Harness Engineering Information Model

Data Dictionary

Description of the objects and attributes

Version *221*
Date: *05.02.2004*
Status: ***Review Version***
Author(s): *Max Ungerer, PROSTEP AG*
Filename: *./KBL Information Model V2.2.doc*
No. of pages: *48*
Distribution: *ECAD-IF, KBL AG, VDA AG Fahrzeugelektrik*

History

Version	Date	Status	Author(s)	Changes
1.0	16.07.2001	DRAFT	Max Ungerer, PS	First Draft
1.1	31.07.2001	DRAFT	Max Ungerer, PS	Actualization
1.2	13.09.2001	DRAFT	Max Ungerer, PS	Actualization
1.3	31.10.2001	DRAFT	Max Ungerer, PS	Actualization
1.4	29.11.2001	DRAFT	Max Ungerer, PS	Actualization
1.5	05.06.2002	DRAFT	Max Ungerer, PS	Workshop results
1.6	30.01.2003	DRAFT	Max Ungerer, PS	Actualization
2.0	14.07.2003	DRAFT	Max Ungerer, PS	Actualization

2.1	12.01.2003	DRAFT	Max Ungerer, PS	Actualization
2.2	05.02.2004	DRAFT	Max Ungerer, PS	ECAD-IF/AG Car Elektrik decisions 01/04

1 Preface

This document describes the objects, attributes and relationships defined for the Harness Engineering Information Model.

2 Terms, definitions and abbreviations

2.1 Terms and definitions

to be completed:

- module part list
- harness complete set
- harness subset
- harness variant
- module

2.2 Abbreviations

3 Units of functionality

The objects of the Harness Engineering Information Model are grouped into logical sections. The sections are as follows:

- common part attributes and properties
- connectivity
- harness and modules
- miscellaneous
- part master data
- part usage list
- topology and routing

3.1 common part attributes and properties

The following objects are used by the common part attributes and properties section:

- Alias_part
- Approval
- Change
- Creation
- External_reference
- Installation_instruction
- Material
- Part
- Part_with_title_block
- Processing_instruction

3.2 harness and modules

The following objects are used by the harness and modules section:

- Harness
- Harness_configuration
- Harness_part
- Module
- Module_configuration
- Module_family

3.3 part master data

The following objects are used by the part master data section:

- Accessory
- Assembly_part
- Cavity_plug
- Cavity_seal

- Co_pack_part
- Connector_housing
- Core
- Fixing
- General_terminal
- General_wire
- Slot
- Wire_colour
- Wire_protection

3.4 connectivity

The following objects are used by the connectivity section:

- Cavity
- Connection
- Core_occurrence
- Part_substitution
- Part_usage
- Special_wire_occurrence
- Wire_occurrence

3.5 part usage list

The following objects are used by the part usage list section:

- Accessory_occurrence
- Specified_accessory_occurrence
- Assembly_part_occurrence
- Cavity_plug_occurrence
- Specified_cavity_plug_occurrence
- Cavity_seal_occurrence
- Cavity_seal_occurrence
- Co_pack_occurrence
- Specified_co_pack_occurrence
- Connector_occurrence
- Connector_occurrence
- Fixing_occurrence
- Specified_fixing_occurrence
- General_wire_occurrence
- Special_terminal_occurrence
- Specified_special_terminal_occurrence

- Terminal_occurrence
- Specified_terminal_occurrence
- Wire_length
- Wire_protection_occurrence
- Specified_wire_occurrence

3.6 topology and routing

The following objects are used by the topology and routing section:

- Fixing_assignment
- Node
- Protection_area
- Routing
- Segment
- Segment_end

3.7 miscellaneous

The following objects are used by the miscellaneous section:

- B_spline_curve
- Cartesian_point
- Numerical_value
- Transformation
- Unit
- Value_range

4 Object definitions

4.1 Accessory

An Accessory is any supplementary portion of a connector with the obligation to help a Harness to perform its function.

EXAMPLE 1 An Accessory may be a sleeve, a cap, a cable strap or comparable parts, which are installed to a plug.

An Accessory is a type of Part.

The data associated with an Accessory are the following:

- accessory_type

4.1.1 accessory_type

The accessory_type specifies the type of an Accessory.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

The accessory_ype need not be specified for a particular Accessory.

4.2 Accessory_occurrence

An Accessory_occurrence is the occurrence of an Accessory in a module part list.

The data associated with an Accessory_occurrence are the following:

- alias_id
- component_of
- id
- installation_information
- part
- placement
- reference_element

4.2.1 alias_id

The alias_id specifies additional identifiers for the Accessory _occurrence.

The alias_id need not be specified for a particular Accessory _occurrence.

4.2.2 component_of

The component_of specifies the Harness that contains the Accessory_occurrence

4.2.3 id

The id specifies the identifier of the Accessory_occurrence.

4.2.4 installation_information

The installation_information provides additional information for the installation of the Accessory_occurrence.

The installation_information need not be specified for a particular Accessory_occurrence.

4.2.5 part

The part specifies the Accessory that serves as a definition for this particular occurrence.

4.2.6 placement

The placement specifies the transformation information which is used to locate and orient the occurrence in the car coordinate system. According to the CES definition, the reference point is pin 1. For further information see E3D guidelines.

The placement need not be specified for a particular Accessory_occurrence.

4.2.7 reference_element

The reference_element specifies the Connector_occurrence supplemented by the Accessory_occurrence.

The reference_element need not be specified for a particular Accessory_occurrence.

4.3 Alias_part

An Alias_part is a mechanism to associate a Part with an additional part_number that is used to identify the Part in another company.

The data associated with an Accessory_occurrence are the following:

- company_name
- part
- part_number

4.3.1 part

The part specifies the Part for which the Alias_part is defined.

4.3.2 company_name

The company_name specifies the company in which the Alias_part is valid.

4.3.3 part_number

The part_number specifies the identifier used in the context specified by the company_name.

4.4 Approval

An Approval is a judgment concerning the quality of those modules or harnesses that are subject of the Approval. An Approval represents a statement made by technical personnel or management personnel whether certain requirements are met. The absence of approval information does not imply any approval status by default.

The data associated with an Approval are the following:

- date
- department
- is_applied_to
- name
- type_of_approval

4.4.1 date

The date specifies the date when the Approval actually became valid.

4.4.2 department

The department specifies the department name of the personnel responsible for the Approval.

The department need not be specified for a particular Approval.

4.4.3 is_applied_to

The is_applied_to specifies the harness or module objects to which the Approval is assigned.

A particular Approval shall be applied to at least one object.

4.4.4 name

The name specifies the name of the personnel responsible for the Approval

The name need not be specified for a particular Approval.

4.4.5 type_of_approval

The type_of_approval specifies the terms characterizing the Approval.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

4.5 Assembly_part

An Assembly_part is a component that contains other subordinate objects. An Assembly_part is ordered as a part to be bought under a part number, due to limited functionalities of the CAD systems these must be described however with several individual parts.

An Assembly_part is a type of Part.

The data associated with an Assembly_part are the following:

- part_type

4.5.1 part_type

The part_type specifies the type of an Assembly_part.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

The part_type need not be specified for a particular Assembly_part.

4.6 Assembly_part_occurrence

An Assembly_part_occurrence is the occurrence of an Assembly_part in a module part list.

The data associated with an Assembly_part_occurrence are the following:

- alias_id
- component_of
- id
- installation_information
- part
- placement

4.6.1 alias_id

The alias_id specifies additional identifiers for the Assembly_part _occurrence.

The alias_id need not be specified for a particular Assembly_part _occurrence.

4.6.2 component_of

The component_of specifies the Harness that contains the Assembly_part_occurrence

4.6.3 id

The id specifies the identifier of the Assembly_part_occurrence.

4.6.4 installation_information

The installation_information provides additional information for the installation of the Connection.

The installation_information need not be specified for a particular Connection.

4.6.5 part

The part specifies the Assembly_part that serves as a definition for this particular occurrence.

4.6.6 placement

The placement specifies the transformation information which is used to locate and orient the occurrence in the car coordinate system. According to the CES definition, the reference point is pin 1. For further information see E3D guidelines.

The placement needs not be specified for a particular Assembly_part_occurrence.

4.7 B_spline_curve

A B-spline curve is a piecewise parametric polynomial or rational curve described in terms of control points and basis functions. The B-spline curve has been selected as the most stable format to represent all types of polynomial or rational parametric curves. With appropriate attribute values it is capable of representing single span or spline curves of explicit polynomial, rational, Bezier or B-spline type.

Within the Harness Engineering Information Model the definition has been restricted to a uniform B_spline_curve, where the knots are evenly spaced. Suitable default values for the knots and knot multiplicities are derived in this case. A B-spline is uniform if and only if all knots are of multiplicity 1 and they differ by a positive constant from the preceding knot. In this case the knot spacing is 1.0, starting at -d , where d is the degree.

NOTE If the B-spline curve is uniform and degree=1, the B-spline is equivalent to a polyline.

The data associated with a B_spline_curve are the following:

- control_points
- degree

4.7.1 control_points

The list of control points for the curve.

The list shall contain at least 2 elements.

4.7.2 degree

The algebraic degree of the basis functions.

4.8 Cartesian_point

A Cartesian_point is a point that is defined by its coordinates in a rectangular Cartesian coordinate system.

The data associated with a Cartesian_point is the following:

- coordinates

4.8.1 coordinates

The coordinates specify the coordinates of the Cartesian_point. The third coordinate will not exist in the case of a two-dimensional point.

4.9 Cavity

A cavity is a defined space in a housing for location of an electrical terminal or cavity plug/seal (can be empty).

The data associated with a Cavity are the following:

- associated_parts
- id
- of_connector
- position_on_wire
- slot

4.9.1 associated_parts

The associated_parts specifies the Cavity_plug_occurrences, Cavity_seal_occurrences, Special_terminal_occurrences, or Terminal_occurrences associated with the Cavity.

The associated_parts need not be specified for a particular Cavity.

4.9.2 id

The id specifies the identifier of the Cavity.

4.9.3 NOTE The uniqueness of a cavity id within a harness is fulfilled by the concatenation of the connector id, the slot id, and the cavity id. of_connector

The component_of specifies the Connector_occurrence that contains the Cavity.

4.9.4 position_on_wire

For flat cables with more than two insulation displacement tap the position of the intermediate pick-up shall be documented.

Valid values are BEGIN, END and numeric millimeter information between them.

The attribute in this section supports CC1-processors. CC3-processors use the appropriate attribute in the topology, write here however for CC1-processors. CC1-processors can only read and write here.

The position_on_wire need not be specified for a particular Cavity.

4.9.5 slot

The slot specifies the Slot the Cavity belongs to.

4.10 Cavity_plug

A Cavity_plug is a water tight non-electrical object to fill an empty cavity.

A Cavity_plug is a type of Part.

The data associated with a Cavity_plug are the following:

- colour
- plug_type

4.10.1 colour

The colour specifies the colour of the Cavity_plug.

The colour need not be specified for a particular Cavity_plug.

4.10.2 plug_type

The plug_type specifies the type of a Cavity_plug.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

The plug_type need not be specified for a particular Cavity_plug.

4.11 Cavity_plug_occurrence

A Cavity_plug_occurrence is the occurrence of a Cavity_plug in a module part list.

NOTE Cavity_plugs do not show up in a module bill of material.

The data associated with a Cavity_plug_occurrence are the following:

- component_of
- part

4.11.1 component_of

The component_of specifies the Harness that contains the Cavity_plug_occurrence.

4.11.2 part

The part specifies the Cavity_plug that serves as a definition for this particular occurrence.

4.12 Cavity_seal

A Cavity_seal is a water tight non-electrical object to fill a populated Cavity.

A Cavity_seal is a type of Part.

The data associated with a Cavity_seal are the following:

- colour
- seal_type
- wire_size

4.12.1 colour

The colour specifies the colour of the Cavity_seal.

The colour need not be specified for a particular Cavity_seal.

4.12.2 seal_type

The seal_type specifies the type of a Cavity_seal.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

The seal_type need not be specified for a particular Cavity_seal.

4.12.3 wire_size

The wire_size specifies the size range of the wires the seal fits.

The wire_size need not be specified for a particular Cavity_plug.

4.13 Cavity_seal_occurrence

A Cavity_seal_occurrence is the occurrence of a Cavity_seal in a module.

NOTE The number of occurrences used in a specific module or harness can be calculated by the individual occurrences.

The usage of a Cavity_seal_occurrence for a particular Cavity is specified by the Part_usage object.

The data associated with a Cavity_seal_occurrence are the following:

- component_of
- part

4.13.1 component_of

The component_of specifies the Harness that contains the Cavity_seal_occurrence.

4.13.2 part

The part specifies the Cavity_seal that serves as a definition for this particular occurrence.

4.14 Change

A Change is a mechanism to keep track of the change history. The set of changes assigned to a Part covers all modification numbers up to the last modification level of the version of the Part.

The data associated with a Change are the following:

- approver_department
- approver_name
- change_date
- change_request
- description
- designer_department
- id
- part
- responsible_designer

4.14.1 approver_department

The approver_department specifies the department of the personnel who approved the Part.

The approver_department need not be specified for a particular Change.

4.14.2 approver_name

The approver_name specifies the name of the personnel who approved the Part.

The approver_name need not be specified for a particular Change.

4.14.3 change_date

The change_date specifies the date the change was performed.

The change_date need not be specified for a particular Change.

4.14.4 change_request

The change_request specifies the activity which triggers one ore more changes.

EXAMPLE change request, AEKO, VV; “Modellpflegepunkt”

The change_request need not be specified for a particular Change.

4.14.5 description

The description specifies additional information about the change.

The description need not be specified for a particular Change.

4.14.6 designer_department

The designer_department specifies the department of the responsible design engineer.

4.14.7 id

The id specifies the identifier by which a certain change can be referenced.

EXAMPLE reference of a fax, note, etc.

The id need not be specified for a particular Change.

4.14.8 part

The part specifies the Part to which the Change applies.

4.14.9 responsible_designer

The responsible_designer specifies the responsible design engineer.

4.15 Co_pack_occurrence

A Co_pack_occurrence is the occurrence of a Co_pack_part in a module part list.

The data associated with a Co_pack_occurrence are the following:

- alias_id
- component_of
- id
- installation_information
- part

4.15.1 alias_id

The alias_id specifies additional identifiers for the Co_pack _occurrence.

The alias_id need not be specified for a particular Co_pack _occurrence.

4.15.2 component_of

The component_of specifies the Harness that contains the Co_pack_occurrence.

4.15.3 id

The id specifies the identifier of the Co_pack_occurrence.

4.15.4 installation_information

The installation_information provides additional information for the installation of the Co_pack_occurrence.

The installation_information need not be specified for a particular Co_pack_occurrence.

4.15.5 part

The part specifies the Co_pack_part that serves as a definition for this particular occurrence.

4.16 Co_pack_part

A Co_pack_part is a Part which is supplied and installed with the wiring harness, but without any electrical connection.

A Co_pack_part is a type of Part.

The data associated with an Co_pack_part are the following:

- part_type

4.16.1 part_type

The part_type specifies the type of a Co_pack_part.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

The part_type need not be specified for a particular Co_pack_part.

4.17 Connection

A Connection is a mechanism to specify the electrical connectivity between two or more contact points.

The data associated with a Connection are the following:

- connectivity_of
- extremities
- id
- installation_information
- processing_information
- signal_name
- wire

4.17.1 connectivity_of

The connectivity_of specifies the Harness for which the Connection is defined.

4.17.2 extremities

The extremities specifies the Cavity objects which are connected by this Connection. There shall be at least two objects specified.

4.17.3 id

The id specifies the identifier of the Connectivity. The values are company specific. They can depend also on wire parameters.

EXAMPLE electrical potential, start->destination

The id need not be specified for a particular Connection.

4.17.4 installation_information

The installation_information provides additional information for the installation of the Connection.

The installation_information need not be specified for a particular Connection.

4.17.5 processing_information

The processing_information provides additional information for the processing of the Connection.

The processing_information need not be specified for a particular Connection.

4.17.6 signal_name

The signal_name specifies logical information on a Connection.

EXAMPLE packet on a bus, analogue voltage(high/low, waved) on a wire

The signal_name need not be specified for a particular Connection.

4.17.7 wire

The wire specifies the Wire_occurrence or Core_occurrence which realizes the Connection.

4.18 Connector_housing

A Connector_housing is a non populated connector, i.e. without addressed/populated cavities.

A Connector_housing is a type of Part.

The data associated with a Connector_housing are the following:

- housing_code
- housing_colour
- housing_type

4.18.1 housing_code

The housing_code specifies a coding for the type of the Connector_housing.

The housing_code need not be specified for a particular Connector_housing.

4.18.2 housing_colour

The housing_colour specifies the colour of the Connector_housing.

The housing_colour need not be specified for a particular Connector_housing.

4.18.3 housing_type

The housing_type specifies the type of a Connector_housing.

EXAMPLE family series type like ‘MQS2.8’

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

The housing_type need not be specified for a particular Connector_housing.

4.19 Connector_occurrence

A Connector_occurrence is the occurrence of a Connector_housing in a module part list.

The data associated with a Connector_occurrence are the following:

- alias_id
- component_of
- id
- installation_information
- part
- placement
- usage

4.19.1 alias_id

The alias_id specifies additional identifiers for the Connector_occurrence.

The alias_id need not be specified for a particular Connector_occurrence.

4.19.2 component_of

The component_of specifies the Harness that contains the Connector_occurrence

4.19.3 id

The id specifies the identifier of the Connector_occurrence.

4.19.4 installation_information

The installation_information provides additional information for the installation of the Connector_occurrence.

The installation_information need not be specified for a particular Connector_occurrence.

4.19.5 part

The part specifies the Connector_housing that serves as a definition for this particular occurrence.

4.19.6 placement

The placement specifies the transformation information which is used to locate and orient the occurrence in the car coordinate system. According to the CES definition, the reference point is pin 1. For further information see E3D guidelines.

The placement need not be specified for a particular Connector_occurrence.

4.19.7 usage

The usage specifies the way how a Connector_housing is used in a connection.

Where applicable the following values shall be used:

- ‘no end’: end of wire without any connector (“blunt cut”)
- 'ring terminal’:
- ‘splice’:
- ‘dangler’: terminal without any connector housing

The usage need not be specified for a particular Connector_occurrence.

4.20 Core

A Core is a single conductor of a multi-core wire including its isolation.

The data associated with a Core are the following:

- bend_radius
- cable_designator
- core_colour
- of_wire
- cross_section_area
- id
- outside_diameter
- wire_type

4.20.1 bend_radius

The bend_radius specifies the bend radius of a core.

The bend_radius need not be specified for a particular Core.

4.20.2 cable_designator

The cable_designator specifies additional information to refer to a Core.

The cable_designator need not be specified for a particular Core.

4.20.3 core_colour

The Core_colour specifies the Wire_colour objects of the core.

There shall be at least one element.

4.20.4 of_wire

The of_wire specifies the multi-core wire the core belongs to.

4.20.5 cross_section_area

The cross_section_area specifies the electrical cross section of the Core.

4.20.6 id

The id specifies the identifier of the Core.

4.20.7 outside_diameter

The outside_diameter specifies the outer width of the Core.

The outside_diameter need not be specified for a particular Core.

4.20.8 wire_type

The wire_type specifies the type of a Core.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

EXAMPLE ‘protected wire’, ‘flat band’.

The wire_type need not be specified for a particular Core.

4.21 Core_occurrence

A Core_occurrence is the occurrence of a Core within a Special_wire_occurrence.

The data associated with a Core_occurrence are the following:

- length_information
- part
- special_wire
- wire_number

4.21.1 length_information

The length_information specifies the length of a Core_occurrence. For a core, as many Wire_length objects as required may be defined. There are two pre-defined types:

- DMU: By CAD model calculated wire length. Usually it is the Sum of the lengths of neutral fibers of the bundle sections, normally too short.
- Manufacturing: determination by means of correction algorithms or measurement of the prototype.

4.21.2 part

The part specifies the Core that serves as a definition for this particular occurrence.

4.21.3 special_wire

The special_wire specifies the Special_wire_occurrence that contains the Core_occurrence.

4.21.4 wire_number

The wire_number specifies the identification of a wire. This number is unique within a vehicle and usually automatically generated (dependent on "from- to" information).

NOTE Each interior conductor of a multi-core wire produces an own wire number.

4.22 Creation

A Creation assigns creation information to a Module or Harness.

The data associated with a Creation are the following:

- date
- department
- is_applied_to
- name

4.22.1 date

The date specifies the creation date.

4.22.2 department

The department specifies the department the creator belongs to.

4.22.3 is_applied_to

The is_applied_to specifies the harness or module objects to which the Creation is assigned.

A Creation shall be applied to at least one object.

4.22.4 name

The name specifies the name of the creator.

4.23 External_reference

An External_reference is a mechanism to provide information of the documents associated with the Part.

EXAMPLE 3D model, form board drawings, etc.

The data associated with a External_reference are the following:

- change_level
- creating_system
- data_format
- document_number
- document_type
- file_name
- location

4.23.1 change_level

The change_level specifies the version of the document.

4.23.2 creating_system

The creating_system specifies the computer application or the machine which is used to create the document.

The creating_system need not be specified for a particular External_reference.

4.23.3 data_format

The data_format specifies the convention that was used to structure the information in the document.

4.23.4 document_number

The document_number specifies the identifier of the document.

4.23.5 document_type

The document_type specifies the kind of the document.

Where applicable the following values shall be used:

- 3D-Data set (wiring, construction unit)
- 2D-Data set (Ltgs design, symbol, plug face)
- cable connection diagram
- set of cables database (VW: LCS-Container)
- specification of set of cables
- standards, technical guidelines

4.23.6 file_name

The file_name specifies the name which is used to locate the file either on a computer system or in a repository of paper documents.

The file_name need not be specified for a particular External_reference.

4.23.7 location

The location specifies where a document can be found in a digital or physical data storage system.

The location need not be specified for a particular External_reference.

4.24 Fixing

A Fixing is a component the harness will be fixed with. Fixing elements cover all parts, that are used in cable section.

EXAMPLE clips, sleeves, cable ducts, grommet, etc.

A Fixing is a type of Part.

The data associated with a Fixing are the following:

- fixing_type

4.24.1 fixing_type

The fixing_type specifies the type of a Fixing.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

EXAMPLE Examples are ‘fastening part’, ‘channel’, ‘sleeve’, ‘shaft’, ‘conduct’, ‘pine-tree’

The fixing_type need not be specified for a particular Fixing.

4.25 Fixing_assignment

A Fixing_assignment assigns a Fixing_occurrence or an Accessory_occurrence to a Segment.

The data associated with a Fixing_assignment are the following:

- fixing
- location
- orientation
- segment

4.25.1 fixing

The fixing specifies the Fixing_occurrence or the Accessory_occurrence which is assigned.

4.25.2 location

The location specifies the position of the fixing on the Segment. The value is given in curve parameters running from 0.0 to 1.0.

4.25.3 orientation

The orientation specifies the direction of the z-axis and is given by 2 or 3 values. The y-axis is defined by the tangent of the center curve at the location.

4.25.4 segment

The segment specifies the Segment the Fixing_occurrence is assigned to.

4.26 Fixing_occurrence

A Fixing_occurrence is the occurrence of a Fixing in a module part list.

The data associated with a Fixing_occurrence are the following:

- alias_id
- component_of
- id
- installation_information
- part
- placement

4.26.1 alias_id

The alias_id specifies additional identifiers for the Fixing _occurrence.

The alias_id need not be specified for a particular Fixing _occurrence.

4.26.2 component_of

The component_of specifies the Harness that contains the Fixing_occurrence

4.26.3 id

The id specifies the identifier of the Fixing_occurrence.

4.26.4 installation_information

The installation_information provides additional information for the installation of the Fixing_occurrence.

The installation_information need not be specified for a particular Fixing_occurrence.

4.26.5 part

The part specifies the Fixing that serves as a definition for this particular occurrence.

4.26.6 placement

The placement specifies the transformation information which is used to locate and orient the occurrence in the car coordinate system. For further information see E3D guidelines.

The placement need not be specified for a particular Fixing_occurrence.

4.27 General_terminal

A General_terminal is a device designed to terminate a conductor to be affixed usually to a post, stud, chassis, or other conductor or the like in order to establish electrical connection.

A General_terminal is a type of Part.

The data associated with a General_terminal are the following:

- cross_section_area
- outside_diameter
- plating_material
- terminal_type

4.27.1 cross_section_area

The cross_section_area specifies the electrical cross section which can be accommodated by the General_terminal.

The cross_section_area need not be specified for a particular General_terminal.

4.27.2 outside_diameter

The outside_diameter specifies the outer width of the isolation which can be accommodated by the General_terminal.

The outside_diameter need not be specified for a particular General_terminal.

4.27.3 plating_material

The plating_material specifies the overlaying of a thin coating of metal on components to improve conductivity, provide for easy soldering or prevent rusting or corrosion.

The plating_material need not be specified for a particular General_terminal.

4.27.4 terminal_type

The terminal_type specifies the type of a General_terminal.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

EXAMPLE 'pin', 'Blade', 'male', 'female', 'grease', 'FL - flat contact', 'KK - box contact', 'SK - ring wire', 'RK - ring lug', 'KS - lug', 'BK - battery clamp', 'OL - open line end of frame', 'SP - splice', 'MK - multiple contact'

The terminal_type need not be specified for a particular General_terminal.

4.28 General_wire

A General_wire is a physical wire, performing electrical connection. A General_wire can either be used to define a single wire or a multi-core wire.

A General_wire is a type of Part.

The data associated with a General_wire are the following:

- bend_radius
- cable_designator
- cover_colour
- cross_section_area
- outside_diameter
- wire_type

4.28.1 bend_radius

The bend_radius specifies the bend radius of a wire.

The bend_radius need not be specified for a particular General_wire.

4.28.2 cable_designator

The cable_designator specifies additional information to refer to a General_wire.

The cable_designator need not be specified for a particular General_wire.

4.28.3 cover_colour

The cover_colour specifies the Wire_colour objects of a General_wire. In the case of a single wire it specifies the colour of the conductor. In case of a multi-core wire it specifies the colour of the cover.

There shall be at least one element specified.

4.28.4 cross_section_area

The cross_section_area specifies the electrical cross section of the General_wire.

The cross_section_area shall not be specified for a multi-core wire.

4.28.5 outside_diameter

The outside_diameter specifies the outer width of the General_wire.

The outside_diameter need not be specified for a particular General_wire.

4.28.6 wire_type

The wire_type specifies the type of a General_wire.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

EXAMPLE 'individual wire', 'multi-core wire', 'protected wire', 'flat band'.

The wire_type need not be specified for a particular General_wire.

4.29 General_wire_occurrence

A General_wire_occurrence is the occurrence of a Wire_occurrence or a Special_wire_occurrence in a module part list.

Each General_wire_occurrence is a Wire_occurrence, or a Special_wire_occurrence,

The data associated with a General_wire_occurrence are the following:

- component_of
- installation_information
- length_information
- part

4.29.1 component_of

The component_of specifies the Harness that contains the General_wire_occurrence

4.29.2 installation_information

The installation_information provides additional information for the installation of the Connection.

The installation_information need not be specified for a particular Connection.

4.29.3 length_information

The length_information specifies the length of a General_wire_occurrence. For a wire, as many Wire_length objects as required may be defined. There are two pre-defined types:

- DMU: By CAD model calculated wire length. Usually it is the Sum of the lengths of neutral fibers of the bundle sections, normally too short.
- Manufacturing: determination by means of correction algorithms or measurement of the prototype.

There shall be at least one Wire_length of type DMU be defined for each wire.

4.29.4 part

The part specifies the General_wire that serves as a definition for this particular occurrence.

4.30 Harness

A Harness is an assembly of insulated conductors formed to a predetermined pattern or configuration.

A Harness is a type of Part_with_title_block.

The data associated with a Harness are the following:

- content

There shall be only one harness object exchanged by a single file.

4.30.1 content

The content specifies the information covered by the Harness.

Where applicable the following values shall be used:

- 'Harness Complete Set'
- 'Harness Subset'

4.31 Harness_configuration

A Harness_configuration is a variant of an harness.

The data associated with a Harness_configuration are the following:

- logistic_control_information
- modules
- of_harness

4.31.1 logistic_control_information

The logistic_control_information specifies the calculated combination of the configuration codes reflecting customer, market or country requirements associated with a Harness_configuration.

EXAMPLE 'LOL/LOR+CFL'

The logistic_control_information need not be specified for a particular Harness_ configuration.

4.31.2 modules

The modules specifies the Module objects which build up the Harness_configuration.

4.31.3 of_harness

The of_harness specifies the Harness the Harness_configuration is a variant of.

4.32 Harness_part

A Harness_part is an occurrence of a modular harness which can be ordered.

A Harness_part is a type of Part.

The data associated with a Harness are the following:

- configuration

4.32.1 configuration

The configuration specifies the Harness_configuration of the Harness_part.

4.33 Installation_instruction

An Installation_instruction is the description of the methods that can be used to install a Part.

The data associated with an Installation_instruction are the following:

- installation_type
- installation_value

4.33.1 installation_type

The installation_type specifies the kind of the Installation_instruction.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

4.33.2 installation_value

The installation_value specifies the value for the kind of the Installation_instruction defined by instruction_type.

4.34 Material

A Material is the substance out of which a Part is or can be made.

The data associated with a Material are the following:

- material_key
- material_reference_system

4.34.1 material_key

The material_key specifies a code by which the material can be identified.

4.34.2 material_reference_system

The material_reference_system specifies the system in which the material_key and its meaning is defined.

EXAMPLE 'IMDS' for the International Material Database System.

The material_reference_system need not be specified for a particular Material.

4.35 Module

A Module is a physical part of harness electrically defined by one or more module groups including required harness furniture.

A Module is a type of Part_with_title_block.

The data associated with a Module are the following:

- configuration
- content
- of_family
- of_harness

4.35.1 configuration

The configuration specifies the Module_configuration the Module represents.

4.35.2 content

The content specifies the information covered by the Module.

Where applicable the following values shall be used:

- 'Variant'
- 'Module'

4.35.3 of_family

The of_family specifies the Module_family to which the Module belongs to.

The of_family need not be specified for a particular Module.

4.35.4 of_harness

The of_harness specifies the Harness the Module belongs to.

NOTE A Module belong to one harness, only. This is no restriction, as there can be only one harness object exchanged by one file.

4.36 Module_configuration

A Module_configuration is a grouping of wires and components fulfilling a specific functionality of a harness.

The data associated with a Module_configuration are the following:

- configuration_type
- controlled_components
- logistic_control_information

4.36.1 configuration_type

The configuration_type specifies further information on the type of the logistic_control_information.

NOTE To control completion parts which are only used if a specific combination of modules occur, a Module_configuration can be used with a logistic_control_information containing the Boolean expression for the combination and a configuration_type 'module list'.

4.36.2 controlled_components

The controlled_components specifies the Connections, Connector_occurrences, Accessory_occurrences, Assembly_part_occurrences, General_wire_occurrences, Fixing_occurrences, Co_pack_occurrences, Cavity_seal_occurrences, Wire_protection_occurrences, Cavity_plug_occurrences, Terminal_occurrences, and Special_terminal_occurrences which are grouped by the Module_configuration.

The controlled_components need not be specified for a particular Module_configuration.

4.36.3 logistic_control_information

The logistic_control_information specifies the calculated combination of the configuration codes reflecting customer, market or country requirements associated with a Module_configuration.

EXAMPLE 'LOL/LOR+CFL'

4.37 Module_family

A Module_family is a mechanism to group mutually exclusive modules.

EXAMPLE 'audio equipment'

The data associated with a Module_family are the following:

- description
- id

4.37.1 description

The description specifies additional information about the Module_family.

4.37.2 id

The id specifies the identifier of the Module_family.

4.38 Node

A node forms begin and end of a Segment.

The data associated with a Node are the following:

- coordinates_3D
- id
- processing_information
- referenced_components

4.38.1 coordinates_3D

The coordinates_3D specifies the position of the Node with respect to the absolute car coordinate system.

4.38.2 id

The id specifies the identifier of the Node.

4.38.3 processing_information

The processing_information provides additional information for the processing of the Node.

The processing_information need not be specified for a particular Node.

4.38.4 referenced_components

The referenced_components specifies the Accessory_occurrences, Assembly_part_occurrences, Connector_occurrences, Fixing_occurrences, Special_terminal_occurrences, and Wire_protection_occurrences located at the node.

NOTE Different elements can lead to a node, e.g. plug, Splice, perhaps clip.

The referenced_components need not be specified for a particular Node.

4.39 Numerical_value

A Numerical_value is a quantity expressed with a numerical value and a unit.

The data associated with a Numerical_value are the following:

- unit_component
- value_component

4.39.1 unit_component

The unit_component specifies the Unit in which the Numerical_value is expressed.

4.39.2 value_component

The value_component specifies the quantity of the Numerical_value.

4.40 Part

A part is an element of a product relevant for a bill-of material.

Each Part is either an Accessory, an Assembly part, a Cavity plug, a Cavity seal, a Co pack part, a Connector housing, a Fixing, a General wire, a General terminal, a Harness occurrence, a Part with title block or a Wire protection.

The data associated with a Part are the following:

- abbreviation
- change_information
- copyright_note
- degree_of_maturity
- description
- external_references
- mass_information
- material_information
- part_number
- predecessor_part_number
- processing_information
- version

4.40.1 abbreviation

The abbreviation specifies a short name for a Part.

4.40.2 copyright_note

The copyright_note specifies copyright information for a Part.

The copyright_note need not be specified for a particular Part except for Module and Harness.

4.40.3 degree_of_maturity

The degree_of_maturity specifies the degree of maturity of a Part.

Where applicable the following values shall be used:

- ‘draft’
- ‘planning’
- ‘equipment order’
- ‘disposition’

The degree_of_maturity need not be specified for a particular Part.

4.40.4 description

The description specifies additional information about the Part.

4.40.5 external_references

The external_references specifies references to documents.

The external_references need not be specified for a particular Part.

4.40.6 mass_information

The mass_information specifies the mass of a Part.

EXAMPLE Valid values for the unit of the Numerical_value specifying the mass are ‘g’, ‘kg’, or also ‘kg/piece’, ‘g/m’

The mass_information need not be specified for a particular Part.

4.40.7 material_information

The material_information specifies the material of a Part.

The material_information need not be specified for a particular Part.

4.40.8 part_number

The part_number specifies the identifier of the Part. The format of the part number is user defined (OEM specific).

4.40.9 predecessor_part_number

The predecessor_part_number specifies the part number of the predecessor of the Part.

The predecessor_part_number need not be specified for a particular Part.

4.40.10 processing_information

The processing_information provides additional information for the processing of the Part.

The processing_information need not be specified for a particular Part.

4.40.11 version

The version specifies the version identifier of the Part. A version cumulates and consolidates one or more single changes.

4.41 Part_substitution

A Part_substitution is a mechanism to describe that a Cavity_plug is replaced by a terminal. Usually, cavities not used by the module that contains the connector, are equipped with a cavity plug. If another module uses that cavity for a connection, the plug is replaced by a terminal.

The data associated with a Part_substitution are the following:

- replaced
- replacing

4.41.1 replaced

The replaced specifies the Cavity_plug_occurrence, Cavity_seal_occurrence, Special_terminal_occurrence, or Terminal_occurrence that is replaced.

4.41.2 replacing

The replacing specifies the Cavity_plug_occurrence, Cavity_seal_occurrence, Special_terminal_occurrence, or Terminal_occurrence that replaces the replaced Cavity_plug_occurrence, Cavity_seal_occurrence, Special_terminal_occurrence, or Terminal_occurrence .

4.42 Part_with_title_block

A Part_with_title_block is a mechanism to assign additional information to a Harness or a Module.

Each Part_with_title_block is a Harness, or a Module.

The data associated with a Part_with_title_block are the following:

- car_classification_level_2
- car_classification_level_3
- car_classification_level_4
- company_name
- model_year
- project_number

4.42.1 car_classification_level_2

The car_classification_level_2 provides a classification according to “CC8 Recommended Practices Specification and Configuration, Product Structures”. Car classification is the identification of a set of similar cars to be offered to the market. Level 2 stands for “Technical information / platform” and reflects the level of a product class in a BoM system which represents a main technical product base (e.g. project, platform, engineering series etc.). In some cases this level carries a complete BoM ("Maximum BoM") for a project, platform, engineering series etc. This level is in some cases called technical documentation.

4.42.2 car_classification_level_3

The car_classification_level_3 provides a classification according to “CC8 Recommended Practices Specification and Configuration, Product Structures”. Car classification is the identification of a set of similar cars to be offered to the market. Level 3 stands for “Configuration information / product family” where all variant control mechanism are attached.

The car_classification_level_3 need not be specified for a particular Part_with_title_block.

4.42.3 car_classification_level_4

The car_classification_level_4 provides a classification according to “CC8 Recommended Practices Specification and Configuration, Product Structures”. Car classification is the identification of a set of similar cars to be offered to the market. Level 4 stands for “Furthest pre-configured abstract product class” and represents the furthest configured class of a product, which is not yet a real product. E.g. this could be a complete vehicle, engine, gear-box etc. which has not

been evaluated against customer special choices or a abstract vehicle, engine, gear-box etc. which could become a real one after the associated BoM is evaluated. The purpose of this level of a product class instance is in any case to reflect that level of product class of a BoM system which leads to the individual BoM for a single product.

The car_classification_level_4 need not be specified for a particular Part_with_title_block.

4.42.4 company_name

The company_name specifies the name of the car manufacturing company (OEM).

4.42.5 model_year

The model_year specifies the year of the car model.

4.42.6 project_number

The project_number specifies the development order number (car or engine project)

The project_number need not be specified for a particular Part_with_title_block.

4.43 Processing_instruction

A Processing_instruction is the description of the methods that can be used to process a Part.

The data associated with a Processing_instruction are the following:

- instruction_type
- instruction_value

4.43.1 instruction_type

The instruction_type specifies the kind of the Processing_instruction.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

4.43.2 instruction_value

The instruction_value specifies the value for the kind of the Processing_instruction defined by instruction_type.

4.44 Protection_area

A Protection_area is a a mechanism to describe the area on a Segment covered by a Wire_protection_occurrence.

NOTE For each Segment covered by a particular Wire_protection_occurrence a separate Protection_area has to be instantiated.

The data associated with a Protection_area are the following:

- associated_protection
- end_location
- gradient
- processing_information
- segment
- start_location
- taping_direction

4.44.1 associated_protection

The associated_protection specifies the Wire_protection_occurrence associated Segment objects.

4.44.2 end_location

The end_location specifies the end position of the Wire_protection_occurrence on the Segment. The value is given in curve parameters running from 0.0 to 1.0.

4.44.3 gradient

The gradient specifies the gradient of the protection.

The gradient need not be specified for a particular Protection_area.

4.44.4 processing_information

The processing_information provides additional information for the processing of the Protection_area.

The processing_information need not be specified for a particular Protection_area.

4.44.5 segment

The segment specifies the Segment the Protection_area is associated with.

4.44.6 start_location

The start_location specifies the start position of the Wire_protection_occurrence on the Segment. The value is given in curve parameters running from 0.0 to 1.0.

4.44.7 taping_direction

The taping_direction specifies the direction of the taping (left/right) regarding to the Segment direction.

The taping_direction need not be specified for a particular Protection_area.

4.45 Routing

A Routing is a course taken to get from a starting point to a destination.

The data associated with a Routing are the following:

- routed_wire
- segments

4.45.1 routed_wire

The routed_wire specifies the Connection for which the Routing is defined.

4.45.2 segments

The segments specifies the Segment objects the course follows.

The segments need not be specified for a particular Routing.

4.46 Segment

A Segment is a section of a Connection where no intermediate electrical contacts appear. At the beginning and at the end the same wires go in and out.

The data associated with a Segment are the following:

- center_curve
- end_node
- end_vector
- id
- real_length
- represented_length
- start_node
- start_vector

4.46.1 center_curve

The center_curve specifies the mathematical definition of the set of center curves of the Segment.

The center_curve need not be specified for a particular Segment.

4.46.2 end_node

The end_node specifies the Node defining the end of the Segment.

4.46.3 end_vector

The end_vector specifies the tangent of the center curve at the end position.

The end_vector need not be specified for a particular Segment.

NOTE The value can be derived from the center_curve. To avoid that the receiving system has to calculate the value, it can be specified.

4.46.4 id

The id specifies the identifier of the Segment.

4.46.5 real_length

The real_length specifies the arc length of the neutral phase of the segment in 3d.

The real_length need not be specified for a particular Segment.

4.46.6 represented_length

The represented_length specifies the represented length of the neutral phase of the segment in 3d.

The represented_length need not be specified for a particular Segment.

4.46.7 start_node

The start_node specifies the Node defining the start of the Segment.

4.46.8 start_vector

The start _vector specifies the tangent of the center curve at the start position.

The start _vector need not be specified for a particular Segment.

NOTE The value can be derived from the center_curve. To avoid that the receiving system has to calculate the value, it can be specified.

4.47 Slot

A Slot is a mechanism to group the Cavity objects of a Connector_housing.

The data associated with a Slot are the following:

- id
- number_of_cavities
- slot_of

4.47.1 id

The id specifies the identifier of the Slot.

The id need not be specified for a particular Slot.

4.47.2 number_of_cavities

The number_of_cavities specifies the number of cavities associated with the Slot.

4.47.3 slot_of

The slot_of specifies the Connector_housing the Slot belongs to.

4.48 Special_terminal_occurrence

A Special_terminal_occurrence is the occurrence of a General_terminal with an identifier in a module part list.

The data associated with a Special_terminal_occurrence are the following:

- alias_id
- component_of
- id
- installation_information
- part
- placement

4.48.1 alias_id

The alias_id specifies additional identifiers for the Special_terminal _occurrence.

The alias_id need not be specified for a particular Special_terminal _occurrence.

4.48.2 component_of

The component_of specifies the Harness that contains the Special_terminal_occurrence.

4.48.3 id

The id specifies the identifier of the Special_terminal_occurrence.

4.48.4 installation_information

The installation_information provides additional information for the installation of the Special_terminal_occurrence.

The installation_information need not be specified for a particular Special_terminal_occurrence.

4.48.5 part

The part specifies the General_terminal that serves as a definition for this particular occurrence.

4.48.6 placement

The placement specifies the transformation information which is used to locate and orient the occurrence in the car coordinate system. According to the CES definition, the reference point is pin 1. For further information see E3D guidelines.

The placement need not be specified for a particular Special_terminal_occurrence.

4.49 Special_wire_occurrence

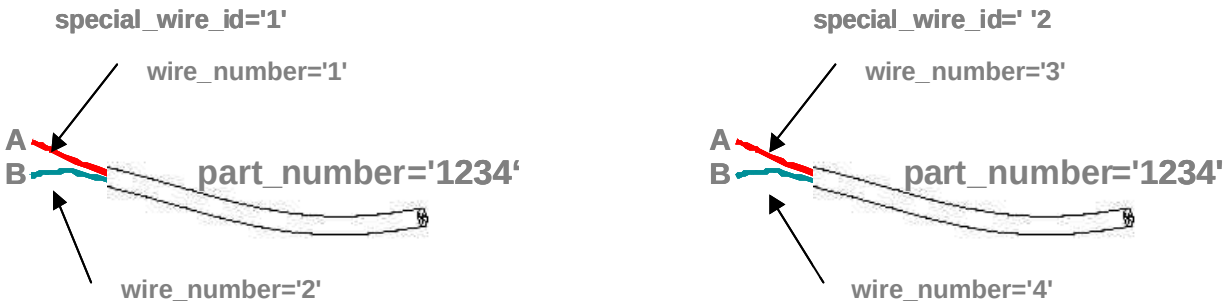
A Special_wire_occurrence is the occurrence of a multi-core wire in a module part list.

A Special_wire_occurrence is a type of General_wire_occurrence.

The data associated with an Special_wire_occurrence are the following:

- special_wire_id

4.49.1 special_wire_id



A special_wire_id specifies the identifier of the individual occurrence of multi-core wire. In contrast to the occurrence of a single wire which do not need to be identified in the module part list, each multi-core wire occurrence must be identified.

4.50 Specified_accessory_occurrence

A Specified_ accessory _occurrence is the occurrence of a Accessory_occurrence within an Assembly_part_occurrence.

A Specified_ accessory _occurrence is a type of Accessory_occurrence.

The data associated with a Specified_ accessory _occurrence are the following:

- related_occurrence
- related_assembly

4.50.1 related_occurrence

The related_occurrence specifies the Accessory_occurrence it is an occurrence of.

4.50.2 related_ assembly

The related_ assembly specifies the Assembly_part_occurrence in which the occurrence is used.

4.51 Specified_ cavity _plug_occurrence

A Specified_ cavity _plug _occurrence is the occurrence of Cavity_plug_occurrence within an Assembly_part_occurrence.

A Specified_ cavity _plug _occurrence is a type of Cavity_plug_occurrence.

The data associated with a Specified_ cavity _plug _occurrence are the following:

- related_occurrence
- related_assembly

4.51.1 related_occurrence

The related_occurrence specifies the Cavity_plug_occurrence it is an occurrence of.

4.51.2 related_ assembly

The related_ assembly specifies the Assembly_part_occurrence in which the occurrence is used.

4.52 Specified_cavity_seal_occurrence

A Specified_ cavity_seal _occurrence is the occurrence of a Cavity_seal_occurrence within an Assembly_part_occurrence.

A Specified_ cavity_seal _occurrence is a type of Cavity_seal_occurrence.

The data associated with a Specified_ cavity_seal _occurrence are the following:

- related_occurrence
- related_assembly

4.52.1 related_occurrence

The related_occurrence specifies the Cavity_seal_occurrence it is an occurrence of.

4.52.2 related_ assembly

The related_ assembly specifies the Assembly_part_occurrence in which the occurrence is used.

4.53 Specified_co_pack_occurrence

A Specified_ co_pack _occurrence is the occurrence of a Co_pack_occurrence within an Assembly_part_occurrence.

A Specified_ co_pack _occurrence is a type of Co_pack_occurrence.

The data associated with a Specified_ co_pack _occurrence are the following:

- related_occurrence
- related_assembly

4.53.1 related_occurrence

The related_occurrence specifies the Co_pack_occurrence it is an occurrence of.

4.53.2 related_ assembly

The related_ assembly specifies the Assembly_part_occurrence in which the occurrence is used.

4.54 Specified_connector_occurrence

A Specified_connector_occurrence is the occurrence of a Connector_occurrence within an Assembly_part_occurrence.

A Specified_connector_occurrence is a type of Connector_occurrence.

The data associated with a Specified_connector_occurrence are the following:

- related_occurrence
- related_assembly

4.54.1 related_occurrence

The related_occurrence specifies the Connector_occurrence it is an occurrence of.

4.54.2 related_ assembly

The related_ assembly specifies the Assembly_part_occurrence in which the occurrence is used.

4.55 Specified_fixing_occurrence

A Specified_ fixing_occurrence is the occurrence of a Fixing_occurrence within an Assembly_part_occurrence.

A Specified_ fixing_occurrence is a type of Fixing_occurrence.

The data associated with a Specified_ fixing _occurrence are the following:

- related_occurrence
- related_assembly

4.55.1 related_occurrence

The related_occurrence specifies the Fixing_occurrence it is an occurrence of.

4.55.2 related_ assembly

The related_ assembly specifies the Assembly_part_occurrence in which the occurrence is used.

4.56 Specified_special_terminal_occurrence

A Specified_ special_terminal _occurrence is the occurrence of a Special_terminal_occurrence within an Assembly_part_occurrence.

A Specified_ special_terminal _occurrence is a type of Special_terminal_occurrence.

The data associated with a Specified_ special_terminal _occurrence are the following:

- related_occurrence
- related_assembly

4.56.1 related_occurrence

The related_occurrence specifies the Special_terminal_occurrence it is an occurrence of.

4.56.2 related_ assembly

The related_ assembly specifies the Assembly_part_occurrence in which the occurrence is used.

4.57 Specified_special_wire_occurrence

A Specified_ special_wire _occurrence is the occurrence of a Special_wire_occurrence within an Assembly_part_occurrence.

A Specified_ special_wire _occurrence is a type of Special_wire_occurrence.

The data associated with a Specified_ special_wire _occurrence are the following:

- related_occurrence
- related_assembly

4.57.1 related_occurrence

The related_occurrence specifies the Special_wire_occurrence it is an occurrence of.

4.57.2 related_ assembly

The related_ assembly specifies the Assembly_part_occurrence in which the occurrence is used.

4.58 Specified_terminal_occurrence

A Specified_ terminal _occurrence is the occurrence of a Terminal_occurrence within an Assembly_part_occurrence.

A Specified_ terminal _occurrence is a type of Terminal_occurrence.

The data associated with a Specified_connector_occurrence are the following:

- related_occurrence
- related_assembly

4.58.1 related_occurrence

The related_occurrence specifies the Terminal_occurrence it is an occurrence of.

4.58.2 related_ assembly

The related_ assembly specifies the Assembly_part_occurrence in which the occurrence is used.

4.59 Specified_wire_occurrence

A Specified_wire_occurrence is the occurrence of a Wire_occurrence within an Assembly_part_occurrence.

A Specified_ wire _occurrence is a type of Wire_occurrence.

The data associated with a Specified_ wire _occurrence are the following:

- related_occurrence
- related_assembly

4.59.1 related_occurrence

The related_occurrence specifies the Wire_occurrence it is an occurrence of.

4.59.2 related_ assembly

The related_ assembly specifies the Assembly_part_occurrence in which the occurrence is used.

4.60 Specified_wire_protection_occurrence

A Specified_wire__protection_occurrence is the occurrence of a Wire_protection_occurrence within an Assembly_part_occurrence.

A Specified_ wire protection_occurrence is a type of Wire_protection_occurrence.

The data associated with a Specified_ wire protection_occurrence are the following:

- related_occurrence
- related_assembly

4.60.1 related_occurrence

The related_occurrence specifies the Wire_protection_occurrence it is an occurrence of.

4.60.2 related_ assembly

The related_ assembly specifies the Assembly_part_occurrence in which the occurrence is used.

4.61 Terminal_occurrence

A Terminal_occurrence is the occurrence of a General_terminal in a module part list.

NOTE The number of occurrences used in a specific module or harness can be calculated by the individual occurrences.

The usage of a Terminal_occurrence for a particular Cavity is specified by the Part_usage object.

The data associated with a Terminal_occurrence are the following:

- component_of
- part

4.61.1 component_of

The component_of specifies the Harness that contains the Terminal_occurrence

4.61.2 part

The part specifies the General_terminal that serves as a definition for this particular occurrence.

4.62 Transformation

A Transformation is a geometric transformation composed of translation and rotation. Scaling is not

included.

The data associated with a Transformation are the following:

- coordinates_3D
- u
- v

4.62.1 coordinates_3D

The coordinates_3D specifies the coordinates of the translation.

4.62.2 u

The u specifies the rotation by means of the y-axis.

The u need not be specified for a particular Unit.

4.62.3 v

The v specifies the rotation by means of the z-axis.

The v need not be specified for a particular Unit.

4.63 Unit

A Unit is a quantity chosen as a standard in terms of which other quantities may be expressed.

The data associated with a Unit are the following:

- si_prefix
- si_unit_name
- unit_name

4.63.1 si_prefix

The si_prefix specifies the prefix for a SI unit.

EXAMPLE ‘milli’, ‘kilo’

The si_prefix need not be specified for a particular Unit.

4.63.2 si_unit_name

The si_ unit_name specifies the name for a SI unit.

EXAMPLE ‘gram’, ‘meter’

The si_unit_name need not be specified for a particular Unit.

4.63.3 unit_name

The unit_name specifies the name for a non SI unit.

NOTE This attribute shall be used to specify units like ‘kg/100 pieces’

EXAMPLE ‘piece’

The unit_name need not be specified for a particular Unit.

4.64 Value_range

A Value_range is a pair of numerical values representing the range in which the value shall lie.

The data associated with a Value_range are the following:

- maximum
- minimum
- unit_component

4.64.1 maximum

The maximum specifies the maximum acceptable value that is constrained by the Value_range.

4.64.2 minimum

The minimum specifies the minimum acceptable value that is constrained by the Value_range.

4.64.3 unit_component

The unit_component specifies the unit in which the Value_range is expressed.

4.65 Wire_colour

A Wire_colour is a mechanism to define a colour for a wire together with a description of the kind of the colour.

The data associated with a Wire_colour are the following:

- colour_type
- colour_value

4.65.1 colour_type

The colour_type specifies the type of the colour.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

EXAMPLE ‘base colour’, ‘second’, ‘third’

4.65.2 colour_value

The colour_value specifies the value of the colour.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

EXAMPLE ‘red’

4.66 Wire_length

A Wire_length is a mechanism to define a length for a wire together with a description of the kind of the length (e.g. for DMU, for manufacturing).

The data associated with a Wire_length are the following:

- length_type
- length_value

4.66.1 length_type

The length_type specifies the type of the length.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

4.66.2 length_value

The length_value specifies the length of the wire.

4.67 Wire_occurrence

A Wire_occurrence is the occurrence of a single wire in a module part list.

A Wire_occurrence is a type of General_wire.

The data associated with an Wire_occurrence are the following:

- wire_number

4.67.1 wire_number

The wire_number specifies the identification of a wire. This number is unique within a vehicle and usually automatically generated (dependent on "from-to" information).

4.68 Wire_protection

A Wire_protection is a mechanism to describe harness wrappings. It covers all kinds of wrappings modeled by CAD systems.

A Wire_protection is a type of Part.

The data associated with an Wire_protection are the following:

- protection_type
- type_dependent_parameter

4.68.1 protection_type

The protection_type specifies the type of the Wire_protection.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

EXAMPLE 'coil', 'corrugated pipe', 'foam rubber strip'

The protection_type need not be specified for a particular Wire_protection.

4.68.2 type_dependent_parameter

The type_dependent_parameter specifies further information dependent on the type of the Wire_protection.

NOTE There are no values pre-defined. Special values have to be negotiated between exchange partners.

EXAMPLE for corrugated pipe: wave shape, for pull-push rule: width

The type_dependent_parameter need not be specified for a particular Wire_protection.

4.69 Wire_protection_occurrence

A Wire_protection_occurrence is the occurrence of a Wire_protection in a module part list.

The data associated with an Wire_protection_occurrence are the following:

- alias_id
- component_of
- id
- installation_information
- protection_length
- part

4.69.1 alias_id

The alias_id specifies additional identifiers for the Wire_protection _occurrence.

The alias_id need not be specified for a particular Wire_protection _occurrence.

4.69.2 component_of

The component_of specifies the Harness that contains the Wire_protection_occurrence

4.69.3 id

The id specifies the identifier of the Wire_protection.

4.69.4 installation_information

The installation_information provides additional information for the installation of the Wire_protection_occurrence.

The installation_information need not be specified for a particular Wire_protection_occurrence.

4.69.5 protection_length

The protection_length specifies the length of the Wire_protection_occurrence.

The protection_length need not be specified for a particular Wire_protection_occurrence.

4.69.6 part

The part specifies the Wire_protection that serves as a definition for this particular occurrence.