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Road vehicles — Vehicles safety information model (VSIM)

Véhicules routiers — Modèle d'information pour la sécurité des véhicules (VSIM)

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Contents

Page

Foreword

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ISO/TS 22240 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 12, *Passive safety crash protection systems*.

Introduction

The vehicle safety information model (VSIM) provides a standard model for the filing and exchange of vehicle safety test data.

Figure 1 shows the many forms of data that can be exchanged from vehicle safety testing. VSIM offers a flexible structure for the filing and exchange of data.

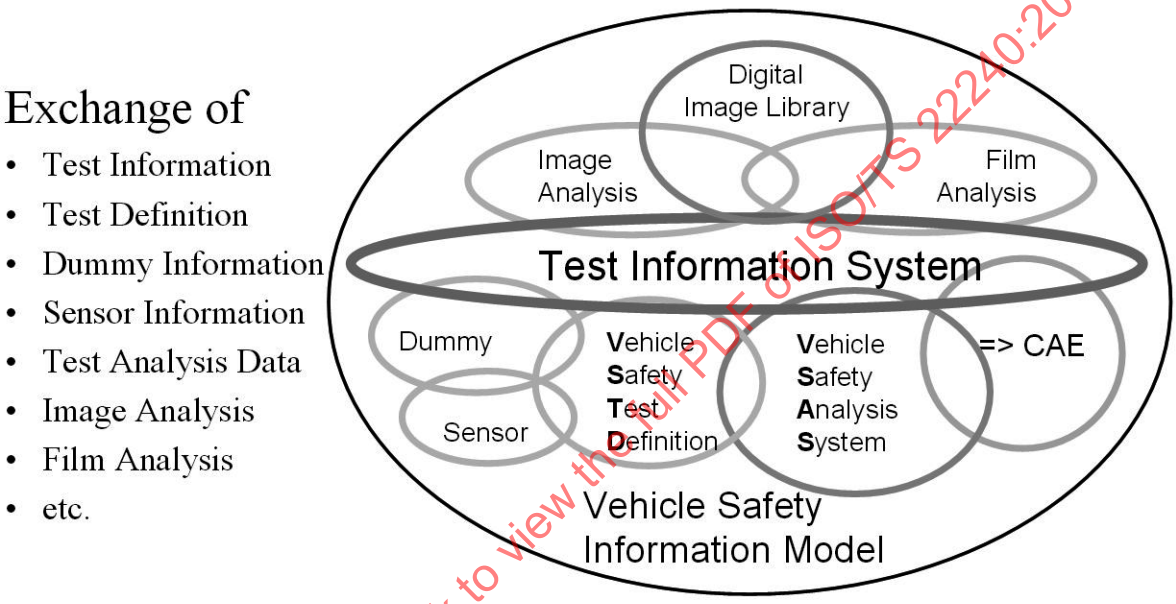

Figure 1 — Forms of data exchange

VSIM serves the already existing ASAM ODS (Association for Standardization of Automation and Measuring Systems Open Data Services) mechanisms. This provides the advantage that the data are available both in a database and a file system. In addition, the data can be exchanged in XML (eXtensible Markup Language) format.

ASAM ODS offers suitable structures for the filing of measurement data. As a result, multidimensional channels and discrete values can be continuously saved.

ASAM ODS offers one model for storing the data either in file or in database, and this method guarantees access to data even after a long period of time.

ASAM ODS is described in ISO/PAS 22720.

VSIM data exchange was developed from the following standards:

— ISO-MME (Multimedia exchange) (see ISO/TS 13499),

— ASAM ATF (ASAM Transport Format), and

— XML (ATF also available as ATF/XML).

Road vehicles — Vehicles safety information model (VSIM)

1 Scope

This Technical Specification presents an enhanced data exchange and data storage format for all data relevant for vehicle safety tests.

The underlying data model is based on ASAM ODS, and the corresponding exchange format is XML.

NOTE 1 Related electronic documents are available on the ISO website.

NOTE 2 The entities defined in Clause 3 are parts of the VSIM data model and are used in Figures 3 to 7.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TS 13499, *Road vehicles — Multimedia data exchange format for impact tests*

ISO/PAS 22720, *ASAM Open Data Services 5.0*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Tests

3.1.1
vehicle safety information model
VSIM
root of the whole data model

NOTE The entity describes the environment of the VSIM data model and holds the ISO-MME and ASAM ODS version numbers of the application model for vehicle safety.

3.1.2
Type_Of_Test
root entity of the administration of the Safety_Test, which stores a possible test type list

NOTE 1 It is advisable that the value of “Type_Of_Test” be part of a possible type list, as is the case in the existing vehicle safety analysis model defined by the German workgroup “Messdatenverarbeitung Fahrzeugsicherheit” (data processing for vehicle safety).

NOTE 2 The values of the Type_Of_Test are not standardized and depend on the customized definition.

3.1.3
Subtype_Of_Test
specific type of test which makes it possible to enter the crash side or the legal codes of practice

NOTE The values of Subtype_Of_Test are not standardized.

3.1.4
Safety_Test
any kind of test performed in vehicle safety

EXAMPLE Crash test, sled test, component test, active safety test, biomechanical test.

3.1.5
contact
object that summarizes the contact information used for customer and laboratory contact for a safety test

NOTE A contact always refers to a person. This is identified with their email address.

3.1.6
Contact_Relation_Type
information that indicates what association the contact has to the Safety_Test.

NOTE The type could be customer, laboratory or “authorized”. It belongs to the ASAM ODS base entity AoAny.

3.1.7
Test_Object
group of components with the same initial state (e.g. speed, direction of movement) at impact time

EXAMPLE Vehicles, barriers, pedestrian dummies.

3.1.8
Possible_Component
list of possible component types (e.g. door, airbag) that can be used in a test

3.1.9
Possible_Component_Attribute
list of attributes belonging to the possible components

3.1.10
Value_List
allowed values for a Possible_Component_Attribute (e.g. “left”, “right”)

NOTE The same list can be used for several attributes.

3.1.11
value
element used to hold values which are grouped by an instance of Value_List

NOTE An example for such groups is the content of selections lists, e.g. of “Position”.

3.1.12
Test_Component
entity that contains the attributes of a component being tested

NOTE 1 The test object consists of one or more test components. For example, the door, B-pillar, airbag module and dummies are components of a vehicle safety test object.

NOTE 2 Test_Component is taken out of the Possible_Test_Components.

3.1.13
Test_Component_Attribute
entity that contains one attribute per instance of a component being tested

EXAMPLE The time to fire of airbags or type of dummy.

3.1.14
requirement
legal or customer specific requirement for the test procedure,which is related to “Safety_Test”

3.2 Measurements

3.2.1
channel
entity that describes the measured quantity within a measurement

NOTE If the measurement type is a signal measurement or a calculated channel, the name of the quantity is generated from the ISO-MME location code.

3.2.2
VSTD_Interface
entity that describes a vehicle safety test definition (VSTD) interface

3.2.3
Physical_Unit
entity that describes the physical unit

NOTE The entity belongs to the ASAM ODS base entity AoUnit.

3.2.4
Physical_Dimension
entity represented by the seven dimensional exponents of the SI base dimensions: length, mass, time, temperature, current, molar amount and light intensity

NOTE 1 The SI base dimensions are measured in the following SI base units: length (m), mass (kg), time (s), temperature (K), current (A), molar amount (Mol), light intensity (cd).

NOTE 2 Many of the exponents are usually zero. In particular, the dimensionless units (e.g. “%”) all have exponents equal to zero.

NOTE 3 Several physical dimensions can exist which have the same set of exponents. The entity belongs to the ASAM ODS base entity AoPhysicalDimension.

3.2.5
Possible_Channel
entity that describes the possible channels

NOTE For the possible channels, the application attribute “default_filter_type” describes a default filtering for measured channels. Possible_Channels are named by using **channel codes** (3.2.7).

3.2.6
Possible_Channel_Group
groups used to build groups of channels that are related

3.2.7
channel code
attribute of the application elements “channel” and “possible channel”, which contains the ISO-MME location code

NOTE 1 This location code has several code elements which are concatenated to the location. Figure 2 shows the convention to compose the content of this attribute.

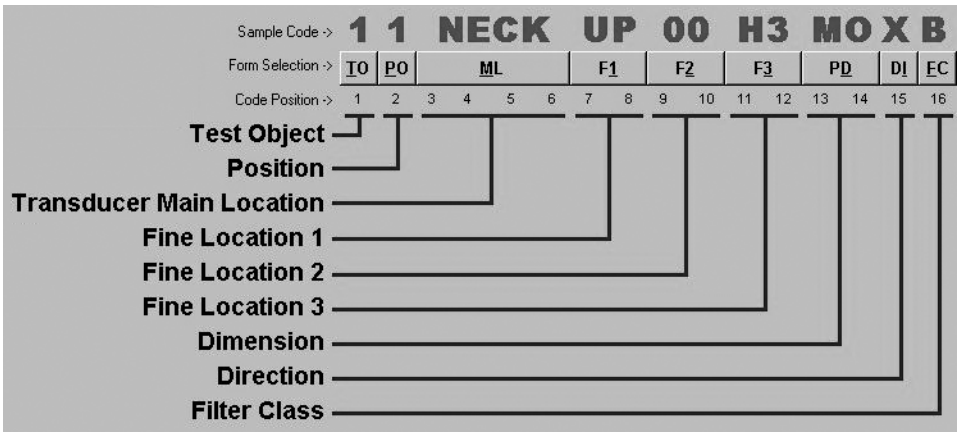

Figure 2 — ISO-MME location code

NOTE 2 ISO-MME also defines the values of code elements and describes them. There are entities defined in the VSIM application model for retaining this code element information. Their entity names are “Test_Object_Code”, “Position_Code”, “Main_Loc_Code”, “Fine_Loc_1_Code”, “Fine_Loc_2_Code”, “Fine_Loc_3_Code”, “Direction_Code”, “Filter_Cls_Code” and “Dimension_Code”. The entity “Test_Object_Code” belongs to the ASAM ODS base entity *AoUnitUnderTest*. The other entities belongs to the ASAM ODS base entity *AoAny* (see Table 1).

Table 1 — Relationship between ISO code and entity name

ISO Code	Entity name
Test Object	Test_Object_Code
Position	Position_Code
Transducer Main Location	Main_Loc_Code
Fine Location 1	Fine_Loc_1_Code
Fine Location 2	Fine_Loc_2_Code
Fine Location 3	Fine_Loc_3_Code
Dimension	Dimension_Code
Direction	Direction_Code
Filter Class	Filter_Cls_Code

NOTE 3 In channel codes, question marks (“?”) are used as placeholders, each for one DT_STRING character. These are replaced by valid combinations (see the related electronic documents).

3.3 Results

3.3.1
photo
entity that describes the photos of the test

NOTE 1 All pictures created during the test are organized in this entity.

NOTE 2 The photos are stored in the file system. The application model contains external references to the photo files and some descriptive attributes as they are given in the ISO-MME format. The photos have a relation to “Test_Object” and/or “Safety_Test”.

3.3.2
movie
entity that describes movies of the test

NOTE 1 All movies created during the test are organized in this entity.

NOTE 2 The movies are stored in the file system. The application model contains external references to the movie files and some descriptive attributes as they are given in the ISO-MME format. The movies have a relation to “Safety_Test” and/or “Test_Object”.

3.3.3
Correction_Parameter
entity that contains additional information for movie analysis

3.3.4
Image_History
entity that describes the history of the images

NOTE The history of the images is a short description of the processes done by the imaging processing tools on the related image. The history of the image is logged in the instances of this entity.

3.3.5
diagram
entity that describes the attributes of a test diagram, such as the location where the diagram is stored and the channels used in the diagram, a simplified and structured visual representation of test data

NOTE Test diagrams are stored in the file system. The application model contains external references to the diagram files. The diagrams are related to “Safety_Test”.

3.3.6
report
entity that describes the attributes of a test report, such as the location where the report is stored and the version of the report, a textual representation of the result of the test data

NOTE Test reports are stored in the file system. The application model contains external references to the report files. The reports are related to “Safety_Test”.

4 Application model

4.1 General

The application model is divided into four parts. Each part represents a part of the entire model and has a specific focus. The first part offers an overview of the entire model. For clarity, only the entities with their relations that are necessary for display of the associations are shown. In addition, the derivation of the VSIM from the ASAM ODS basis model is displayed.

The second part goes into the test definition in greater depth. All of the entities with those relations relative to the definition data are described. The third part elaborates on the measurement data. The fourth part deals with the test results.

4.2 VSIM Overview

Figure 3 shows the most important entities with their most important relations to each other (shown by dotted lines).

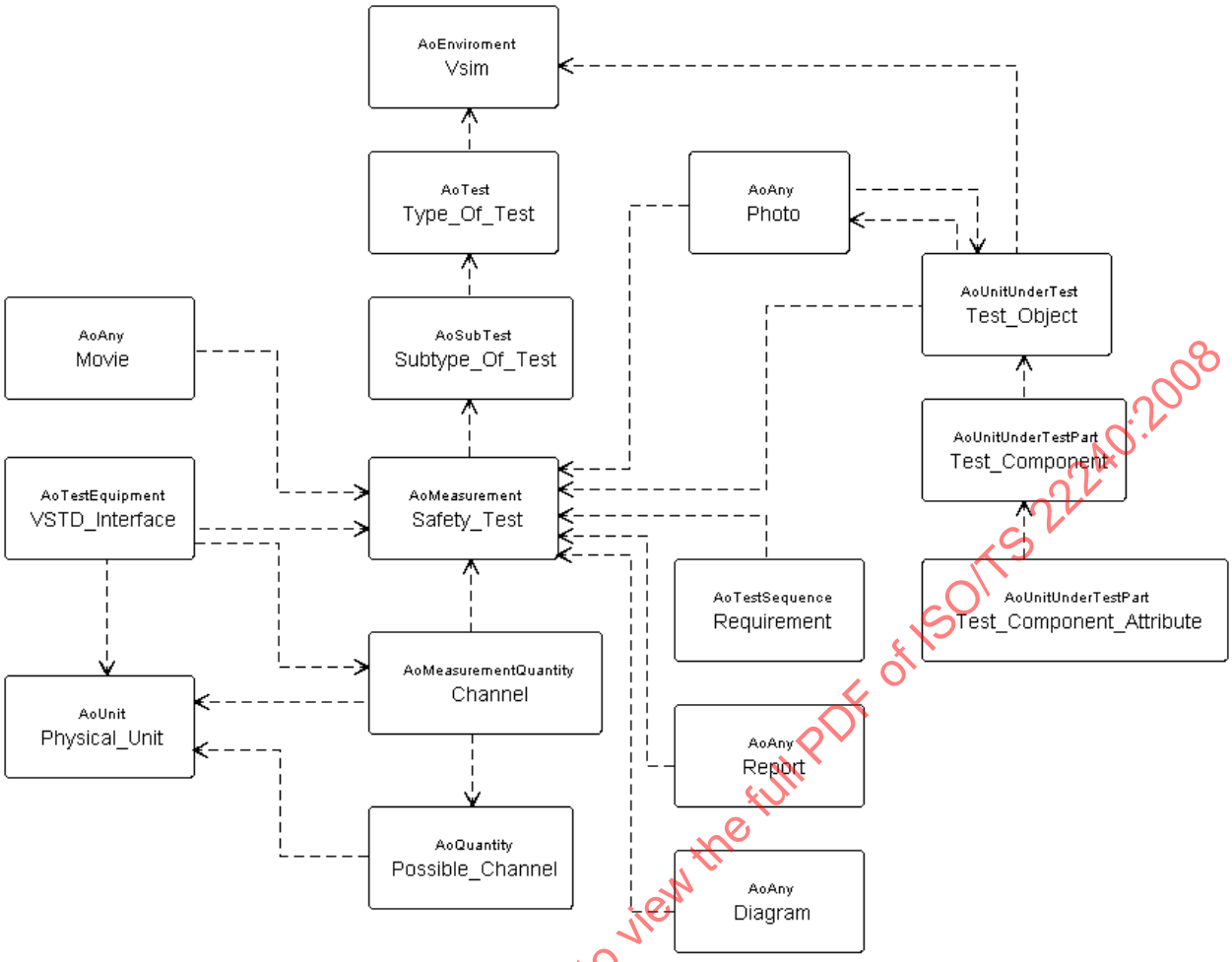

Figure 3 — VSIM overview

The dashed arrows symbolize the dependency between the entities. The arrows point toward the father entities. For example, the Test_Object depends on a Safety_Test. The Safety_Test is the father entity for Test_Object.

The information beginning with "Ao" above the name indicates the ASAM ODS basis elements from which the VSIM entities are derived.

To store data in any data repository, a data model describing what the data looks like must be defined. With this description (called "metadata") the data repository is configured to work with data according to this model. The data model consists of descriptions for each data type to be used. These data types are also called data objects or entities. An entity is described by its attributes, and each of these describes a property by providing a name as well as a data type for it. This data type can be a simple type, e.g. integer, real, or string, or again a data object. In this latter case, the attribute describes a reference to another entity.

An application model conforming to ASAM ODS had to be built with the data types known in the vehicle safety area. In ASAM ODS, all entities are derived from "base entities" which have a predefined meaning and a number of predefined "base attributes". This derivation provides a minimum semantic even in the case of data exchange between dissimilar systems. In addition, ASAM ODS tools benefit from knowledge about the meaning of the data. The ASAM ODS model for vehicle safety applications therefore consists of entities with names and attributes known in the vehicle safety area, but follows the rules for any ASAM ODS application model. The base model already provides many attributes (including reference attributes) that could be used in the application model. This was done wherever possible; but often application-specific properties and relations had to be added.

Figure 4 provides a comprehensive overview of the ODS base model and its most important relations.

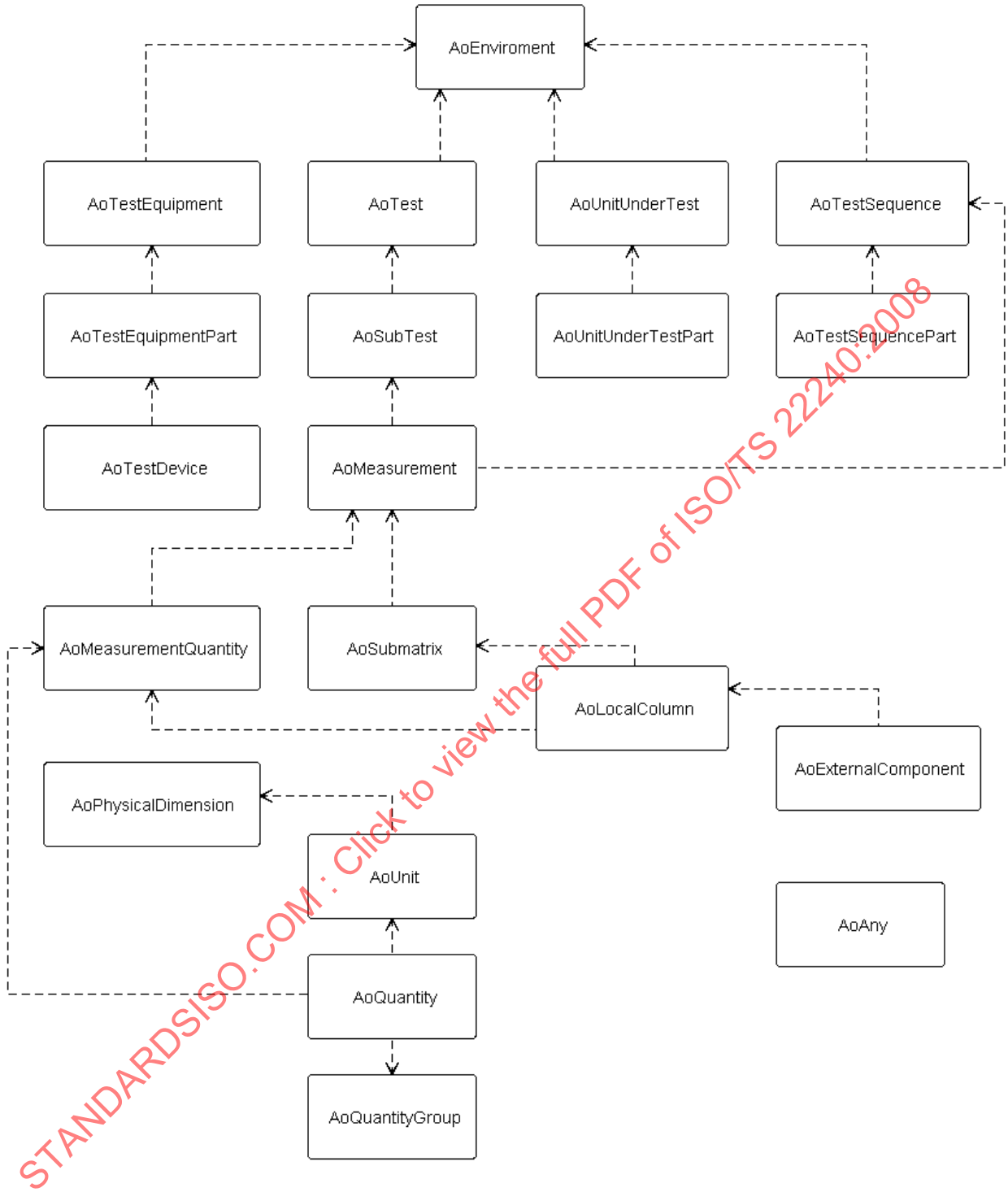

Figure 4 — ASAM ODS base model overview

For further information about ASAM ODS, its models and its use, please refer to References [5], [6], [7] and [8] in the Bibliography.

In the 4.3, 4.4 and 4.5 below, the entities of the application model for vehicle safety are presented with a short description of their purpose, their relationship to the ASAM ODS base model, and some important attributes.

4.3 Test definition

The test definition is described as follows. A Safety_Test consists of Test_Objects (e.g. vehicle, fixed barrier), which are also arranged as Test_Components (e.g. door, dummy). The Possible_Components are used to define which Test_Components are possible. The Possible_Components provide insight into the attributes (colour, part number, dummy type) of a specific component. The values of the attributes can be taken from Value_Lists or entered via free text function (see Figure 5).

The individuals participating in the test are described with the Contact entity. Their relation to Safety_Test is defined with the Contact_Relation_Type (e.g. Customer, Laboratory).

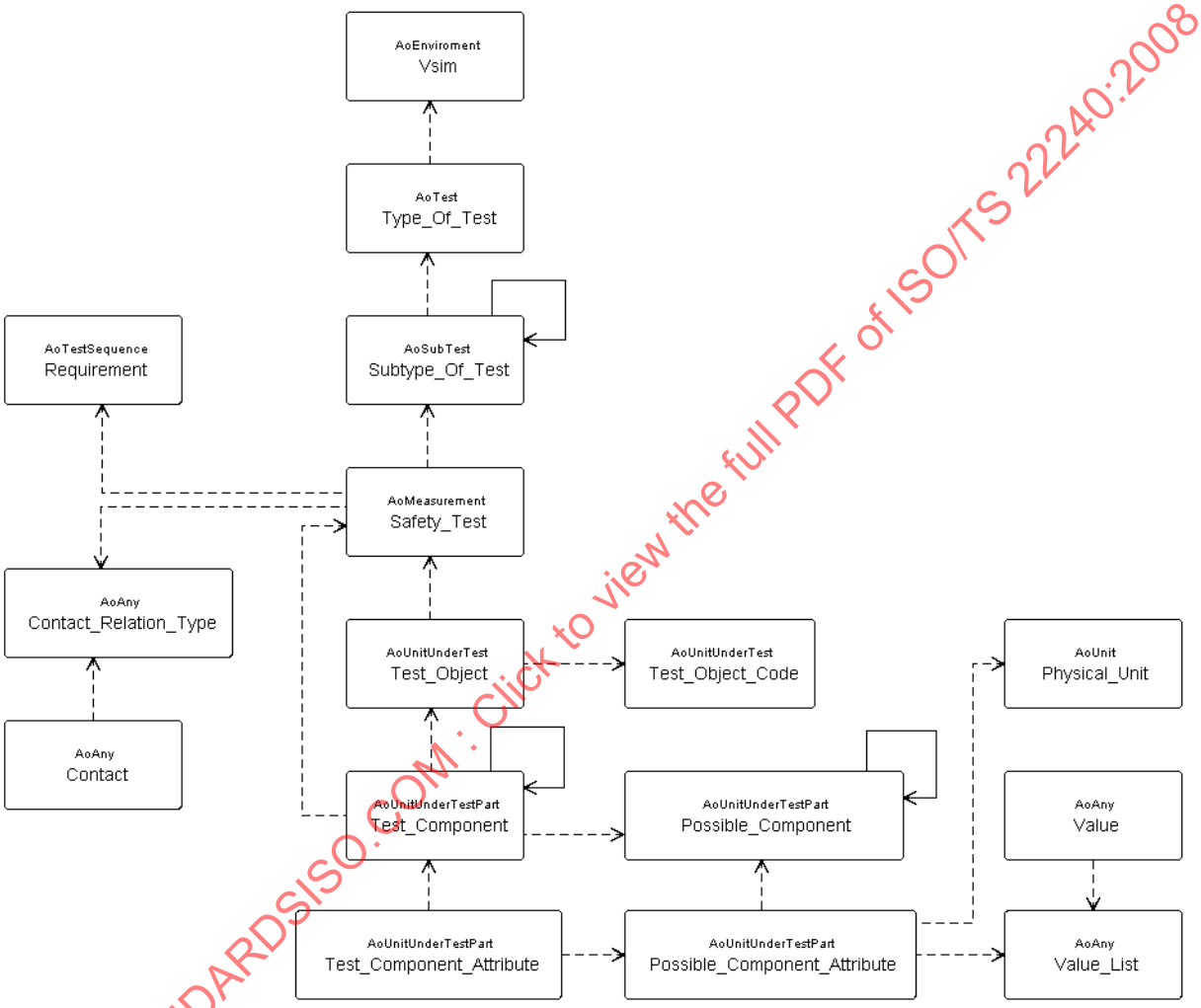

Figure 5 — Part of application model for test definition

A Safety_Test is assigned to one Subtype_Of_Test. Subtype_Of_Tests are grouped in Type_of_Tests. A further grouping of the Subtype_Of_Test is possible. This feature makes it possible to build different logical hierarchies above the Safety_Test. For example, the Element Type_of_Test can be used to represent the Projects. The recursive relation of Subtype_Of_Test to itself is used to model the dependency between Type_Of_Test and Subtype_Of_Test.