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Industrial automation systems and integration — Product data representation and exchange —

Part 5001: Guidance on the usage of ISO 10303-214 for gear units

*Systèmes d'automatisation industrielle et intégration — Représentation
et échange de données de produits —*

*Partie 5001: Directives relatives à l'utilisation de l'ISO 10303-214 pour
les transmissions à engrenages*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
- an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

ISO/TS 10303-5001 was prepared by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 4, *Industrial data*.

Each part of ISO 10303 is a member of one of the following series: description methods, implementation methods, conformance testing methodology and framework, integrated generic resources, integrated application resources, application protocols, abstract test suites, application interpreted constructs, application modules and usage guidance.

A complete list of parts of ISO 10303 is available from the Internet:

<http://www.tc184-sc4.org/titles/>

Introduction

ISO 10303 is an International Standard for the computer-interpretable representation of product information and for the exchange of product data. The objective is to provide a neutral mechanism capable of describing products throughout their life cycle. This mechanism is suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases, and as a basis for archiving.

This part of ISO 10303 is a member of a series of guidance documents for application protocols (APs). This part of ISO 10303 specifies guidance for gear mechanical design processes.

This guidance document defines the context, scope, and information requirements for various development phases during the design of a gear unit and specifies the ISO 10303-214 resources necessary to satisfy these requirements.

NOTE 1 ISO 10303-214 is an application protocol for automotive mechanical design processes. It might also be applicable to other forms of vehicles, such as rail, agricultural, and construction vehicles.

Clause 1 defines the scope of the usage guide and summarizes the functionality and data covered by the usage guide. Clause 3 lists the words defined in this part of ISO 10303 and gives pointers to words defined elsewhere. The information requirements of the application are specified in Clause 4 using terminology appropriate to the application. A graphical representation of the information requirements, referred to as the application reference model, is given in Annex A.

This part of ISO 10303 is an optional addition to ISO 10303-214 that specifies requirements for the representation and exchange of product model data related to gear units using ISO 10303-214. This part of ISO 10303 contains a product model for gear units. This product model covers gear units with all their machine elements, tools for the manufacturing of gears, and properties that arise during the product development process of gear units. The properties can be assigned to machine elements, functional part relations or an entire gear unit. Only the mechanical aspects of gear units and their components are covered by this part of ISO 10303; electrical, electronic, hydraulic, and pneumatic aspects are not included.

While the product model for gear units contains some high-level concepts defined in ISO 10303-214, it is not an extension (through subtyping or some other formal means) of the ISO 10303-214 application reference model (ARM). The product model for gear units is a requirements model and is not intended to be implemented directly. Instead, the ISO 10303-214 ARM or application interpreted model (AIM) should be used. Clause 5 shows the correspondence between the information requirements specified in this part of ISO 10303 and the ISO 10303-214 ARM.

NOTE 2 ISO 10303-214 includes a mapping between the ISO 10303-214 ARM and AIM.

NOTE 3 Because the product model for gear units is mapped to the ISO 10303-214 ARM, the ISO 10303-214 ARM or AIM can be used, unchanged, to represent and exchange product model data related to gear units.

Annex A provides the product model for gear units. The product model is a graphical representation of the structure and constraints of the application objects presented in EXPRESS-G.

Annex B contains tables that show recommendations for properties of the product model for gear units.

Annex C describes the connection between the product model for gear units and ISO 10303-214 which consists of a mechanism that defines a data structure in ISO 10303-214 equivalent to the product model for gear units.

Annex D describes a divergent mapping mechanism for the application objects of the product model for gear units to explicit ARM constructs of ISO 10303-214.

Industrial automation systems and integration — Product data representation and exchange — Part 5001: Guidance on the usage of ISO 10303-214 for gear units

1 Scope

This part of ISO 10303 specifies guidance on the usage of ISO 10303-214 application reference model (ARM) for the scope and information requirements for the exchange of information between the applications that support the development process of the mechanical aspects of gear units.

The following are within the scope of this part of ISO 10303:

- parts related to gear units:
 - baseplate;
 - basic material;
 - belt;
 - bevel gear;
 - brake;
 - chain;
 - clutch;
 - coupling;
 - crossed helical gear;
 - fit of key assembly
 - fitting key;
 - helical gear;
 - housing;
 - hypoid gear;
 - interference fit assembly;
 - lubricant;
 - pinion shaft;
 - plain bearing;
 - planetary gear train;
 - rolling element bearing;
 - sealing;
 - shaft;
 - spur gear;

- tool;
- user defined machine element;
- wheel;
- worm and worm wheel;
- basic materials used to produce those parts;
- lubricants for gear units;
- tools used for the manufacturing of gear units;
- gear technology properties that can be assigned to parts, assemblies, tools, lubricants and basic materials:
 - deformations, shift and bending;
 - dynamic;
 - efficiency loss;
 - environment;
 - forces and moments;
 - geometry, topology and geometry dependent data;
 - hardness;
 - life time;
 - load capacity data (wear, pitting, breakage, scuffing);
 - manufacturing data;
 - mesh data;
 - operating data;
 - power, rotation and speed;
 - pressure and stress;
 - safety;
 - service data;
 - sliding and wear;
 - stiffness, suspension;
 - surface texture;
 - temperature data.

The following are outside the scope of this part of ISO 10303:

- manufacturing of elements other than gears;
- items that are outside the scope of ISO 10303-214.

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 10303-1, *Industrial automation systems and integration — Product data representation and exchange — Part 1: Overview and fundamental principles*

ISO 10303-214, *Industrial automation systems and integration — Product data representation and exchange — Part 214: Application protocol: Core data for automotive mechanical design processes*

3 Terms, definitions and abbreviated terms

3.1 Terms defined in ISO 10303-1

For the purposes of this document, the following terms defined in ISO 10303-1 apply:

- application;
- application activity model;
- application interpreted model;
- application protocol;
- assembly;
- conformance class;
- unit of functionality.

3.2 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

AAM	application activity model
AIM	application interpreted model
AP	application protocol
CAD	Computer Aided Design
CSG	Constructive Solid Geometry
UoF	unit of functionality

4 Information requirements

4.1 Preliminary elements

For the purposes of this part of ISO 10303, the following ISO 10303-214 units of functionality apply:

- external_reference_mechanism (E1);
- item_property (PR1);
- product_management_data (S1);
- item_defined_structure (S3);
- process_plan (S8).

4.2 Application objects

This subclause specifies the application objects for the usage of ISO 10303-214 for gear units. Each application object is an atomic element that embodies a unique application concept and contains attributes specifying the data elements of the object. The application objects and their definitions are given below.

4.2.1 Application_context

An Application_context is a shared universe of discourse.

NOTE The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214.

The data associated with an Application_context are the following:

- application_domain;
- life_cycle_stage.

4.2.1.1 application_domain

The application_domain specifies the identification of the applications for which an object might be relevant.

Where applicable the following values shall be used:

- 'assembly study': The object might be relevant for an assembly study;
- 'digital mock-up': The object might be relevant for digital mock-up;
- 'electrical design': The object might be relevant for the electrical design;
- 'mechanical design': The object might be relevant for the mechanical design;
- 'preliminary design': The object might be relevant for the preliminary design;

- 'process planning': The object might be relevant for the process planning.

4.2.1.2 life_cycle_stage

The life_cycle_stage specifies of the general stage in the product life cycle to which the concerned parts belong.

Where applicable the following values shall be used:

- 'design': The concerned part belongs to the design phase of the life cycle;
- 'manufacturing': The concerned part belongs to the manufacturing phase of the life cycle;
- 'recycling': The concerned part belongs to the recycling phase of the life cycle.

4.2.2 Application_property

An Application_property is a type of Property (see 4.2.77) that arises during operation of the gear unit.

NOTE The definition of this application object corresponds to the definition of the application object General_property of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The property_type attribute of the General_property object is instantiated with "application" to identify it as an application property.

An Application_property is a Service_property (see 4.2.83), a Safety (see 4.2.81), a Life_time (see 4.2.45), an Efficiency_loss (see 4.2.24), an Environment (see 4.2.25), a Sliding_wear (see 4.2.93), a Temperature (see 4.2.101), a Pressure_stress (see 4.2.76), a Torque_force (see 4.2.104), a Power_rotation_speed (see 4.2.75) or a Deformation_shift_bending (see 4.2.20).

4.2.3 Assembly_definition

An Assembly_definition is a type of Part_definition (see 4.2.62) that is a definition of a Part_version (see 4.2.66) that contains other subordinate objects.

NOTE The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214.

The data associated with an Assembly_definition are the following:

- assembly_type

4.2.3.1 assembly_type

The assembly_type specifies the kind of the Assembly_definition.

EXAMPLE 'functional assembly', 'manufacturing assembly', and 'design assembly' are examples of an assembly_type.

The assembly_type need not be specified for a particular Assembly_definition.

4.2.4 Assembly_relationship

An Assembly_relationship is the relation between an Assembly_definition (see 4.2.3) and a Part_definition (see 4.2.62) representing a constituent of the assembly. The Assembly_definition and the Part_definition that serves as definition should share at least one Application_context (see 4.2.1).

NOTE 1 The constituent may also be an assembly.

NOTE 2 The definition of this application object corresponds to the definition of the application objects `Assembly_component_relationship` and `Item_definition_instance_relationship` of ISO 10303-214. The following restrictions/limitations to the definition of the application objects of ISO 10303-214 have been made: The `Assembly_component_relationship` is used to define the assembly attribute of the `Assembly_relationship` object. The `Item_definition_instance_relationship` is used to define the `part_in_assembly` attribute of the `Assembly_relationship` object.

The data associated with an `Assembly_relationship` are the following:

- `assembly`;
- `part_in_assembly`.

4.2.4.1 assembly

The assembly specifies the `Assembly_definition` (see 4.2.3) that has subordinate constituents.

4.2.4.2 part_in_assembly

The `part_in_assembly` specifies the `Part_instance` (see 4.2.64) that defines the occurrence of an object in the assembly.

4.2.5 Baseplate

A Baseplate is a type of `Part` (see 4.2.59) that is typically used in a gear unit and defines a basement on which the gear unit is mounted.

NOTE The definition of this application object corresponds to the definition of the application objects `Item` and `Specific_item_classification` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `Item` is referenced by a `Specific_item_classification` object. The `classification_name` attribute of the `Specific_item_classification` is instantiated with “baseplate” to classify it as a part that represents a baseplate.

4.2.6 Basic_material

A `Basic_material` is a type of `Part` (see 4.2.59) that is a treated material and also includes alloys. The basic material is not the raw material.

NOTE The definition of this application object corresponds to the definition of the application objects `Item` and `Specific_item_classification` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `Item` is referenced by a `Specific_item_classification` object. The `classification_name` attribute of the `Specific_item_classification` is instantiated with “basic material” to classify it as the material a part is made of.

4.2.7 Bearing

A `Bearing` is a type of `Part` (see 4.2.59) that supports, guides, and reduces the friction of motion between fixed and moving machine parts.

NOTE The definition of this application object corresponds to the definition of the application objects `Item` and `Specific_item_classification` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `Item` is referenced by a `Specific_item_classification` object. The `classification_name` attribute of the `Specific_item_classification` is instantiated with “bearing” to classify it as a part that represents a bearing.

Each Bearing may be a Plain_bearing (see 4.2.70) or a Rolling_element_bearing (see 4.2.80).

4.2.8 Bearing_bearing

A Bearing_bearing is a type of Functional_relationship (see 4.2.29) that relates two Bearing (see 4.2.7) objects.

NOTE The definition of this application object corresponds to the definition of the application object General_item_definition_relationship of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The relation_type attribute of the General_item_definition_relationship object is instantiated with "bearing bearing" to identify it as a Bearing_bearing object.

4.2.9 Belt_or_chain

A Belt_or_chain is a type of Part (see 4.2.59) that is typically used for transferring motion or power from one wheel or shaft to another. It defines a continuous belt or chain.

NOTE The definition of this application object corresponds to the definition of the application objects Item and Specific_item_classification of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The Item is referenced by a Specific_item_classification object. The classification_name attribute of the Specific_item_classification is instantiated with "belt or chain" to classify it as a part that represents a belt or a chain.

4.2.10 Bevel_or_hypoid_gear

A Bevel_or_hypoid_gear is a type of Gear (see 4.2.30) of a gear pair, whose axes intersects and might have an offset.

NOTE The definition of this application object corresponds to the definition of the application objects Item and Specific_item_classification of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The Item is referenced by a Specific_item_classification object. The classification_name attribute of the Specific_item_classification is instantiated with "bevel or hypoid gear" to classify it as a part that represents a bevel gear or a hypoid gear.

4.2.11 Bevel_or_hypoid_gear_pair

A Bevel_or_hypoid_gear_pair is a type of Gear_pair (see 4.2.31) that establishes a relationship between two Bevel_or_hypoid_gear (see 4.2.10) objects.

NOTE The definition of this application object corresponds to the definition of the application object General_item_definition_relationship of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The relation_type attribute of the General_item_definition_relationship object is instantiated with "bevel or hypoid gear pair" to identify it as a Bevel_or_hypoid_gear_pair object.

4.2.12 Clutch_or_brake

A Clutch_or_brake is a type of Part (see 4.2.59) that is typically used for engaging and disengaging two working parts of a shaft or of a shaft and a driving mechanism.

NOTE The definition of this application object corresponds to the definition of the application objects Item and Specific_item_classification of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The Item is referenced by a Specific_item_classification object. The classification_name attribute of the Specific_item_classification is instantiated with "clutch or brake" to classify it as a part that represents a clutch or a brake.

4.2.13 Coordinate_definition

A `Coordinate_definition` is the definition of coordinates to define a point of origin in either two-dimensional or three-dimensional space.

NOTE The definition of this application object corresponds to the definition of the application object `Value_list` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `value_name` attribute of the supertype is instantiated with “coordinate definition” to classify the `Value_list` object as a property value that represents a coordinate definition.

The data associated with a `coordinate_definiton` are the following:

— values

4.2.13.1 values

The values specifies the three coordinate values which define the position in the coordinate space.

4.2.14 Coupling

A `Coupling` is a type of `Part` (see 4.2.59) that is typically used to link or connect machine parts.

NOTE The definition of this application object corresponds to the definition of the application objects `Item` and `Specific_item_classification` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `Item` is referenced by a `Specific_item_classification` object. The `classification_name` attribute of the `Specific_item_classification` is instantiated with “coupling” to classify it as a part that represents a coupling.

A `Coupling` may be a `Fit_of_key_assembly` (see 4.2.27) or an `Interference_fit_assembly` (see 4.2.44).

4.2.15 Crossed_helical_gear

A `Crossed_helical_gear` is a type of `Gear` (see 4.2.30) that is one of the gears of a gear pair having skewed axes.

NOTE The definition of this application object corresponds to the definition of the application objects `Item` and `Specific_item_classification` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `Item` is referenced by a `Specific_item_classification` object. The `classification_name` attribute of the `Specific_item_classification` is instantiated with “crossed helical gear” to classify it as a part that represents a crossed helical gear.

4.2.16 Crossed_helical_gear_pair

A `Crossed_helical_gear_pair` is a type of `Gear_pair` (see 4.2.31) that is a functional relationship between two `Crossed_helical_gear` (see 4.2.15) objects.

NOTE The definition of this application object corresponds to the definition of the application object `General_item_definition_relationship` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `relation_type` attribute of the `General_item_definition_relationship` object is instantiated with “crossed helical gear pair” to identify it as a `Crossed_helical_gear_pair` object.

4.2.17 Cylindrical_gear

A `Cylindrical_gear` is a type of `Gear` (see 4.2.30) whose reference surface is a cylinder and that is a spur or a helical gear.

NOTE The definition of this application object corresponds to the definition of the application objects Item and Specific_item_classification of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The Item is referenced by a Specific_item_classification object. The classification_name attribute of the Specific_item_classification is instantiated with "cylindrical gear" to classify it as a part that represents a cylindrical gear.

4.2.18 Cylindrical_gear_pair

A Cylindrical_gear_pair is a type of Gear_pair (see 4.2.31) that establishes a relationship between two Cylindrical_gear (see 4.2.17) objects.

NOTE The definition of this application object corresponds to the definition of the application object General_item_definition_relationship of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The relation_type attribute of the General_item_definition_relationship object is instantiated with "cylindrical gear pair" to identify it as a Cylindrical_gear_pair object.

4.2.19 Data_environment

A Data_environment is the specification of the conditions under which a Material_property_value_definition (see 4.2.55) is valid.

EXAMPLE A Data_environment may have the name 'standard' and the description '20 degrees Celsius, 75% humidity'.

The data associated with a Data_environment are the following:

— environment_name

4.2.19.1 environment_name

The environment_name specifies the word or group of words by which the Data_environment is referred to.

4.2.20 Deformation_shift_bending

A Deformation_shift_bending is a type of Application_property (see 4.2.2) that defines deformation, shift or bending of an object.

NOTE 1 The definition of this application object corresponds to the definition of the application object General_property of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The property_type attribute of the General_property object is instantiated with "deformation shift bending" to identify it as a deformation, shift or bending object.

NOTE 2 Typical property values for a Deformation_shift_bending are given in Table B.1 — Deformation shift bending.

4.2.21 Direction_definition

A Direction_definition is the definition of coordinates to define a direction in either two-dimensional or three-dimensional space.

NOTE The definition of this application object corresponds to the definition of the application object Value_list of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214

have been made: The value_name attribute of the supertype is instantiated with "direction definition" to classify the Value_list object as a property value that represents a direction definition.

The data associated with a direction_definition are the following:

- values

4.2.21.1 values

The values specify the three coordinate values which define a vector that represents the direction in the coordinate space.

4.2.22 Document_assignment

A Document_assignment is a mechanism to associate a document with an object, where the assigned document provides information about the object it is associated to.

Each Document_assignment may be a Partial_document_assignment (see 4.2.60).

The data associated with a Document_assignment are the following:

- assigned_document;
- is_assigned_to;
- role.

4.2.22.1 assigned_document

The assigned_document specifies the object that is used to provide the document information.

NOTE The objects to define any sort of document are not explicitly defined in the scope of this document. Only the link to these elements is defined through the Assigned_document_select object.

4.2.22.2 is_assigned_to

The is_assigned_to specifies the object that information is provided for.

4.2.22.3 role

The role specifies the meaning of the Document_assignment.

Where applicable the following values shall be used:

- 'additional information': The assigned document provides information that is relevant for the associated object, but is not a description of the associated object itself;
- 'behavior': The assigned document specifies information about the behaviour of the associated object;
- 'description': The assigned document provides textual information for the associated object itself;

- 'informative': The assigned document may or may not be considered;
- 'mandatory': The associated object shall conform to the content of the assigned document;
- 'mathematical description': The assigned document specifies the associated object by providing the algorithmic specification of its behavior.

4.2.23 Dynamic

A Dynamic is a type of Parameter_property (see 4.2.58) that defines a certain quality that is relevant when dynamical behavior of an object is regarded.

NOTE 1 The definition of this application object corresponds to the definition of the application object General_property of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The relation_type attribute of the General_property object is instantiated with "dynamic" to identify it as a dynamic property.

NOTE 2 Typical property values for a Dynamic are given in Table B.2.

4.2.24 Efficiency_loss

An Efficiency_loss is a type of Application_property (see 4.2.2) that defines efficiency and loss of an object.

NOTE 1 The definition of this application object corresponds to the definition of the application object General_property of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The relation_type attribute of the General_property object is instantiated with "efficiency loss" to identify it as an efficiency or loss property.

NOTE 2 Typical property values for an Efficiency_loss are given in Table B.3.

4.2.25 Environment

An Environment is a type of Application_property (see 4.2.2) that defines environment conditions for an object.

NOTE 1 The definition of this application object corresponds to the definition of the application object General_property of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The relation_type attribute of the General_property object is instantiated with "environment" to identify it as an environment property.

NOTE 2 Typical property values for an Environment are given in Table B.4.

4.2.26 External_geometric_model

An External_geometric_model is the identification of a model that contains geometry in a 3D context only. The External_geometric_model mechanism is not explicitly defined in the scope of this document. Only the link to elements in the scope of this document is defined.

4.2.27 Fit_of_key_assembly

A Fit_of_key_assembly is a type of Coupling (see 4.2.14) that is typically used to link or connect machine parts using a fitting key.

NOTE 1 The definition of this application object corresponds to the definition of the application objects `Item` and `Specific_item_classification` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `Item` is referenced by a `Specific_item_classification` object. The `classification_name` attribute of the `Specific_item_classification` is instantiated with "fit of key assembly" to classify it as a part that represents a fit of key assembly.

NOTE 2 A fit of key assembly should be defined as an assembly of a shaft, a fitting key and a collar. The collar can be a gear, a housing or another shaft.

4.2.28 Fitting_key

A `Fitting_key` is a type of `Part` (see 4.2.59), such as a wedge or pin, inserted to lock together mechanical or structural parts. It is typically used in a fit of key assembly.

NOTE The definition of this application object corresponds to the definition of the application objects `Item` and `Specific_item_classification` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `Item` is referenced by a `Specific_item_classification` object. The `classification_name` attribute of the `Specific_item_classification` is instantiated with "fitting key" to classify it as a part that represents a fitting key.

4.2.29 Functional_relationship

A `Functional_relationship` is a type of `Part_definition_relationship` (see 4.2.63) that relates two `Part_definition` (see 4.2.62) objects. It defines a functional relationship between two parts, connected by their `Part_definition`.

NOTE The definition of this application object corresponds to the definition of the application object `General_item_definition_relationship` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: `Functional_relationship` is an abstract supertype of the gear-unit machine element relationships that occur in the product model for gear units.

Each `Functional_relationship` is a `Shaft_shaft` (see 4.2.89), `Shaft_bearing` (see 4.2.85), `Shaft_sealing` (see 4.2.88), `Shaft_wheel` (see 4.2.90), `Shaft_collar` (see 4.2.87), `Shaft_clutch_or_brake` (see 4.2.86), `Bearing_bearing` (see 4.2.8), `Wheel_wheel` (see 4.2.116), `Wheel_bearing` (see 4.2.114), `Wheel_belt_or_chain` (see 4.2.115), `Housing_baseplate` (see 4.2.39), `Housing_bearing` (see 4.2.40), `Housing_sealing` (see 4.2.43), `Housing_coupling` (see 4.2.42), or `Housing_clutch_or_brake` (see 4.2.41).

4.2.30 Gear

A `Gear` is a type of `Wheel` (see 4.2.113) that is a toothed member designed to transmit motion to, or receive motion from, another toothed member, by means of successively engaging teeth.

NOTE The definition of this application object corresponds to the definition of the application objects `Item` and `Specific_item_classification` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `Item` is referenced by a `Specific_item_classification` object. The `classification_name` attribute of the `Specific_item_classification` is instantiated with "gear" to classify it as a part that represents a gear.

Each `Gear` may be a `Crossed_helical_gear` (see 4.2.15), a `Cylindrical_gear` (see 4.2.17), a `Bevel_or_hypoid_gear` (see 4.2.10), a `Worm` (see 4.2.117) or a `Worm_wheel` (see 4.2.119).

4.2.31 Gear_pair

A `Gear_pair` is a type of `Wheel_wheel` (see 4.2.116) that is a functional relationship between two `Gear` (see 4.2.30) objects.

NOTE The definition of this application object corresponds to the definition of the application object `General_item_definition_relationship` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `relation_type` attribute of the `General_item_definition_relationship` object is instantiated with "gear pair" to identify it as a `Gear_pair` object.

Each `Gear_pair` is a `Crossed_helical_gear_pair` (see 4.2.15), a `Bevel_or_hypoid_gear_pair` (see 4.2.11), a `Cylindrical_gear_pair` (see 4.2.17), a `Worm_gear_pair` (see 4.2.118), or a `General_gear_pair` (see 4.2.33).

4.2.32 Gear_unit

A `Gear_unit` is a type of `Part` (see 4.2.59) that typically represents a complete assembly of parts to transmit motion or to change speed or direction. A `Gear_unit` can also be used as a part of another gear unit.

NOTE The definition of this application object corresponds to the definition of the application objects `Item` and `Specific_item_classification` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `Item` is referenced by a `Specific_item_classification` object. The `classification_name` attribute of the `Specific_item_classification` is instantiated with "gear unit" to classify it as a part that represents a gear unit.

Each `Gear_unit` may be a `Planetary_gear_train` (see 4.2.71).

4.2.33 General_gear_pair

A `General_gear_pair` is a type of `Gear_pair` (see 4.2.31) that is a functional relationship between two `Part_definition` (see 4.2.62) objects. It is specified by the attribute 'gearpair_type' and it establishes a relationship between two gears.

NOTE The definition of this application object corresponds to the definition of the application object `General_item_definition_relationship` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `relation_type` attribute of the `General_item_definition_relationship` object is instantiated with the value of the `gearpair_type` attribute of the `General_gear_pair` object.

The data associated with a `General_gear_pair` are the following:

— gearpair_type

4.2.33.1 gearpair_type

The `gearpair_type` specifies the kind of gear pair the `General_gear_pair` defines.

4.2.34 General_property

A `General_property` is a type of `Property` (see 4.2.77) that is specified by the attribute 'property_type'.

NOTE The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214.

The data associated with a `General_property` are the following:

— property_type.

4.2.34.1 property_type

The property_type specifies the kind of property the General_property defines.

4.2.35 Geometric_model

A Geometric_model is a representation of geometry. The Geometric_model mechanism is not explicitly defined in the scope of this document. Only the link to elements in the scope of this document is defined.

4.2.36 Geometry_property

A Geometry_property is a user-defined geometrical characteristic of an object. The 'property_value' specified by a Geometry_property is derived from geometry.

NOTE The Geometry_property may be used for the purpose of validation of geometric models.

The data associated with a Geometry_property are the following:

- described_object;
- property_type;
- property_value;
- value_determination.

4.2.36.1 described_object

The described_object specifies the object that the Geometry_property is associated to.

4.2.36.2 property_type

The property_type defines the type of characteristic that is specified for an object.

Where applicable the values in Table B.5 shall be used.

4.2.36.3 property_value

The property_value specifies the value that is given for a particular characteristic.

4.2.36.4 value_determination

The value_determination specifies information on how the Geometry_property is to be interpreted.

NOTE Some Geometry_property may have the same value_type and same meaning but may have different values due to there special use for different calculation methods. Therefore the value_determination attribute allows one to distinguish Geometry_property objects by their calculation method.

The value_determination need not be specified for a particular Geometry_property.

4.2.37 Hardness

A Hardness is a type of Surface_condition (see 4.2.97) that is the hardness of a material on its surface. The hardness represents the resistance of a surface to deformation by external forces.

NOTE The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214.

The data associated with a Hardness are the following:

- description;
- environment_condition;
- hardness_value;
- measuring_method.

4.2.37.1 description

The description specifies additional information about the Hardness.

Where applicable the following values shall be used:

- See Table B.6 — Hardness.

The description need not be specified for a particular Hardness.

4.2.37.2 environment_condition

The environment_condition specifies the conditions under that the specified hardness_value is valid.

There may be more than zero environment_condition for a Hardness.

4.2.37.3 hardness_value

The hardness_value specifies the value of the hardness.

4.2.37.4 measuring_method

The measuring_method specifies the method for measuring hardness values.

Where applicable the following values shall be used:

- 'brinell': The Hardness is measured according to the Brinell method;
- 'rockwell': The Hardness is measured according to the Rockwell method;
- 'vickers': The Hardness is measured according to the Vickers method.

4.2.38 Housing

A Housing is a type of Part (see 4.2.59) that is typically used to cover, protect, or support the mechanical parts of a gear unit. It defines the housing of the gear unit.

NOTE The definition of this application object corresponds to the definition of the application objects `Item` and `Specific_item_classification` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `Item` is referenced by a `Specific_item_classification` object. The `classification_name` attribute of the `Specific_item_classification` is instantiated with "housing" to classify it as a part that represents a housing.

4.2.39 Housing_baseplate

A `Housing_baseplate` is a type of `Functional_relationship` (see 4.2.29) that relates two `Part_definition` (see 4.2.62) objects. It establishes a relationship between a housing and a baseplate on which the housing is mounted.

NOTE The definition of this application object corresponds to the definition of the application object `General_item_definition_relationship` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `relation_type` attribute of the `General_item_definition_relationship` object is instantiated with "housing baseplate" to identify it as a `Housing_baseplate` object.

4.2.40 Housing_bearing

A `Housing_bearing` is a type of `Functional_relationship` (see 4.2.29) that relates two `Part_definition` (see 4.2.62) objects. It establishes a relationship between a housing and a bearing that is mounted in the housing.

NOTE The definition of this application object corresponds to the definition of the application object `General_item_definition_relationship` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `relation_type` attribute of the `General_item_definition_relationship` object is instantiated with "housing bearing" to identify it as a `Housing_bearing` object.

4.2.41 Housing_clutch_or_brake

A `Housing_clutch_or_brake` is a type of `Functional_relationship` (see 4.2.29) that relates two `Part_definition` (see 4.2.62) objects. It establishes a relationship between a housing and a clutch or a brake that is mounted in the housing.

NOTE The definition of this application object corresponds to the definition of the application object `General_item_definition_relationship` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `relation_type` attribute of the `General_item_definition_relationship` object is instantiated with "housing clutch or brake" to identify it as a `Housing_clutch_or_brake` object.

4.2.42 Housing_coupling

A `Housing_coupling` is a type of `Functional_relationship` (see 4.2.29) that relates two `Part_definition` (see 4.2.62) objects. It establishes a relationship between a housing and a coupling that is mounted in the housing.

NOTE The definition of this application object corresponds to the definition of the application object `General_item_definition_relationship` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `relation_type` attribute of the `General_item_definition_relationship` object is instantiated with "housing coupling" to identify it as a `Housing_coupling` object.

4.2.43 Housing_sealing

A **Housing_sealing** is a type of **Functional_relationship** (see 4.2.29) that relates two **Part_definition** (see 4.2.62) objects. It establishes a relationship between a housing and a sealing that is mounted in the housing.

NOTE The definition of this application object corresponds to the definition of the application object **General_item_definition_relationship** of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The **relation_type** attribute of the **General_item_definition_relationship** object is instantiated with "housing sealing" to identify it as a **Housing_sealing** object.

4.2.44 Interference_fit_assembly

A **Interference_fit_assembly** is a type of **Coupling** (see 4.2.14) that is typically used to link or connect a shaft and a collar by friction.

NOTE 1 The definition of this application object corresponds to the definition of the application objects **Item** and **Specific_item_classification** of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The **Item** is referenced by a **Specific_item_classification** object. The **classification_name** attribute of the **Specific_item_classification** is instantiated with "interference fit assembly" to classify it as a part that represents a interference fit assembly.

NOTE 2 A interference fit assembly should be defined as an assembly of a shaft and a collar. The collar can be a gear, a housing or another shaft.

4.2.45 Life_time

A **Life_time** is a type of an **Application_property** (see 4.2.2) that defines values describing the life time of an object.

NOTE 1 The definition of this application object corresponds to the definition of the application object **General_property** of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The **property_type** attribute of the **General_property** object is instantiated with "life time" to identify it as a life time property.

NOTE 2 Typical property values for a **Life_time** are given in Table B.7.

4.2.46 Load_capacity

A **Load_capacity** is a type of **Parameter_property** (see 4.2.58) that defines a certain quality describing the calculated load capacities that are valid for an object.

NOTE 1 The definition of this application object corresponds to the definition of the application object **General_property** of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The **property_type** attribute of the **General_property** object is instantiated with "load capacity" to identify it as a load capacity property.

NOTE 2 Typical property values for a **Load_capacity** are given in Table B.8 and Table B.9.

4.2.47 Lubricant

A **Lubricant** is a type of **Part** (see 4.2.59) that is used for lubrication in the gear unit.

NOTE The definition of this application object corresponds to the definition of the application objects Item and Specific_item_classification of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The Item is referenced by a Specific_item_classification object. The classification_name attribute of the Specific_item_classification is instantiated with "lubricant" to classify it as a lubricant that is used for lubrication.

4.2.48 Lubricant_definition

A Lubricant_definition is a type of Material_definition (see 4.2.51) of a lubricant that defines a Lubricant (see 4.2.47).

NOTE The definition of this application object corresponds to the definition of the application object Material of ISO 10303-214. The following restrictions/limitations to the definition of the application object Material of ISO 10303-214 have been made: The Lubricant_definition object is used to associate a Lubricant object to it.

4.2.49 Lubricant_part

A Lubricant_part is a type of Part_definition_relationship (see 4.2.63) between a part and the lubricant that is used to lubricate the part.

4.2.50 Manufacturing

A Manufacturing is a type of Parameter_property (see 4.2.58) that defines a certain quality that is relevant for manufacturing.

NOTE 1 The definition of this application object corresponds to the definition of the application object General_property of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The property_type attribute of the General_property object is instantiated with "manufacturing" to identify it as a manufacturing property.

NOTE 2 Typical property values for a Manufacturing are given in Table B.10.

4.2.51 Material_definition

A Material_definition is the definition of a substance out of which a part is or can be made.

NOTE The definition of this application object corresponds to the definition of the application object Material of ISO 10303-214. The following restrictions/limitations to the definition of the application object Material of ISO 10303-214 have been made: The described_object attribute of Material_definition only references a Part_definition.

Each Material_definition may be a Lubricant_definition (see 4.2.48).

The data associated with a Material_definition are the following:

- described_object;
- material_name.

4.2.51.1 described_object

The described_object specifies the Basic_material (see 4.2.6) or the Lubricant (see 4.2.47) the material information is provided for.

4.2.51.2 material_name

The material_name specifies the word or group of words by which the Material_definition is referred to.

4.2.52 Material_part

A Material_part is a relationship between a part and the material it consists of.

A Material_part is a type of Part_definition_relationship (see 4.2.63).

4.2.53 Material_property

A Material_property is a type of Property (see 4.2.77) that is a characteristic that depends on material aspects.

NOTE The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214.

The data associated with a Material_property are the following:

- property_name

4.2.53.1 property_name

- The property_name specifies the kind of Material_property.

4.2.54 Material_property_association

A Material_property_association is an object that associates a Material_definition (see 4.2.51) object with a Material_property_value_definition (see 4.2.55) object.

NOTE The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214.

The data associated with a Material_property_association are the following:

- associated_property_value;
- described_material.

4.2.54.1 associated_property_value

The associated_property_value specifies the associated Material_property_value_definition.

4.2.54.2 described_material

The described_material specifies the Material_definition a property value is assigned to.

4.2.55 Material_property_value_definition

A Material_property_value_definition is a type of Property_value_definition (see 4.2.79) that is the representation of a characteristic of a material.

NOTE The definition of this application object is exactly the same as of the Material_property_value_representation object in ISO 10303-214. The name of this object is changed to match to the Property_value_definition object.

The data associated with a Material_property_value_definition are the following:

- environment_condition;
- property_definition.

4.2.55.1 environment_condition

The environment_condition specifies the environmental conditions in which the defined Material_property_value_definition is applicable.

4.2.55.2 property_definition

The property_definition specifies the Material_property (see 4.2.53) that defines the Material_property_value_definition.

4.2.56 Mesh

A Mesh is a type of Parameter_property (see 4.2.58) that defines the engagement of gear teeth.

NOTE 1 The definition of this application object corresponds to the definition of the application object General_property of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The property_type attribute of the General_property object is instantiated with "mesh" to identify it as a mesh property.

NOTE 2 Typical property values for a Mesh are given in Table B.11.

4.2.57 Numerical_value

A Numerical_value is a type of Value_with_unit (see 4.2.112) that is a quantity expressed with a numerical value and a unit.

NOTE The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214.

The data associated with a Numerical_value are the following:

- value_component

4.2.57.1 value_component

The value_component specifies the quantity of the Numerical_value.

4.2.58 Parameter_property

A Parameter_property is a type of Property (see 4.2.77) that defines a certain quality of an object.

NOTE 1 The definition of this application object corresponds to the definition of the application object General_property of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The property_type attribute of the General_property object is instantiated with "parameter" to identify it as a parameter property.

NOTE 2 Typical property values for a `Parameter_property` are given in Table B.12 — `Parameter` property.

Each `Parameter_property` may be a `Dynamic` (see 4.2.23), a `Load_capacity` (see 4.2.46), a `Manufacturing` (see 4.2.50), a `Mesh` (see 4.2.56) or a `Stiffness_suspension` (see 4.2.95).

4.2.59 Part

A `Part` is either a single object or a unit in a group of objects. It collects the information that is common to all versions of the object.

NOTE 1 A `Part` may be either a single piece part, an assembly of arbitrary complexity, a raw material, or a tool.

NOTE 2 The definition of this application object corresponds to the definition of the application objects `Item` and `Specific_item_classification` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: `Part` is an abstract supertype of the gear-unit machine elements that occur in the product model for gear units.

Each `Part` is a `Baseplate` (see 4.2.5), a `Housing` (see 4.2.38), a `Bearing` (see 4.2.7), a `Coupling` (see 4.2.14), a `Clutch_or_brake` (see 4.2.12), a `Belt_or_chain` (see 4.2.9), a `Lubricant` (see 4.2.47), a `Tool` (see 4.2.102), a `Sealing` (see 4.2.82), a `Basic_material` (see 4.2.6), a `Gear_unit` (see 4.2.32), a `Wheel` (see 4.2.113), a `Shaft` (see 4.2.84), a `Pinion_shaft` (see 4.2.67) or a `User_defined_part` (see 4.2.106).

The data associated with a `Part` are the following:

- `id`;
- `name`.

4.2.59.1 id

The `id` specifies the identifier of the `Part`.

4.2.59.2 name

The `name` specifies the word or group of words used to refer to the `Part`.

4.2.60 Partial_document_assignment

A `Partial_document_assignment` is a type of `Document_assignment` (see 4.2.22) that identifies a specific portion of the contents of a document. It assigns this portion to the product data for which it is relevant.

The data associated with a `Partial_document_assignment` are the following:

- `document_portion`.

4.2.60.1 document_portion

The `document_portion` specifies the word or group of words that convey the subject or sub contents of the document.

4.2.61 Partial_part_shape_definition

A Partial_part_shape_definition is a portion of shape that has to be identified explicitly to be associated with other information.

The data associated with a Partial_part_shape_definition are the following:

- partial_shape_of;
- shape_name.

4.2.61.1 partial_shape_of

- The partial_shape_of specifies the shape that the Partial_part_shape_definition is part of.

4.2.61.2 shape_name

The shape_name specifies the word or group of words by which the Partial_part_shape_definition is referred to.

Where applicable the following values shall be used:

- 'borehole': The shape represents a borehole;
- 'chain link': The shape represents a chain link;
- 'disk': The shape represents a disk of a clutch or a brake;
- 'first helix': The shape represents the first helix of a double helical gear (herringbone gear);
- 'flank': The shape represents the flank of a tooth;
- 'friction material carrier': The shape represents a friction material carrier of a clutch or a brake;
- 'friction surface': The shape represents a friction surface of a clutch or a brake;
- 'inner disk': The shape represents a inner disk of a clutch or a brake;
- 'left flank': The shape represents the left flank of a tooth;
- 'modification': The shape represents the modification of the flank of a tooth. It defines the modification of the left flank of a tooth in the case of the existence of a shape 'modification right flank' for the right flank. Otherwise the shape 'modification' defines both flanks. The type of the modification (i.d. linear tip relief, circular tip relief, parabolic tip relief, linear root relief, circular root relief, parabolic root relief, profile slope correction, helix correction, circular height crowning, circular width crowning, end relief, generated end relief, end relief left, end relief right, generated tip relief, generated root relief) is defined by the value of the property 'Type'. Each type of modification is represented by its own shape;
- 'modification right flank': The shape represents the modification of the right flank of a tooth. The type of the modification (i.d. linear tip relief, circular tip relief, parabolic tip relief, linear root

relief, circular root relief, parabolic root relief, profile slope correction, helix correction, circular height crowning, circular width crowning, end relief, generated end relief, end relief left, end relief right, generated tip relief, generated root relief) is defined by the value of the property 'Type'. Each type of modification is represented by its own shape;

- 'modification second helix': The shape represents the modification of the flank of a tooth of the second helix of a double helical gear (herringbone gear). It defines the modification of the left flank of a tooth of the second helix in the case of the existence of a shape 'modification right flank second helix' for the right flank. Otherwise the shape 'modification second helix' defines both flanks of the second helix. The type of the modification (i.d. linear tip relief, circular tip relief, parabolic tip relief, linear root relief, circular root relief, parabolic root relief, profile slope correction, helix correction, circular height crowning, circular width crowning, end relief, generated end relief, end relief left, end relief right, generated tip relief, generated root relief) is defined by the value of the property 'Type'. Each type of modification is represented by its own shape;
- 'modification right flank second helix': The shape represents the modification of the right flank of a tooth of the second helix of a double helical gear (herringbone gear). The type of the modification (i.d. linear tip relief, circular tip relief, parabolic tip relief, linear root relief, circular root relief, parabolic root relief, profile slope correction, helix correction, circular height crowning, circular width crowning, end relief, generated end relief, end relief left, end relief right, generated tip relief, generated root relief) is defined by the value of the property 'Type'. Each type of modification is represented by its own shape;
- 'outer disk': The shape represents a outer disk of a clutch or a brake;
- 'planet carrier': The shape represents the planet carrier of the planet of a planetary gear train;
- 'right flank': The shape represents the right flank of a tooth;
- 'rim': The shape represents the rim of a gear;
- 'rolling element': The shape represents a rolling element of a rolling element bearing;
- 'root': The shape represents the root of a tooth;
- 'second helix': The shape represents the second helix of a double helical gear (herringbone gear);
- 'shaft section': The shape represents a section of a shaft;
- 'tooth': The shape represents a tooth of a gear.

The shape_name need not be specified for a particular Partial_part_shape_definition.

4.2.62 Part_definition

A Part_definition is a view of a Part_version (see 4.2.66). This view is relevant for the requirements of one or more life cycle stages and application domains and collects product data of the Part_version (see 4.2.66).

NOTE The definition of this application object is exactly the same as of the Design_discipline_item_definition object in ISO 10303-214. The name of this object is changed to match to the Part_version object.

Each Part_definition is an Assembly_definition (see 4.2.3) or a Single_part_definition (see 4.2.92).

The data associated with a Part_definition are the following:

- additional_context;
- applies_to_version;
- id;
- initial_context.

4.2.62.1 additional_context

The additional_context specifies the Application_context (see 4.2.1) in which this view of the Part_version (see 4.2.66) is also relevant.

4.2.62.2 applies_to_version

The applies_to_version specifies the Part_version (see 4.2.66) for which the Part_definition is a view.

4.2.62.3 id

The id specifies the identifier of the Part_definition.

4.2.62.4 initial_context

The initial_context specifies the Application_context (see 4.2.1) in which this view of the Part_version (see 4.2.66) has been designed primarily.

4.2.63 Part_definition_relationship

A Part_definition_relationship is a relationship between two Part_definition (see 4.2.62) objects.

Each Part_definition_relationship is a Functional_relationship (see 4.2.29), Lubricant_part (see 4.2.49), Material_part (see 4.2.52) or a User_defined_relationship (see 4.2.107).

The data associated with a Part_definition_relationship are the following:

- first_part_definition;
- second_part_definition.

4.2.63.1 first_part_definition

The `first_part_definition` specifies the first of the `Part_definition` (see 4.2.62) objects that are part of the relationship.

4.2.63.2 second_part_definition

The `second_part_definition` specifies the second of the `Part_definition` (see 4.2.62) objects that are part of the relationship.

4.2.64 Part_instance

An `Part_instance` is the occurrence of an object in a product structure that is defined by a `Part_definition` (see 4.2.62).

NOTE The definition of this application object is exactly the same as the `Item_instance` object in ISO 10303-214. The name of this object is changed to match to the `Part_definition` object.

A `Part_instance` shall be used, at least once, in an `Assembly_relationship` (see 4.2.4).

The data associated with a `Part_instance` are the following:

- `definition`;
- `id`.

4.2.64.1 definition

The `definition` specifies the `Part_definition` (see 4.2.62) that serves as a definition for this particular occurrence.

4.2.64.2 id

The `id` specifies the identifier of the `Part_instance`.

4.2.65 Part_shape_definition

A `Part_shape_definition` is the definition of the shape of a `Part_definition` (see 4.2.62) or a `Part_instance` (see 4.2.64).

NOTE The definition of this application object is exactly the same as of the `Item_shape` object in ISO 10303-214. The name of this object is changed to match to the `Part_definition` object.

EXAMPLE A `Part_shape_definition` may define the shape of a `Part_instance` in a given usage context, e.g., in order to define the shape of a flexible pipe when placed in a car.

The data associated with a `Part_shape_definition` are the following:

- `described_object`

4.2.65.1 described_object

- The `described_object` specifies the object whose shape the `Part_shape_definition` defines.

4.2.66 Part_version

A Part_version is a version of a Part (see 4.2.59) and serves as the collector for the different Part_definition (see 4.2.62) objects that are valid for this particular Part_version.

NOTE The definition of this application object is exactly the same as of the Item_version object in ISO 10303-214. The name of this object is changed to match to the Part object.

The data associated with Part_version are the following:

- applies_to_part;
- id.

4.2.66.1 applies_to_part

The applies_to_part specifies the Part (see 4.2.59) with which the Part_version is associated.

4.2.66.2 id

The id specifies the identifier of the Item_version. The id shall be unique within the scope of the associated Item.

NOTE A particular object is identified by the id of Item_version that serves to identify the particular version coupled with the id of the associated Item that serves to identify the generic object.

4.2.67 Pinion_shaft

A Pinion_shaft is a type of Part (see 4.2.59) that is the definition of a part that is typically the shaft of that gear of a pair which has the smaller number of teeth. It defines a pinion shaft.

NOTE 1 The definition of this application object corresponds to the definition of the application objects Item and Specific_item_classification of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The Item is referenced by a Specific_item_classification object. The classification_name attribute of the Specific_item_classification is instantiated with "pinion shaft" to classify it as a part that represents a pinion shaft.

NOTE 2 A pinion shaft should be defined as an assembly of a shaft and a gear.

4.2.68 Placement_reference_relationship

A Placement_reference_relationship is a type of Placement_relationship (see 4.2.69) that establishes a relationship between two Position_orientation_property_value_definition objects. The relating Position_orientation_property_value_definition (see 4.2.74) object is placed relativ to the related Position_orientation_property_value_definition (see 4.2.74) object.

The data associated with a Placement_association are the following:

- related

4.2.68.1 related

The related specifies the Position_orientation_property_value_definition (see 4.2.74) that is placed.

4.2.69 Placement_relationship

A Placement_relationship is a mechanism to assign a Position_orientation_property_value_definition (see 4.2.74) to a Property_value_definition (see 4.2.79) in order to give some positioning and/or orientation information for the Property_value_definition.

Each Placement_relationship may be a Placement_reference_relationship (see 4.2.68)

The data associated with a Placement_relationship are the following:

- related;
- relating.

4.2.69.1 related

The related specifies the Property_value_definition the positioning and/or orientation information is provided for.

4.2.69.2 relating

The relating specifies the Position_orientation_property_value_definition that provides the positioning and/or orientation information.

4.2.70 Plain_bearing

A Plain_bearing is a type of Bearing (see 4.2.7) that supports, guides, and reduces the friction of motion between fixed and moving machine parts not using rolling elements but sliding.

NOTE The definition of this application object corresponds to the definition of the application objects Item and Specific_item_classification of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The Item is referenced by a Specific_item_classification object. The classification_name attribute of the Specific_item_classification is instantiated with “plain bearing” to classify it as a part that represents a plain bearing.

4.2.71 Planetary_gear_train

A Planetary_gear_train is a type of Gear_unit (see 4.2.32) that represents a combination of coaxial elements, of which one or more are annulus gears and one or more are planet carriers which turn around the common axes and support one or more planet gears which mesh with the annulus gears and one or more sun gears.

NOTE The definition of this application object corresponds to the definition of the application objects Item and Specific_item_classification of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The Item is referenced by a Specific_item_classification object. The classification_name attribute of the Specific_item_classification is instantiated with “planetary gear train” to classify it as a part that represents a planetary gear train.

4.2.72 Position_orientation_property

A Position_orientation_property is a type of Property (see 4.2.77) which gives information about positioning and/or orientation.

4.2.73 Position_orientation_property_value

The Position_orientation_property_value is a type of Property_Value (see 4.2.78) that defines the values for the position and the orientation of the defined Position_orientation_property_value_definition (see 4.2.74).

NOTE The definition of this application object corresponds to the definition of the application object Value_list of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The coordinate definition that is referenced by the position attribute is the first element of the list. The direction definition that is referenced by the direction attribute is the second element of the list. The direction definition that is referenced by the reference_direction attribute is the third element of the list.

The data associated with a Position_orientation_property_value are the following:

- direction;
- position;
- reference_direction.

4.2.73.1 direction

The direction specifies the Direction_definition (see 4.2.21) which defines the initial direction of the Position_orientation_property_value_definition.

The direction need not be specified for a particular Position_orientation_property_value.

4.2.73.2 position

The position specifies the Coordinate_definition (see 4.2.13) which defines the location of the Position_orientation_property_value_definition.

The position need not be specified for a particular Position_orientation_property_value.

4.2.73.3 reference_direction

The reference_direction specifies a second Direction_definition which can be used as a reference for the positioning of a Position_orientation_property_value_definition in three-dimensional space.

The reference_direction need not be specified for a particular Position_orientation_property_value.

4.2.74 Position_orientation_property_value_definition

A Position_orientation_property_value_definition is a type of Property_value_definition (see 4.2.79) that is the representation of a Position_orientation_property (see 4.2.72).

NOTE A Position_orientation_property_value_definition can be used to define a property which indicates a placement or some special point or direction of objects in the two-dimensional or three-dimensional space. These informations may be relevant for calculations or simulations.

The data associated with a Position_orientation_property_value_definition are the following:

- definition;
- specified_value.

4.2.74.1 definition

The definition specifies the `Position_orientation_property` (see 4.2.72) the `Position_orientation_property_value_definition` characterizes.

4.2.74.2 specified_value

The `specified_value` specifies the `Position_orientation_property_value` (see 4.2.738) that qualifies the `Position_orientation_property_value_definition`.

4.2.75 Power_rotation_speed

A `Power_rotation_speed` is a type of `Application_property` (see 4.2.2) that defines power values, rotation values and speed values.

NOTE 1 The definition of this application object corresponds to the definition of the application object `General_property` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `property_type` attribute of the `General_property` object is instantiated with "power rotation speed" to identify it as a power rotation speed property.

NOTE 2 Typical property values for a `Power_rotation_speed` are given in Table B.13.

4.2.76 Pressure_stress

A `Pressure_stress` is a type of `Application_property` (see 4.2.2) that defines a pressure or a stress of an object.

NOTE 1 The definition of this application object corresponds to the definition of the application object `General_property` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `property_type` attribute of the `General_property` object is instantiated with "pressure stress" to identify it as a pressure stress property.

NOTE 2 Typical property values for a `Pressure_stress` are given in Table B.14.

4.2.77 Property

A `Property` is the definition of a particular quality.

NOTE Each `Property` may be a combination of a `Material_property` and one of the other types of `Property`.

Each `Property` may be a `Material_property` (see 4.2.53).

Each `Property` is a `Specification_property` (see 4.2.94), an `Application_property` (see 4.2.2), a `General_property` (see 4.2.34), a `Parameter_property` (see 4.2.58) or a `Position_orientation_property` (see 4.2.72).

The data associated with a `Property` are the following:

- `allowed_unit`;
- `id`.

4.2.77.1 allowed_unit

The allowed_unit specifies the unit or set of units that are accepted.

EXAMPLE A company may accept a mass specified in kilograms or tons, but not in grams or pounds.

4.2.77.2 id

The id specifies the identifier of the Property.

4.2.78 Property_value

A Property_value is the numerical or textual value of a certain Property (see 4.2.77).

The Property_value describes a certain property of a specific object.

Each Property_value is a Position_orientation_property_value (see 4.2.73), a String_value (see 4.2.96), a Value_list (see 4.2.110) or a Value_with_unit (see 4.2.112).

The data associated with a Property_value are the following:

- value_name

4.2.78.1 value_name

The value_name specifies the word or group of words by which the Property_value is referred to.

Depending on the property_definition attribute of the Property_value_definition that is referencing the Property_value, where applicable one of the predefined values in Annex B: Property Table for gear units shall be used.

EXAMPLE If the Property_value is referenced by a Property_value_definition object that is referencing a Safety object with its property_definition attribute, the values from Table B.15.

4.2.79 Property_value_definition

The Property_value_definition is the representation of a Property (see 4.2.77).

Each Property_value_definition may be a Material_property_value_definition (see 4.2.55) or a Position_orientation_property_value_definition (see 4.2.74).

The data associated with a Property_value_definition are the following:

- definition;
- specified_value;
- value_determination.

4.2.79.1 definition

The definition specifies the Property (see 4.2.77) that the Property_value_definition characterizes.

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4.2.79.2 specified_value

The `specified_value` specifies the `Property_value` (see 4.2.78) that qualifies the `Property_value_definition` by a `Value_with_unit`, a `String_value`, a `Position_orientation_property_value` or an arbitrary aggregate thereof.

4.2.79.3 value_determination

The `value_determination` specifies information on how the `Property_value_definition` shall be interpreted.

NOTE Some `Property_values` may have the same `value_name` and same meaning but may have different values due to there special use for different calculation methods. Therefore the `value_determination` attribute allows to distinguish `Property_value` objects by their calculation method.

Where applicable the following values shall be used to define a calculation method:

The `value_determination` need not be specified for a particular `Property_value_definition`.

4.2.80 Rolling_element_bearing

A `Rolling_element_bearing` is a type of `Bearing` (see 4.2.7) that supports, guides, and reduces the friction of motion between fixed and moving machine parts by using rolling elements like balls or pins.

NOTE The definition of this application object corresponds to the definition of the application objects `Item` and `Specific_item_classification` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `Item` is referenced by a `Specific_item_classification` object. The `classification_name` attribute of the `Specific_item_classification` is instantiated with "rolling element bearing" to classify it as a part that represents a rolling element bearing.

4.2.81 Safety

A `Safety` is a type of `Application_property` (see 4.2.2) that defines safety qualities of an object.

NOTE 1 The definition of this application object corresponds to the definition of the application object `General_property` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `property_type` attribute of the `General_property` object is instantiated with "safety" to identify it as a safety property.

NOTE 2 Typical property values for a `Safety` are given in Table B.15.

4.2.82 Sealing

A `Sealing` is a type of `Part` (see 4.2.59) that is typically used to join two systems or elements in such a way as to prevent leakage.

NOTE The definition of this application object corresponds to the definition of the application objects `Item` and `Specific_item_classification` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `Item` is referenced by a `Specific_item_classification` object. The `classification_name` attribute of the `Specific_item_classification` is instantiated with "sealing" to classify it as a part that represents a sealing.

4.2.83 Service_property

A Service_property is a type of Application_property (see 4.2.2) that arises during operation of the gear unit.

NOTE 1 The definition of this application object corresponds to the definition of the application object General_property of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The property_type attribute of the General_property object is instantiated with "service" to identify it as a service property.

NOTE 2 Typical property values for a Service_property are given in Table B.16.

4.2.84 Shaft

A Shaft is a type of Part (see 4.2.59) that is typically a long, generally cylindrical bar that rotates and transmits power.

NOTE The definition of this application object corresponds to the definition of the application objects Item and Specific_item_classification of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The Item is referenced by a Specific_item_classification object. The classification_name attribute of the Specific_item_classification is instantiated with "shaft" to classify it as a part that represents a shaft.

4.2.85 Shaft_bearing

A Shaft_bearing is a type of Functional_relationship (see 4.2.29) that relates two Part_definition (see 4.2.62) objects. It establishes a relationship between a shaft and a bearing that is mounted on the shaft.

NOTE The definition of this application object corresponds to the definition of the application object General_item_definition_relationship of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The relation_type attribute of the General_item_definition_relationship object is instantiated with "shaft bearing" to identify it as a Shaft_bearing object.

4.2.86 Shaft_clutch_or_brake

A Shaft_clutch_or_brake is a type of Functional_relationship (see 4.2.29) that relates two Part_definition (see 4.2.62) objects. It establishes a relationship between a shaft and a clutch or brake that is mounted on the shaft.

NOTE The definition of this application object corresponds to the definition of the application object General_item_definition_relationship of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The relation_type attribute of the General_item_definition_relationship object is instantiated with "shaft clutch or brake" to identify it as a Shaft_clutch_or_brake object.

4.2.87 Shaft_collar

A Shaft_collar is a type of Functional_relationship (see 4.2.29) that relates two Part_definition (see 4.2.62) objects. It establishes a relationship between a shaft and a coupling that is mounted to the shaft.

NOTE The definition of this application object corresponds to the definition of the application object General_item_definition_relationship of ISO 10303-214. The following restrictions/limitations to the definition of

the application object of ISO 10303-214 have been made: The `relation_type` attribute of the `General_item_definition_relationship` object is instantiated with "shaft collar" to identify it as a `Shaft_collar` object.

4.2.88 Shaft_sealing

A `Shaft_sealing` is a type of `Functional_relationship` (see 4.2.29) that relates two `Part_definition` (see 4.2.62) objects. It establishes a relationship between a shaft and a sealing that seals the shaft.

NOTE The definition of this application object corresponds to the definition of the application object `General_item_definition_relationship` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `relation_type` attribute of the `General_item_definition_relationship` object is instantiated with "shaft sealing" to identify it as a `Shaft_sealing` object.

4.2.89 Shaft_shaft

A `Shaft_shaft` is a type of `Functional_relationship` (see 4.2.29) that relates two `Part_definition` (see 4.2.62) objects. It establishes a relationship between two shafts.

NOTE The definition of this application object corresponds to the definition of the application object `General_item_definition_relationship` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `relation_type` attribute of the `General_item_definition_relationship` object is instantiated with "shaft shaft" to identify it as a `Shaft_shaft` object.

4.2.90 Shaft_wheel

A `Shaft_wheel` is a type of `Functional_relationship` (see 4.2.29) that relates two `Part_definition` (see 4.2.62) objects. It establishes a relationship between a shaft and a wheel that is mounted on the shaft.

NOTE The definition of this application object corresponds to the definition of the application object `General_item_definition_relationship` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `relation_type` attribute of the `General_item_definition_relationship` object is instantiated with "shaft wheel" to identify it as a `Shaft_wheel` object.

4.2.91 Shape_description_association

A `Shape_description_association` is a mechanism to associate the definition of a shape or of a portion of a shape with a geometric representation.

NOTE Through `Shape_description_association`, it is possible to associate objects with geometry defined in an external document; the same is possible through `Document_assignment`. The difference between the two possibilities is that in the case of `Shape_description_association`, it is the shape of the object that is assigned whereas `Document_assignment` may be used to assign other kinds of geometry.

The data associated with a `Shape_description_association` are the following:

- `defining_geometry`;
- `is_defining_shape_for`.

4.2.91.1 defining_geometry

The `defining_geometry` specifies the `Geometric_model` or the `External_model` that contains the shape information.

4.2.91.2 is_defining_shape_for

The is_defining_shape_for specifies the object the Shape_description_association is associated with.

4.2.92 Single_part_definition

A Single_part_definition is a view of a Part_version (see 4.2.66). In this view the part is seen as a single part that does not consist of subordinate parts or assemblies.

NOTE The definition of this application object is exactly the same as of the Design_discipline_item_definition object in ISO 10303-214. The name of this object is changed to match to the Part_definition object.

A Single_part_definition is a type of Part_definition (see 4.2.62).

4.2.93 Sliding_wear

A Sliding_wear is a type of Application_property (see 4.2.2) that defines sliding or wear of an object.

NOTE 1 The definition of this application object corresponds to the definition of the application object General_property of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The property_type attribute of the General_property object is instantiated with "sliding wear" to identify it as a sliding wear property.

NOTE 2 Typical property values for a Sliding_wear are given in Table B.17.

4.2.94 Specification_property

A Specification_property is a type of Property (see 4.2.77) that serves as specification for an object.

NOTE 1 The definition of this application object corresponds to the definition of the application object General_property of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The property_type attribute of the General_property object is instantiated with "specification" to identify it as a specification property.

NOTE 2 Typical property values for a Specification_property are given in Table B.18.

4.2.95 Stiffness_suspension

A Stiffness_suspension is a type of Parameter_property (see 4.2.58) that defines stiffness or suspension of an object.

NOTE 1 The definition of this application object corresponds to the definition of the application object General_property of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The property_type attribute of the General_property object is instantiated with "stiffness suspension" to identify it as a stiffness suspension property.

NOTE 2 Typical property values for a Stiffness_suspension are given in Table B.19.

4.2.96 String_value

A String_value is a type of Property_value (see 4.2.78) that represents a sequence of one or more alphanumeric characters.

NOTE The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214.

The data associated with a String_value are the following:

- value_specification

4.2.96.1 value_specification

The value_specification specifies the string represented by the String_value.

4.2.97 Surface_condition

A Surface_condition is a Surface_texture (see 4.2.99) or a Hardness (see 4.2.37) that is a characteristic or property of a surface of a part.

NOTE 1 The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214

NOTE 2 A Surface_condition may be specified during the design phase of a product as an expected characteristic of the parts resulting from the manufacturing process, but it may also be documented as measured on a prototype.

4.2.98 Surface_condition_association

A Surface_condition_association is a mechanism to associate a Surface_condition (see 4.2.97) with an object.

NOTE The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214.

The data associated with a Surface_condition_association are the following:

- described_object;
- describing_surface_condition.

4.2.98.1 described_object

The described_object specifies the object that is characterized by the Surface_condition.

4.2.98.2 describing_surface_condition

The describing_surface_condition specifies the condition of a surface that is being assigned to an object.

4.2.99 Surface_texture

A Surface_texture is a type of Surface_condition (see 4.2.97) that is the characterization of irregularities of the surface of a shape or of a portion of a shape. Such an irregularity has a negligible impact on its dimensions but may impact some of its mechanical or functional characteristics. In this context Surface_texture covers the concepts of roughness and waviness as well as information about the method and parameters used to determine these irregularities.

NOTE The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214.

The data associated with a Surface_texture are the following:

- measuring_method

4.2.99.1 measuring_method

The measuring_method specifies the method or standard that describes the method used to characterize the Surface_texture.

Where applicable the following values shall be used:

- 'ISO 4287': The used surface texture parameters are defined in ISO 4287 [2];
- 'ISO 12085': The used surface texture parameters are defined in ISO 12085 [6];
- 'ISO 13565': The used surface texture parameters are defined in ISO 13565 [7].

4.2.100 Surface_texture_parameter

A Surface_texture_parameter is a combination of a parameter name and possibly indices describing one particular parameter of a surface texture such as roughness or waviness.

The meaning of the Surface_texture_parameter is defined by the measuring method that is specified by the using Surface_texture.

EXAMPLE A typical Surface_texture_parameter according to ISO 4287 [2] is Ra; in this case, the parameter name is 'R' and the index is 'a'.

NOTE 1 The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214

NOTE 2 Qualifier such as 'min' or 'max' may be assigned using the subtypes of Value_with_unit.

The data associated with a Surface_texture_parameter are the following:

- described_texture;
- parameter_name;
- parameter_value.

4.2.100.1 described_texture

The described_texture specifies the surface texture that is described by the Surface_texture_parameter.

4.2.100.2 parameter_name

The parameter_name specifies the word or group of words by which the Surface_texture_parameter is referred to.

EXAMPLE 1 Parameter names defined in ISO 4287 [2] are, e.g., sampling or evaluation length 'l', primary profile parameter 'P', roughness profile parameter 'R', and waviness profile parameter 'W'. Parameter indices defined in ISO 4287 [2] are, e.g., maximum peak height 'p', maximum valley depth 'v', maximum height 'y', mean height 'c', total height 't', arithmetical mean deviation 'a', and root mean square deviation 'q'.

EXAMPLE 2 Parameter names defined in ISO 12085 [6] are, e.g., mean spacing of roughness motifs 'AR', mean depth of roughness motifs 'R', mean spacing of waviness motifs 'AW', and mean depth of waviness motifs 'W'.

Where applicable the following values shall be used:

- See Table B.20.

4.2.100.3 parameter_value

The parameter_value specifies the value of the Surface_texture_parameter.

4.2.101 Temperature

A Temperature is a type of Application_property (see 4.2.2) that defines the temperature of an object.

NOTE 1 The definition of this application object corresponds to the definition of the application object General_property of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The property_type attribute of the General_property object is instantiated with "temperature" to identify it as a temperature property.

NOTE 2 Typical property values for a Temperature are given in Table B.21.

4.2.102 Tool

A Tool defines is a type of Part (see 4.2.59) that is used to produce another part.

NOTE The definition of this application object corresponds to the definition of the application objects Item and Specific_item_classification of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The Item is referenced by a Specific_item_classification object. The classification_name attribute of the Specific_item_classification is instantiated with "tool" to classify it as a part that represents a tool.

4.2.103 Tool_part_relationship

A Tool_part_relationship is a relationship between two Part_definition (see 4.2.62) objects. It establishes a relationship between a part (produced_part) and a tool (used_tool) that is used to produce the part.

The data associated with a Tool_part_relationship are the following:

- produced_part;
- production_technology;
- used_tool.

4.2.103.1 produced_part

The produced_part specifies the part which is produced by the tool.

4.2.103.2 production_technology

The production_technology specifies the technology which is used to produce the part with the tool.

The production_technology need not be specified for a particular Tool_part_relationship.

4.2.103.3 used_tool

The used_tool specifies the tool which produces the part.

4.2.104 Torque_force

A Torque_force is a type of Application_property (see 4.2.2) that defines a torque or a force.

NOTE 1 The definition of this application object corresponds to the definition of the application object General_property of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The property_type attribute of the General_property object is instantiated with "torque force" to identify it as a torque force property.

NOTE 2 Typical property values for a Torque_force are given in Table B.22.

4.2.105 Unit

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

The types of units supported by this standard are SI units as well as derived or conversion based units as defined in ISO 10303-41.

NOTE The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214.

The data associated with a Unit are the following:

— unit_name

4.2.105.1 unit_name

The unit_name specifies the term representing the kind of unit.

EXAMPLE 'gram', 'litre', or 'volt' are examples for the unit_name.

4.2.106 User_defined_part

An User_defined_part is a type of Part (see 4.2.59) that is specified by the attribute 'part_type'.

NOTE The definition of this application object corresponds to the definition of the application objects Item and Specific_item_classification of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The Item is referenced by a Specific_item_classification object. The classification_name attribute of the Specific_item_classification is instantiated with the value of the part_type attribute of the User_defined_part.

The data associated with an User_defined_part are the following:

— part_type

4.2.106.1 part_type

The `part_type` specifies the kind of part the `User_defined_part` defines.

4.2.107 User_defined_relationship

A `User_defined_relationship` is a type of `Part_definition_relationship` (see 4.2.63) between two parts whose meaning is specified by the attribute '`relation_type`'.

NOTE The definition of this application object corresponds to the definition of the application object `General_item_definition_relationship` of ISO 10303-214. The following restrictions/limitations to the definition of the application object of ISO 10303-214 have been made: The `relation_type` attribute of the `General_item_definition_relationship` object is instantiated with the value of the `relation_type` attribute of the `User_defined_relationship` object.

The data associated with a `User_defined_relationship` are the following:

- `relation_type`

4.2.107.1 relation_type

The `relation_type` specifies the kind of relationship the `User_defined_relationship` defines.

4.2.108 Value_association

A `Value_association` is a mechanism to associate a property value with an object.

NOTE The definition of this application object corresponds to the definition of the application objects `Property_value_association` and `Item_property_association` of ISO 10303-214. The following restrictions/limitations to the definition of the application objects `Property_value_association` and `Item_property_association` of ISO 10303-214 have been made: The `Property_value_association` is used to define the `describing_property_value` attribute. The `Item_property_association` is used to define the `described_object` attribute. The `described_object` attribute of `Value_association` only references a `Part_definition`, `Part_definition_relationship`, a `Tool_part_relationship`, a `Part_shape_definition`, a `Partial_part_shape_definition` or an `Assembly_relationship`.

The data associated with a `Value_association` are the following:

- `described_object`;
- `describing_property_value`.

4.2.108.1 described_object

The `described_object` specifies the object that is characterized by the `Property_value` (see 4.2.78).

4.2.108.2 describing_property_value

The `describing_property_value` specifies the value that is being assigned.

4.2.109 Value_limit

A `Value_limit` is a type of `Value_with_unit` (see 4.2.112) that is a qualified numerical value representing either the lower limit or the upper limit of a particular physical characteristic.

NOTE The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214.

The data associated with a Value_limit are the following:

- limit;
- limit_qualifier.

4.2.109.1 limit

The limit specifies the value of the limit.

4.2.109.2 limit_qualifier

The limit_qualifier specifies the kind of limit.

The following values shall be used:

- 'maximum': The specified limit is an upper limit;
- 'minimum': The specified limit is a lower limit.

4.2.110 Value_list

A Value_list is a type of Property_value (see 4.2.78) that is an ordered collection of Property_value (see 4.2.78) objects.

NOTE The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214.

The data associated with a Value_list are the following:

- values

4.2.110.1 values

The values specifies the ordered collection of Property_value (see 4.2.78) objects that together are provided as a Property_value.

4.2.111 Value_range

A Value_range is a type of Value_with_unit (see 4.2.112) that is a pair of numerical values representing the range in which the value shall lie.

NOTE The definition of this application object is exactly the same as of the application object of the same name in ISO 10303-214.

The data associated with a Value_range are the following:

- lower_limit;
- upper_limit.