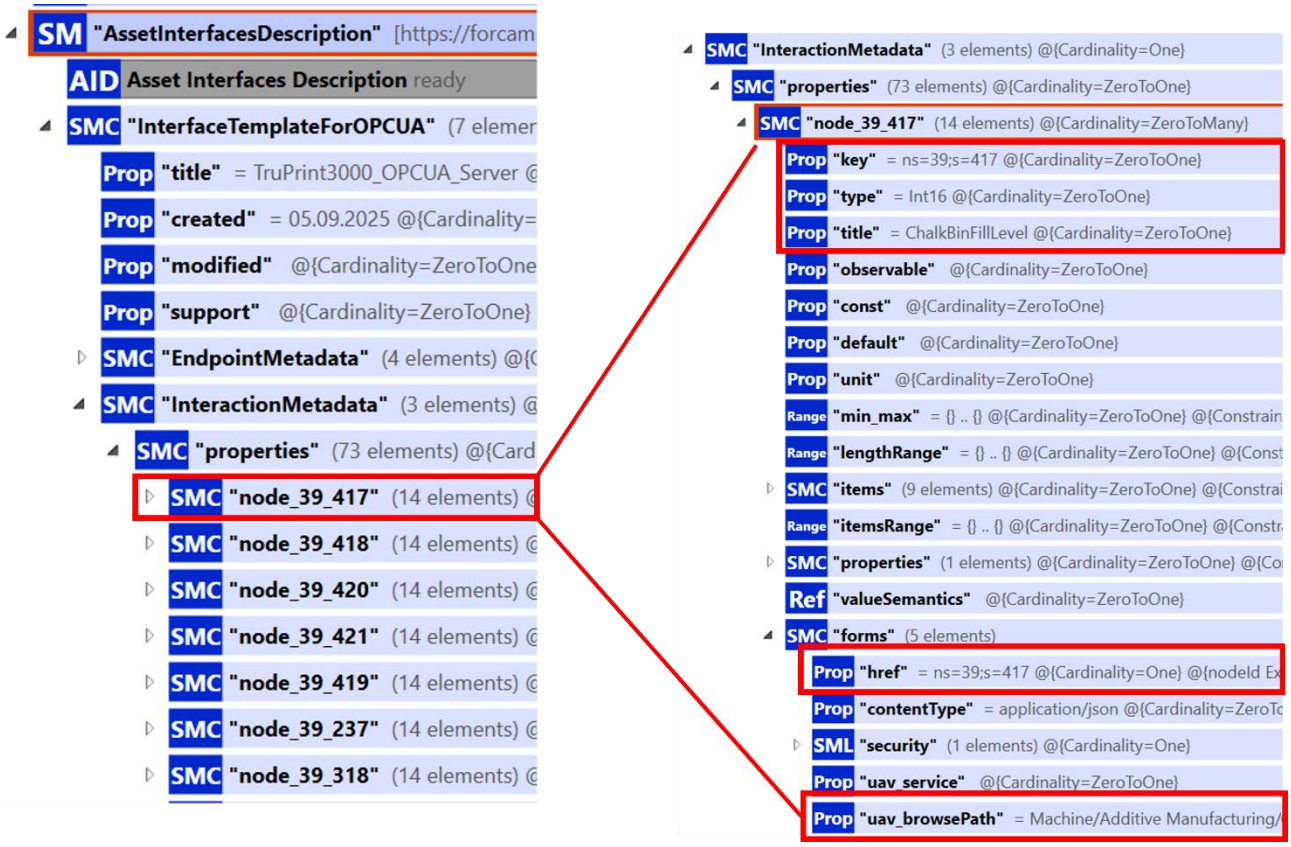


Figure 6: Example of the Asset Interface Description Submodel

AIMC Submodel

The description of the logic, which transforms multiple machine signals (described in the AID Submodel) to a process variable (described in the PVM Submodel) is done in the AIMC Submodel. In Figure 7 the newest version of the AIMC Submodel, which is at the time of this specification under development, stipulates

- the usage of a Blob Element to define the formula with the help of the programming language Lua[5]
- a SML for the source variables, which in this context are the machine signals and
- a SML for the sink variables, which in this context are the process variables for manufacturing KPI calculation.

The source variables are referencing the *key* in the AID *property* SMC. This is not shown to keep Figure 7 as simple as possible.

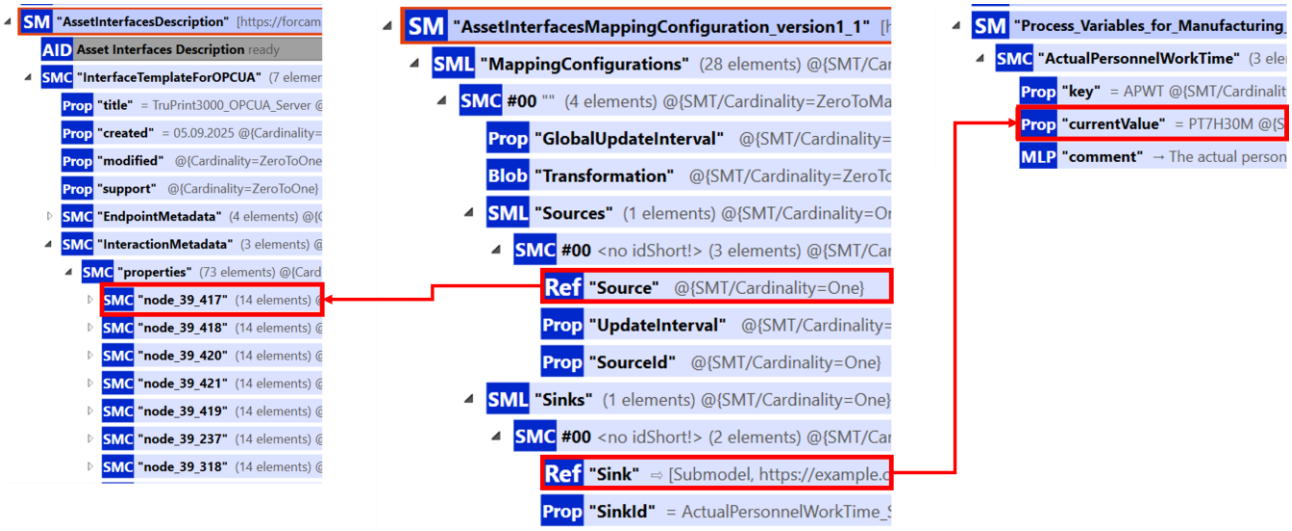


Figure 7: Example of relations between AID, AIMC and PVM Submodel

[5] https://www.lua.org

2 Submodel Process Variables for Manufacturing Key Performance Indicators

2.1 Approach

This section defines the PVM Submodel with its set of process variables, defined by the ISO 22400-2 and shown as class diagram in Figure 8.

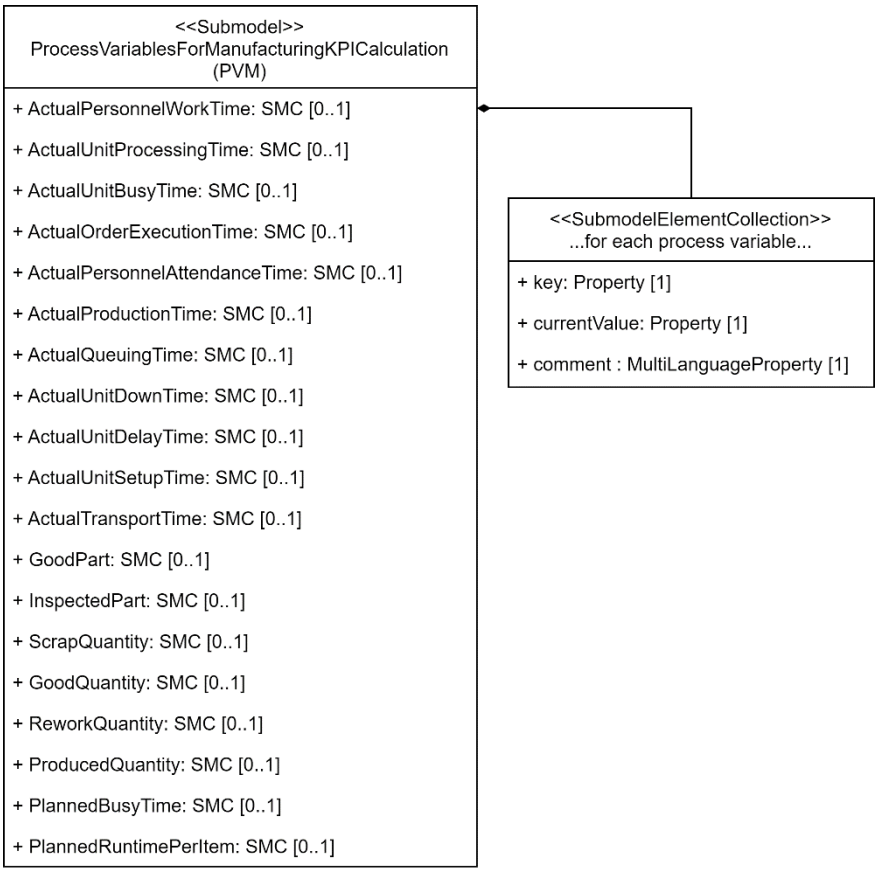


Figure 8: Class diagram of PVM Submodel

2.2 Attributes of the Submodel

For the Submodel the following attributes have to be set, depending on the cardinality of every element.

Table 2: Attributes of the Submodel

idShort:	ProcessVariablesForManufacturingKPICalculation		
Class:	Submodel (SM)		
semanticId:	[IRI] https://admin-shell.io/idta/SubmodelTemplate/ProcessVariablesForManufacturingKPICalculation/1/0		
Parent:	Asset Administration Shell		
Explanation:	The Submodel defines a subset of process variables (defined in ISO 22400-2), which are required to calculate Manufacturing KPIs.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**

idShort	Description@en	example	
[SMC] ActualPersonnelWorkTime	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualPersonnelWorkTime For description see following Tables.		0..1
[SMC] ActualUnitProcessingTime	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualUnitProcessingTime For description see following Tables.		0..1
[SMC] ActualUnitBusyTime	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualUnitBusyTime For description see following Tables.		0..1
[SMC] ActualOrderExecutionTime	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualOrderExecutionTime For description see following Tables.		0..1
[SMC] ActualPersonnelAttendanceTime	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualPersonnelAttendanceTime For description see following Tables.		0..1
[SMC] ActualProductionTime	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualProductionTime For description see following Tables.		0..1
[SMC] ActualQueuingTime	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualQueuingTime For description see following Tables.		0..1
[SMC] ActualUnitDownTime	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualUnitDownTime For description see following Tables.		0..1
[SMC] ActualUnitDelayTime	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualUnitDelayTime For description see following Tables.		0..1
[SMC] ActualUnitSetupTime	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualSetupTime For description see following Tables.		0..1
[SMC] ActualTransportTime	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualTransportTime For description see following Tables.		0..1
[SMC] GoodPart	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#GoodPart For description see following Tables.		0..1
[SMC] InspectedPart	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#InspectedPart For description see following Tables.		0..1

[SMC] ScrapQuantity	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ScrapQuantity For description see following Tables.		0..1
[SMC] GoodQuantity	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#GoodQuantity For description see following Tables.		0..1
[SMC] ReworkQuantity	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ReworkQuantity For description see following Tables.		0..1
[SMC] ProducedQuantity	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ProducedQuantity For description see following Tables.		0..1

2.3 Actual Personnel Work Time

Table 3: Attributes of SMC "ActualPersonnelWorkTime"

idShort:	ActualPersonnelWorkTime Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualPersonnelWorkTime		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] APWT	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Duration]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die Arbeitszeit ist die Zeit, die ein Produktionsmitarbeiter für die Ausführung eines Fertigungsauftrags verwendet.	1

		[ENG] The actual personnel work time shall be the time that a worker needs for the execution of a production order.	

2.4 Actual Unit Processing Time

Table 4: Attributes of SMC "ActualUnitProcessingTime"

idShort:	ActualUnitProcessingTime Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualUnitProcessingTime		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] AUPT	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Duration]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die Bearbeitungszeit ist die verwendete Zeit für das Rüsten und für die Hauptnutzung. [ENG] The actual unit processing time shall be the actual production time plus the actual unit setup time.	1

2.5 Actual Unit Busy Time

Table 5: Attributes of SMC "ActualUnitBusyTime"

idShort:	ActualUnitBusyTime Note: A different idShort should not be used.
Class:	SubmodelElementCollection (SMC)

semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualUnitBusyTime		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] AUBT	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Duration]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die Belegungszeit ist die Zeit mit der eine Produktionseinheit für die Ausführung eines Auftrags belegt wird. [ENG] The actual unit busy time shall be the actual time that a work unit is used for the execution of a production order.	1

2.6 Actual Order Execution Time

Table 6: Attributes of SMC "ActualOrderExecutionTime"

idShort:	ActualOrderExecutionTime Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualOrderExecutionTime		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0	[String] AOET	1

	The key is the abbreviation of the process variable and defined in the ISO 22400-2.		
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Duration]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die Durchlaufzeit ist die Differenzzeit zwischen Auftragsstartzeit und Auftragsendezeit. Sie schließt die Belegungszeit sowie die Liege- und Transportzeit ein. [ENG] The actual order execution time shall be the time difference between start time and end time of a production order. It includes the actual busy time, the actual transport time and the actual queuing time.	1

2.7 Actual Personnel Attendance Time

Table 7: Attributes of SMC "ActualPersonnelAttendanceTime"

idShort:	ActualPersonnelAttendanceTime Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualPersonnelAttendanceTime		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] APAT	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Duration]	1

[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Gesamtanwesenheitszeit ist die Zeit, die ein Produktionsmitarbeiter im Unternehmen anwesend ist. Sie ist die Differenzzeit zwischen „Kommt“ und „Geht“. [ENG] The actual personnel attendance time shall be the actual time that a worker is available to work on production orders. It does not include actual time for company authorized break periods (e.g. lunch). It shall be the difference between login and logout excluding breaks.	1

2.8 Actual Production Time

Table 8: Attributes of SMC "ActualProductionTime"

idShort:	ActualProductionTime Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualProductionTime		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] APT	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Duration]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die Hauptnutzungszeit ist die Zeit, in der die Maschine produziert. Sie beinhaltet nur die wertschöpfenden Prozesse.	1

		[ENG] The actual production time shall be the actual time during which a work unit is producing. It includes only the value-adding functions.	

2.9 Actual Queuing Time

Table 9:Attributes of SMC "ActualQueuingTime"

idShort:	ActualQueuingTime Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualQueuingTime		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] AQT	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Duration]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die Liegezeit ist die Zeit, in der das Material im Fertigungsprozess nicht in Bearbeitung ist und sich nicht im Transport befindet. [ENG] The actual queuing time shall be the actual time when the work unit is not executing order production although its available.	1

2.10 Actual Unit Down Time

Table 10: Attributes of SMC "ActualUnitDownTime"

idShort:	ActualUnitDownTime Note: A different idShort should not be used.

Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualUnitDownTime		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	semanticId = [idType]value	[valueType]	card.
idShort	Description@en	example	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] ADOT	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Duration]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die Stillstandszeit ist die Zeit, in der die Maschine nicht mit Aufträgen belegt ist, obwohl sie dafür zur Verfügung steht. [ENG] The actual unit down time shall be the actual time when the work unit is not execution order production although it is available.	1

2.11 Actual Unit Delay Time

Table 11: Attributes of SMC "ActualUnitDelayTime"

idShort:	ActualUnitDelayTime Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualUnitDelayTime		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	semanticId = [idType]value	[valueType]	card.
idShort	Description@en	example	

[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] ADET	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Duration]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die störungsgedingten Unterbrechungen sind Zeiten, die während der Auftragsbearbeitung ungeplant auftreten und dadurch ungewollt die Belegungszeiten verlängern. [ENG] The actual unit delay time shall be the actual time associated with malfunction-caused interruptions, minor stoppages, and other unplanned time intervals that occur while tasks are being completed that lead to unwanted extension of the order processing time.	1

2.12 Actual Unit Setup Time

Table 12: Attributes of SMC "ActualUnitSetupTime"

idShort:	ActualUnitSetupTime Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualSetupTime		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] AUST	1

[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Duration]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die tatsächliche Rüstzeit ist die Zeit, die für die Vorbereitung eines Auftrages an einer Produktionseinheit aufgewendet wurde. [ENG] The actual unit setup time shall be the time consumed for the preparation of an order at a work unit.	1

2.13 Actual Transport Time

Table 13: Attributes of SMC "ActualTransportTime"

idShort:	ActualTransportTime Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ActualTransportTime		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] ATT	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Duration]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die Transportzeit ist die Zeit, die für den Transport zwischen Produktionseinheiten oder zum/vom Lager für das Material verwendet wird.	1

		[ENG] The actual transport time shall be the actual time required for transport between work units.	

2.14 Good Part

Table 14: Attributes of SMC "GoodPart"

idShort:	GoodPart Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#GoodPart		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] GP	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Decimal]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Ein Gutteil ist ein einzeln identifizierbares Teil z.B. durch Serialisierung, welches den qualitativen Anforderungen entspricht. [ENG] A good part shall be the count of individual identifiable parts, e.g. by serialization, which meets the quality requirements.	1

2.15 Inspected Part

Table 15: Attributes of SMC "InspectedPart"

idShort:	InspectedPart Note: A different idShort should not be used.

Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#InspectedPart		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] IP	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Decimal]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Ein geprüftes Teil ist ein einzeln identifizierbares Teil z.B. durch Serialisierung, welches bzgl. der qualitativen Anforderungen überprüft wurde. [ENG] An inspected part shall be the count of individual identifiable parts, e.g., by serialization, which was tested against the quality requirements.	1

2.16 Scrap Quantity

Table 16: Attributes of SMC "ScrapQuantity"

idShort:	ScrapQuantity Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ScrapQuantity		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	

[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] SQ	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Decimal]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE Die Ausschussmenge ist die produzierte Menge, die den qualitativen Anforderungen nicht entsprochen hat und entweder verschrottet oder recycelt werden muss. [ENG] The scrap quantity shall be the planned quantity of products for a production order (lot size, production order quantity).	1

2.17 Good Quantity

Table 17: Attributes of SMC "GoodQuantity"

idShort:	GoodQuantity Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#GoodQuantity		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] GQ	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Decimal]	1

[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die Gutmenge ist die produzierte Menge, die den qualitativen Anforderungen entspricht. [ENG] The good quantity shall be the produced quantity that meets quality requirements.	1

2.18 Rework Quantity

Table 18: Attributes of SMC "ReworkQuantity"

idShort:	ReworkQuantity Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ReworkQuantity		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] RQ	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Decimal]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die Nacharbeitsmenge ist die produzierte Menge, die den qualitativen Anforderungen nicht entsprochen hat. Diese Anforderungen können aber durch Nacharbeit erreicht werden. [ENG] The rework quantity shall be the quantity that fails to meet the quantity requirements, but where these requirements can be met by subsequent work.	1

2.19 Produced Quantity

Table 19: Attributes of SMC "ProducedQuantity"

idShort:	ProducedQuantity Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#ProducedQuantity		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] PQ	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Decimal]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die produzierte Menge ist die Menge, die eine Produktionseinheit bezogen auf einen Fertigungsauftrag produziert hat. Die produzierte Menge ist die Summe aus Gutmenge, Ausschussmenge und Nacharbeitsmenge. [ENG] The produced quantity shall be the quantity that a work unit has produced in relation to a production order.	1

2.20 Planned Busy Time

Table 20: Attributes of SMC "PlannedBusyTime"

idShort:	PlannedBusyTime Note: A different idShort should not be used.
Class:	SubmodelElementCollection (SMC)
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#PlannedBusyTime

Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] PBT	1
[Property] currentValue	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0 The current value of the process variable, which must be updated by the Submodel responsible application.	[Duration]	1
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die Planbelegungszeit ist die Betriebszeit abzüglich der geplanten Stillstände. [ENG] The planned busy time shall be the planned operation time minus the planned downtime.	1

2.21 Planned Runtime per Item

Table 21: Attributes of SMC "PlannedRuntimePerItem"

idShort:	PlannedRuntimePerItem Note: A different idShort should not be used.		
Class:	SubmodelElementCollection (SMC)		
semanticId:	[IRI] http://www.w3id.org/hsu-aut/ISO22400-2#PlannedRuntimePerUnit		
Parent:	ProcessVariablesForManufacturingKPICalculation		
Explanation:	Each process variable contains the same three fixed elements.		
[SME type]	**semanticId = [idType]value**	**[valueType]**	**card.**
idShort	**Description@en**	**example**	
[Property] key	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/key/1/0 The key is the abbreviation of the process variable and defined in the ISO 22400-2.	[String] PRI	1
[Property]	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/currentValue/1/0	[Duration]	1

currentValue	The current value of the process variable, which must be updated by the Submodel responsible application.		
[MultiLanguageProperty] comment	[IRI] https://admin-shell.io/idta/ProcessVariablesForManufacturingKPICalculation/comment/1/0 Multi language comment, translated from the ISO 22400-2.	[DE] Die Produktionszeit je Einheit ist die geplante Zeit, um eine Einheit zu produzieren. [ENG] The planned run time per item shall be the planned time for producing one quantity unit.	1

Annex A. Explanations on used table formats

1. General

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

2. Tables on Submodels and SubmodelElements

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

- The tables follow in principle the same conventions as in [5].
- The table heads abbreviate 'cardinality' with 'card'.
- The tables often place two informations in different rows of the same table cell. In this case, the first information is marked out by sharp brackets [] form the second information. A special case are the semanticIds, which are marked out by the format: (type)(local)[idType]value.
- The types of SubmodelElements are abbreviated:

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

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

Bibliography

[1] "Recommendations for implementing the strategic initiative INDUSTRIE 4.0", acatech, April 2013. [Online]. Available https://www.acatech.de/Publikation/recommendations-for-implementing-the-strategic-initiative-industrie-4-0-final-report-of-the-industrie-4-0-working-group/

[2] "Implementation Strategy Industrie 4.0: Report on the results of the Industrie 4.0 Platform"; BITKOM e.V. / VDMA e.V., /ZVEI e.V., April 2015. [Online]. Available: https://www.bitkom.org/noindex/Publikationen/2016/Sonstiges/Implementation-Strategy-Industrie-40/2016-01-Implementation-Strategy-Industrie40.pdf

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

[4] "Beispiele zur Verwaltungsschale der Industrie 4.0-Komponente – Basisteil (German)"; ZVEI e.V., Whitepaper, November 2016. [Online]. Available: https://www.zvei.org/presse-medien/publikationen/beispiele-zur-verwaltungsschale-der-industrie-40-komponente-basisteil/

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

[6] "Details of the Asset Administration Shell; Part 1 - The exchange of information between partners in the value chain of Industrie 4.0 (Version 3.0RC01)", November 2020, [Online]. Available: https://www.plattform-i40.de/PI40/Redaktion/EN/Downloads/Publikation/Details-of-the-Asset-Administration-Shell-Part1.html

[7] "IDTA 02017-1-0—Asset Interfaces Description", January 2024, [Online], Available: https://industrialdigitaltwin.org/wp-content/uploads/2024/01/IDTA-02017-1-0_Submodel_Asset-Interfaces-Description.pdf

[8] "IDTA 02027-1-0—Asset Interfaces Mapping Configuration", June 2024, [Online]. Available: https://industrialdigitaltwin.org/wp-content/uploads/2024/06/IDTA-02027-1-0_Submodel_AssetInterfacesMappingConfiguration.pdf

[9] "OPC UA for Machinery; Part 1: Basic Building Blocks", July 2025, [Online]. Available: https://reference.opcfoundation.org/Machinery/v104/docs/

www.industrialdigitaltwin.org