TECHNICAL SPECIFICATION

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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order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn.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 10303-224.

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 occurence 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 “directon definition” to classify the Value_list object as a property value that represents a direction definition.

The data associated with a direction_definiton are the following:

— values

4.2.21.1 values

The values specifie 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 to 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_defnition 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_defintion 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 decribed_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.

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 allowes 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_relationshiop 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.

4.2.111.1 lower_limit

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

4.2.111.2 upper_limit

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

4.2.112 Value_with_unit

A Value_with_unit is a type of Property_value (see 4.2.78) that is either a single numerical measure, or a range of numerical measures with upper, lower, or upper and lower bounds.

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

Each Value_with_unit is a Value_range (see 4.2.111), a Numerical_value (see 4.2.57), or a Value_limit (see 4.2.109).

The data associated with a Value_with_unit are the following:

— unit_component

4.2.112.1 unit_component

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

The unit_component need not be specified for a particular Value_with_unit.

4.2.113 Wheel

A Wheel is a type of Part (see 4.2.59) that is typically that gear of a gear pair, which has the larger number of 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 “wheel” to classify it as a part that represents a wheel.

Each Wheel may be a Gear (see 4.2.30).

4.2.114 Wheel_bearing

A Wheel_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 bearing and a wheel that is mounted on the bearing.

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 “wheel bearing” to identify it as a Wheel_bearing object.

4.2.115 Wheel_belt_or_chain

A Wheel_belt_or_chain 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 wheel and a belt or between a wheel and a chain.

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 “wheel belt or chain” to identify it as a Wheel_belt_or_chain object.

4.2.116 Wheel_wheel

A Wheel_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 two wheels.

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 “wheel wheel” to identify it as a Wheel_wheel.

Each Wheel_wheel may be a Gear_pair (see 4.2.31)

4.2.117 Worm

A Worm is a type of Gear (see 4.2.30) that is typically a gear of cylindrical or toroidal shape that meshes with a worm wheel.

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 “worm” to classify it as a part that represents the worm of a worm gearing.

4.2.118 Worm_gear_pair

A Worm_gear_pair is a type of Gear_pair (see 4.2.31) that establishes a relationship between a Worm (see 4.2.117) object and a Worm_wheel (see 4.2.119) object.

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 “worm gear pair” to identify it as a Worm_gear_pair object.

4.2.119 Worm_wheel

A Worm_wheel is a type of Gear (see 4.2.30) that is typically a gear having flanks capable of linear contact with the flanks of a worm.

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 “worm wheel” to classify it as a part that represents the worm wheel of a worm gearing.

4.3 Application assertions

This subclause specifies the application assertions for the usage of ISO 10303-214 for gear units. Application assertions specify the relationships between application objects, the cardinality of the relationships, and the rules required for the integrity and validity of the application objects and UoFs. The application assertions and their definitions are given below.

4.3.1 Assembly_relationship to Assembly_definition

Each Assembly_relationship refers to exactly one Assembly_definition in the role of assembly. Each Assembly_definition is referenced by zero or more Assembly_relationship objects as assembly.

4.3.2 Assembly_relationship to Part_instance

Each Assembly_relationship refers to exactly one Part_instance in the role of part_in_assembly. Each Part_instance is referenced by zero or more Assembly_relationship objects as part_in_assembly.

4.3.3 Coordinate_definition to Value_with_unit

Each Coordinate_definition refers to one, two or three Value_with_unit objects in the role of values. Each Value_with_unit acts as values for zero or more Coordinate_definition objects.

4.3.4 Direction_definition to Value_with_unit

Each Direction_definition refers to one, two or three Value_with_unit objects in the role of values. Each Value_with_unit acts as values for zero or more Direction_definition objects.

4.3.5 Document_assignment to Assembly_ relationship

Each Document_assignment is_assigned_to zero or one Assembly_relationship. Each Assembly_relationship is related to zero or more Document_assignment objects.

NOTE This assertion is established through Described_object_select.

4.3.6 Document_assignment to Partial_part_shape_definition

Each Document_assignment is_assigned_to zero or one Partial_part_shape_definition object. Each Partial_part_shape_definition object is related to zero or more Document_assignment objects.

NOTE This assertion is established through Described_object_select and Shape_definition_select.

4.3.7 Document_assignment to Part_definition

Each Document_assignment is_assigned_to zero or one Part_definition. Each Part_definition is related to zero or more Document_assignment objects.

NOTE This assertion is established through Described_object_select.

4.3.8 Document_assignment to Part_definition_relationship

Each Document_assignment is_assigned_to zero or one Part_definition_relationship. Each Part_definition_relationship is related to zero or more Document_assignment objects.

NOTE This assertion is established through Described_object_select

4.3.9 Document_assignment to Part_shape_definition

Each Document_assignment is_assigned_to zero or one Part_shape_definition. Each Part_shape_definition is related to zero or more Document_assignment objects.

NOTE This assertion is established through Described_object_select and Shape_definition_select.

4.3.10 Document_assignment to Tool_part_relationship

Each Document_assignment is_assigned_to zero or one Tool_part_relationship. Each Tool_part_relationship is related to zero or more Document_assignment objects.

NOTE This assertion is established through Described_object_select.

4.3.11 Geometry_property to Partial_Part_shape_definition

Each Geometry_property refers to exactly one Partial_part_shape_definition in the role of described_object. Each Partial_part_shape_definition acts as described_object for zero or more Geometry_property objects.

NOTE This assertion is established through Shape_definition_select.

4.3.12 Geometry_property to Part_shape_definition

Each Geometry_property refers to exactly one Part_shape_definition in the role of described_object. Each Part_shape_definition acts as described_object for zero or more Geometry_property objects.

NOTE This assertion is established through Shape_definition_select.

4.3.13 Hardness to Value_with_unit

Each Hardness refers to exactly one Value_with_unit in the role of hardness_value. Each Value_with_unit acts as hardness_value for zero or more Hardness objects.

4.3.14 Material_definition to Part_definition

Each Material_definition refers to zero or more Part_definition objects in the role of described_object. Each Part_definition acts as described_object for zero or more Material_definition objects.

4.3.15 Material_property_association to Material_definition

Each Material_property_association refers to exactly one Material_definition in the role of described_material. Each Material_definition acts as described_material for zero or more Material_property_association objects.

4.3.16 Material_property_association to Material_property_value_definition

Each Material_property_association refers to exactly one Material_property_value_definition in the role of associated_property_value. Each Material_property_value_definition acts as associated_property_value for zero or more Material_property_association objects.

4.3.17 Material_property_value_definition to Material_property

Each Material_property_value_definition refers to exactly one Material_property in the role of definition. Each Material_property acts as definition for zero or more Material_property_value_definition objects.

4.3.18 Material_property_value_definition to Data_environment

Each Material_property_value_definition refers to exactly one Data_environment in the role of environment_condition. Each Data_environment acts as environment_condition for zero or more Material_property_value_definition objects.

4.3.19 Part_definition to Application_context

Each Part_definition refers to zero or more Application_context objects in the role of additional_context. Each Application_context acts as additional_context for zero or more Part_definition objects.

Each Part_definition refers to exactly one Application_context in the role of initial_context. Each Application_context acts as initial_context for zero or more Part_definition objects.

4.3.20 Part_definition to Part_version

Each Part_definition refers to exactly one Part_version in the role of applies_to_version. Each Part_version acts as applies_to_version for zero or more Part_definition objects.

4.3.21 Part_definition_relationship to Part_definition

Each Part_definition_relationship refers to exactly one Part_definition in the role of first_part_definition. Each Part_definition is referenced by zero or more Part_definition_relationship objects as first_part_definition.

Each Part_definition_relationship refers to exactly one Part_definition in the role of second_part_definition. Each Part_definition is referenced by zero or more Part_definition_relationship objects as second_part_definition.

4.3.22 Part_instance to Part_definition

Each Part_instance refers to exactly one Part_definition in the role of definition. Each Part_definition acts as definition for zero or more Part_instance objects.

NOTE This assertion is established through Instance_definition_select

4.3.23 Partial_part_shape_definition to Part_shape_definition

Each Partial_part_shape_definition refers to exactly one Part_shape_definition in the role of partial_shape_of. Each Part_shape_definition acts as partial_shape_of for zero or more Partial_part_shape_definition objects.

4.3.24 Part_shape_definition to Part_definition

Each Part_shape_definition refers to zero or one Part_definition in the role of described_object. Each Part_definition acts as described_object for zero or one Part_shape_definition_objects.

NOTE This assertion is established through Part_definition_select.

4.3.25 Part_shape_definition to Part_instance

Each Part_shape_definition refers to zero or one Part_instance in the role of described_object. Each Part_instance acts as described_object for zero or one Part_shape_definition.

NOTE This assertion is established through Part_definition_select.

4.3.26 Part_version to Part

Each Part_version refers to exactly one Part in the role of applies_to_part. Each Part has applies_to_version defined by one or more Part_version objects.

4.3.27 Placement_reference_relationship to Position_orientation_property_value_definition

Each Placement_reference_relationship refers to exactly one Position_orientation _property_value_definition in the role of related. Each Position_orientation_property_value_definition acts as related for zero or more Placement_reference_relationship objects.

4.3.28 Placement_relationship to Position_orientation_property_value_definition

Each Placement_relationship refers to exactly one Position_orientation_property_value_definition in the role of relating. Each Position_orientation_property_value_definition acts as relating for zero or more Placement_relationship objects.

4.3.29 Placement_relationship to Property_value_definition

Each Placement_relationship refers to exactly one Property_value_definition in the role of related. Each Property_value_definition acts as related for zero or more Placement_ relationship objects.

4.3.30 Position_orientation_property_value to Coordinate_definition

Each Position_orientation_property_value refers to zero or one Coordinate_definition in the role of position. Each Coordinate_definition acts as position for zero or more Position_orientation_property_value objects.

4.3.31 Position_orientation_ property_value to Direction_definition

Each Position_orientation_property_value refers to zero or one Direction_definition in the role of direction. Each Direction_definition acts as direction for zero or more Position_orientation_property_value objects.

Each Position_orientation_property_value refers to zero or one Direction_definition in the role of reference_direction. Each Direction_definition acts as reference_direction for zero or more Position_orientation_property_value objects.

4.3.32 Position_orientation _property_value_definition to Position_orientation_property

Each Position_orientation_property_value_definition refers to exactly one Position_orientation_property in the role of definition. Each Position_orientation_property acts as definition for zero or more Position_orientation_property_value_definition_objects.

4.3.33 Position_orientation _property_value_definition to Position_orientation_property_value

Each Position_orientation_property_value_definition refers to exactly one Position_orientation_property_value in the role of specified_value. Each

Position_orientation_property_value acts as specified_value for zero or more Position_orientation _property_value_definition objects.

4.3.34 Property to Unit

Each Property refers to zero or more Unit objects in the role of allowed_unit. Each Unit acts as allowed_unit for zero or more Property objects.

4.3.35 Property_value_definition to Property

Each Property_value_definition refers to exactly one Property in the role of definition. Each Property acts as definition for zero or more Property_value_definition objects.

4.3.36 Property_value_definition to Property_value

Each Property_value_definition refers to exactly one Property_value in the role of specified_value. Each Property_value acts as specified_value for zero or more Property_value_definition objects.

4.3.37 Shape_description_association to External_geometric_model

Each Shape_description_association refers to zero or one External_geometric_model in the role of defining_geometry. Each External_geometric_model acts as defining_geometry for zero or more Shape_description_association objects.

NOTE This assertion is established through Geometry_select.

4.3.38 Shape_description_association to Geometric_model

Each Shape_description_association refers to zero or one Geometric_model in the role of defining_geometry. Each Geometric_model acts as defining_geometry for zero or more Shape_description_association objects.

NOTE This assertion is established through Geometry_select.

4.3.39 Shape_description_association to Partial_part_shape_definition

Each Shape_description_association is_defining_shape_for zero or one Partial_part_shape_definition. Each Partial_part_shape_definition is related to zero or more Shape_description_association objects.

NOTE This assertion is established through Shape_definition_select

4.3.40 Shape_description_association to Part_shape_definition

Each Shape_description_association is_defining_shape_for zero or one Part_shape_definition. Each Part_shape_definition is related to zero or more Shape_description_association objects.

NOTE This assertion is established through Shape_definition_select

4.3.41 Surface_condition_association to Part_shape_definition

Each Surface_condition_association refers to zero or one Part_shape_definition in the role of described_object. Each Part_shape_definition acts as described_object for zero or more Surface_condition_association objects.

NOTE This assertion is established through Shape_definition_select.

4.3.42 Surface_condition_association to Partial_part_shape_definition

Each Surface_condition_association refers to zero or one Partial_part_shape_definition in the role of described_object. Each Partial_part_shape_definition acts as described_object for zero or more Surface_condition_association objects.

NOTE This assertion is established through Shape_definition_select.

4.3.43 Surface_condition_association to Surface_condition

Each Surface_condition_association refers to exactly one Surface_condition in the role of describing_surface_condition. Each Surface_condition acts as describing_surface_condition for zero or more Surface_condition_association objects.

4.3.44 Surface_texture_parameter to Surface_texture

Each Surface_texture_parameter refers to zero or one Surface_texture in the role of described_texture. Each Surface_texture acts as described_texture for one or more Surface_texture_parameter objects.

NOTE This assertion is established through Texture_select.

4.3.45 Surface_texture_parameter to Value_with_unit

Each Surface_texture_parameter refers to exactly one Value_with_unit in the role of parameter_value. Each Value_with_unit acts as parameter_value for zero or more Surface_texture_parameter objects.

4.3.46 Tool_part_relationship to Part_definition

Each Tool_part_relationship refers to exactly one Part_definition in the role of produced_part. Each Part_definition is referenced by zero or more Tool_part_relationship objects as produced_part.

Each Tool_part_relationship refers to exactly one Part_definition in the role of used_tool. Each Part_definition is referenced by zero or more Tool_part_relationship objects as used_tool.

4.3.47 Value_association to Assembly_relationship

Each Value_association refers to zero or one Assembly_relationship in the role of described_object. Each Assembly_relationship acts as described_object for zero or more Value_association objects.

NOTE This assertion is established through Described_object_select.

4.3.48 Value_association to Partial_part_shape_definition

Each Value_association refers to zero or one Partial_part_shape_definition in the role of described_object. Each Partial_part_shape_definition acts as described_object for zero or more Value_association objects.

NOTE This assertion is established through Described_object_select and Shape_definition_select.

4.3.49 Value_association to Part_definition

Each Value_association refers to zero or one Part_definition in the role of described_object. Each Part_definition acts as described_object for zero or more Value_association objects.

NOTE This assertion is established through Described_object_select.

4.3.50 Value_association to Part_definition_relationship

Each Value_association refers to zero or one Part_definition_relationship in the role of described_object. Each Part_definition_relationship acts as described_object for zero or more Value_association objects.

NOTE This assertion is established through Described_object_select.

4.3.51 Value_association to Part_shape_definition

Each Value_association refers to zero or one Part_shape_definition in the role of described_object. Each Part_shape_definition acts as described_object for zero or more Value_association objects.

NOTE This assertion is established through Described_object_select and Shape_definition_select.

4.3.52 Value_association to Property_value_definition

Each Value_association refers to exactly one Property_value_definition in the role of describing_property_value. Each Property_value_definition acts as describing_property_value for zero or more Value_association objects.

4.3.53 Value_association to Tool_part_relationship

Each Value_association refers to zero or one Tool_part_relationship in the role of described_object. Each Tool_part_relationship acts as described_object for zero or more Value_association objects.

NOTE This assertion is established through Described_object_select.

4.3.54 Value_list to Property_value

Each Value_list refers to one or more Property_value objects in the role of values. Each Property_value acts as values for zero or more Value_list objects.

5 Mapping to ISO 10303-214

This clause contains the mapping table that shows how each UoF and application object of this part of ISO 10303 (see clause 1) maps to one or more ARM constructs of ISO 10303-214. The mapping table is organized in three columns.

Column 1) Application element: Name of an application element as it appears in the application object definition in 4.2.

Column 2) Appplication element: Name of the corresponding ARM element of ISO 10303-214, the term ‘IDENTICAL MAPPING’, or the term ‘PATH’. Application object names are written in uppercase. Attribute names and assertions are listed after the application object to which they belong and are written in lower case. The term ‘IDENTICAL MAPPING’ indicates that both application objects of an

application assertion map to the same ARM element of ISO 10303-214. The term ‘PATH’ indicates that the application assertion maps to the entire reference path.

Column 3) Reference path: To describe fully the mapping of an application element, it may be necessary to specify a reference path through several related ISO 10303-214 ARM elements.

For the expression of reference paths and the relationships between ARM elements of ISO 10303-214 the following notational conventions apply:

a) ->: attribute references the entity or select type given in the following row;

b) <-: entity or select type is referenced by the attribute in the following row;

c) =>: entity is a supertype of the entity given in the following row;

d) <=: entity is a subtype of the entity given in the following row;

e) =: the string, select, or enumeration type is constrained to a choice or value;

f) { }: enclosed section constraints the reference path to satisfy an information requirement;

g) [ ]: enclosed section constrains multiple ARM elements or sections of the reference path are required to satisfy an information requirement;

h) ( ): enclosed section constrains multiple ARM elements or sections of the reference path are identified as alternatives within the mapping to satisfy an information requirement;

i) [i]: attribute is an aggregation of which a single member is given in the following row;

j) [n]: attribute is an aggregation of which member n is given in the following row.

Table 1 — Mapping table for ARM level of ISO 10303-214

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
Application_context	IDENTICAL MAPPING	
life_cycle_stage	Application_context.life_cycle_-stage	
application_domain	Application_context.application_domain	
Application_property	General_property	
Assembly_definition	IDENTICAL MAPPING	
assembly_type	Assembly_definition.assembly_-type	
Assembly_relationship	Assembly_component_-relationship	
Assembly_relationship to Part_definition (as part_in_assembly)	PATH	Assembly_component_relationship<= Item_definition_instance_relationship Item_definition_instance_relationship.related-> Item_instance Item_instance.definition-> Instance_definition_select Instance_definition_select=Design_discipline_-item_definition Design_discipline_item_definition
Assembly_relationship to Assembly_definition (as assembly)	PATH	Assembly_component_relationship.relating-> Assembly_definition
Baseplate	PATH	Item {[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='baseplate'] [Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='part']}
Basic_material	PATH	Item {Item<- Specific_item_classification.associated_item Specific_item_classification.-classification_name='basic material'}
Bearing	PATH	Item {[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='bearing'] [Item<- Specific_item_classification.associated_item Specific_item_classification

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
		Specific_item_classification.-classification_name='part']}
Bearing_bearing	PATH	General_item_definition_relationship {General_item_definition_relationship.-relation_type='bearing bearing'}
Belt_or_chain	PATH	Item {[Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='belt or chain'] [Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='part']}
Bevel_or_hypoid_gear	PATH	Item {[Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='bevel or hypoid gear'] [Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='part']}
Bevel_or_hypoid_gear_pair	PATH	General_item_definition_relationship {General_item_definition_relationship.-relation_type='bevel or hypoid gear pair'}
Clutch_or_brake	PATH	Item {[Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='clutch or brake'] [Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='part']}
Coordinate_definition	PATH	Value_list {Value_list<= Property_value Property_value.name='coordinate definition'}
Coordinate_definition to Value_with_unit (as values)	PATH	Value_list.values[i]-> Property_value=> Value_with_unit
Coupling	PATH	Item {[Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='coupling']

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
		[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='part']}
Crossed_helical_gear	PATH	Item {[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='crossed helical gear'] [Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='part']}
Crossed_helical_gear_pair	PATH	General_item_definition_relationship {General_item_definition_relationship. relation_type='crossed helical gear pair'}
Cylindrical_gear	PATH	Item {[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='cylindrical gear'] [Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='part']}
Cylindrical_gear_pair	PATH	General_item_definition_relationship {General_item_definition_relationship. relation_type='cylindrical gear pair'}
Data_environment	IDENTICAL MAPPING	
environment_name	Data_environment.- environment_name	
Deformation_shift_bending	PATH	General_property {General_property.property_type= 'deformation shift bending'}
Direction_definition	PATH	Value_list {Value_list<= Property_value Property_value.name='direction definition'}
Direction_definition to Value_with_unit (as values)	PATH	Value_list.values[i]-> Property_value=> Value_with_unit
Document_assignment #1:(if Tool_part_relationship is used with Uof S8 of ISO 10303-214) #2:(if Tool_part_relationship is	IDENTICAL MAPPING	

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
used without Uof S8 of ISO 10303-214)		
role	Document_assignment.role	
Document_assignment to Assembly_relationship (as is_assigned_to)	PATH	Document_assignment.is_assigned_to-> Documented_element_select Documented_element_select=Assembly_-component_relationship Assembly_component_relationship
Document_assignment to Partial_part_shape_definition (as is_assigned_to)	PATH	Document_assignment.is_assigned_to-> Documented_element_select Documented_element_select=Documented_-sub_element_select Documented_sub_element_select Documented_sub_element_select=Shape_-element Shape_element
Document_assignment to Part_definition (as is_assigned_to)	PATH	Document_assignment.is_assigned_to-> Documented_element_select Documented_element_select=Design_-discipline_item_definition Design_discipline_item_definition
Document_assignment to Part_definition_relationship (as is_assigned_to)	PATH	Document_assignment.is_assigned_to-> Documented_element_select Documented_element_select=Item_definition_-relationship Item_definition_relationship
Document_assignment to Part_shape_definition (as is_assigned_to)	PATH	Document_assignment.is_assigned_to-> Documented_element_select Documented_element_select=Item_shape Item_shape
Document_assignment to Tool_part_relationship (as is_assigned_to)	PATH	Document_assignment.is_assigned_to-> Documented_element_select Documented_element_select=Item_definition_-relationship Item_definition_relationship #1:(Item_definition_relationship=> Tool_part_relationship) #2:(Item_definition_relationship=> General_item_definition_relationship {General_item_definition_-relationship.relation_type='Tool part'})
Dynamic	PATH	General_property {General_property.property_type='dynamic'}
Efficiency_loss	PATH	General_property {General_property.property_type='efficiency loss'}
Environment	PATH	General_property {General_property.property_type='environment'}
External_geometric_model	IDENTICAL MAPPING	
Fit_of_key_assembly	PATH	Item

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
		{[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='fit of key assembly'] [Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='part']}
Fitting_key	PATH	Item {[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='fitting key'] [Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='part']}
Functional_relationship	General_item_definition_- relationship	
Gear	PATH	Item {[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='gear'] [Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='part']}
Gear_pair	General_item_definition_- relationship	
Gear_unit	PATH	Item {[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='gear unit'] [Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='part']}
General_gear_pair	General_item_definition_- relationship	
gearpair_type	General_item_definition_- relationship.relation_type	
General_property	IDENTICAL MAPPING	

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
property_type	General_property.property_type	
Geometric_model	IDENTICAL MAPPING	
Geometry_property	General_shape_dependent_-property	
property_type	PATH	{(General_shape_dependent_property.-property_type) (General_shape_dependent_property.-property_type=Table B.5 — Geometry_property -values)}
property_value	General_shape_dependent_-property.propery_value	
value_determination	PATH	General_shape_dependent_property<= Shape_dependent_property Shape_dependent_property.value_determination
Geometry_property to Part_shape_definition (as described_object)	PATH	General_shape_dependent_property<= Shape_dependent_property.described_-element-> Shaped_element_select Shaped_element_select=Item_shape Item_shape
Geometry_property to Partial_part_shape_definition (as described_object)	PATH	General_shape_dependent_property<= Shape_dependent_property.described_-element-> Shaped_element_select Shaped_element_select=Shape_element Shape_element
Hardness	IDENTICAL MAPPING	
description	Hardness.description	{(Hardness.description) (Hardness.description=Table B.6 — Hardness -values)}
environment_condition	Hardness.environment_condition	
measuring_method	Hardness.measuring_method	
Hardness to Value_with_unit (as hardness_value)	PATH	Hardness.hardness_value-> Value_with_unit
Housing	PATH	Item {[Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='housing'] [Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='part']}

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
Housing_baseplate	PATH	General_item_definition_relationship {General_item_definition_relationship. relation_type='housing baseplate'}
Housing_bearing	PATH	General_item_definition_relationship {General_item_definition_relationship. relation_type='housing bearing'}
Housing_clutch_or_brake	PATH	General_item_definition_relationship {General_item_definition_relationship. relation_type='housing clutch or brake'}
Housing_coupling	PATH	General_item_definition_relationship {General_item_definition_relationship. relation_type='housing coupling'}
Housing_sealing	PATH	General_item_definition_relationship {General_item_definition_relationship. relation_type='housing sealing'}
Interference_fit_assembly	PATH	Item {[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='interference fit assembly'] [Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='part']}
Life_time	PATH	General_property {General_property.property_type='life time'}
Load_capacity	PATH	General_property {General_property.property_type='load capacity'}
Lubricant	PATH	Item {Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='lubricant'}
Lubricant_definition	Material	
Lubricant_part	PATH	General_item_definition_relationship {General_item_definition_relationship. relation_type='lubricant part'}
Manufacturing	PATH	General_property {General_property.property_type= 'manufacturing'}
Material_definition #1: if the Material_definition serves for a Material #2: if the Material_definition is a Lubricant_definition that serves for a Lubricant	Material	

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
material_name	Material.material_name	
Material_definition to Part_definition (as described_object)	PATH	Material.described_element-> Item_property_select Item_property_select=Design_discipline_item_-definition Design_discipline_item_defintion #1:({Design_disipline_item_definition.-associated_item_version-> Item_version Item_version.associated_item-> Item Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='basic_material'}) #2:({Design_disipline_item_definition.-associated_item_version-> Item_version Item_version.associated_item-> Item Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='lubricant'})
Material_part	PATH	General_item_definition_relationship {General_item_definition_relationship.-relation_type='material part'}
Material_property	IDENTICAL MAPPING	
property_name	Material_property.property_-name	
Material_property_association	IDENTICAL MAPPING	
Material_property_association to Material_definition (as decribed_material)	PATH	Material_property_association.described_-material-> Material
Material_property_association to Material_property_value_definition (as associated_property_value)	PATH	Material_property_association.associated_-property_value-> Material_property_value_representation
Material_property_value_definition	Material_property_value_-representation	
Material_property_value_definition to Data_environment (as environment_condition)	PATH	Material_property_value_representation.-environment_-condition-> Data_environment
Material_property_value_definition to Material_property (as property_definition)	PATH	Material_property_value_representation.-definition-> Material_property

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
Mesh	PATH	General_property {General_property.property_type='mesh'}
Numerical_value	IDENTICAL MAPPING	
value_component	Numerical_value.value_-component	
Parameter_property	PATH	General_property {General_property.property_type='parameter'}
Part	Item	
id	Item.id	
name	Item.name	
Partial_document_assignment	IDENTICAL MAPPING	
document_portion	Partial_document_assignment.-document_portion	
Partial_part_shape_definition	Shape_element	
shape_name	PATH	{(Shape_element.element_name) (Shape_element.element_name='borehole') (Shape_element.element_name='chain link') (Shape_element.element_name='disk') (Shape_element.element_name='first helix') (Shape_element.element_name='flank') (Shape_element.element_name='friction material carrier') (Shape_element.element_name='friction surface') (Shape_element.element_name='inner disk') (Shape_element.element_name='left flank') (Shape_element.element_name='modification') (Shape_element.element_name='modification right flank') (Shape_element.element_name='modification second helix') (Shape_element.element_name='modification right flank second helix') (Shape_element.element_name='outer disk') (Shape_element.element_name='planet carrier') (Shape_element.element_name='rolling element') (Shape_element.element_name='right flank') (Shape_element.element_name='rim') (Shape_element.element_name='root') (Shape_element.element_name='second helix') (Shape_element.element_name='shaft section') (Shape_element.element_name='tooth')}
Partial_part_shape_definition to Part_shape_definition (as partial_shape_of)	PATH	Shape_element.composition-> Item_shape
Part_definition	Design_discipline_item_-definition	

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
id	Design_discipline_item_-definition.id	
Part_definition to Application_context (as additional_context)	PATH	Design_discipline_item_definition.-additional_context-> Application_context
Part_definition to Application_context (as initial_context)	PATH	Design_discipline_item_definition.initial_-context-> Application_context
Part_definition to Part_version (as applies_to_version)	PATH	Design_discipline_item_definition.associated_-item_version-> Item_version
Part_definition_relationship	Item_definition_relationship	
Part_definition_relationship to Part_definition (as first_part_definition)	PATH	Item_definition_relationship.related-> Design_discipline_item_definition
Part_definition_relationship to Part_definition (as second_part_definition)	PATH	Item_definition_relationship.relating-> Design_discipline_item_definition
Part_instance	Item_instance	
id	Item_instance.id	
Part_instance to Part_definition (as definition)	PATH	Item_instance.definition-> Instance_definition_select Instance_definition_select=Design_discipline_-item_definition Design_discipline_item_defintion
Part_shape_definition	Item_shape	
Part_shape_definition to Part_definition (as described_object)	PATH	Item_shape.described_element-> Item_information_select Item_information_select=Design_discipline_-item_definition Design_discipline_item_definition
Part_shape_definition to Part_instance (as described_object)	PATH	Item_shape.described_element-> Item_information_select Item_information_select=Item_instance Item_instance
Part_version	Item_version	
id	Item_version.id	
Part_version to Part (as applies_to_part)	PATH	Item_version.associated_item-> Item
Pinion_shaft	PATH	Item {[Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
		classification_name='pinion shaft'] [Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='part']}
Placement_reference_- relationship	PATH	{Property_value_representation_- relationship.relation_type='placement reference'}
Placement_reference_- relationship to Position_orientation_property_- value_definition (as related)	PATH	{Property_value_representation_- relationship.relation_type='placement reference'} Property_value_representation_relationship.- related-> Property_value_definition
Placement_relationship	PATH	Property_value_representation_relationship {Property_value_representation_- relationship.relation_type='placement'}
Placement_relationship to Position_orientation_property_- value_definition (as relating)	PATH	Property_value_representation_relationship {Property_value_representation_- relationship.relation_type='placement'} Property_value_representation_relationship.- relating-> Property_value_representation
Placement_relationship to Property_value_definition (as related)	PATH	Property_value_representation_relationship {Property_value_representation_- relationship.relation_type='placement'} Property_value_representation_relationship.- related-> Property_value_representation
Plain_bearing	PATH	Item {[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='plain bearing'] [Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='part']}
Planetary_gear_train	PATH	Item {[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='planetary gear train'] [Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='part']}
Position_orientation_property	PATH	General_property {General_property.property_type='position orientation'}

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
Position_orientation_property_-value	Value_list	
Position_orientation_property_value to Coordinate_definition (as position)	PATH	Value_list.values[0]-> Property_value=> Value_list {Value_list<= Property_value Property_value.name='coordinate definition'}
Position_orientation_property_value to Direction_definition (as direction)	PATH	Value_list.values[1]-> Property_value=> Value_list {Value_list<= Property_value Property_value.name='direction definition'}
Position_orientation_property_value to Direction_definition (as reference_direction)	PATH	Value_list.values[2]-> Property_value=> Value_list {Value_list<= Property_value Property_value.name='direction definition'}
Position_orientation_property_-value_definition	Property_value_representation	
Position_orientation_property_-value_definition to Position_orientation_property (as property_definition)	PATH	Property_value_representation.definition-> Property=> General_property {General_property.property_type='position orientation'}
Position_orientation_property_-value_definition to Position_orientation_property_-value (as specified_value)	PATH	Property_value_representation.specified_-value-> Value_list
Power_rotation_speed	PATH	General_property {General_property.property_type='power rotation speed'}
Pressure_stress	PATH	General_property {General_property.property_type='pressure stress'}
Property	IDENTICAL MAPPING	
id	Property.id	
Property to Unit (as allowed_unit)	PATH	Property.allowed_unit-> Unit
Property_value #1: if Property_value is referenced by a Property_value_definition which is referencing a Deformation_shift_bending in its definition attribute	IDENTICAL MAPPING	

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
#2: if Property_value is referenced by a Property_value_definition which is referencing a Dynamic in its definition attribute #3: if Property_value is referenced by a Property_value_definition which is referencing an Efficiency_loss in its definition attribute #4: if Property_value is referenced by a Property_value_definition which is referencing an Environment in its definition attribute #5: if Property_value is referenced by a Property_value_definition which is referencing a Life_time in its definition attribute #6: if Property_value is referenced by a Property_value_definition which is referencing a Load_capacity in its definition attribute #7: if Property_value is referenced by a Property_value_definition which is referencing a Manufacturing in its definition attribute #8: if Property_value is referenced by a Property_value_definition which is referencing a Mesh in its definition attribute #9: if Property_value is referenced by a Property_value_definition which is referencing a Parameter_property in its definition attribute #10: if Property_value is referenced by a Property_value_definition which is referencing a Power_rotation_speed in its definition attribute #11: if Property_value is referenced by a Property_value_definition which is referencing a Pressure_stress in its definition attribute #12: if Property_value is referenced by a Property_value_definition which		

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
is referencing a Safety in its definition attribute #13: if Property_value is referenced by a Property_value_definition which is referencing a Service_property in its definition attribute #14: if Property_value is referenced by a Property_value_definition which is referencing a Sliding_wear in its definition attribute #15: if Property_value is referenced by a Property_value_definition which is referencing a Specification_property in its definition attribute #16: if Property_value is referenced by a Property_value_definition which is referencing a Stiffness_suspension in its definition attribute #17: if Property_value is referenced by a Property_value_definition which is referencing a Temperature in its definition attribute #18: if Property_value is referenced by a Property_value_definition which is referencing a Torque_force in its definition attribute		
value_name	PATH	{(Property_value.value_name) #1:(Property_value.value_name= Table B.1 - values) (Property_value.value_name) #2:(Property_value.value_name= Table B.2 - values) (Property_value.value_name) #3:(Property_value.value_name= Table B.3 - values) (Property_value.value_name) #4:(Property_value.value_name= Table B.4 - values) (Property_value.value_name) #5:(Property_value.value_name= Table B.7 - values) (Property_value.value_name) #6:(Property_value.value_name= Table B.8 - values) (Property_value.value_name= Table B.9 - values) (Property_value.value_name) #7:(Property_value.value_name= Table B.10 - values)

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
		(Property_value.value_name) #8:(Property_value.value_name= Table B.11 - values) (Property_value.value_name) #9:(Property_value.value_name= Table B.12 - values) (Property_value.value_name) #10:(Property_value.value_name= Table B.13 - values) (Property_value.value_name) #11:(Property_value.value_name= Table B.14 - values) (Property_value.value_name) #12:(Property_value.value_name= Table B.15 - values) (Property_value.value_name) #13:(Property_value.value_name= Table B.16 - values) (Property_value.value_name) #14:(Property_value.value_name= Table B.17 - values) (Property_value.value_name) #15:(Property_value.value_name= Table B.18 - values) (Property_value.value_name) #16:(Property_value.value_name= Table B.19 - values) (Property_value.value_name) #17:(Property_value.value_name= Table B.21 - values) (Property_value.value_name) #18:(Property_value.value_name= Table B.22 - values) (Property_value.value_name)}
Property_value_definition	Property_value_representation	
value_determination	Property_value_representation.-value_determination	
Property_value_definition to Property (as definition)	PATH	Property_value_representation.definition-> Property
Property_value_definition to Property_value (as specified_value)	PATH	Property_value_representation.specified_-value-> Property_value
Rolling_element_bearing	PATH	Item {[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='rolling element bearing'] [Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='part']}
Safety	PATH	General_property {General_property.property_type='safety'}

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
Sealing	PATH	Item {[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='sealing'] [Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='part']}
Service_property	PATH	General_property {General_property.property_type='service'}
Shape_description_association	IDENTICAL MAPPING	
Shape_description_association to External_geometric_model (as defining_geometry)	PATH	Shape_description_association.defining_- -geometry->- Shape_definition_select Shape_definition_select=External_geometric_- model External_geometric_model
Shape_description_association to Geometric_model (as defining_geometry)	PATH	Shape_description_association.defining_- geometry->- Shape_definition_select Shape_definition_select=Geometric_model Geometric_model
Shape_description_association to Partial_part_shape_definition (as is_defining_shape_for)	PATH	Shape_description_association.is_defining_- shape_for->- Shape_information_select Shape_information_select=Shaped_element_- select Shaped_element_select Shaped_element_select=Shape_element Shape_Element
Shape_description_association to Part_shape_definition (as is_defining_shape_for)	PATH	Shape_description_association.is_defining_- shape_for->- Shape_information_select Shape_information_select=Shaped_element_- select Shaped_element_select Shaped_element_select=Item_shape Item_shape
Shaft	PATH	Item {[Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='shaft'] [Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='part']}
Shaft_bearing	PATH	General_item_definition_relationship

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
		{General_item_definition_relationship.-relation_type='shaft bearing'}
Shaft_clutch_or_brake	PATH	General_item_definition_relationship {General_item_definition_relationship.-relation_type='shaft clutch or brake'}
Shaft_collar	PATH	General_item_definition_relationship {General_item_definition_relationship.-relation_type='shaft collar'}
Shaft_sealing	PATH	General_item_definition_relationship {General_item_definition_relationship.-relation_type='shaft sealing'}
Shaft_shaft	PATH	General_item_definition_relationship {General_item_definition_relationship.-relation_type='shaft shaft'}
Shaft_wheel	PATH	General_item_definition_relationship {General_item_definition_relationship.-relation_type='shaft wheel'}
Single_part_definition	Design_discipline_item_-definition	
Sliding_wear	PATH	General_item_definition_relationship {General_property.property_type='sliding wear'}
Specification_property	PATH	General_item_definition_relationship {General_property.property_type='specification'}
Stiffness_suspension	PATH	General_item_definition_relationship {General_property.property_type= 'stiffness suspension'}
String_value	IDENTICAL MAPPING	
value_specification	String_value.value_specification	
Surface_condition	IDENTICAL MAPPING	
Surface_condition_association	IDENTICAL MAPPING	
Surface_condition_association to Part_shape_definition (as described_object)	PATH	Surface_condition_association.described_-element-> Shaped_element_select Shaped_element_select=Item_shape Item_shape
Surface_condition_association to Partial_part_shape_definition (as described_object)	PATH	Surface_condition_association.described_-element-> Shaped_element_select Shaped_element_select=Shape_element Shape_element
Surface_condition_association to Surface_condition (as describing_surface_condition)	PATH	Surface_condition_association.describing_-surface_condition-> Surface_condition

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
Surface_texture	IDENTICAL MAPPING	
measuring_method	Surface_texture.measuring_-method	
Surface_texture_parameter	IDENTICAL MAPPING	
parameter_name	PATH	{(Surface_texture_parameter.parameter_name) (Surface_texture_parameter.parameter_name= Table B.20 - values)}
Surface_texture_parameter to Surface_texture (as described_texture)	PATH	Surface_texture_parameter.described_texture-> Texture_select Texture_select=Surface_texture Surface_texture
Surface_texture_parameter to Value_with_unit (as parameter_value)	PATH	Surface_texture_parameter.parameter_value-> Value_with_unit
Temperature	PATH	General_property {General_property.property_type='temperature'}
Tool	PATH	Item {Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='tool'}
Tool_part_relationship #1:(if Tool_part_relationship is used with Uof S8 of ISO 10303-214) #2:(if Tool_part_relationship is used without Uof S8 of ISO 10303-214)	#1:(IDENTICAL MAPPING) #2:(PATH)	#2:(General_item_definition_realtionship {General_item_definition_-relationship.relation_type='Tool part'})
production_technology	PATH	#1:(Tool_part_relationship.used_technology_-description) #2:(General_item_definition_relationship.-description)
Tool_part_relationship to Part_definition (as produced_part)	PATH	#1:(Tool_part_relationship<= Item_definition_relationship) #2:(General_item_definition_relationship<= Item_definition_relationship) Item_definition_relationship.relating-> Design_discipline_item_definition
Tool_part_relationship to Tool (as used_tool)	PATH	#1:(Tool_part_relationship<= Item_definition_relationship) #2:(General_item_definition_relationship<= Item_definition_relationship) Item_definition_relationship.related-> Design_discipline_item_definition {Design_disipline_item_definition.associated_-item_version-> Item_version Item_version.associated_item-> Item

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
		Item<- Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.- classification_name='tool'|}
Torque_force	PATH	General_property {General_property.property_type='torque force'}
Unit	IDENTICAL MAPPING	
unit_name	Unit.unit_name	
User_defined_part	PATH	Item {Item<- Specific_item_classification.associated_item Specific_item_classification.- classification_name='part'}
part_type	PATH	Item<- Specific_item_classification.associated_item Specific_item_classification.- classification_name
User_defined_relationship	General_item_definition_- relationship	
relation_type	General_item_definition_- relationship.relation_type	
Value_association #1:(if Tool_part_relationship is used with Uof S8 of ISO 10303-214) #2:(if Tool_part_relationship is used without Uof S8 of ISO 10303-214)	Item_property_association	
Value_association to Assembly_relationship (as described_object)	PATH	Item_property_association.described_element-> Item_property_select Item_property_select=Item_definition_instance_- relationship Item_definition_instance_relationship=> Assembly_component_relationship
Value_association to Part_definition_relationship (as_described_object)	PATH	Item_property_association.described_element-> Item_property_select Item_property_select=Item_definition_instance_- relationship Item_definition_instance_relationship=> Item_definition_relationship=> General_item_definition_relationship
Value_association to Part_definition (as described_object)	PATH	Item_property_association.described_element-> Item_property_select Item_property_select=Design_discipline_item_- definition Design_discipline_item_definition
Value_association to Partial_part_shape_definition	PATH	Item_property_association.described_element-> Item_property_select

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
(as described_object)		Item_property_select=Shape_element Shape_element
Value_association to Part_shape_definition (as described_object)	PATH	Item_property_association.described_element->Item_property_select Item_property_select=Item_shape Item_shape
Value_association to Tool_part_relationship (as described_object)	PATH	Item_property_association.described_element->Item_property_select Item_property_select=Item_definition_-relationship Item_definition_relationship {#1:(Item_definition_relationship=>Tool_part_relationship) #2:(Item_definition_relationship=>General_item_definition_relationship {General_item_definition_-relationship.relation_type='tool part'})}
Value_association to Property_value_definition (as describing_property_value)	PATH	Item_property_association<=Property_value_association Property_value_association.describing_-property_value->Property_value_representation
Value_limit	IDENTICAL MAPPING	
limit	Value_limit.limit	
limit_qualifier	Value_limit.limit_qualifier	
Value_list	IDENTICAL MAPPING	
Value_list to Property_value (as values)	PATH	Value_list.values->Property_value
Value_range	IDENTICAL MAPPING	
lower_limit	Value_range.lower_limit	
upper_limit	Value_range.upper_limit	
Value_with_unit	IDENTICAL MAPPING	
unit_component	Value_with_unit.unit_component	Value_with_unit.unit_component
Wheel	PATH	Item {[Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='wheel'] [Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='part']}
Wheel_bearing	PATH	General_item_definition_relationship {General_item_definition_relationship.-

Application element of product model for gear units	ISO 10303-214 ARM Application element	ISO 10303-214 ARM Reference path
		relation_type='wheel bearing'}
Wheel_belt_or_chain	PATH	General_item_definition_relationship {General_item_definition_relationship.-relation_type='wheel belt or chain'}
Wheel_wheel	PATH	General_item_definition_relationship {General_item_definition_relationship.-relation_type='wheel wheel'}
Worm	PATH	Item {[Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='worm'] [Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='part']}
Worm_gear_pair	PATH	General_item_definition_relationship {General_item_definition_relationship.-relation_type='worm gear pair'}
Worm_wheel	PATH	Item {[Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='worm wheel'] [Item<-Specific_item_classification.associated_item Specific_item_classification Specific_item_classification.-classification_name='part']}

6 Conformance requirements

Conformance to this part of ISO 10303 includes satisfying the requirements stated in this part and the relevant requirements of the normative references.

Conformance to this part of ISO 10303 requires conformance to one of the following conformance classes of ISO 10303-214:

— conformance class for effectivity controlled process planning of assemblies (CC13);

— conformance class for configuration controlled process planning of components and assemblies with 3D shape representation and kinematic data (CC18);

— conformance class for configuration controlled process planning of components and assemblies with 3D shape representation including form features and kinematic data (CC19);

— conformance class for data storage and retrieval systems (CC20).

Annex A

(informative)

Product model for gear units

This annex provides the product model for gear units. The product model is a graphical representation of the structure and constraints of the application objects specified in Clause 4. The graphical form of the product model is presented in EXPRESS-G. The product model is independent from any implementation method.

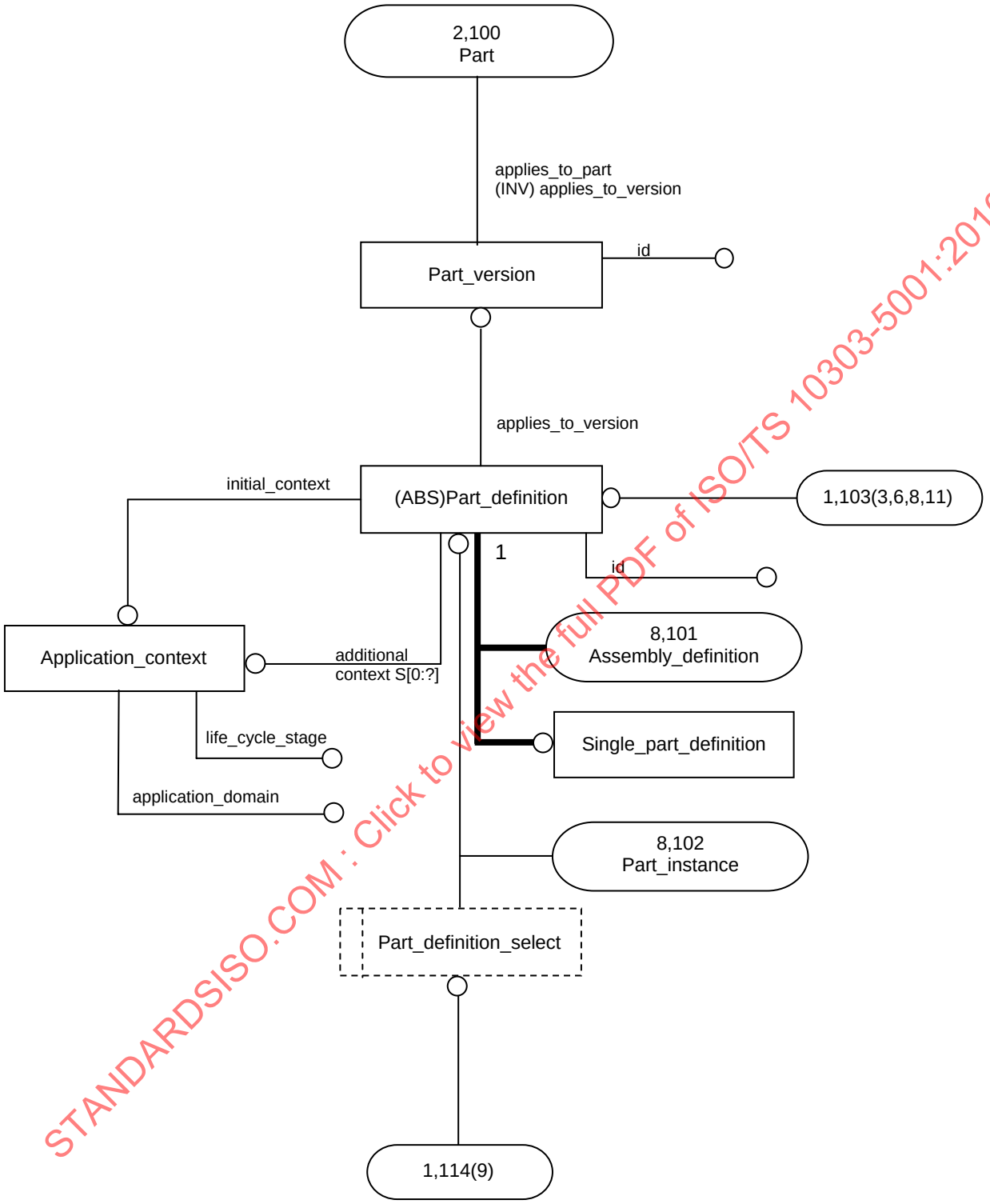

Figure A.1 — Product model for gear units EXPRESS-G diagram: 1 of 11

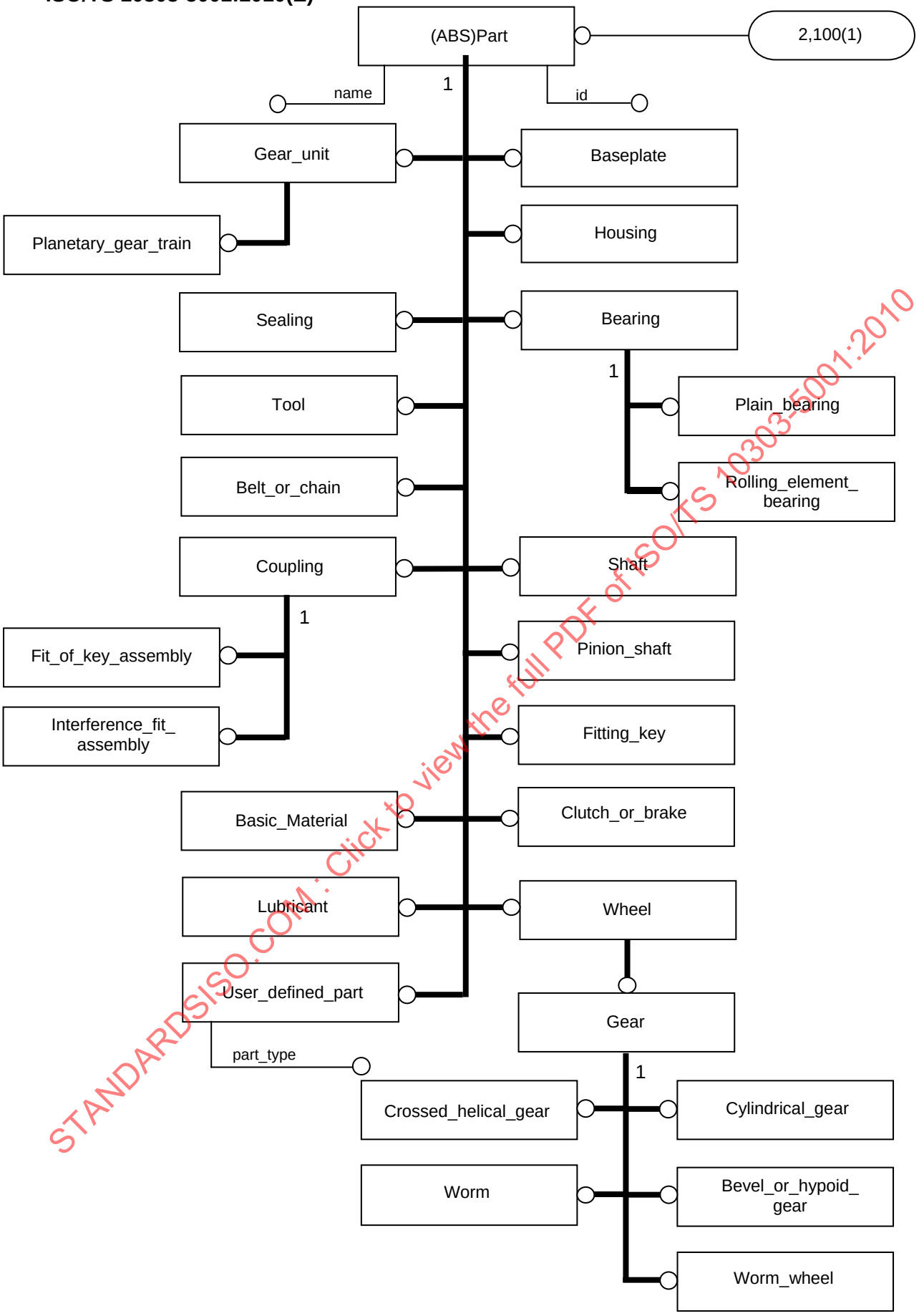

Figure A.2 — Product model for gear units EXPRESS-G diagram: 2 of 11

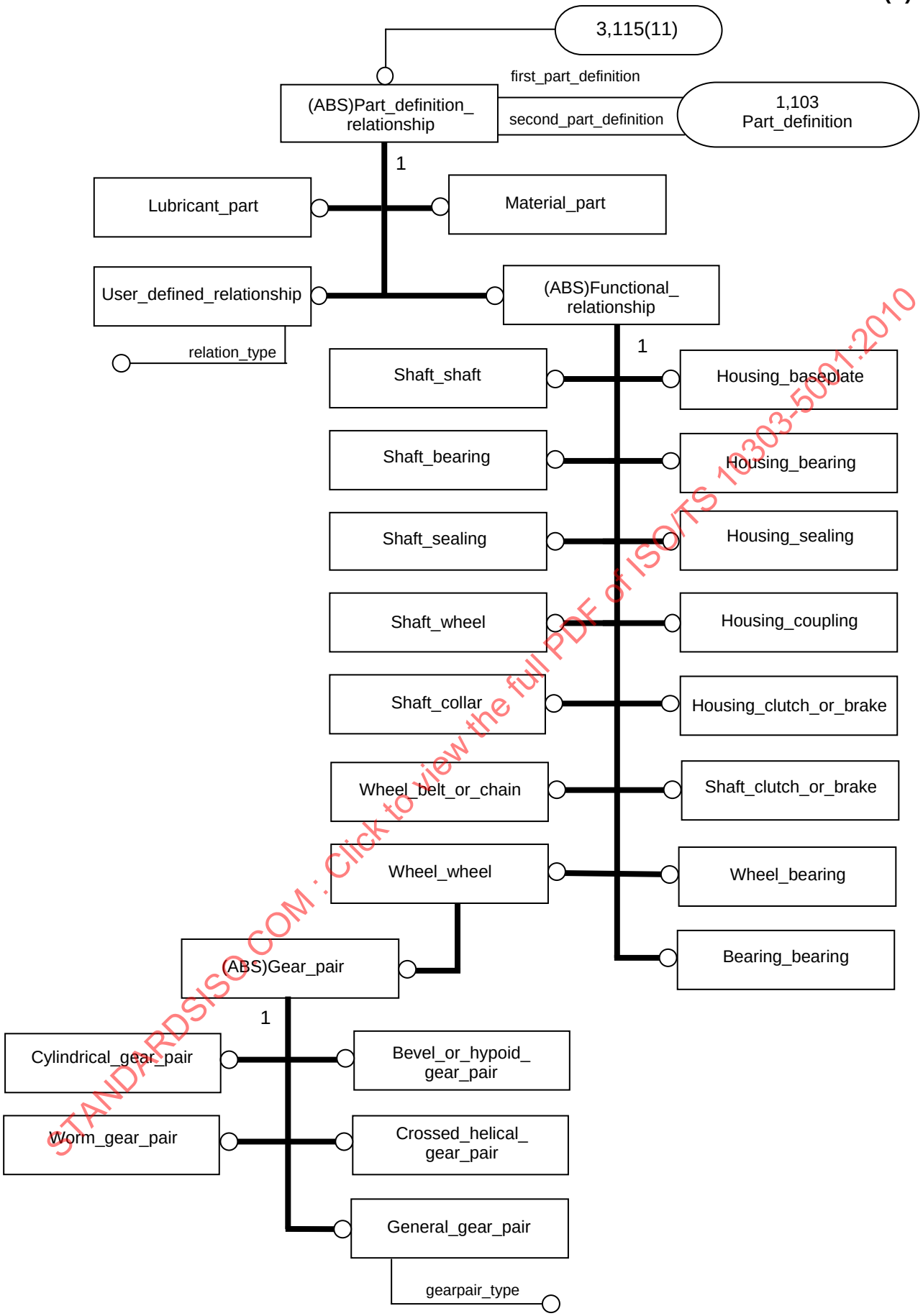

Figure A.3 — Product model for gear units EXPRESS-G diagram: 3 of 11

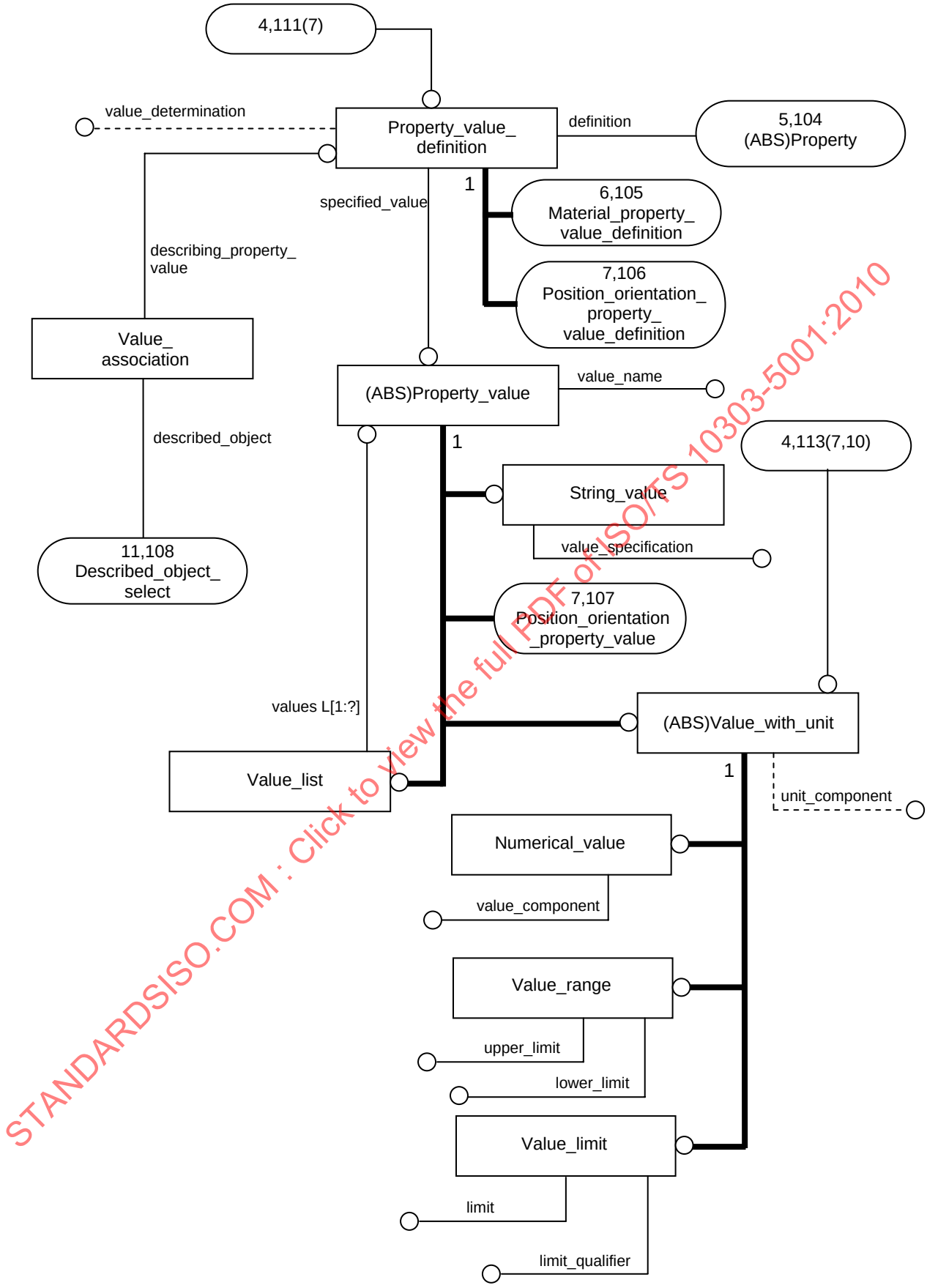

Figure A.4 — Product model for gear units EXPRESS-G diagram: 4 of 11

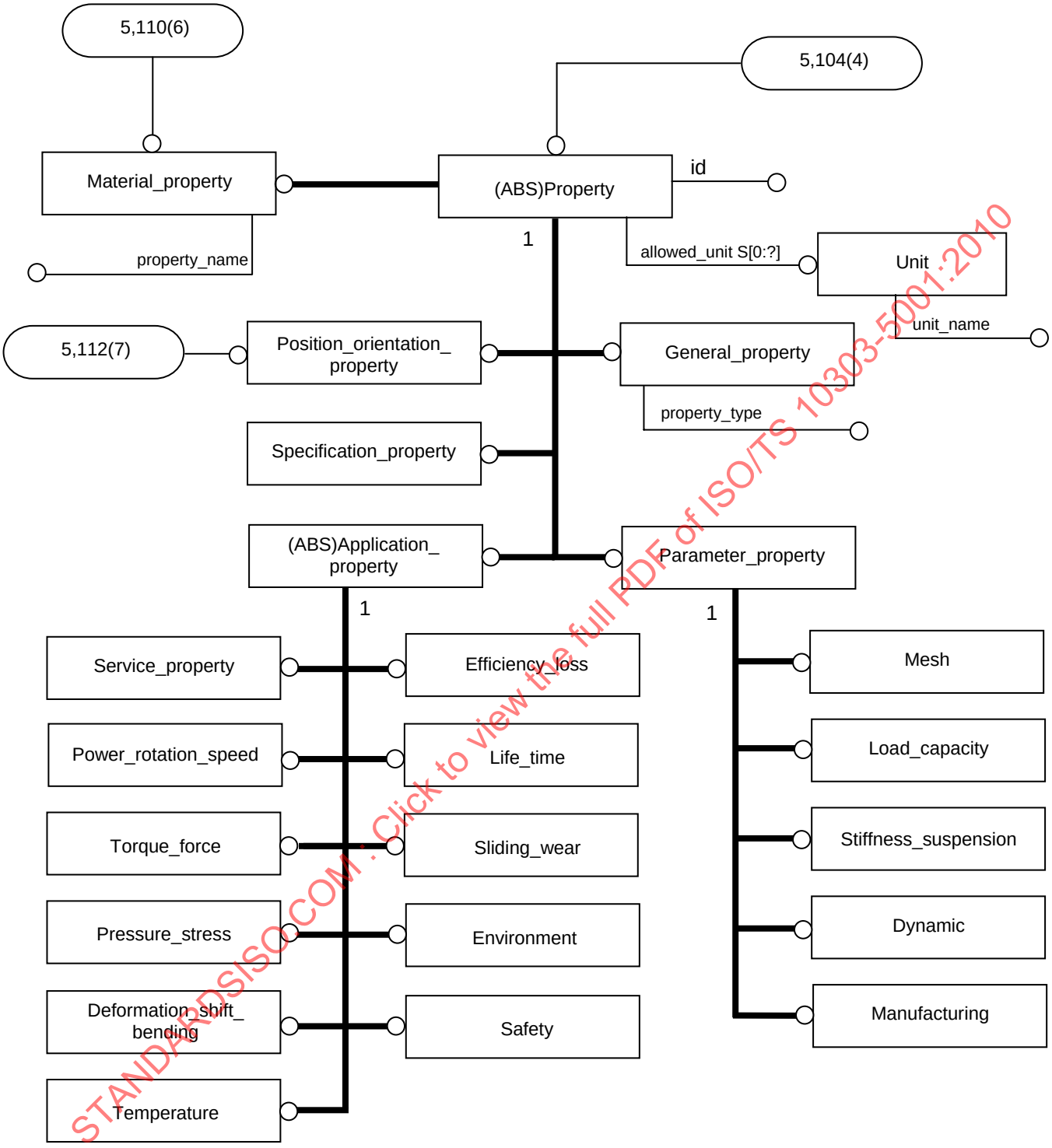

Figure A.5 — Product model for gear units EXPRESS-G diagram: 5 of 11

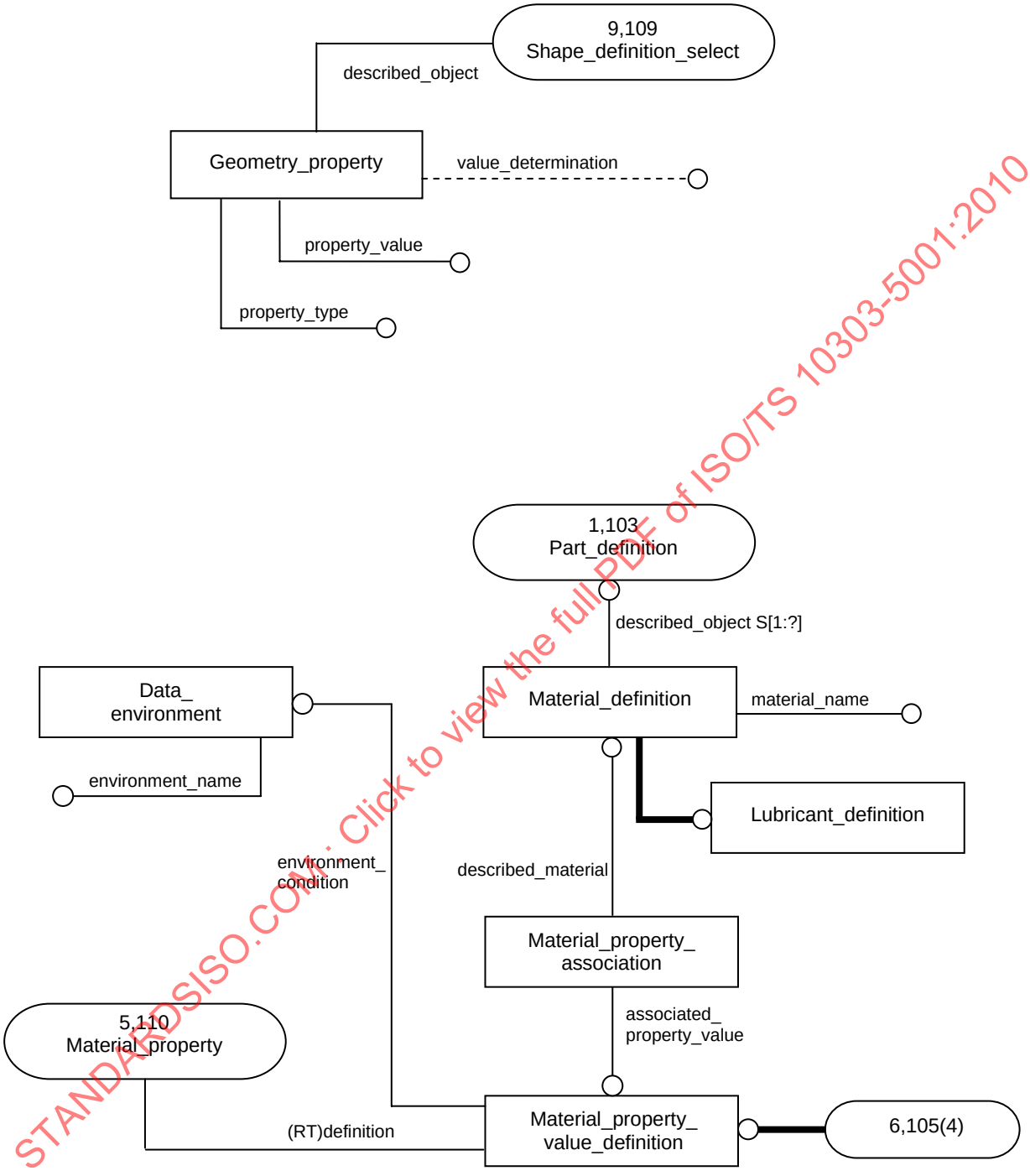

Figure A.6 — Product model for gear units EXPRESS-G diagram: 6 of 11

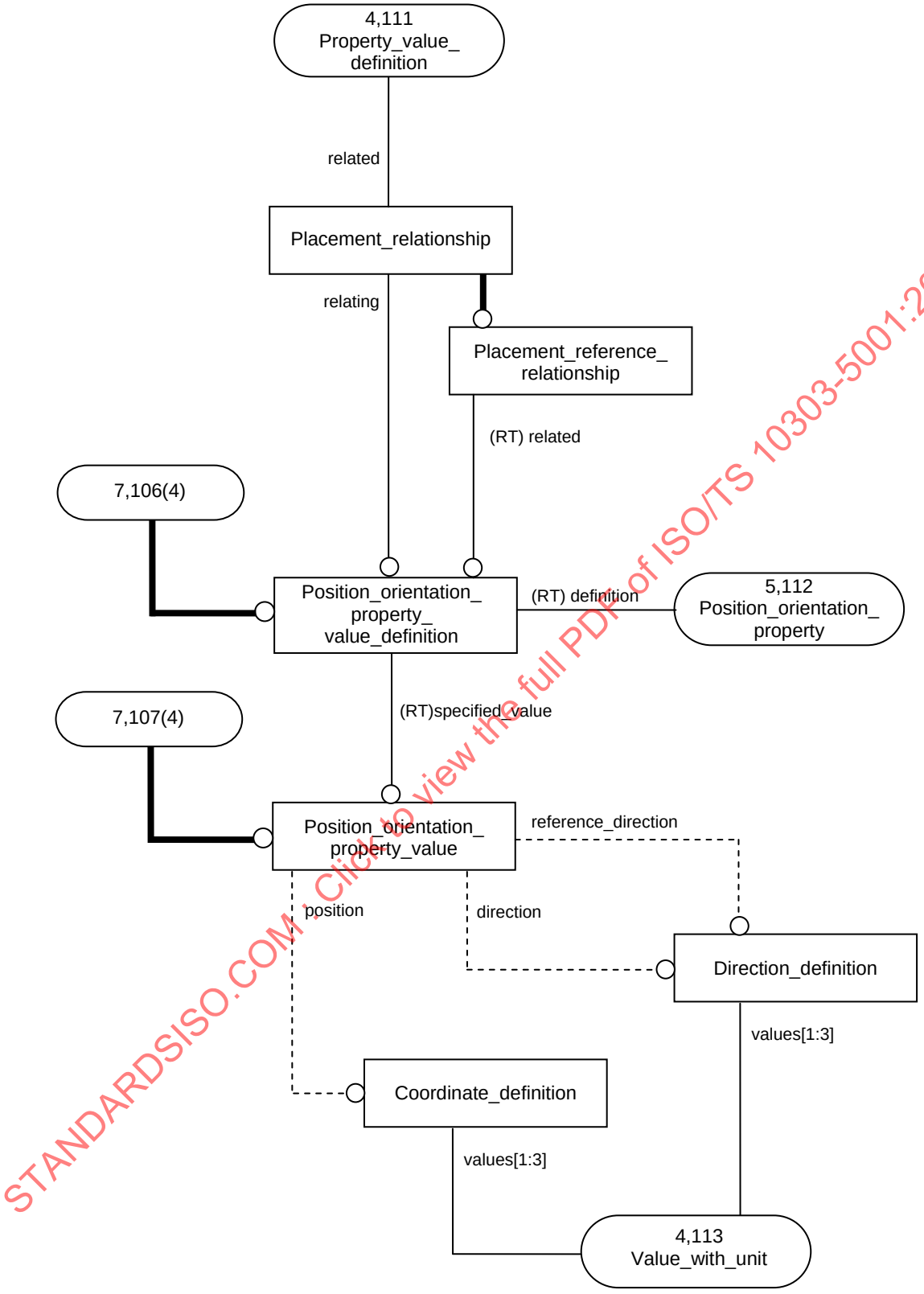

Figure A.7 — Product model for gear units EXPRESS-G diagram: 7 of 11

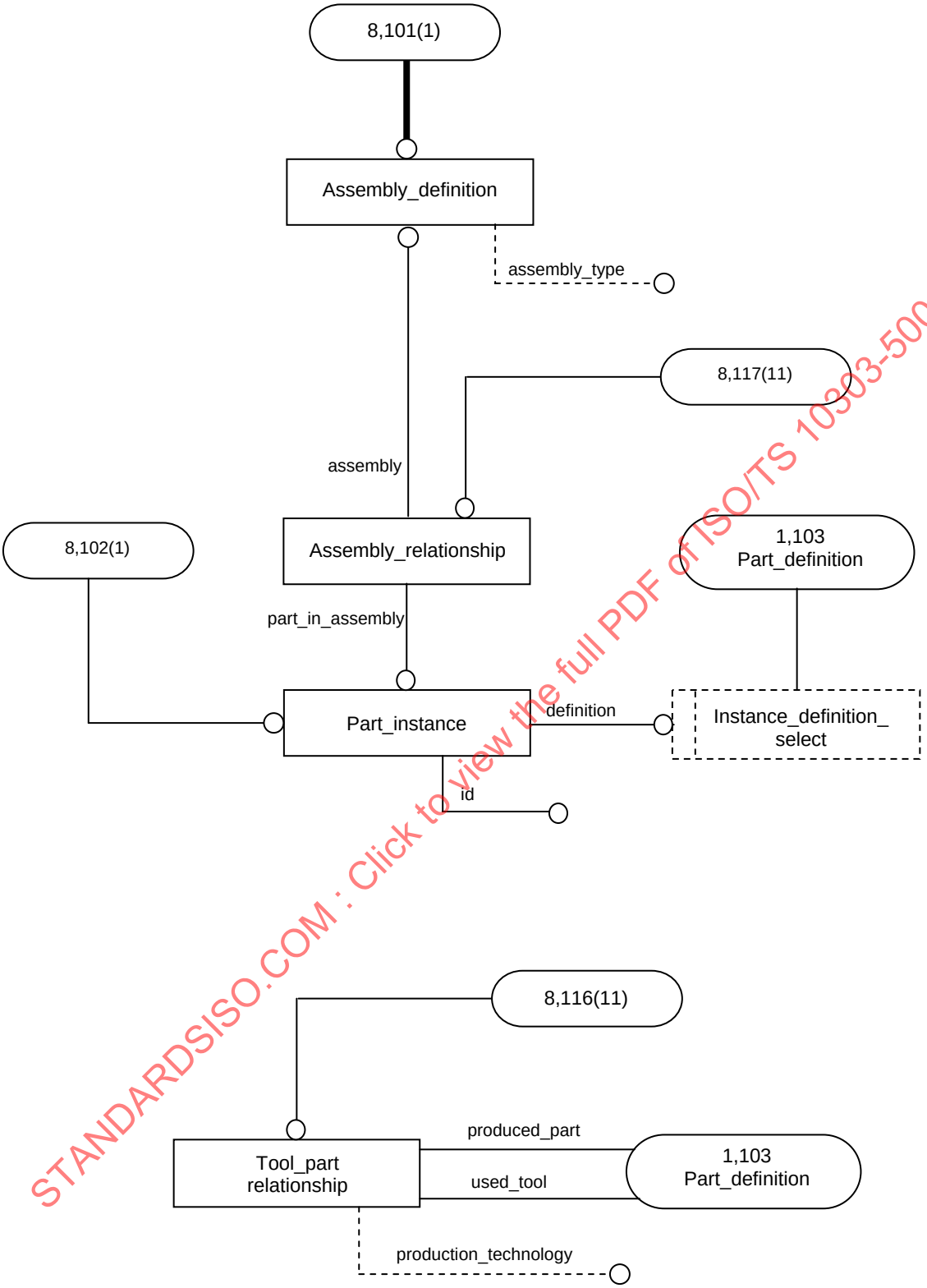

Figure A.8 — Product model for gear units EXPRESS-G diagram: 8 of 11

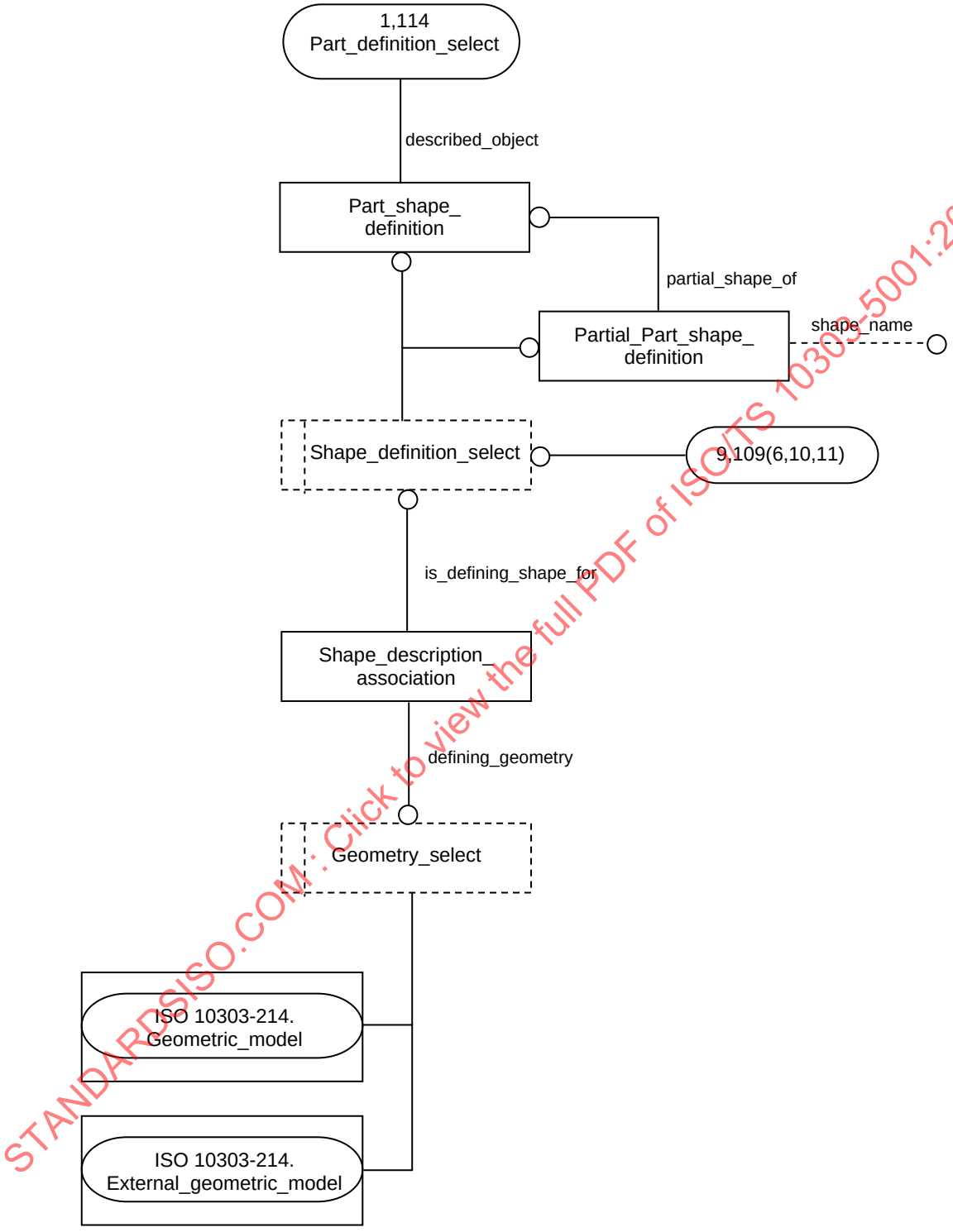

Figure A.9 — Product model for gear units EXPRESS-G diagram: 9 of 11

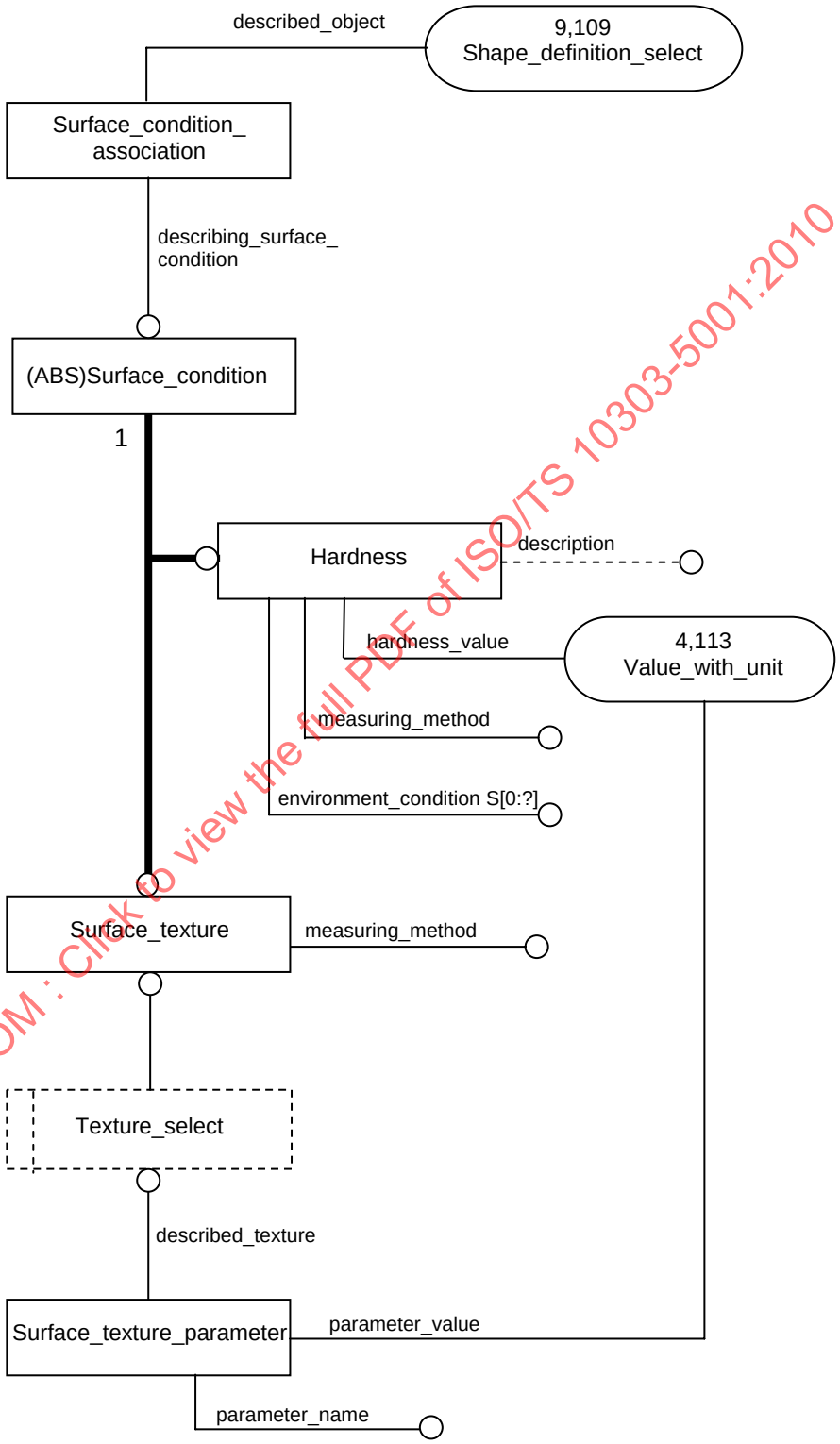

Figure A.10 — Product model for gear units EXPRESS-G diagram: 10 of 11

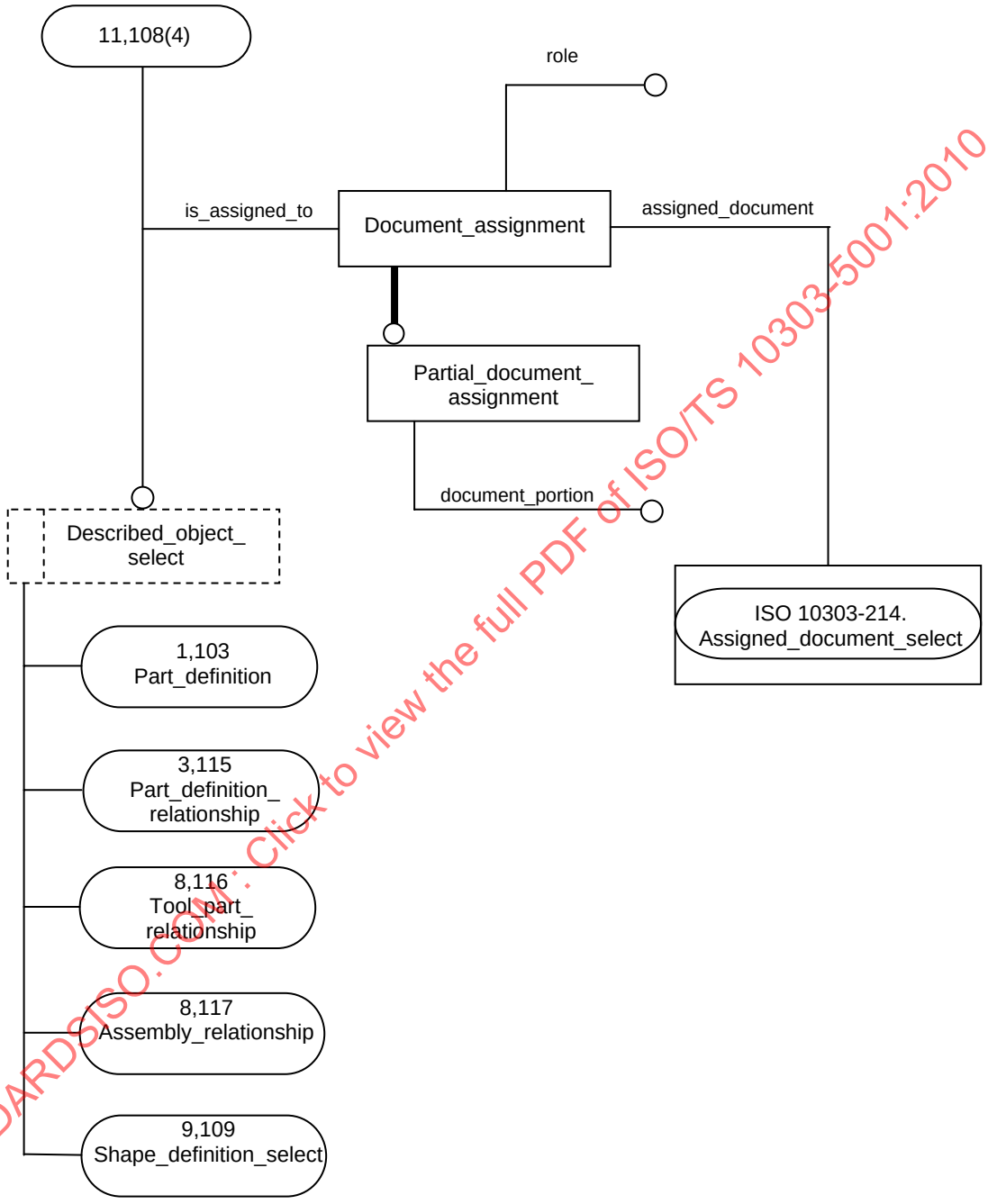

Figure A.11 — Product model for gear units EXPRESS-G diagram: 11 of 11

Annex B

(informative)

Property tables for gear units

This annex contains tables that show recommendation for properties of the product model for gear units according to figure A5, A6 and A10. The properties are listed in Tables B.1 to B.22:

The load capacity property is split into two tables for better handling. One for the load capacity factors only, the other one for the rest of the data.

The properties are not assigned to a certain object. They can be used generally for all objects. The tables give a recommendation for suitable objects (column 4).

Where applicable, the properties from Tables B.1 to B.22 should be used.

Some properties are recommended to be assigned to a gear and a gear pair as well (see column explanation). These properties are usually assigned to a gear but they are depending on each mesh. In the case of multiple contacts these properties are identified by the second assignment to the gear pair.

The user is responsible for the plausibility of the data. He has to set the rules for checking the data. Also suitable value limits and the number of digits of numerical values have to be determined by the user.

All tables are organized in four columns.

Column 1) property value name of product model for gear units

Column 2) explanation of property: If any name of a normative document is given inside this column, this means that the origin of this property is inside this document. More information about the application of the property is given there. The property can be used for any other standards as well.

Column 3) shortcut for the kind of unit:

— A: area unit;

— AN: angle unit;

— C: stiffness unit;

— D: density unit;

— F: force unit;

— G: mass unit;

— H: hardness unit;

— L: length unit;

— P: power unit;

— PR: pressure unit;

— t: time unit;

— T: temperature unit;

— v: speed unit;

— V: volume unit;

— W: energy unit;

— X: no unit (string value);

— %: no unit (numerical value).

Column 4) shortcuts for one or more objects of the product model for gear units that can be brought in conjunction with this property. For the expression of these objects the following notational conventions apply:

— b: baseplate;

— bc: belt or chain;

— bp: plain bearing;

— br: rolling element bearing;

— bx: bearing;

— b+b: bearing – bearing relationship;

— cb: clutch or brake;

— cp: coupling;

— fk: fitting key

— fka: fit of key assembly

— gb: bevel or hypoid gear;

— gch: crossed helical gear;

— gcy: cylindrical gear;

— gpb: bevel or hypoid gear pair;

— gpch: crossed helical gear pair;

— gpcy: cylindrical gear pair;

— gpg: general gear pair;

— gpw: worm gearing;

— gu: gear-unit in general;

— gw: worm;

— gx: gear in general;

— h: housing;

— h+b: housing – bearing relationship;

— h+ba: housing – baseplate relationship;

— h+cb: housing – clutch or brake relationship;

— h+cp: housing – coupling relationship;

— h+se: housing – sealing relationship;

— ifa: interference fit assembly

— l: lubricant;

— l+p: lubricant – part relationship;

— m: basic material;

— m+p: material – part relationship;

— pgu: planetary gear train;

— se: sealing;

— sh: shaft;

— shp: pinion shaft;

— s+b: shaft - bearing relationship;

— s+cb: shaft - clutch or brake relationship;

— s+co: shaft - collar relationship;

— s+s: shaft - shaft relationship;

— s+w: shaft - wheel relationship;

— t: tool;

— t+p: tool – part relationship;

— w: wheel in general (A wheel includes all kind of gears.);

— ww: worm wheel;

— w+b: wheel – bearing relationship;

— w+bc: wheel – belt or chain relationship;

— w+w: wheel – wheel relationship.

Table B.1 — Deformation shift bending

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
bending		L	bx,sh
bending expansion	expansion caused by bending (belt or chain)	L	bc
deformation		L	bx,sh
deformation of tooth		L	gx
free expansion	(belt or chain)	L	bc
inclination of bending line	inclination of bending line	AN	sh,bx,gx
initial load shift		L	b+b
offset of angle		AN	bx,sh
shift		L	bx,sh
tensile expansion		L	bc
torsional deformation		L	gx,sh
transversal deformation		L	gx,bx,sh

Table B.2 — Dynamic

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
bending damping Lehr	bending damping according to Lehr	%	gp
bending frequency		1/t	bc
damping coefficient d11		F*t/L	bx
damping coefficient d12		F*t/L	bx
damping coefficient d21		F*t/L	bx
damping coefficient d22		F*t/L	bx
damping constant		F*t/L	gp,bx,sh
excitation force		%	gp
exciting frequency		1/t	bc
lower mesh frequency crevasse curve	lower mesh frequency for calculation of crevasse curve	1/t	gp
lower mesh frequency quasi acceleration	lower mesh frequency for the calculation of quasi acceleration	1/t	gp
lower mesh frequency stationary oscillation	lower mesh frequency for the calculation of stationary oscillation	1/t	gp
lowest number of eigenvalues		%	sh
number of eigenvalues		%	sh
number of mesh periods		%	gp
outer damping coefficient		%	sc
resonance speed		1/t	gx
resonant frequency		1/t	bc
tooth force level		%	gp
torsion damping Lehr	torsion damping according to Lehr	%	gp,sh
transverse length of period		t	gp
upper limit for eigenvalues		1/t	sh
upper mesh frequency crevasse curve	upper mesh frequency for the calculation of crevasse curve	1/t	gp
upper mesh frequency quasi acceleration	upper mesh frequency for the calculation of quasi acceleration	1/t	gp
upper mesh frequency stationary oscillation	upper mesh frequency for the calculation of stationary oscillation	1/t	gp

Table B.3 — Efficiency loss

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
acceleration losses Ariura	acceleration losses according to Ariura	P	gu,gp
axial load dependent torque loss	torque loss dependent of axial load	F*L	bx,gp
bearing power loss	power loss of bearing	P	bx,gu
bearing power loss load dependent portion	load dependent portion of bearing power loss	P	bx,gu
bearing power loss load independent portion	load independent portion of bearing power loss	P	bx,gu
efficiency		%	gu,gp
efficiency friction points	efficiency of friction points	%	w+w
efficiency impact loss		%	w,bc
efficiency joint friction	efficiency of joint friction	%	w,bc
efficiency motor pump	efficiency of motor of pump	%	gu
efficiency pump	efficiency of pump	%	gu
efficiency switching equipement	efficiency of switching equipement	%	cb
friction power loss		P	gu
gear efficiency		%	gu,gp
gear power loss		P	gu,gp
gear power loss load dependent portion	load dependent portion of gear power loss	P	gu,gp
gear power loss load independent portion	load independent portion of gear power loss	P	gu,gp
idle power loss		P	gu,gp
idle power loss Eiselt	idle power loss according to Eiselt	P	gu,gp
impact power loss	power loss caused by impact (belt and chain drives)	P	w+bc
loss grade of power		P	gu
mean friction power loss		P	gu
oil squeeze losses Butsch	oil squeeze losses according to Butsch	P	gp
oil squeeze losses Mauz	oil squeeze losses according to Mauz	P	gp
other power loss		P	gu
power dependent torque loss		F*L	gu,bx
power independent torque loss		F*L	gu,gx,gp
power loss		P	gu
power loss by bearing load		P	gu
power loss by friction force		P	gu
power loss by pitch friction		P	gu
power loss load dependent portion	load dependent portion of power loss	P	gu,gp,bx
power loss load independent portion	load independent portion of power loss	P	gu,gp,bx
power loss oil pump	power loss of oil pump	P	gu
rated power loss		P	gu,gp,bx

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
sealing power loss	power loss of all sealings of gear unit	P	gu,se
shaft power loss	power loss of all shafts of gear unit	P	gu,sh
splashing loss		P	gp,gu
splashing loss Butsch	splashing loss according to Butsch	P	gp,gu
splashing loss Mauz	splashing loss according to Mauz	P	gp,gu
splashing loss Walter	splashing loss according to Walter	P	gp,gu
starting gear efficiency	gear efficiency at starting	%	gp,gu
thermal efficiency of rib		%	gu
torque loss of bearing seal	torque loss at seal of bearing	F*L	Se
total efficiency		%	gu,w,bc
total efficiency wheel	total efficiency if wheel is driving (worm gear pair)	%	gu
total efficiency worm	total efficiency if worm is driving (worm gear pair)	%	gu
total gear efficiency		%	gu
total power loss		P	gu
ventilation losses Maurer	ventilation losses according to Maurer	P	gu,gp

Table B.4 — Environment

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
air speed ventilated	air speed with ventilation	v	gu
altitude	elevation of installation above sea level	L	gu
dirt	dirt from the outside: '1' if dirt is occurring, '0' if not	%	se,gu
fan ventilated area		A	h
injection direction	set 'into mesh' or 'against rotating direction'	X	gu
injection volume		V	gu,gp
surface of gear case wind	ventilated surface of housing	A	h
velocity of cooling air		v	gu,cb
ventilated length		L	h

Table B.5 — Geometry property

Property type of Geometry property of product model for gear units	Explanation of property	Unit type	Assigned to
addendum	(ISO 1122 [1])	L	gx,t
addendum angle	(ISO 1122 [1])	AN	gx,t
addendum center	addendum at center	L	gx
addendum chamfer		L	gx,t
addendum coefficient		%	gx,t
addendum coefficient basic rack	addendum coefficient of basic rack	%	gx
addendum outside		L	gx
adjustable stroke		L	w,bc
allowed backlash increase		L	gx
angle for orientation	angle for the orientation of the ripple of flank	AN	gx
angle input shaft	angle of input shaft	AN	sh
angle of bevel		%	gx
angle of deplacement	angle for deplacement at plain bearings	AN	bp
angle of grinding notch root	angle of grinding notch at root	AN	gx
angle of inclination		AN	cp
angle of roller bedding	(of sprocket)	AN	w
arch height		L	bc
axial distance		L	w,bx
axial module		L	gx
axial path for pressing in		L	cp
base diameter	(ISO 1122 [1])	L	gx
bearing area	area for bearing of belt or chain	A	bc
bending moment arm	bending moment arm at root	L	gx
bending moment arm DIN	bending moment arm according to DIN	L	gx
bending moment arm Lewis	bending moment arm according to Lewis	L	gx
bolt diameter		L	bc
broadening outer ring	broadening of outer ring (clutch or brake)	L	cb
bushing diameter	(belt or chain)	L	bc
chamfer		L	gx
chamfer angle		AN	t
chamfer at each end of tooth		L	gx
characteristic length for cooling process	(clutch or brake)	L	cb
characteristic length for sliding process	(clutch or brake)	L	cb
chord 30 degree tangent	chord at 30 degrees tangent	L	gx
chord 60 degree tangent	chord at 60 degrees tangent according to FVA 45 I/II [30], may assigned to list property root of gear pair	L	gx
chord lewis parabola tip	chord at lewis parabola for load application at tip	L	gx
chord lewis parabola upsc	chord at lewis parabola for load	L	gx

Property type of Geometry property of product model for gear units	Explanation of property	Unit type	Assigned to
	application at upper singular contact point		
circular normal space width at standard pitch diameter		L	gx
circular normal tooth thickness at standard pitch diameter	(ISO 1122 [1])	L	gx
circular tooth thickness at standard pitch diameter		L	gx
clamping angle under load	(clutch or brake)	AN	cb
clamping angle without load inside	(clutch or brake)	AN	cb
clamping angle without load outside	(clutch or brake)	AN	cb
clearance angle for clamping rolls	(clutch or brake)	AN	cb
clearance normal to friction surface	(clutch or brake)	L	cb
clearing angle		AN	t
cone angle		AN	cb
contact angle		AN	bx
contact angle e	contact angle with variable e from catalogue of FAG, INA, SKF (rolling element bearing)	AN	bx
conversion factor		%	gx
conversion factor backlash allowance	conversion factor for backlash allowance	%	gx
cooling surface		A	cb
coordinate of centre of rim related to tooth centre	axial coordinate of centre of rim related to tooth centre	L	gx
chordal height	(ISO 1122 [1])	L	gx
correction value of gear		L	gx
cross section area		A	bc
decisive wheel width		L	gx
dedendum	(ISO 1122 [1])	L	gx,t
dedendum angle	(ISO 1122 [1])	AN	gx,t
dedendum coefficient		%	gx,t
depth coefficient of protuberance		%	t
depth of gear case		L	h
depth of grinding notch		L	gx
depth of protuberance		L	t
depth of rib		L	h,b
deviation		L	gx
deviation of base diameter		L	gx
deviation of base pitch		L	gx
deviation of rotation degree	deviation of rotation in degrees of angle	AN	gx
deviation of rotation in contact direction	deviation of rotation in direction of contact	L	gx
diameter		L	t,w,cp,sh,h
diameter of ball or pin		L	gx
diameter of borehole	diameter of borehole in housing	L	h
diameter of rolling element		L	br
diameter of seal		L	se
diameter of splined shaft		L	cb

Property type of Geometry property of product model for gear units	Explanation of property	Unit type	Assigned to
diameter offset 1	diameter at offset number 1 (loose gear, FVA 206 [24])	L	gx,cb
diameter offset 2	diameter at offset number 2 (loose gear, FVA 206 [24])	L	gx,cb
diameter quotient	(ISO 1122 [1])	%	gx
diameter ratio		%	cb
diameter ratio hub	diameter ratio of hub	%	cp
diameter ratio shaft	diameter ratio of shaft	%	cp
diameter1 - diameter10	diameter assigned to shape rim, according to FVA STIRAK	L	gx
diametral pitch		L	gx
disc diameter	for synchronous belt	L	w
distance of bearing rows	distance between bearing rows	L	bx
distance to m-plane	(for loose gear, FVA 206 [24])	L	gx,cb
distance to offset 1	(for loose gear, FVA 206 [24])	L	gx,cb
distance to offset 2	(for loose gear, FVA 206 [24])	L	gx,cb
distance to s-plane	(for loose gear, FVA 206 [24])	L	gx,cb
dynamic relative factor		%	ro
edge radius		L	gx
effective diameter		L	w
effective face width	(ISO 1122 [1])	L	gx
effective tooth width		L	gx
endurance limit for bending stress		PR	m
equivalent length		L	cp
equivalent length Mauz	equivalent length according to Mauz	L	h
equivalent length Walter	equivalent length according to Walter	L	h
equivalent misaglinement beta	(ABS 97 [16])	L	gx
equivalent radius of curvature		L	cb,w
face width	(ISO 1122 [1])	L	gx
face width for root stress	assigned to shape root of gear	L	gx
face width transverse section	face width in transverse section	L	gx
fillet radius		L	gx
fillet radius 30 degree	fillet radius at 30 degrees tangent	L	gx
fillet radius 60 degree	fillet radius at 60 degrees tangent, may assigned to list property root of gear pair	L	gx,gp
fillet radius Lewis parabola	radius at Lewis parabola	L	gx
fit		%	sc
flank angle		AN	gx
flank angle deviation		L	gx
flank deviation		L	gx
flank deviation after running in		L	gx
flank deviation before running in		L	gx
flank misalignment elastic deformation	flank misalignment because of elastic deformation	L	gx
flank misalignment manufacturer	flank misalignment caused by manufacturer	L	gx
floor space	floor space needed by gear unit	A	gu

Property type of Geometry property of product model for gear units	Explanation of property	Unit type	Assigned to
foot area		A	gu
form diameter of addendum		L	gx,t
form diameter of dedendum		L	gx,t
gear rim thickness	thickness of gear rim	L	gx
gear ratio sun-carrier	assigned to planetary gear train	%	pgu
gear width		L	gx
generating profile shift coefficient	generating profile shift coefficient	%	t
groove area		A	cb
groove depth		L	cp,sc
groove diameter		L	cp
groove radius		L	cp,fk
height		L	b,h
height crowning	height of crowning	L	gx
height oil pressure ring		L	cb
helix angle	set amount of helix angle (ISO 1122 [1])	AN	gx
helix angle base diameter	helix angle at base diameter	AN	gx
helix angle deviation	devation of helix angle	AN	gx
helix angle direction	set 'straight', 'left' or 'right'	X	gx
helix angle reference diameter	helix angle at reference diameter	AN	gx
helix angle transverse section	helix angle in transverse section	AN	gb
inner diameter		L	w,se,sh,bx
inner diameter of plate		L	bp
inner flattning		L	cb
inner friction diameter		L	cb
inner friction material diameter		L	cb
inner hub diameter		L	cp
inner surface of gear case		A	h
intermediate distance		L	w,bx
large diameter		L	sh
lead	(ISO 1122 [1])	L	gx
lead angle	(ISO 1122 [1])	AN	t,gx
lead direction	set 'left' or 'right'	X	gx
lead of cutter		L	t
lead of maschine		L	t
length		L	b,bc,sh
length of bushing	(belt or chain)	L	bc
length of clamping element	(clutch or brake)	L	cb
length of free chain strand	(belt or chain)	L	bc
length of groove	(coupling)	L	cp
length of rolling bodies	(rolling element bearing)	L	br
length of rolling element		L	br
length of segment		L	bx
length of spline	(coupling)	L	cp
lengthwise curvature root	lengthwise curvature at root	L	gx
lever 30 degree tangent tip	lever at 30 degrees tangent for load application at tip	L	gx
lever application of load tip	lever, if application of load at tip	L	gx

Property type of Geometry property of product model for gear units	Explanation of property	Unit type	Assigned to
lever arm		L	cp
lever arm for rolling friction		L	w
lever Lewis parabola tip	lever at Lewis parabola for load application at tip	L	gx
load angle	load angle for load application	AN	gx
load angle tip	load angle for load application at tip	AN	gx
load application angle		AN	gx
load application angle DIN	load application angle according to DIN	AN	gx
load application angle Lewis	load application angle according to Lewis	AN	gx
lower backlash allowance		L	gx
lower backlash allowance balls pins	lower backlash allowance for ball and pins	L	gx
lower backlash allowance for normal chordal tooth thickness		L	gx
lower backlash allowance referenced to span		L	gx
lower bearing tolerance		L	bp
lower pin tolerance		L	bp
lubrication thickness ratio	ration of lubrication thickness	%	bx
maximum deviation of helix angle		AN	gx
mean diameter		L	w,bx
mean friction diameter	(clutch or brake)	L	cb
mean helix angle		AN	gb
mean normal module	(hypoid and bevel gears)	L	gc
mean radius of outer ring	(clutch or brake)	L	cb
mean shaft diameter		L	sh
mean thickness of rib		L	h,b
mean transmission error		AN	gx
mean wall thickness of gear case		L	h
measured oversize		L	fka
measurement over balls	(ISO 1122 [1])	L	gx
measurement over rollers	(ISO 1122 [1])	L	gx
measuring diameter		L	gx
measuring diameter at upper backlash allowance		L	gx
measuring diameter ball flank		L	gx
measuring diameter for span		L	gx
minimum deviation of helix angle		AN	gx
minimum diameter		L	t
module of locking tooth	(clutch or brake)	L	cb
nominal diameter		L	bx
nominal endurance limit for bending stress		PR	m
normal chordal tooth thickness	(ISO 1122 [1])	L	gx
normal diametral pitch		L	gx,t
normal module	(ISO 1122 [1])	L	gx,t
normal tip thickness at upper backlash		L	gx

Property type of Geometry property of product model for gear units	Explanation of property	Unit type	Assigned to
allowance			
normal top land		L	gx
notch depth root	notch depth at root, assigned to shape root of gear	L	gx
notch radius root	notch radius at root	L	gx
number of bearing rows		%	br
number of fitting keys		%	fka
number of rolling bodies	number of rolling bodies per row	%	br
number of rolling element rows		%	br
number of teeth	(ISO 1122 [1])	%	gx,t
number of teeth for span measurement		%	gx
number of teeth of virtual gear	(helical gear)	%	gx
outer cone distance		L	gb
outer diameter		L	se,sh,bx
outer flattning		L	cb
outer friction diameter		L	cb
outer friction material diameter		L	cb
outer hub diameter		L	cp
outer pitch diameter		L	gb
outer surface of gear case		A	h
outer transverse module	(bevel and hypoid gear)	L	gb
outside diameter of plate		L	bp
oversize	(coupling)	L	cp
pitch cone distance		L	gb
pitch length		L	bc
pitch length loose	pitch length of belt or chain under loose condition	L	bc
plane deviation		AN	gx
plasticity diameter		L	sc
pressure angle	(ISO 1122 [1])	AN	br
pressure angle e	(ISO 1122 [1])	%	br
profile correction axial	profile correction in axial direction	L	gx
profile correction radial	profile correction in radial direction	L	gx
profile deviation		L	gx
profile form deviation		L	gx
profile shift	(ISO 1122 [1])	L	gx,t
profile shift coefficient	(ISO 1122 [1])	%	gx,t
profile shift coefficient after finishing		%	gx
profile slope deviation		AN	gx
projected surface of ribs		A	b,h
protuberance		L	gx,t
protuberance angle		AN	gx,t
radial amount	for pinion cutter	L	t
radial amount of rounding		L	t
radial backlash of clamping element	(clutch or brake)	L	cb
radius		L	gx
radius of addendum chamfer		L	gx

Property type of Geometry property of product model for gear units	Explanation of property	Unit type	Assigned to
radius of contact surface		L	w
radius of curvature		L	t,w
radius of curvature first plane	(NIEMANN [25][26])	L	w
radius of curvature second plane	(NIEMANN [25][26])	L	w
radius of grinding notch root	radius of grinding notch at root	L	gx
radius of inner surface for clamping free wheel	(clutch or brake)	L	cb
radius of outer surface for clamping free wheel	(clutch or brake)	L	cb
radius of roller bedding	(of sprocket)	L	w
range of radial ring groove	range of radial ring groove (angle)	AN	bp
reference cone angle	(ISO 1122 [1])	AN	gb
reference cone distance	length of reference cone (ISO 1122 [1])	L	gb
reference diameter	(ISO 1122 [1])	L	gx
reference diameter of loose gear bearing		L	bx
relevant inner diameter		L	sc
relevant outer diameter		L	w,bx
remaining thickness		L	gx
roller diameter		L	bc
root angle	(ISO 1122 [1])	AN	gb
root apex beyond crossing point		L	gb
root diameter	(ISO 1122 [1])	L	gx
root undercut	(ISO 1122 [1])	L	gx
running path radius of inner ring	running path radius at inner ring	L	bx
running path radius of outer ring	running path radius at outer ring	L	bx
runout		L	gx
sag	(belt or chain)	L	bc
second inner diameter	second inner diameter for shaft sections with conical borehole	L	sh
second outer diameter	second outer diameter for conical shaft sections	L	sh
semicone angle		AN	w
shaft diameter		L	fka
shaft inner diameter		L	fka
shape of groove		%	fka
span measurement	(ISO 1122 [1])	L	gx
spline depth		L	bx
stationary gear ratio OH	relation of rotation of ring gear to rotation of sun gear (stationary planet carrier)	%	pgu
stationary gear ratio OZ	relation of rotation of sun gear to rotation of ring gear (stationary planet carrier)	%	pgu
surface		A	h
surface of groove		A	cp
switching distance	(clutch or brake)	L	cb
thickness		L	t,gx,bc
thickness against breakage tooth		L	cb

Property type of Geometry property of product model for gear units	Explanation of property	Unit type	Assigned to
thickness hub		L	cp
thickness of link plates		L	bc
thickness of ring		L	cb,se
thickness of spline		L	cp
tip angle	(ISO 1122 [1])	AN	gb
tip apex beyond crossing point		L	gb
tip diameter	(ISO 1122 [1])	L	gx,t
tip height		L	gx,t
tip radius	radius for tip (tool)	L	gx,t
tip radius coefficient		%	gx,t
tooth depth	(ISO 1122 [1])	L	gx,t,cb
tooth root chord		L	gx
tooth root chord DIN	tooth root chord according to DIN	L	gx
tooth root chord Lewis	tooth root chord according to Lewis	L	gx
tooth root normal chord new	tooth root normal chord on new condition	L	gx
tooth root normal chord used	tooth root normal chord on used condition	L	gx
tooth to tooth pitch deviation		L	gx
torsion angle of free wheel rings under load		AN	cb
total flank area of the wheel		A	gx
total pitch deviation		L	gx
total surface		A	h
total surface of ribs		A	b,h
transverse angle		AN	t,gx
transverse module	(ISO 1122 [1])	L	gx,t
transverse module outside	(bevel and hypoid gear)	L	gx
undercut angle		AN	gx
upper backlash allowance		L	gx
upper backlash allowance balls rollers	upper backlash allowance over balls or rollers	L	gx
upper backlash allowance for normal chordal tooth thickness		L	gx
upper backlash allowance referenced to span		L	gx
upper bearing tolerance		L	bx
upper pin tolerance		L	bx
utilized addendum coefficient		%	t
utilized dedendum		L	gx,t
utilized dedendum coefficient		%	gx,t
virtual diameter		L	cp
virtual diameter bending	virtual diameter for (shaft) bending if shaft with teething	L	gx
virtual diameter torsion	virtual diameter for (shaft) torsion if shaft with teething	L	gx
virtual number of teeth		%	gx
wedge angle		AN	bc,w
width	width (general), for tooth: set face	L	w,cb,t,se,b

Property type of Geometry property of product model for gear units	Explanation of property	Unit type	Assigned to
	width		c,bx
width back	width of base behind gear unit	L	b
width crowning	(ISO 1122 [1])	L	gx
width front	width of base in front of gear unit	L	b
width inner ring	width of inner ring of bevel roller bearing	L	br
width of friction material		L	cb
width of gap		L	se
width of pawl		L	cb
width of radial ring groove		L	bp
width of rear of tooth		L	cb
width of rim		L	gx
width of segment		L	bx
width of spline		L	cp
width offset		L	gx
width_c		L	w,bx
width_D1		L	w,bx
width_D2		L	w,bx
working contact angle	pressure angle of bearing under load	AN	bx
working friction material surface		A	cb
z_coordinate1 - z_coordinate10	z-coordinate assigned to shape rim, according to FVA STIRAK	L	gx

Table B.6 — Hardness

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
flank hardness	hardness of flank	H	gx
flank hardness rockwell		H	gx
hardness		H	m
minimum hardness		H	gx,sh,m
surface hardness		H	gx,sh,m

Table B.7 — Life time

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
duration of life wear	duration of life according to wear	t	gp,bx
equivalent number of load cycles	for gears may assigned to list property load case of shapes flank, root	%	all parts
lifetime		t	w+w, gp
lifetime exponent	(rolling element bearing)	%	br
lifetime N	(FVA 54/6 [23])	s	gp
lifetime NST	(FVA 54/6 [23])	s	gp
lifetime of friction material	(clutch or brake)	t	cb
lifetime phase1	(FVA 12 [28])	t	gp
lifetime phase2	(FVA 12 [28])	t	gp
lifetime phase3	(FVA 12 [28])	t	gp
lifetime under full power		t	w,bc
lifetime until 03 module	lifetime until 0.3*module (for worm gear pair)	t	gpw
lifetime until pointed teeth	lifetime until 'pointed teeth' (for worm gear pair)	t	gpw
maximum application factor		%	all parts
number of load cycles		%	gu,gp,bx,sh
number of stress cycle		%	fka
percentage of individual damage	for gears may assigned to list property load case of shapes flank, root	%	all parts
percentage of number of load cycles	for gears may assigned to list property load case of shapes flank, root	%	all parts
required life time		t	gu,gp,bx
time share load condition	time share of different load conditions	%	bx, gu
working time		t	gu,gp,bx

Table B.8 — Load capacity – factors

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
adhesive friction coefficient 1	adhesive friction coefficient at offset 1 (loose gear, FVA 206 [24])	%	gl
adhesive friction coefficient 2	adhesive friction coefficient at offset 2 (loose gear, FVA 206 [24])	%	gl
adhesive measurement		%	cp
air speed coefficient		%	gu
alignment error factor		%	gp
allowable contact load factor		%	gp
allowable contact stress factor		%	gp
allowable k factor	may assigned to shape flank of gear pair	%	gp
allowed material factor	assigned to shape flank	%	gp
ambient temperature coefficient		%	gp
amount for auxiliary engine		%	gp
angle factor	may assigned to list property flank or scuffing of gear pair	%	gp
application factor	may assigned to gear pair or shapes flank, root or scuffing of gear or list property flank of gear pair	%	gx,gp
application factor ca	application factor ca (AGMA 2001 [9])	%	gp
approach factor	assigned to list property integral temperature criterion	%	gp
approach factor scuffing	approach factor for scuffing	%	gp
axial factor		%	br
basic friction coefficient		%	gp
basic rack profile factor		%	gp
bearing factor		%	gp
bevel gear factor		%	gpb
case depth factor		%	gp
coefficient c1	coefficient c1 (GL 80 [19], RINA 82 [22], integral temperature criterion)	%	gp
coefficient c2	coefficient c2 (GL 80 [19], RINA 82 [22], integral temperature criterion)	%	gp
coefficient c3	coefficient c3 for flank (RINA 82 [22])	%	gp
coefficient c8	coefficient c8 (GL 80 [19])	%	gp
coefficient c9	coefficient c9 (GL 80 [19])	%	gp
coefficient e1	coefficient e1 for flank (GL 80 [19])	%	gp
coefficient j	coefficient j for root (LRS 78 [21])	%	gp
coefficient k2	coefficient k2 for flank (LRS 78 [21])	%	gp
coefficient of expansion		1/T	m
coefficient y1	coefficient y1 for root (LRS 78	%	gp

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
	[21])		
coefficient y2	coefficient y2 for root (LRS 78 [21])	%	gp
coefficient y3	coefficient y3 for root (LRS 78 [21])	%	gp
coefficient y4	coefficient y4 for root (LRS 78 [21])	%	gp
coefficient y5	coefficient y5 for root (LRS 78 [21])	%	gp
coefficient y6	coefficient y6 for root (LRS 78 [21])	%	gp
coefficient_q	for calculation of dynamic factor according to DIN 3990 [12]	%	gx
combined tooth form factor		%	gx
constant b	constant b (DIN 3990 [12])	%	gp
constant kf	constant kf for root (BV 77 [14]), assigned to shape root of gear	%	gp
constant kh	constant kh for flank (BV 77 [14]), assigned to list flank of gear pair	%	gp
contact factor lubricant	contact factor for the influence of lubricant, assigned to list scuffing of gear pair	%	gp
contact height factor	may assignet to list flank of gear pair	%	gp
contact load factor	may assignet to list flank, root or integral temperature criterion of gear pair	%	gp
contact ratio factor	(flank, root, intergral temperature criterion, scuffing)	%	gp
contact stress coefficient ybeta	contact stress coefficient ybeta (NIEMANN [25][26])	%	gp
contact stress coefficient yc	contact stress coefficient yc (NIEMANN [25][26])	%	gp
contact stress coefficient yeps	contact stress coefficient yeps (NIEMANN [25][26])	%	gp
contact stress factor ybeta	contact stress factor ybeta for pitting (NIEMANN [25][26])	%	gp
contact stress factor yc	contact stress factor yc for pitting (NIEMANN [25][26])	%	gp
contact stress factor yeps	contact stress factor yeps for pitting (NIEMANN [25][26])	%	gp
core hardness factor		%	gx
correction factor		%	gx, gp
correction value		%	gx
crowning factor		%	gp
curvature factor	may assigned to list property flank of gear pair	%	gx
design factor	may assigned to shape root	%	gx
diameter coefficient	may assigned to list property flank of gear pair	%	gx
distribution factor		%	gp

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
dynamic axial load factor		%	gp
dynamic capacity		F	br
dynamic factor	may assigned to list property flank or root of gear pair	%	gp
dynamic sensitivity factor		%	gp
effective friction coefficient		%	w+w
effective tooth form factor		%	gx
elasticity coefficient	may assigned to list property flank of gear pair	%	gx,gp
elasticity factor	may assigned to list property flank of gear pair	%	gp
engagement factor		%	gp
external dynamic factor		%	gp
face load factor	assigned to list property flank, root or scuffing of gear pair	%	gp
face load factor cm	face load factor cm (AGMA 2001 [9])	%	gp
face load factor ice	face load factor for ice conditions	%	gp
face load factor km	face load factor km(AGMA 2001 [9])	%	gp
face load factor tolerances	face load factor according to manufacturing tolerances	%	gp
factor f4 ice	factor f4 for ice condition (CCS 96 [16])	%	gp
factor for gear arrangement	factor for gear arrangement	%	gp
factor for increased stress	factor for increased stress at root, assigned to shape root of gear	%	gx
factor kd yg	factor kd yg (NIEMANN [25][26])	%	gp
factor kd ys	factor kd ys (NIEMANN [25][26])	%	gp
factor kd yv	factor kd yv (NIEMANN [25][26])	%	gp
fatigue limiting load	factor for rolling element bearing	%	br
film thickness parameter wear	film thickness parameter according to wear	%	gp
flash factor	assigned to list integral temperature criterion	%	gp
form factor	may assigned to shape root of gear or list flank or root of gear AND/OR gear pair	%	gx
form factor new condition	form factor for new condition	%	gx
form factor wear	form factor according to wear	%	gx
form factor ys	form factor ys according to FVA 45 I/II [30]	%	gx
friction coefficient	may assigned to list property scuffing of gear pair	%	gp,w,bx,w+bc,w+w,bc
friction coefficient pressing in		%	cp
friction coefficient scuffing	friction coefficient for scuffing	%	gp
friction coefficient sliding in circumferential direction	friction coefficient for sliding in circumferential direction	%	cp
friction coefficient sliding in longitudinal direction	friction coefficient for sliding in longitudinal direction	%	cp

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
friction disc factor		%	cb
friction path factor		%	w,bc
gear loss factor Ohlendorf	gear loss factor according to Ohlendorf	%	gp
gear ratio factor	assigned to list property flank of gear pair	%	gp
geometry and service factor		%	gx
geometry factor	may assigned to shape root of gear or list flank, root or integral temperature criterion of gear pair AND/OR gear	%	gx
geometry factor b2	geometry factor b2 (ISO 10300 [3])	%	gx
groove factor		%	cb
hardening process factor	may assigned to shape root of gear	%	gx
hardness factor	may assigned to shape root of gear or list flank, root or integral temperature criterion of gear pair AND/OR gear	%	gx
hardness ratio factor	assigned to list flank of gear pair	%	gp
helix angle factor	may assigned to list property flank, root or sciffing of gear pair	%	gp
helix gear factor		%	gp
hertzian stress factor	assigned to list flank of gear pair	%	gp
ice class coefficient	(GL 98 [20])	%	gp
ice class factor	(GL 98 [20])	%	gp
ice class reinforcement factor		%	gp
impact factor		%	cb
insulation factor		%	cb
integration factor		%	gp
internal dynamic factor		%	gp
k factor	actual k factor at flank, may assigned to shape flank of gear or list property flank of gear pair	%	gp
lead correction factor		%	gx
lengthwise curvature factor		%	gx
life factor	may assigned to shapes flank, root of gear	%	gx
life factor yn	life factor y n for root (DIN 3990 [12]), assigned to shape root of gear	%	gx
life factor ynt	life factor y nt for root (DIN 3990 [12]), assigned to shape root of gear	%	gx
life factor z n	life factor z n for flank (DIN 3990 [12]), assigned to shape flank of gear	%	gx
life factor z nt	life factor z nt for flank (DIN 3990 [12]), assigned to shape flank of gear	%	gx

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
load distribution factor	may assigned to list property flank, root of gear pair	%	gx, gp
load factor	may assigned to list property flank, integral temperature criterion of gear pair	%	gp
load sharing factor	may assigned to list property flank, root of gear pair	%	gx,gp
load sharing ratio		%	gx,gp
longitudinal friction coefficient		%	sc
longitudinal load distribution factor		%	gx
lubricant factor	may assigned to shape flank of gear or list property flank, scuffing of gear pair	%	gp
lubrication factor	may assigned to shape flank of gear or list property flank, scuffing of gear pair	%	gp
material coefficient	may assigned to list property flank of gear pair	%	gx,gp
material factor	may assigned to shapes flank, root of gear or list property flank of gear pair	%	gx,
material index		%	m
material lubricant factor wear	material lubricant factor according to wear	%	gx
material value	may assigned to shapes flank, root of gear	%	gx
maximum coefficient of friction	may assigned to list property contact temperature criterion of gear pair	%	gp,w+w
maximum load factor		%	gp
mean friction coefficient	may assigned to list property scuffing of gear pair	%	cb,gp
mesh alignment correction factor		%	gp
mesh alignment correction factor ce	(AGMA 2001 [9])	%	gp
mesh alignment correction factor cma	(AGMA 2001 [9])	%	gp
mesh alignment factor for curve 2	(AGMA 2001 [9])	%	gp
mesh factor		%	gp
mesh mechanical advantage		%	gp
mid zone factor		%	gx
minimum coefficient of friction	may assigned to list property contact temperature criterion of gear pair	%	gp
minimum dynamic factor		%	gx
negative coefficient of expansion		1/T	m
notch factor	assigned to shape root of gear	%	gx
notch parameter	assigned to shape root of gear or list property root of gear pair	%	gx
notch sensitivity factor	assigned to shape root of gear	%	gx
overlap factor		%	cb
overload factor		%	gx,gp

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
parameter for mean hertzian stress		%	gp
parameter for mean lubrication film thickness		%	gp
parameter for mean sliding path		%	gp
parameter gamma a	parameter gamma a according to FVA 45 III [31], assigned to list property scuffing of gear pair	%	gp
parameter gamma b	parameter gamma b according to FVA 45 III [31], assigned to list property scuffing of gear pair	%	gp
parameter gamma c	parameter gamma c according to FVA 45 III [31], assigned to list property scuffing of gear pair	%	gp
parameter gamma d	parameter gamma d according to FVA 45 III [31], assigned to list property scuffing of gear pair	%	gp
parameter gamma e	parameter gamma e according to FVA 45 III [31], assigned to list property scuffing of gear pair	%	gp
peak overload factor		%	gp
pinion mesh factor	assigned to list property flank of gear pair	%	gp
pinion proportion factor		%	gp
pinion proportion modifier		%	gp
pitch factor flank	pitch factor for flank, assigned to list property flank of gear pair	%	gp
pitch friction coefficient		%	w+w
preloading factor		%	gp
pressure factor wear	pressure factor according to wear	%	gp
profile correction factor		%	gp
radial factor		%	br
radial factor x1	radial factor x1 for thrust bearings if (axial force / radial force) < factor e	%	br
radial factor x2	radial factor x2 for thrust bearings if (axial force / radial force) > factor e	%	br
rating factor c1	rating factor c1 for flank (AGMA 421 [8]), assigned to list property flank of gear pair	%	gp
rating factor c2	rating factor c2 for flank (AGMA 421 [8]), assigned to list property flank of gear pair	%	gp
rating factor c3	rating factor c3 for flank (AGMA 421 [8]), assigned to list property flank of gear pair	%	gp
ratio correction factor		%	gp
relative adhesive measure		%	cp
relative sensitive factor	may assigned to shape root of gear or list property root of gear	%	gp

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
	pair		
relative stress correction factor	may assigned to shape root of gear	%	gp
relative structure factor		%	gp
relative surface factor	assigned to shape root of gear	%	gx
relative welding factor lubricant	relative welding factor of lubricant, assigned to list property scuffing of gear pair	%	gx
reliability factor		%	gp
reliability factor cr	(AGMA 2001 [9])	%	gp
reliability factor kr	(AGMA 2001 [9])	%	gp
relief factor	assignet to list integral temperature criterion of gear pair	%	gp
reverse factor	assigned to list property root of gear pair	%	gp
reverse load factor		%	gp
rim thickness factor	may assigned to shape root of gear or list property root of gear pair	%	gx
rolling friction coefficient		%	w+w
rotation factor		%	gp
roughness factor	may assigned to shape flank, root of gear or list property flank of gear pair	%	gx
running in factor		%	gp
scuffing factor		%	gp
scuffing test value	may assigned to list property scuffing of gear pair	%	gp
service factor	may assigned to list property flank or root of gear pair	%	gp,w+bc
service factor cs1	(BV 77 [14])	%	gp
service factor cs2	(BV 77 [14])	%	gp
service factor input	service factor for input	%	gp
shape factor		%	gx
shifting coefficient	may assigned to shape root of gear	%	gp
shrinkfit factor	may assigned to shape root of gear	%	gp
single pair mesh factor	assigned to list property flank of gear pair	%	gp
single pair mesh factor zb	single pair mesh factor zb (ABS 97 [16]/DIN 3990 [12]), assigned to list property flank of gear pair	%	gp
single pair mesh factor zd	single pair mesh factor_zd (ABS 97 [16]/DIN 3990 [12]), assigned to list property flank of gear pair	%	gp
size factor	may assigned to shape flank, root of gear or list property flank, root of gear pair	%	gx,gp
size factor cs	(AGMA 2001 [9])	%	gx,gp

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
size factor ks	(AGMA 2001 [9])	%	gx,gp
size factor spray lubrication	size factor for use of spray lubrication	%	gx
sliding friction coefficient	coefficient of sliding friction	%	gp,cp
sliding friction coefficient 1	sliding friction coefficient at offset 1 (for loose gear, FVA 206 [24])	%	gx,cb
sliding friction coefficient 2	sliding friction coefficient at offset 2 (for loose gear, FVA 206 [24])	%	gx,cb
speed factor spray lubrication	speed factor for use of spray lubrication	%	gp
static axial load factor		%	bx
stiffness factor	stiffness factor for root, may assigned to list property root of gear pair	%	gx
stress correction factor	may assigned to shape root of gear or list property root of gear pair	%	gx
stress correction factor ys	stress correction factor ys for root (DIN 3990 [12]), may assigned to list property root of gear pair	%	gx
stress correction factor yst	stress correction factor yst for root (DIN 3990 [12]), may assigned to shape root of gear	%	gx
stress cycle factor	stress cycle factor for flank, assigned to shape root of gear	%	gp
stress ratio root	stress ratio at tooth root	%	gp
structure factor	assigned to list property scuffing of gear pair	%	gx
surface condition factor	may assigned to shape root of gear or list property flank of gear pair	%	gx
temperature factor		%	gp
temperature factor ct	(DIN 3990 [12])	%	gp
temperature factor kt	(DIN 3990 [12])	%	gp
thermal contact coefficient	assigned to list scuffing of gear pair	%	gp
thrust factor y1	thrust factor (y1) for bearings if (axial force/radial force) < factor e	%	br
thrust factor y2	thrust factor (y2) for bearings if (axial force/radial force) > factor e	%	br
tip relief factor	assigned to list property integral temperature criterion (ISO 1122 [1])	%	gx
tooth form factor	may assigned to shape root of gear	%	gx
tooth loss coefficient		%	gp
tooth root coefficient	assigned to shape root of gear	%	gp
tooth root stress factor		%	gp
transverse friction coefficient		%	sc
transverse load factor	may assigned to list property flank, root, scuffing of gear pair	%	gx

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
u factor	(NIEMANN [25][26])	%	gp
velocity coefficient	assigned to list property flank of gear pair	%	gp
velocity factor	may assigned to shape flank, root of gear or list property flank of gear pair	%	gp
velocity factor breakage	velocity factor according to tooth breakage	%	gp
velocity factor c	speed factor c for flank (BV 90 [15]), assigned to shape flank of gear	%	gp
velocity factor wear	velocity factor according to wear	%	gp
viscosity factor		%	gp
viscosity factor spray lubrication	viscosity factor for spray lubrication	%	gp
wear coefficient		%	gp
width diameter coefficient	assigned to list property flank of gear pair	%	gp
work hardening factor		%	gp
working capacity coefficient		%	gp
yield stress factor		%	m
zone factor	assigned to list property flank of gear pair	%	gp

Table B.9 — Load capacity – strength

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
allowable hertzian contact stress	for gears may assigned to list property flank of gear pair AND/OR shape flank of gear	PR	gx,m
allowable line load	for gears may assigned to list property flank or root of gear pair AND/OR shape flank or root of gear	F/L	gx,gp
allowable line load reverse loading	assigned to shape flank	F/L	gx
allowable longtime mean heat flow density		W/A	cb
allowable mean heat flow density for sliding process		W/A	cb
allowable nominal root stress	assigned to shape root	PR	gx
allowable output torque		F*L	gx
allowable output torque 26000h breakage	allowable output torque according to breakage after 26000 hours	F*L	gx
allowable output torque 26000h wear	allowable output torque according to wear after 26000 hours	F*L	gx
allowable output torque breakage	allowable output torque according to breakage	F*L	gx
allowable output torque wear	allowable output torque according to wear	F*L	gx
allowable pitting area	allowable area for pitting	A	gx
allowable power	for gears may assigned to list property flank or root of gear pair AND/OR shape flank or root of gear	P	gx,gp,sh
allowable power ratio	for gears may assigned to list property flank or root of gear pair AND/OR shape flank or root of gear	%	gx
allowable root stress	for gears may assigned to list property flank or root of gear pair AND/OR shape flank or root of gear	PR	gx,m
allowable sliding		%	w+w
allowable stationary contact stress		PR	gx
allowable stationary tooth root stress		PR	gx
allowable stress number pitting	allowable contact stress at flank according to pitting	PR	gx
allowable stribeck pressure		PR	w
allowable unit load root	for gears may assigned to list property root of gear pair AND/OR shape root of gear	PR	gx,gp
allowable wear		L	gx
allowed circumferential force		F	w
allowed normal force at contact		F	w,sh
bending fatigue limit		PR	gx
coefficient c10 root	coefficient c10 for root (GL 80 [19])	%	gp

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
core endurance limit	endurance limit at core	PR	gx
deformation for standard load		L	gx
dynamic load rating		F	bx
endurance limit		PR	gx
endurance limit core	may assigned to shape root of gear	PR	gx
endurance limit dedendum		PR	gx
endurance limit flank	endurance limit at flank	PR	gx
endurance limit flank h3	endurance limit h3 at flank (DNV 93 [18])	PR	gx
endurance limit flank h5	endurance limit h5 at flank (DNV 93 [18])	PR	gx
endurance limit for Hetzian contact stress		PR	m
endurance limit root	endurance limit at root	PR	gx
endurance limit root static	static endurance limit at root	PR	gx
ice class	ice class (GL 98 [20])	X	gp
limiting deflection	limiting value for deflection	L	gw
load ratio		%	gp
load values		%	gp
lower yield stress		F/A	m
material index no	material index number at flank (API 613 [10])	X	gx,m
maximum allowed area pressure		PR	cb
maximum axial force		F	sc
maximum oversize		L	sc
maximum possible pitting area	maximum possible area for pitting	A	gx
maximum static load		F*L	gx
maximum torque		F*L	gx
maximum torque at ambient temperature		F*L	sc
maximum torque at ambient temperature for tiered collar		F*L	sc
maximum torque at ambient temperature with centrifugal force		F*L	sc
maximum torque at service temperature		F*L	sc
maximum torque at service temperature for tiered collar		F*L	sc
maximum torque at service temperature with centrifugal force		F*L	sc
mean allowed area pressure		PR	cb
mean stress sensitivity	may assigned to list property root of gear pair	%	gx
miner sum	assigned to shapes flank, root of gear	%	gx
minimum oversize		L	sc
nominal load value		%	gp,gx
normal tooth force scuffing	normal tooth force according to scuffing	F	gx
notch capacity	(FVA 45 I/II [30])	%	rop
power rating	may assigned to shape root of gear or list property flank of gear	P	gx

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
	pair		
push pull fatigue limit		PR	m
rated input power		P	gp
rated output power		P	gp
required oversize		L	sc
reverse load	set '1' if reverse load, else set '0'	X	gp
root stress limit		PR	gx
static capacity		F	br
static equivalent bearing load		PR	br
static load rating		F	bx,gp
tensile strength		PR	m
torque fatigue limit		PR	m

Table B.10 — Manufacturing

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
accuracy din 3965		%	gx
adjacent pitch deviation		L	gx
alignment error		L	gx
allowance		L	gx,t
allowed accuracy	according to the stated standard	X	gx
allowed accuracy in low cycle fatigue area	according to the stated standard	X	gx
amount of machine-relieve		L	t
axial pitch deviation		X	gx
backlash allowance sequence		X	gx
backlash tolerance sequence		X	gx
bearing clearance class		X	bx
case depth 300hv	depth of 300 hv hardness	L	gx
case depth 400hv	depth of 400 hv hardness	L	gx
case depth 550hv	depth of 550 hv hardness	L	gx
clearance for mounting		L	sh
core hardness vickers		%	m
cutting angle		AN	t
cutting method		%	gp
depth of minimum hardness	depth where minimum hardness occurs	L	gx
distance between face		L	t
finish cutting		%	gp
flank hardness vickers		%	m
form allowance	may assigned to gear AND gear pair	L	gx,gp
form of cutter		%	t
grade of accuracy	according to the stated standard	X	gx
heat treatment	for different kind of heat treatment set: 'case carburized', 'through hardening', 'induction hardening', 'flame hardening', 'nitriding', 'tempering', 'normalizing', 'annealing'	X	gx, m
kind of abrasion		%	gx
kind of cutting		%	gx
lead of spiral		L	t
maximum helix angle deviation		L	gx
maximum profile slope deviation		L	gx
minimum case depth root	may assigned to shape root of gear	L	gx
minimum helix angle deviation		L	gx
minimum profile slope deviation		L	gx
mounting force		F	sc
mounting temperature at ambient temperature		T	sc
mounting temperature co2		T	sc
mounting temperature for shaft at ambient temperature		T	sc

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
mounting temperature for shaft co2		T	sc
mounting temperature for shaft n2		T	sc
mounting temperature n2		T	sc
number of cutters		%	t
safety factor against perfectly plastic loading at ambient temperature		%	sc
safety factor against plastic stretching at ambient temperature		%	sc
smoothing depth hub		L	cp
smoothing depth shaft		L	cp
tolerance		%	sc
tolerance class	according to the stated standard	X	gx
tolerance field	according to the stated standard	X	gx,gp
value	assigned to shape modification	L	gx

Table B.11 — Mesh

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
amount of correction		L	gx,gp
amount of running in		L	gp,gx
amount of running in y alfa	(DIN 3990 [12], DNV [18], LR)	L	gp
amount of running in y beta	(DIN 3990 [12], LR)	L	gp
amount of running in y f	(DIN 3990 [12])	L	gp
amount of running in y p	(DIN 3990 [12], DNV [18])	L	gp
amount of running in y s	(DNV [18])	L	gp
amount of running in y alfa	(DIN 3990 [12])	L	gp
angle between flank line and contact line		AN	gpch
backlash ratio		%	gp
begin of contact		L	gp
begin of singular contact		L	gp
beginn of contact	coordinate on path of contact	L	gp
beginn of singular contact	coordinate on path of contact	L	gp
beginning of radius of relief	length to beginning of radius of relief (FVA 30 [27])	L	gp,gx
common face width		L	gp
contact ratio		%	gp
contact ratio epsva	(ISO 10300 [3])	%	gp
contact ratio epsvb	(ISO 10300 [3])	%	gp
contact ratio epsvg	(ISO 10300 [3])	%	gp
contact ratio load	contact ration under load	%	gp
contact width		L	gp,w+w
coordinate arc of contact for long correction root	coordinate of arc of contact for long correction at root (SIGG, AGMA 109.16 [32])	L	gp
coordinate arc of contact for long correction tip	coordinate of arc of contact for long correction at tip (SIGG, AGMA 109.16 [32])	L	gp
coordinate arc of contact for short correction root	coordinate of arc of contact for short correction at root (SIGG, AGMA 109.16 [32])	L	gp
coordinate arc of contact for short correction tip	coordinate of arc of contact for short correction at tip (SIGG, AGMA 109.16 [32])	L	gp
coordinate length of contact for long modification end of contact	coordinate of length of contact for long modification at the ending of contact (SIGG, AGMA 109.16 [32])	L	gp
coordinate length of contact for long modification begin of contact	coordinate of length of contact for long modification at the beginning of contact (SIGG, AGMA 109.16 [32])	L	gp
coordinate length of contact for short modification end of contact	coordinate of length of contact for short modification at the ending of contact (SIGG, AGMA 109.16 [32])	L	gp

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
coordinate length of contact for short modification begin of contact	coordinate of length of contact for short modification at the beginning of contact (SIGG, AGMA 109.16 [32])	L	gp
coordinate on path of contact		L	gp
cutter module		L	gx
cutter radius		L	gx
dedendum basic rack		L	gx
dedendum coefficient basic rack		L	gx
dedendum outside		L	gx
deviation of pressure angle		AN	gp
diameter for long correction root	diameter for long correction at root (SIGG, AGMA 109.16 [32])	L	gp
diameter for long correction tip	diameter for long correction at tip (SIGG, AGMA 109.16 [32])	L	gp
diameter for short correction root	diameter for short correction at root (SIGG, AGMA 109.16 [32])	L	gp
diameter for short correction tip	diameter for short correction at tip (SIGG, AGMA 109.16 [32])	L	gp
distance tip line pinion cutter working pitch diameter	distance between the tip line of the pinion cutter and the working pitch diameter (ISO 1122 [1])	L	t+p
distance tip line tool pitch diameter	distance between the tip line of the tool and the pitch diameter	L	t+p
distance tip line tool working pitch diameter	distance between the tip line of the tool and the working pitch diameter	L	t+p
edge radius factor		L	gx
effective contact ratio		%	gp
effective line of contact		L	gp
effective normal pressure angle coast side		AN	gp
effective normal pressure angle drive side		AN	gp
effective tip relief	assigned to list property scuffing of gear pair (ISO 1122 [1])	L	gp,gx
end of contact	coordinate on path of contact	L	gp
end of singular contact	coordinate on path of contact	L	gp
ending of radius of relief	length to ending of radius of relief (FVA 30 [27])	L	gp,gx
equivalent radius of curvature coast side		L	gp
equivalent radius of curvature contact	equivalent radius of curvature in contact	L	gp
equivalent radius of curvature drive side		L	gp
friction coefficient contact		%	gp
gear ratio	(ISO 1122 [1])	%	gp
hertzian auxiliary angle		AN	gpch
hertzian half axle coefficient		%	gpch
hypoid offset	offset of hypoid gear pair	L	gpb
length line of contact lb1	(ISO 10300 [3])	L	gp
length line of contact lb2	(ISO 10300 [3])	L	gp

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
length line of contact lb3	(ISO 10300 [3])	L	gp
length of path of contact	length of path of contact between two gears (ISO 1122 [1])	L	gp
length of addendum path of contact		L	gp,gx
length of arc of contact	length of circle of contact of gear	L	gx
length of contact	(crossed helical gear)	L	gp,gx
limit pressure angle		AN	gp
mean addendum		L	gx
mean dedendum		L	gx
mean reference cone distance		L	gx
mean reference diameter		L	gx
mean transverse module		L	gx
mesh misalignement f betax	mesh misalignment f betax (DIN 3990 [12])	L	gx,gp
mesh misalignement f betay	mesh misalignment f betay (DIN 3990 [12])	L	gx,gp
mesh misalignement f ma	mesh misalignment f ma (DIN 3990 [12])	L	gx,gp
mesh misalignement f sh	mesh misalignment f sh (DIN 3990 [12])	L	gx,gp
mesh misalignment		L	gx,gp
mesh misalignment f beta		L	gp
normal base pitch	(ISO 1122 [1])	L	gp
normal pressure angle	(ISO 1122 [1])	AN	gp,t+p
normal pressure angle coast side	normal pressure angle at coast side of tooth	AN	gp
normal pressure angle drive side	normal pressure angle at drive side of tooth	AN	gp
optimal tip relief	optimal tip relief (DNV 93 [18]), assigned to list property root of gear pair	L	gp,gx
overlap contact ratio		%	gp
overlap length	(ISO 1122 [1])	L	gp
part of total line load flc1	(ISO 10300 [3])	%	gp
part of total line load flc2	(ISO 10300 [3])	%	gp
part of total line load flc3	(ISO 10300 [3])	%	gp
pitch point	coordinate of pitch point on path of contact (ISO 1122 [1])	L	gp
projected length of contact line	projected length of contact line	L	gp
reference cone distance outside		L	gx
referenced tip clearance	assigned to gear AND gear pair (necessary if more than one mesh)	%	gx,gp
relative contact pattern width	relative contact pattern width	L	gp
relief at the beginning of contact	(SIGG, AGMA 109.16 [32])	L	gp
relief at the end of contact	(SIGG, AGMA 109.16 [32])	L	gp
relief tolerance	tolerance of relief	L	gp,gx
sum of profile shift coefficients		%	gp
tangential composite deviation		L	gx
tangential composite deviation pairing	tangential compsite deviation of pairing	L	gp

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
target pressure angle		AN	gp
tip clearance		L	gp
tooth to tooth tangential composite deviation		L	gx
tooth to tooth tangential composite deviation pairing	tooth to tooth tangential composite deviation of pairing	L	gp
total contact ratio	(ISO 1122 [1])	%	gp
transmission error		AN	gx
transverse base pitch	(ISO 1122 [1])	L	gp
transverse circular pitch		L	gx
transverse contact ratio	(ISO 1122 [1])	%	gp
transverse pressure angle	(ISO 1122 [1])	AN	gp
transverse pressure angle pitch diameter	transverse pressure angle at pitch diameter (ISO 1122 [1])	AN	gp
transverse pressure angle reference diameter	transverse pressure angle at reference diameter (ISO 1122 [1])	AN	gp
type of correction	set type of correction : 'linear tip relief', 'circular tip relief', 'linear root relief', 'cicular root relief', 'profile angle correction', 'helix angle correction', 'circular height crowning', 'circular barreling', 'end relief', 'end relief right', 'end relief left' (ISO 1122 [1])	X	gp,gx
variation backlash normal plane a ae	variation of backlash at normal plane for upper tolerance of centre distance (DIN 3960 [11])	L	gp
variation backlash normal plane a ai	variation of backlash at normal plane for lower tolerance of centre distance (DIN 3960 [11])	L	gp
variation backlash pitch diameter a ae	variation of backlash at pitch diameter for upper tolerance of centre distance (DIN 3960 [11])	AN	gp
variation backlash pitch diameter a ai	variation of backlash at pitch diameter for lower tolerance of centre distance (DIN 3960 [11])	AN	gp
working depth	working depth of two meshing gears	L	gp
working depth factor		%	gp
working transverse pressure angle		AN	gp

Table B.12 — Parameter property

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
auxiliary mass		G	sc
axial pitch	(ISO 1122 [1])	L	gx
backlash		L	gp,bx
backlash axial		L	bx
backlash increase		L	gp
backlash increase 03m	backlash increase until wear is '0.3 * module' (worm gear pair)	L	gpw
backlash increase pointed teeth	backlash increase until 'pointed teeth' (worm gear pair)	L	gpw
backlash increase relative to angle	(worm gear pair)	AN	gpw
backlash m-plane	backlash at m-plane between loose gear and clutch (FVA 206 [24])	L	cb,gx
backlash normal plane lower tolerance	lower tolerance of backlash at normal plane	L	gp
backlash normal plane upper tolerance	upper tolerance of backlash at normal plane	L	gp
backlash of tooth		L	gp
backlash pitch diameter lower tolerance	lower tolerance of backlash at pitch diameter	AN	gp
backlash pitch diameter upper tolerance	upper tolerance of backlash at pitch diameter	AN	gp
backlash radial	radial backlash	L	gx,bx
backlash s-plane	backlash at s-plane between loose gear and clutch (FVA 206 [24])	L	cb,gx
backlash torsion spring	backlash of torsion spring	AN	gx
bearing arrangement	arrangement of bearings: 'X-arrangement', 'O-arrangement','fixed-movable-arrangement'	X	b+b
biot coefficient		%	cb
bode coefficient a1	coefficient a1 according to Bode	%	l
bode coefficient a2	coefficient a2 according to Bode	%	l
bode coefficient a3	coefficient a3 according to Bode	G/V	l
bode coefficient a4	coefficient a4 according to Bode	1/T	l
bode coefficient a5	coefficient a5 according to Bode	G/V	l
bode coefficient b0	coefficient b0 according to Bode	%	l
bode coefficient b1	coefficient b1 according to Bode	%	l
bode coefficient b2	coefficient b2 according to Bode	%	l
centre distance	(ISO 1122 [1])	L	s+s,w+w
centre distance modification	modification of centre distance	L	gp,t+p
centre offset		L	gp,s+s,w+w
clearance	for gears may assigned to gear AND gear pair (ISO 1122 [1])	L	gx,gp
coefficient of fineness	coefficient of fineness	%	bx
condition	(clutch or brake), set: 'old', 'new'	X	cb
contact surface		A	w

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
content aluminium	content of aluminium	%	m
content carbon	content of carbon	%	m
content chromium	content of chromium	%	m
content copper	content of copper	%	m
content iron	content of iron	%	m
content lead	content of lead	%	m
content magnesium	content of magnesium	%	m
content manganese	content of manganese	%	m
content molybdenum	content of molybdenum	%	m
content nickel	content of nickel	%	m
content phosphor	content of phospor	%	m
content sulphur	content of sulphur	%	m
content vanadium	content of vanadium	%	m
density	actual density (for lubricants)	D	l
density 15	density at 15 degrees Celsius (lubricant)	D	l
density material	density of material	D	m
density of clutch disc		D	w
deviation of centre distance		L	gp
deviation of circular pitch		L	gx
diameter of active flank at root	assigned to gear AND gear pair (necessary if more than one mesh)	L	gx,gp
diameter of active flank at tip	assigned to gear AND gear pair (necessary if more than one mesh)	L	gx,gp
diameter of undercut	assigned to gear AND gear pair (necessary if more than one mesh)	L	gx,gp
distance	distance between two bearings	L	b+b
distance between center of inertia and center of rotation		L	cb
distance between centre point and clamp surface		L	cb
distance between centre point and rotating point of pawl		L	cb
distance from centre fi1 pitting	distance from centre fi1 according to pitting (ISO 10300 [3])	L	gp
distance from centre fi2 pitting	distance from centre fi2 according to pitting (ISO 10300 [3])	L	gp
distance from centre fi3 pitting	distance from centre fi3 according to pitting (ISO 10300 [3])	L	gp
distance from centre fj1 root	distance from centre fj1 at root (ISO 10300 [3])	L	gp
distance from centre fj2 root	distance from centre fj2 at root (ISO 10300 [3])	L	gp
distance from centre fj3 root	distance form centre fj3 at root (ISO 10300 [3])	L	gp
distance gear housing	distance between gear and	L	gx

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
	housing		
dynamic viscosity 100	dynamic viscosity at 100 degrees celsius	PR	l
dynamic viscosity 40	dynamic viscosity at 40 degrees celsius	PR	l
dynamic viscosity wear	dynamic viscosity according to wear	PR	l
effective angle		AN	w+bc
elasticity of material		PR	m
elasticity of material bending	elasticity of material according to bending	PR	m
emission ratio	emission ratio	%	gu,h
equatorial moment of inertia		G*A	sc
equivalent emodule	equivalent elasticity of material	PR	m
equivalent thermal resistance	equivalent thermal resistance	T/P	b
factor for distribution between both sides of double helical gear	factor for distribution of load (moment first helix / moment second helix)	%	gx
filling notches	filling notches (for bearings): '1' if occurring, '0' if not	X	bx
flank profile	profile form of flank for worm gear pairs according to DIN 3975: 'ZA', 'ZN', 'ZI', 'ZK', 'ZC'	X	gp
Fourier coefficient cooling phase	Fourier coefficient for cooling phase	%	cb
Fourier coefficient heating phase	Fourier coefficient for heating phase	%	cb
FZG load stage	FZG load stage	X	l
FZG load stage l42	load stage according to FZG l42 test	X	l
FZG micropitting test	load stage according to FZG micropitting test	X	l
FZG scuffing torque	scuffing torque according to FZG T1T	F*L	l
gear loss		P	gp
gear loss factor		%	gp
gear ratio		%	w+w
heat capacity		W/T	l,m
heat transfer coefficient		P/(A*T)	h,b,gx,gu
heat transfer coefficient Funck	heat transfer coefficient according to Funck	P/(A*T)	h,b,gx,gu
heat transfer coefficient Winter Michaelis	heat transfer coefficient according to Winter/Michaelis	P/(A*T)	h,b,gx,gu
heat transmission coefficient		P/(A*T)	h,b,gx,gu,cb,cp
heat transmission coefficient constrained convection	heat transmission coefficient for constraint convection	P/(A*T)	h,b,gx,gu
heat transmission coefficient free surface	heat transmission coefficient at free surface	P/(A*T)	h,b,gx,gu
heat transmission coefficient oil side	heat transmission coefficient at oil side	P/(A*T)	h,b,gx,gu
heat transmission coefficient outside Funck	heat transmission coefficient outside according to Funck	P/(A*T)	h,b,gx,gu

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
heat transmission coefficient outside Winter Michaelis	heat transmission coefficient outside according to Winter/Michaelis	P/(A*T)	h,b,gx,gu
heat transmission coefficient rib surface	heat transmission coefficient at rib surface	P/(A*T)	h,b,gx,gu
horizontal mass		G	bx
hypoid offset angle tangential plane		AN	gp
kinematic viscosity 100	kinematic viscosity at 100 degrees Celsius	A/t	l
kinematic viscosity 40	kinematic viscosity at 40 degrees Celsius	A/t	l
kinematic viscosity 50	kinematic viscosity at 50 degrees Celsius	A/t	l
kinematic viscosity wear	kinematic viscosity according to wear	A/t	l
lateral fixing	lateral fixing of gear for cutting into shaft ('0' no lateral fixing, '1' fixing at left side, '2' fixing at right side, '3' fixing at both side) (FVA 30 [27])	X	gx
lever 30 degree tangent upsc	lever at 30 degrees for load application at upper singular contact point	L	gp
lever 60 degree tangent	lever at 60 degrees tangent, may assigned to list property root of gear pair	L	gp
lever Lewis parabola upsc	lever at Lewis parabola for load application at upper singular contact point	L	gp
load angle upsc	load angle for load application at upper singular contact point, assigned to list property root of gear pair	AN	gp
load condition	load condition for bearing life time (FVA 30 [27]), list that contains number or load condition, rotation, time share and load	list	bx,gp,sh,gu
load stage 30	load stage at 30 degrees Celsius	X	l
load stage 60	load stage at 60 degrees Celsius	X	l
lower tolerance of centre distance		L	gp
mass		G	bx,gx,sh,bc,cb
mass per meter		G/L	bc
mean circular normal tooth thickness at standard pitch diameter	(ISO 1122 [1])	L	gx
mean circular tooth thickness at standard pitch diameter		L	gx
mean coefficient of friction		%	gp
mean density		D	m
mean gear ratio		%	w+w
mean grain size		L	m
measurement Bz0	measurement Bz0 according to DIN 58412 [13]	L	t

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
micropitting load stage		X	l
minimum lubrification thickness	minimum thickness of lubricating film	L	gp,bx
moment of inertia		G*A	w,sh,bx, bc
moment of inertia input	moment of inertia at input	G*A	gx
moment of inertia machine	machine at output	G*A	cb
moment of inertia motor	motor at input	G*A	cb
moment of inertia of plane		A*A	sh,cb
moment of inertia of torsion		G*A	sh
moment of inertia output	moment of inertia at output	G*A	gx
normal pitch	(ISO 1122 [1])	L	gx
nominal width		L	w+bc
number of chain strands		%	bc
number of clamping elements		%	cb
number of discs		%	w
number of friction material segments		%	cb
number of friction places		%	w+w
number of friction surfaces		%	cb
number of iterations for rotational speed		%	sh
number of links	number of links (of chain)	%	bc
number of load condition		%	bx,gp,sh, gu
number of mating gears	number of mating gears under load	%	gx
number of planets		%	pgu
number of sealings		%	sh
number of segments	(plain bearing)	%	bp
offset		L	bx,sh,w
offset between hub and wheel	offset between hub and wheel in axial direction	L	s+w
pitch		L	w+bc,cb
pitch angle	(ISO 1122 [1])	AN	gb,w+bc, cb
pitch diameter	assigned to gear AND gear pair (necessary if more than one mesh)	L	gx,gp
plastic deformation allowed	plastic deformation allowed : set '1', if not set '0'	X	gx
poisson ratio		%	m
polar moment of inertia		G*A	sc
pressure viscosity 2000 Barus	pressure viscosity at 2000 bar according to Barus	PR	l
pressure viscosity 2000 Bode	pressure viscosity at 2000 bar according to Bode	PR	l
pressure viscosity coefficient Mann	pressure viscosity coefficient according to Mann	1/PR	l
pressure viscosity exponent		1/PR	l
pressure viscosity exponent 100	pressure viscosity exponent at 100 degrees Celsius	1/PR	l
ratio e	ratio e for thrust bearings (axial force / radial force)	%	br

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
reduced mass		G	gx,gp
reduced moment of inertia	on one part (shaft) reduced moment of inertia	G*A	cb
related pressure viscosity coefficient bode	related pressure viscosity coefficient according to Bode	1/PR	l
related tooth thickness		AN	gp
relative clearance		L	gp
relative excentricity		%	bp
resisting moment		V	cb
reverse loading	reverse loading : set '1' ,else set '0'	X	bx,sh,gp
rotating angle		AN	gx,w+bc
Ryder test load	test line load according to Ryder	X	l
sealing media	set name of medium: 'air', 'lubricant', 'water'	X	se
shaft angle	(ISO 1122 [1])	AN	s+s,gp
shaft angle deviation	deviation of shaft angle	AN	s+s,gp
shear modulus		PR	m
single moment of inertia		G*A	cb
slope at vt	slope of viscosity-temperature-curve	%	l
sommerfeld coefficient		%	bp
specific heat		W/(G*T)	cb,l
speed range	range between highest and lowest speed	v	w,bc,w+w
starting coefficient of friction		%	gp
starting gradient of heating curve		%	cb
target centre distance		L	gp
temperature viscosity exponent		%	l
thermal conductivity		P/(L*T)	l,m
thermal conductivity of disc	thermal conductivity of disc of clutch or brake	P/(L*T)	cb
thermal expansion coefficient		1/T	bx,sh,h,cp
thermal expansion coefficient pin	thermal expansion coefficient of pin (of plain bearing)	1/T	bp
thickness modification coefficient		L	gx
thickness of wearing material		L	w,cb
total deviation		L	gx
total mass		G	sh
total profile deviation		L	gx
total tooth alignment deviation		L	gx
total width		L	w+bc
type of lubrication	set 'splash lubrication', 'spray lubrication', 'gravity feed lubrication', 'intermittent mechanical spray lubrication'	X	bx,gp,gu
upper tolerance of centre distance		L	gp
vertical mass		G	bx
viscosity index		%	l
weight of bearing		%	bx
width length ratio of bearing segment	ratio between width and length of	%	bx

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
	bearing segment		
working backlash	backlash under operation	L	gp
working width		L	w+bc
yield stress		PR	m

Table B.13 — Power rotation speed

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
angular speed normal to contact		v	w
average rotation		1/t	gx,bx,sh
base power		P	gu
boring speed		v	w
carrier speed		1/t	gx
circumferential speed	tangential speed	v	w,sh,se,bc,cb
circumferential speed pitch diameter	circumferential speed at pitch diameter	v	gx
circumferential speed reference diameter	circumferential speed at reference diameter	v	gx
critical rotation		1/t	w,bc
difference in angular speed		1/t	cb
difference in rotation		1/t	cb
friction power loss sliding phase	friction power loss during sliding phase	P	gu
holding input power		P	gu
idle rotation		1/t	cb
impact speed		v	w+bc
increase of rotation		1/t	cb
input power		P	gx,sh,gu
input rotational speed		1/t	gx,bx,sh,cb
kinetic energy		P	cb
maximum sliding speed		v	se
mean circumferencial speed scuffing	mean tangential speed according to scuffing	v	gb
mean sliding velocity		v	gp
mean sum of velocity		v	gp
modified thermal power rating		P	gu,gp
nominal power		P	gu, gp
nominal rotational speed		1/t	gx,bx,sh
output power		P	sh,gu
output rotational speed	rotational speed at output	1/t	sh,gx,bx,cb
pitch angular speed		1/t	w
pitch speed		v	w
power		P	gu,gp,w,sh
power main drive	power of main drive	P	sh,gx
power oil pumpe	power of oil pump	P	gu
related rotational speed		1/t	gx,gp,sh,bx
related rotational speed tooth force level	related rotational speed according to tooth force level	1/t	gx
rolling power		P	gp
rotational rolling speed		1/t	gx
rotational speed		1/t	w,bx,sh,cb,cp
rotational speed for releasing	(coupling)	1/t	cp

Value name of property value of product model for gear units	Explanation of property	Unit type	Assigned to
rotational speed for stationary torque		1/t	cb
rotational speed of propeller		1/t	gu,sh
screwing speed	(crossed helical gear)	v	gpch
sense of rotation	set '1' if direction is antirotation (left), set '-1' if direction is clockwise (right) (according to the coordinate system of the part)	X	w, sh
service power	may assigned to shape root of gear or list property flank of gear pair	P	gu
specific power		P	gu
starting rotational speed		1/t	sh
sum of speeds		v	gp
terminating rotational speed		1/t	sh
total sliding speed		v	w+w
transmittable power		P	gu,gp
velocity of moving masses		v	cb