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PartModel Design Rule Kits Guidelines for Electronic-Device Packages – XML Requirements

JEP30-K100

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JEDEC SOLID STATE TECHNOLOGY ASSOCIATION

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PartModel Design Rule Kits Guidelines for Electronic-Device Packages – XML Requirements

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PART MODEL SUPPLYCHAIN GUIDELINE FOR ELECTRONIC-DEVICE PACKAGES - XML REQUIREMENTS

(From JEDEC Board Ballots JCB-24-53, formulated under the cognizance of the JC-11 Committee on Mechanical Standardization.)

1 Scope

The JEP30 document establishes the requirements for exchanging part data between part manufacturers and their customers for electrical and electronic products. The JEP30 documents are part of a series to describe XML data exchange structure and hierarchy. The JEP30 document series will detail data exchange between companies for design at the next level, analysis, and interconnection. The parent JEP30 document specifically focuses on the parental structure, under which several sub-sections are listed, such as electrical, physical, thermal, supply chain, assembly process classification, generated ECAD models, and environment including material declaration. This document adds a new section called the Design Kit sub-section to the JEP30 PartModel XML Schema series.

1.1 Purpose

This standard is intended to benefit part manufacturers and their customers by providing consistency and efficiency to the transfer of part design rule data from part manufacturer to customers. It establishes standard electronic data exchange formats that will facilitate and improve data transfer along the entire global supply chain, at every stage in the product life cycle. A key aspect therefore is the structure of the content that is contained in this format, which the committee believes should be based on the following two principals:

1) Data that is required to be consumed by software tools, and

2) Data that is not required to be consumed by software tools but is provided for informational purpose.

This standard specifically covers data applicable to the Design Rule Kits that is required to support the design, fabrication and consumption modelling of the device.

2 Applicable Documents

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

2.1 JEDEC (www.jedec.org)

JEP30, *PartModel Guidelines for Electronic-Device Packages – XML Requirements*

JEP30-A100, PartModel Assembly Process Classification Guidelines for Electronic-Device Packages – XML Requirements

***JEP30-E100**, PartModel Electrical Guidelines for Electronic-Device Packages – XML Requirements*

JEP30-P100, PartModel Package Guidelines for Electronic-Device Packages – XML Requirements

JEP30-T100, PartModel Thermal Guidelines for Electronic-Device Packages – XML Requirements

2.1.1 JEDEC PartModel Schema and Sub-Schemas

JEP30-10, PartModel Schema

JEP30-A101, PartModel Assembly Process Classification Schema

JEP30-E101, PartModel Electrical Schema

JEP30-P101, PartModel Package Schema

JEP30-S101, PartModel Supply Chain Schema

JEP30-T101, PartModel Thermal Schema

JEP30-K101, PartModel Design Kit Schema

JEP30-M101, PartModel Generated ECAD – Models Schema

JEP30-D10, *PartModel Schema Types Dictionary* (Required to support the PartModel Schema and each of its sectional sub-schemas.)

2.2 IPC (www.ipc.org)

IPC-7352, Generic Guideline for Land Pattern Design

3 Requirements

The following terms and definitions are applicable to this XML Schema.

3.1 Terms and Definitions

All definitions and terms associated with the Design Kit Data are defined in the relevant standards that govern the definition of those parameters, as listed in the applicable documents section. The Design Kit details of the part are defined in the *DesignKitSection* of the XML Schema.

All common Terms and Definitions that are used by more than one sectional sub-schema, such as any of the Assembly Process Classification, Electrical, Environmental, Package, Supply Chain, Thermal, Design Kits, or Generated ECAD Models are defined in the “JEP30-D10 PartModel Schema Types Library”.

All other definitions and terms necessary to define the schema, are defined by this document.
PartModel: A PartModel is a data representation described in an XML file that conforms to the rules and structure of the PartModel XML Schema.

NOTE 1 Companies who use the PartModel XML Files and claim compliance to JEDEC, must ensure that their PartModel XML file conforms to the specific released version of the PartModel XML Schema released by JEDEC.

NOTE 2 Section 4 will define the outline of the structure of the Design Kit XML Schema. Specific components of the XML Schema and their hierarchy are specifically controlled by the JC-11 Standards Committee who retain the expertise for these structures.

NOTE 3 The *DesignKitSection* of the schema forms part of the PartModel XML Schema and is not intended to act as a standalone schema. In addition, there is a “PartModel Schema Types Library” XML Schema, which is a common set of xml structures shared across the PartModel XML Schema and all of its sub-section schemas.

3.2 XML Schema Key Terms and Definitions

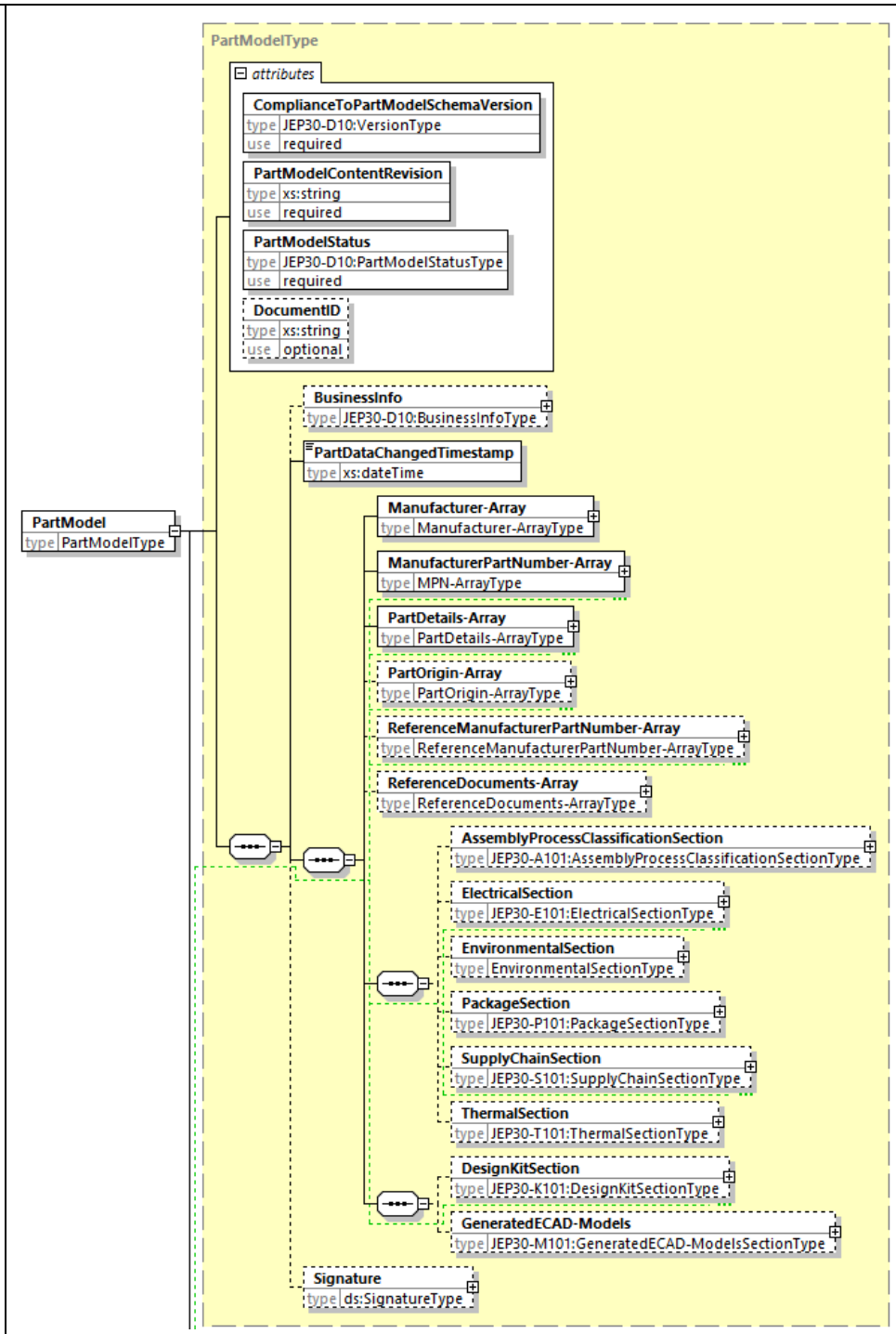
Reference the JEP30 publication for details of the "XML Schema Key Terms and Definitions".

4 PartModel Schema Definition

The following section describes the XML Schema structure.

4.1 PartModel – Design Kit Section

diagram



type **PartModelType -> DesignKitSection, ds:SignatureType**

4.1 PartModel – Design Kit Section (cont'd)

The *PartModelType* belongs to the "PartModel XML Schema". The *DesignKitSection* belongs to the "PartModel Design Kit XML Schema". The primary purpose of the PartModel Schema is to provide the structure for identifying unique parts (Manufacturer and MPN), and the structure to include the sub schemas which define the part details, as outline in the JEP30 - PartModel Guidelines for Electronic-Device Packages – XML Requirements.

This document covers the *DesignKitSection*, which is referenced from its parent's structure, the *PartModel*. The contents under the *DesignKitSection* are

1. Tied to the Manufacturer's name and Manufacturer's part number if the Design kit is applicable to a part or a chiplet, or
2. Tied to the Manufacturer's name and Process Technology Identifier if the Design kit is applicable to a process technology as in the design rules applicable to an organic Interposer, or .
3. Tied to a Standards Body and a Standards Identifier, if the Design Kit represents a standard set of rules as defined by a specific Standards Body.

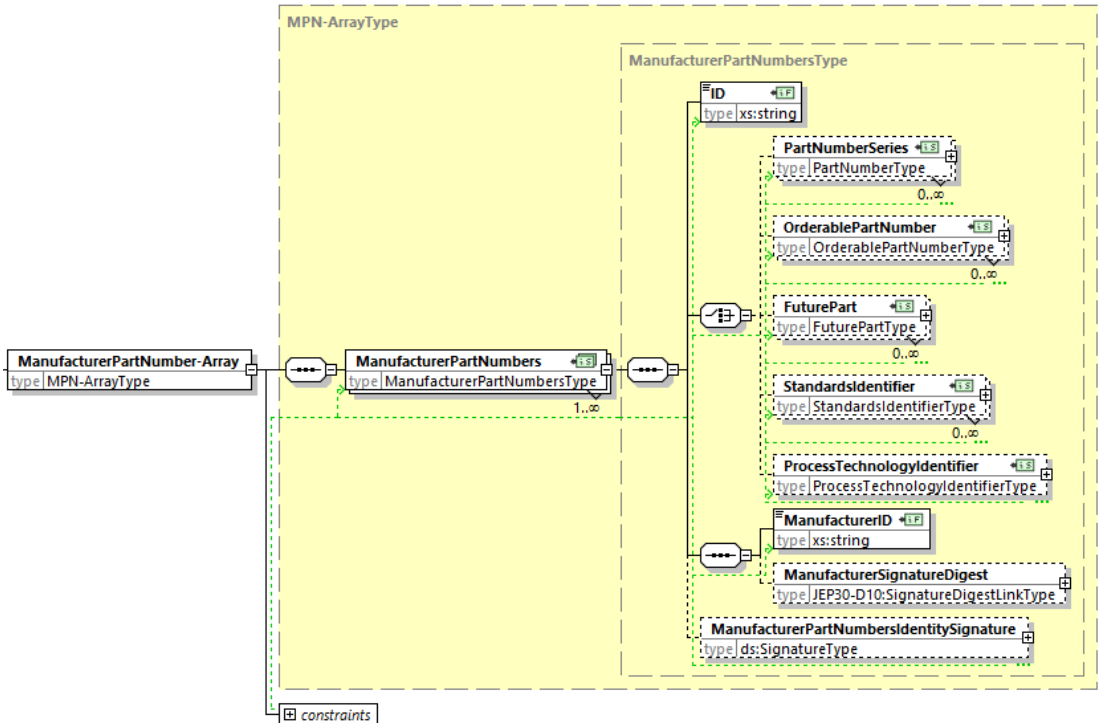
All releases of the *DesignKitSection* sub-schema must be under the umbrella of the PartModel Schema to ensure that the PartModel schema is referencing the correct version of the Design Kit sub-schema. In addition, this will enable the Design Kit sub-schemas to connect to the identity structure as defined in the parent schema JEP30.

The *ComplianceToPartModelSchemaVersion* indicates the version of the Schema to which the XML file is to be validated against. All new releases to this document or XML Schema is governed by the rules outlined in JEP30, and must be released in sync with the PartModel.

"Each time that a Sub-schema gets updated, then the PartModel version also gets updated in order to release that Sub-schema under the umbrella of the PartModel. This is because the PartModel must now reference the new version of Sub-schema, since all subschemas have their own version number. The parent schema includes them by referring to a precise version, so a version bump in the subschema requires a version bump in the parent only at the time of release of the Parent."

The *PartModelContentRevision* indicates the revision of the data for the Part that is submitted in the XML file. This enables the Component Manufacturer to provide a new XML file for a Part each time they wish to upgrade a new set of data for a part, in any of the sub-sections such as this *DesignKitSection*.

4.2 Manufacturer Part Number-Array

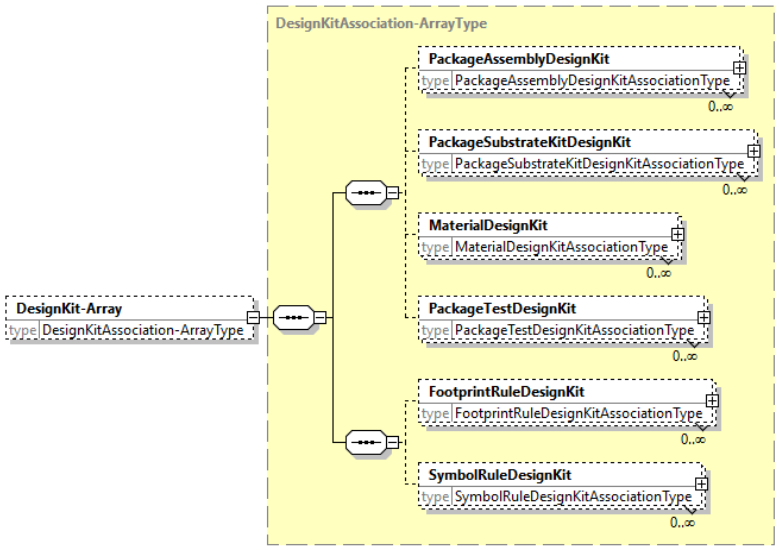
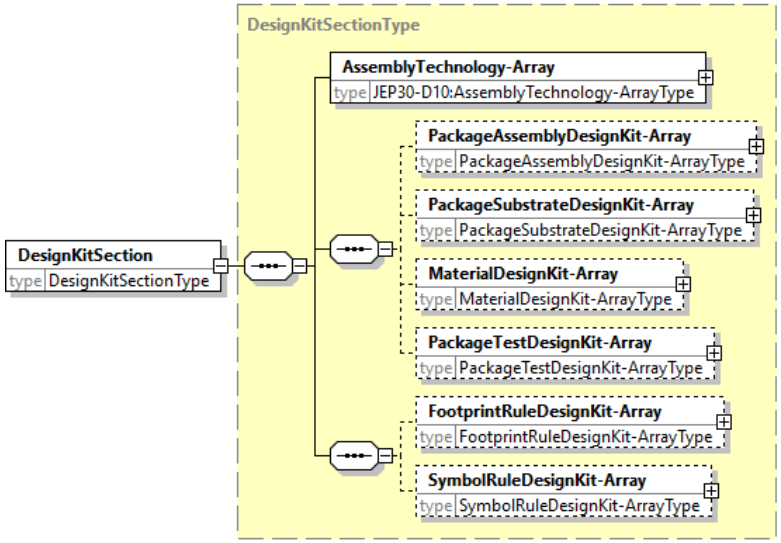
path	**PartModel/ManufacturerPartNumber-Array.**
diagram	
type	**MPN–ArrayType, ManufacturerPartNumbersType, PartNumberType, OrderablePartNumberType, FuturePartType, StandardsIdentifierType, ProcessTechnologyIdentifierType, JEP30-D10:SignatureDigestLinkType, ds:SignatureType.**

The *ManufacturerPartNumber-Array/ManufacturerPartNumbers* provides the definition of the part number, design kit, or a specific Standard, so that it can be connected to the technical specification details in the *DesignKitSection* via the *PartDetails-Array* section.

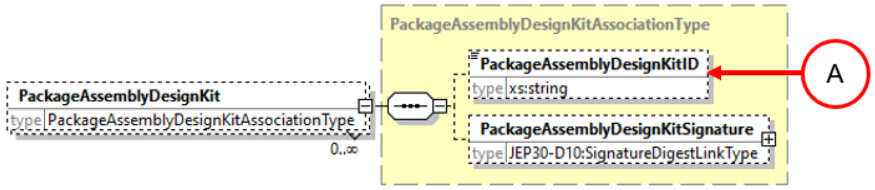
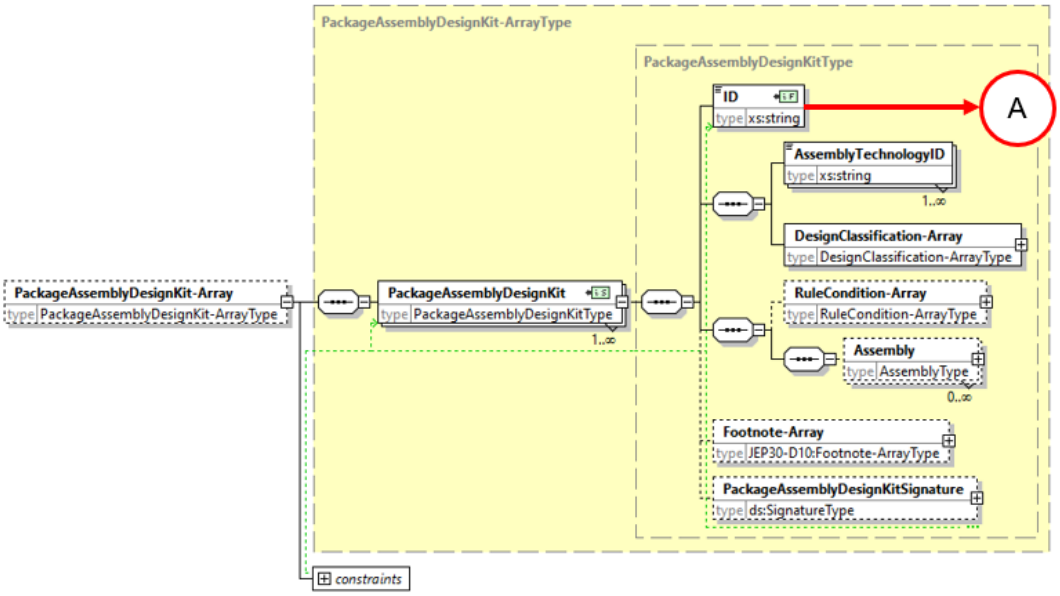
4.3 Linking the Manufacturing Part Number to a specific Design Kit Data set

The linking of the Parts, Standards or Process Technology Identifier to its technical data is done via the *PartDetails-Array* section as outline in the JEP30 - PartModel Guidelines for Electronic-Device Packages – XML Requirements. This consists of two sections called *PartsSelection-Array* and *Association-Array* which defines the relationship between identifying the specific set of parts, process identifiers, or standards identifiers and how they are associated with the Design Kit content. Reference the JEP30 parent document for more details on this association.

4.3 Linking the Manufacturing Part Number to a specific Design Kit Data set (cont'd)

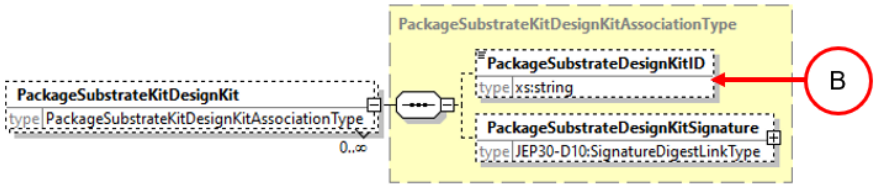
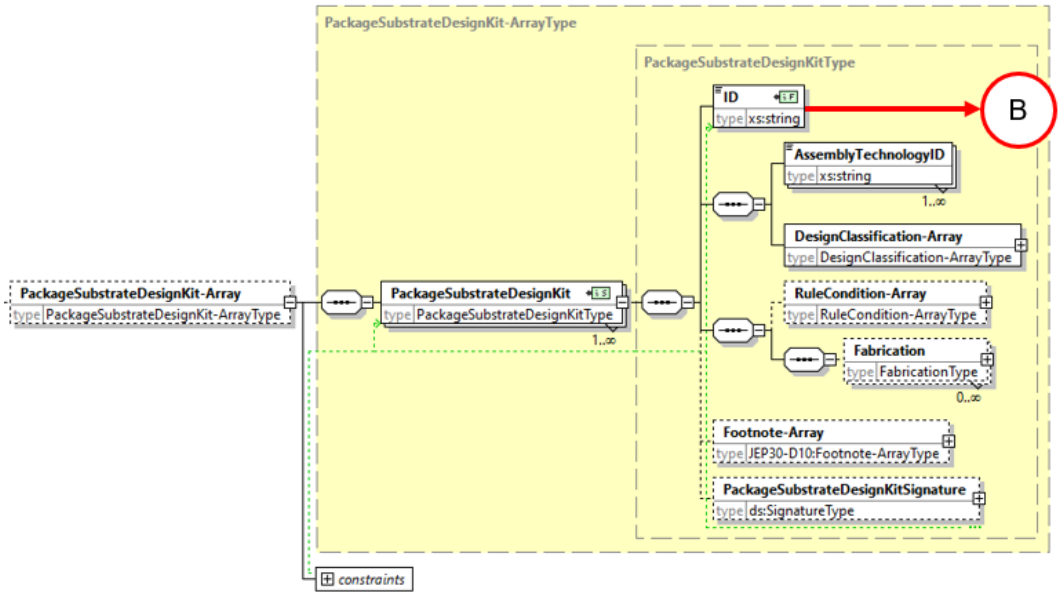
path	**PartModel/PartDetails-Array/PartDetails/Association-Array/Association/DesignKit-Array**
diagram at the Association level	
type	**DesignKitAssociation-ArrayType, PackageAssemblyDesignKitAssociationType, PackageSubstrateKitDesignKitAssociationType, MaterialDesignKitAssociationType, PackageTestDesignKitAssociationType, FootprintRuleDesignKitAssociationType, SymbolRuleDesignKitAssociationType.**
path	**PartModel/DesignKitSection**
diagram at the Design Kit Section level	
type	**JEP30-K101:DesignKitSectionType, JEP30-D10:AssemblyTechnology-ArrayType, PackageAssemblyDesignKit-ArrayType, PackageSubstrateDesignKit-ArrayType, MaterialDesignKit-ArrayType, PackageTestDesignKit-ArrayType, FootprintRuleDesignKit-ArrayType, SymbolRuleDesignKit-ArrayType.**

4.3.1 Linking the Manufacturing Part Number to Package Assembly Design Kit

path	**PartModel/PartDetails-Array/PartDetails/Association-Array/Association/DesignKit-Array/PackageAssemblyDesignKit**
diagram at the Package Assembly Design Kit Association level	
type	**PackageAssemblyDesignKitAssociationType, JEP30-D10:SignatureDigestLinkType**
path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array**
diagram at the Package Assembly Design Kit level.	
type	**PackageAssemblyDesignKit-ArrayType, AssemblyDesignKitType, DesignClassification-ArrayType, RuleCondition-ArrayType, AssemblyType, JEP30-D10:Footnote-ArrayType, ds:SignatureType.**

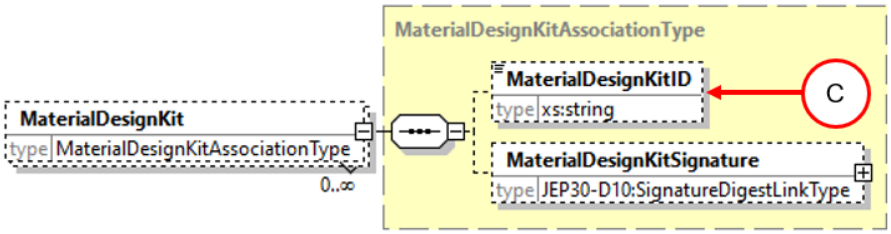
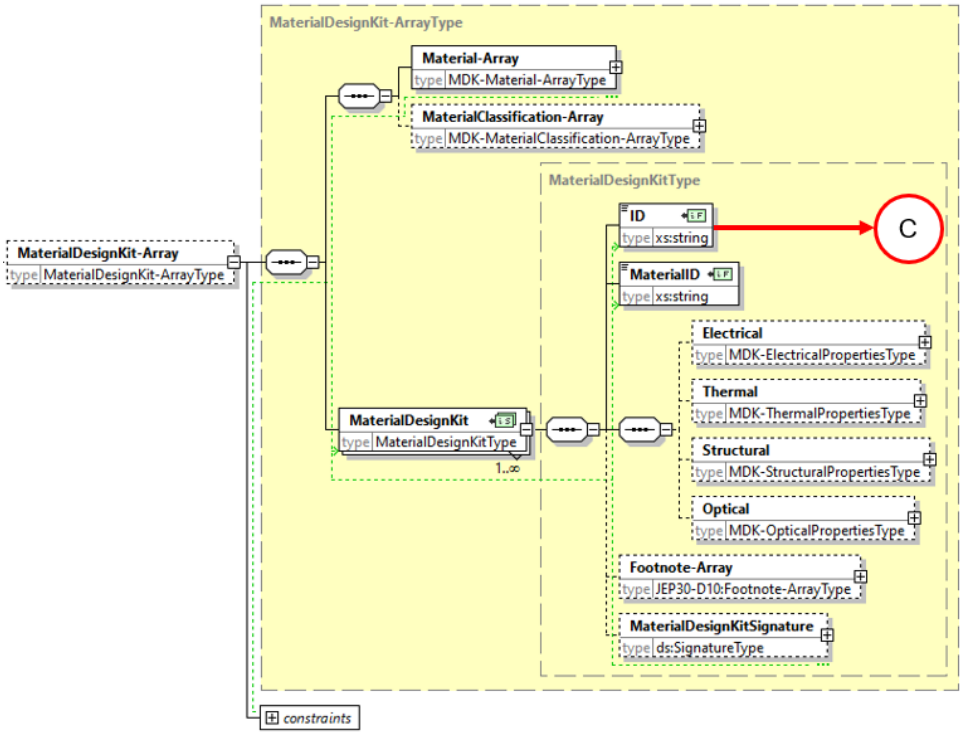
The *PackageAssemblyDesignKitID* references the *PackageAssemblyDesignKit*/ID under the DesignKitSection/PackageAssemblyDesignKit-Array. This is enforced by the key named as *PackageAssemblyDesignKitKey* that is assigned to the *PackageAssemblyDesignKit*/ID element, which is referenced by the *PackageAssemblyDesignKitID* which has a KeyRef that refers to the *JEP30-K101:PackageAssemblyDesignKitKey*.

4.3.2 Linking the Manufacturing Part Number to Package Substrate Design Kit

path	**PartModel/PartDetails-Array/PartDetails/Association-Array/Association/DesignKit-Array/PackageSubstrateDesignKit**
diagram at the Package Substrate Design Kit Association level	
type	**PackageSubstrateDesignKitAssociationType, JEP30-D10:SignatureDigestLinkType**
path	**PartModel/DesignKitSection/PackageSubstrateDesignKit-Array**
diagram at the Package Substrate Design Kit level.	
type	**PackageSubstrateDesignKit-ArrayType, PackageSubstrateDesignKitType, DesignClassification-ArrayType, RuleCondition-ArrayType, FabricationType, JEP30-D10:Footnote-ArrayType, ds:SignatureType.**

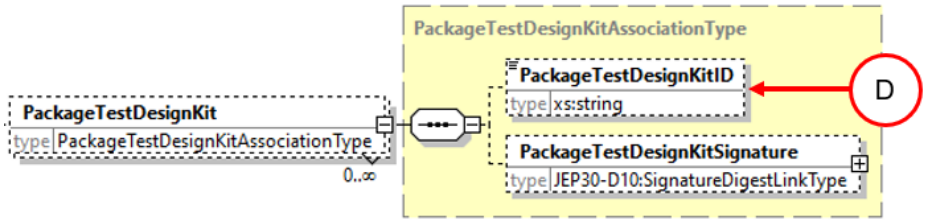
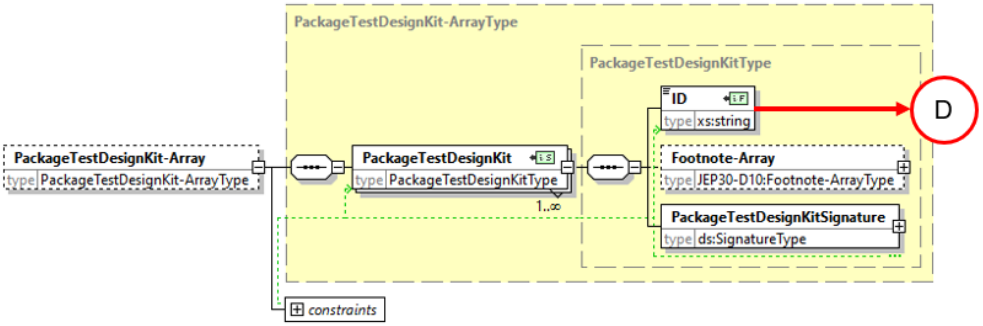
The *PackageSubstrateDesignKitID* references the *PackageSubstrateDesignKit*/ID under the DesignKitSection/PackageSubstrateDesignKit-Array. This is enforced by the key named as *PackageSubstrateDesignKitKey* that is assigned to the *PackageSubstrateDesignKit*/ID element, which is referenced by the *PackageSubstrateDesignKitID* which has a KeyRef that refers to the *JEP30-K101:PackageSubstrateDesignKitKey*.

4.3.3 Linking the Manufacturing Part Number to Material Design Kit

path	**PartModel/PartDetails-Array/PartDetails/Association-Array/Association/DesignKit-Array/MaterialDesignKit**
diagram at the Material Design Kit Association level	
type	**MaterialDesignKitAssociationType, JEP30-D10:SignatureDigestLinkType**
path	**PartModel/DesignKitSection/MaterialDesignKit-Array**
diagram at the Material Design Kit level.	
type	**MaterialDesignKit-ArrayType, MDK-Material-ArrayType , MDK-MaterialClassification-ArrayType, MaterialDesignKit, MDK-ElectricalPropertiesType , MDK-ThermalPropertiesType, MDK-StructuralPropertiesType, MDK-OpticalPropertiesType, JEP30-D10:Footnote-ArrayType, ds:SignatureType.**

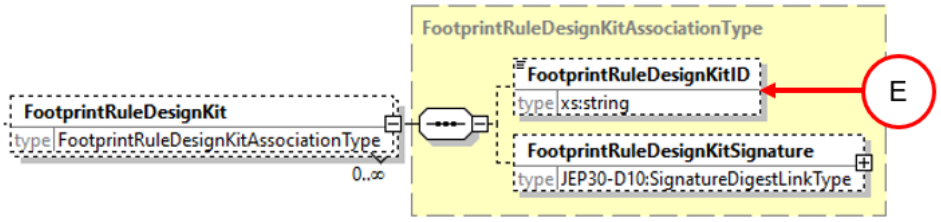
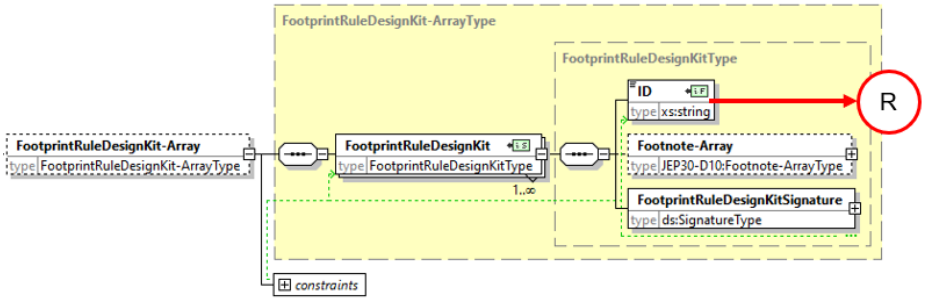
The *MaterialDesignKitID* references the *MaterialDesignKit/ID* under the *DesignKitSection/MaterialDesignKit-Array*. This is enforced by the key named as *MaterialDesignKitKey* that is assigned to the *MaterialDesignKit/ID* element, which is referenced by the *MaterialDesignKitID* which has a KeyRef that refers to the *JEP30-K101:MaterialDesignKitKey*.

4.3.4 Linking the Manufacturing Part Number to Package Test Design Kit

path	**PartModel/PartDetails-Array/PartDetails/Association-Array/Association/DesignKit-Array/PackageTestDesignKit**
diagram at the Package Test Design Kit Association level	
type	**PackageTestDesignKitAssociationType, JEP30-D10:SignatureDigestLinkType**
path	**PartModel/DesignKitSection/PackageTestDesignKit-Array**
diagram at the Package Test Design Kit level.	
type	**PackageTestDesignKit-ArrayType, PackageTestDesignKit, JEP30-D10:Footnote-ArrayType, ds:SignatureType.**

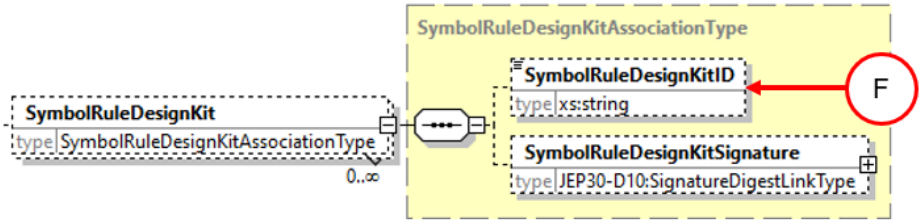
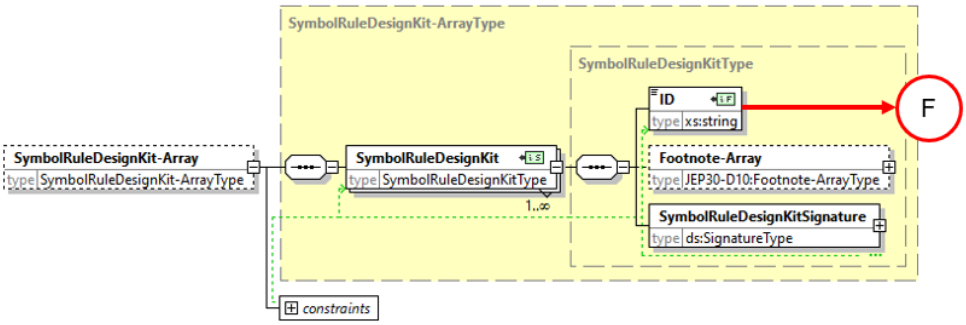
The *PackageTestDesignKitID* references the *PackageTestDesignKit*/ID under the DesignKitSection/PackageTestDesignKit-Array. This is enforced by the key named as *PackageTestDesignKitKey* that is assigned to the *PackageTestDesignKit*/ID element, which is referenced by the *PackageTestDesignKitID* which has a KeyRef that refers to the *JEP30-K101:PackageTestDesignKitKey*.

4.3.5 Linking the Manufacturing Part Number to Footprint Rule Design Kit

path	**PartModel/PartDetails-Array/PartDetails/Association-Array/Association/DesignKit-Array/FootprintRuleDesignKit**
diagram at the Footprint Rule Design Kit Association level	
type	**FootprintRuleDesignKitAssociationType, JEP30-D10:SignatureDigestLinkType**
path	**PartModel/DesignKitSection/FootprintRuleDesignKit-Array**
diagram at the Footprint Rule Design Kit level.	
type	**FootprintRuleDesignKit-ArrayType, FootprintRuleDesignKit, JEP30-D10:Footnote-ArrayType, ds:SignatureType.**

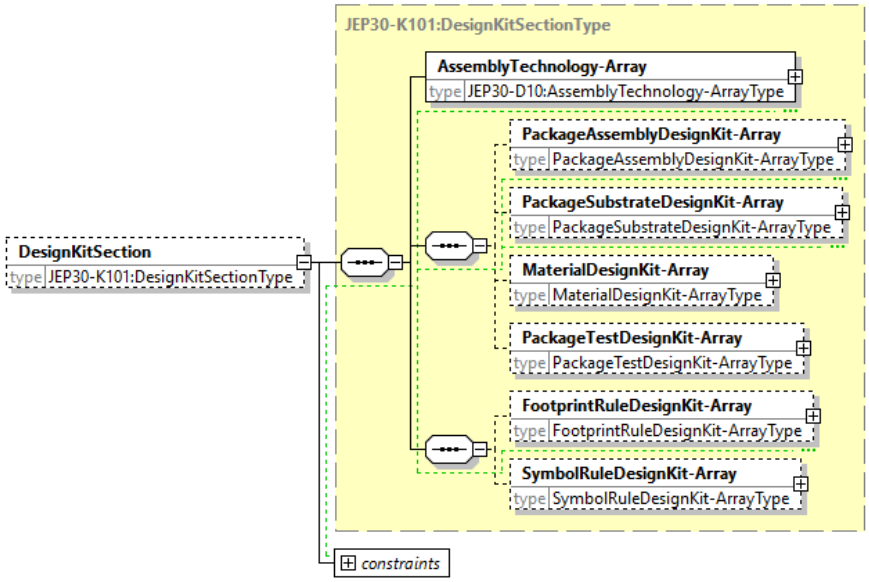
The *FootprintRuleDesignKitID* references the *FootprintRuleDesignKit*/ID under the DesignKitSection/FootprintRuleDesignKit-Array. This is enforced by the key named as *FootprintRuleDesignKitKey* that is assigned to the *FootprintRuleDesignKit*/ID element, which is referenced by the *FootprintRuleDesignKitID* which has a KeyRef that refers to the *JEP30-K101:FootprintRuleDesignKitKey*.

4.3.6 Linking the Manufacturing Part Number to Symbol Rule Design Kit

path	**PartModel/PartDetails-Array/PartDetails/Association-Array/Association/DesignKit-Array/SymbolRuleDesignKit**
diagram at the Symbol Rule Design Kit Association level	
type	**SymbolRuleDesignKitAssociationType, JEP30-D10:SignatureDigestLinkType**
path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array**
diagram at the Symbol Rule Design Kit level.	
type	**SymbolRuleDesignKit-ArrayType, SymbolRuleDesignKit, JEP30-D10:Footnote-ArrayType, ds:SignatureType.**

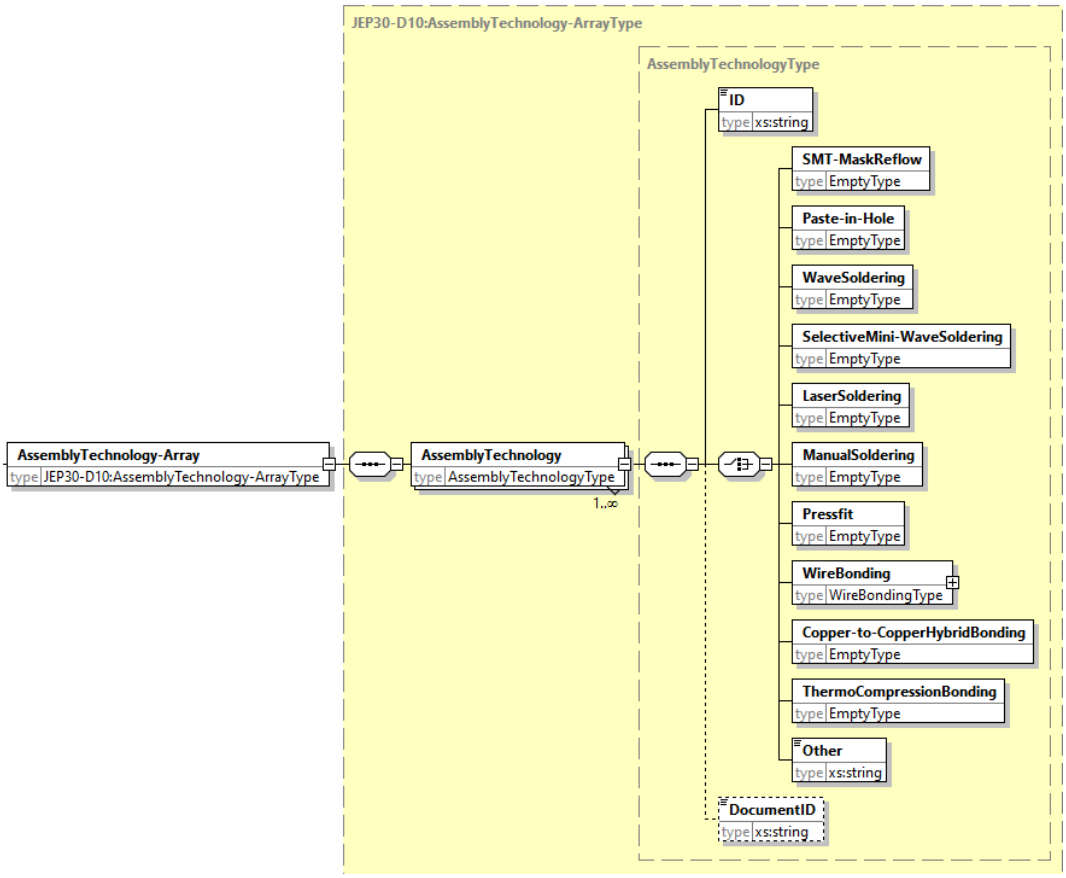
The *SymbolRuleDesignKitID* references the *SymbolRuleDesignKit*/ID under the DesignKitSection/SymbolRuleDesignKit-Array. This is enforced by the key named as *SymbolRuleDesignKitKey* that is assigned to the *SymbolRuleDesignKit*/ID element, which is referenced by the *SymbolRuleDesignKitID* which has a KeyRef that refers to the *JEP30-K101:SymbolRuleDesignKitKey*.

5 Design Kit Section

path	**PartModel/DesignKitSection**
diagram	
type	**JEP30-K101:DesignKitSectionType, JEP30-D10:AssemblyTechnology-ArrayType, PackageAssemblyDesignKit-ArrayType, PackageSubstrateDesignKit-ArrayType, MaterialDesignKit-ArrayType, PackageTestDesignKit-ArrayType, FootprintRuleDesignKit-ArrayType, SymbolRuleDesignKit-ArrayType.**

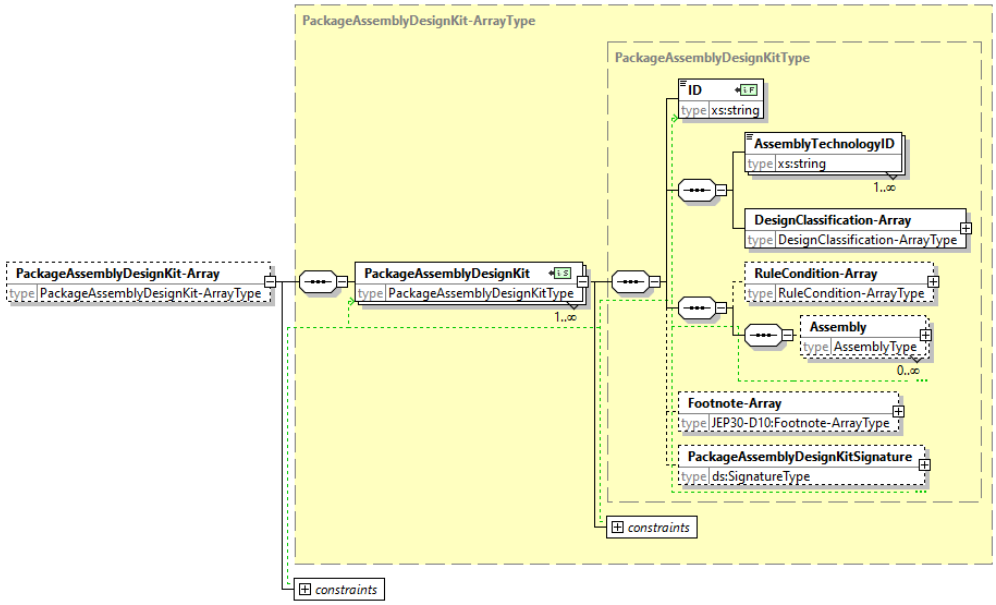
The *DesignKitSection* consists of 7 sections as shown above in the diagram. Each of these sections are described in further detail in the sub-sections below.

5.1 Assembly Technology - Array

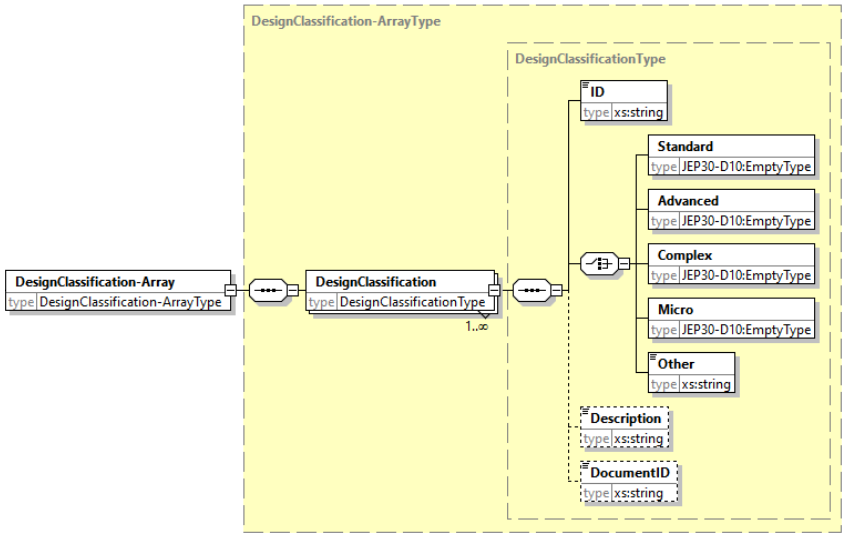
path	**PartModel/DesignKitSection/AssemblyTechnology-Array**
diagram	
type	**JEP30-D10:AssemblyTechnology-ArrayType, AssemblyTechnologyType, EmptyType, WireBondingType.**

The *AssemblyTechnology-Array* outlines the various technologies that can be applied to the applied to the part during its assembly to its parent's assembly. This technology can drive the rules values for the design kits that are defined in this *DesignKitSection*.

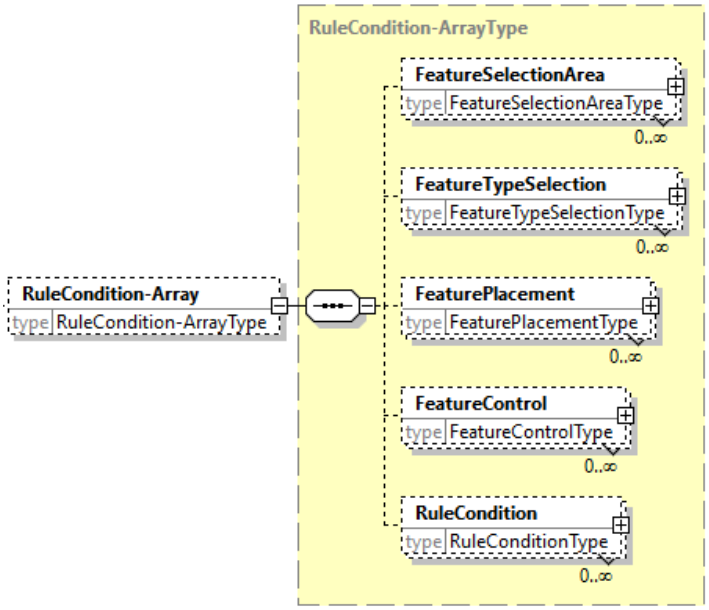
5.2 Package Assembly Design Kit - Array

path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array**
diagram	
type	**PackageAssemblyDesignKit-ArrayType, PackageAssemblyDesignKitType,** **DesignClassification-ArrayType, RuleCondition-ArrayType, AssemblyType,** **JEP30-D10:Footnote-ArrayType, ds:SignatureType**

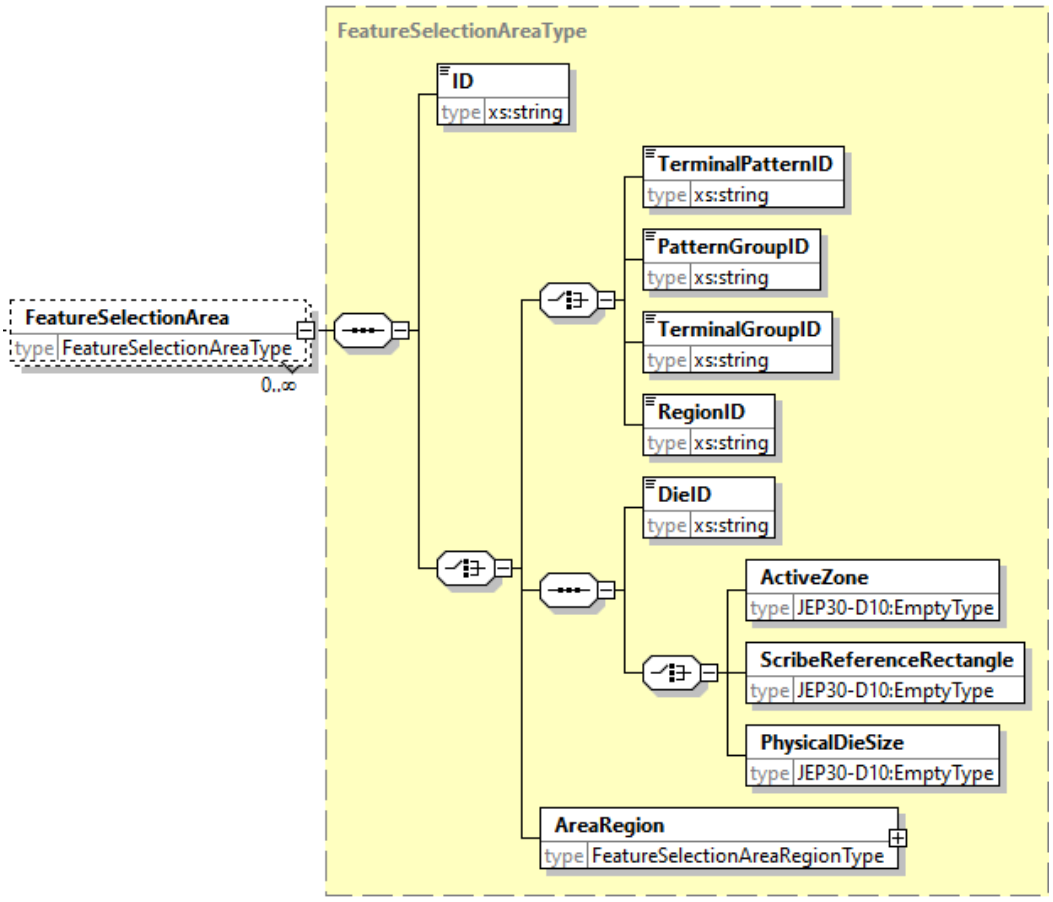
5.2.1 Design Classification - Array

path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/DesignClassification-Array**
diagram	
type	**DesignClassification-ArrayType, DesignClassificationType.**

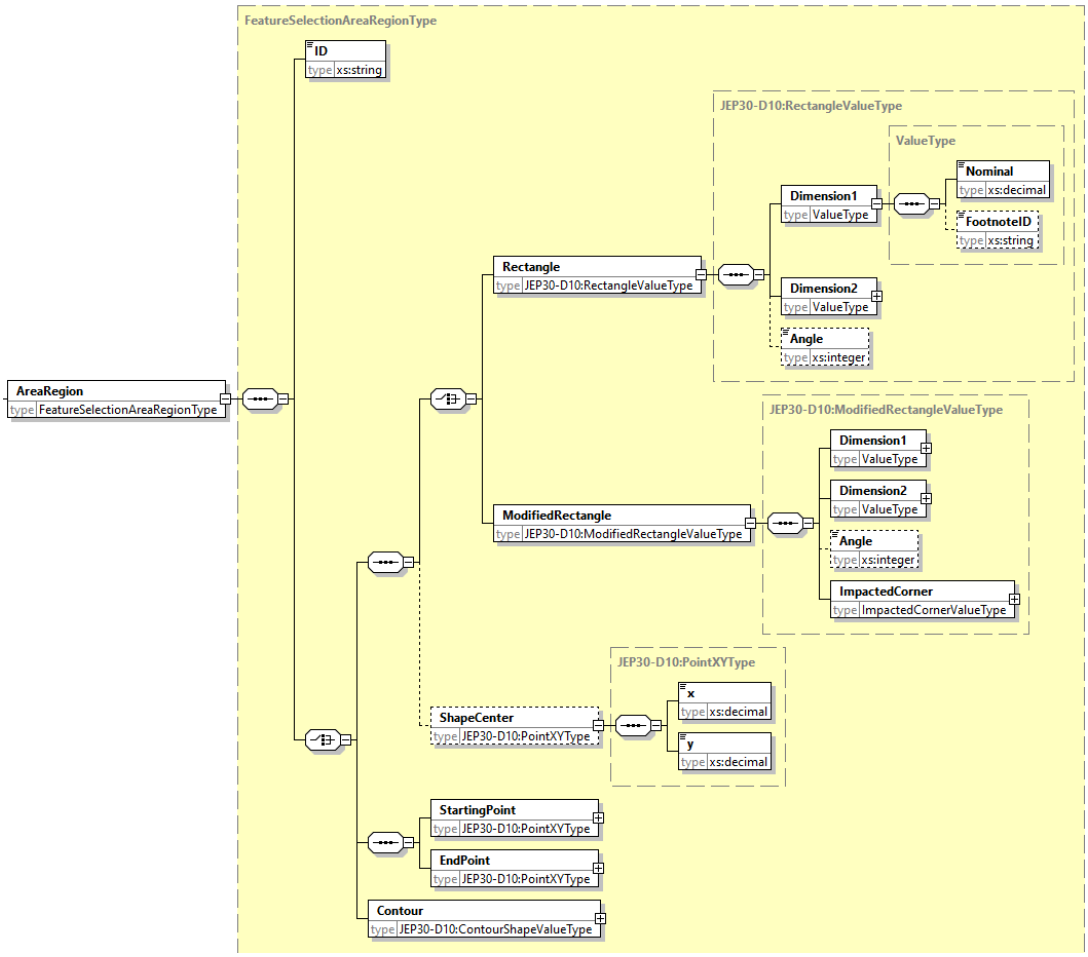
5.2.2 Rule Condition - Array

path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/RuleCondition-Array**
diagram	
type	**RuleCondition-ArrayType, FeatureSelectionAreaType, FeatureTypeSelectionType, FeaturePlacementType, FeatureControlType, RuleConditionType.**

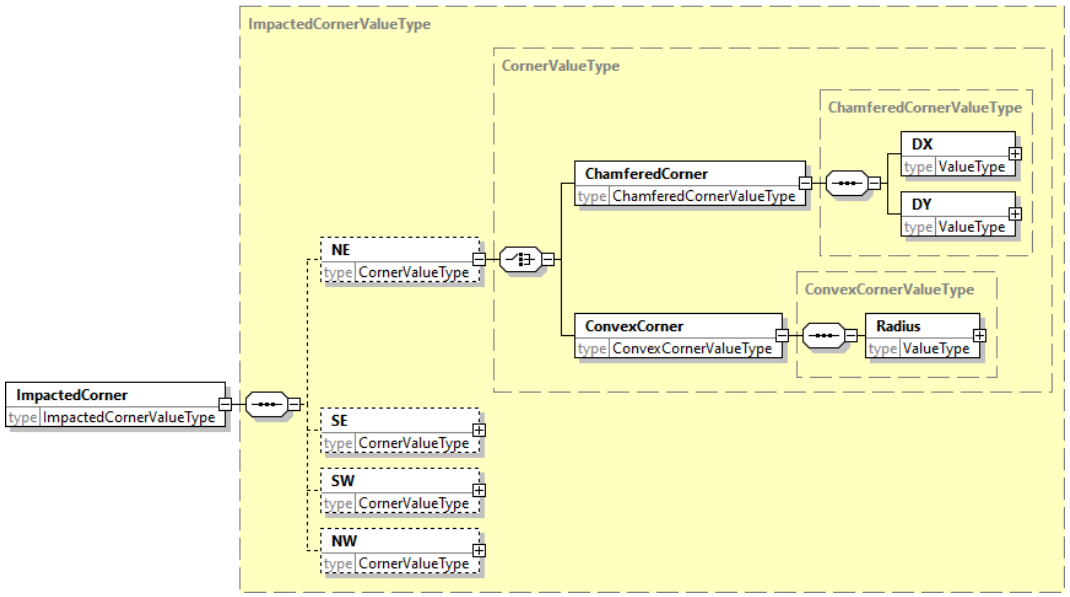
5.2.2.1 Feature Selection Area

path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/RuleCondition-Array/FeatureSelectionArea**
diagram	
type	**FeatureSelectionAreaType, JEP30-D10:EmptyType, FeatureSelectionAreaRegionType.**

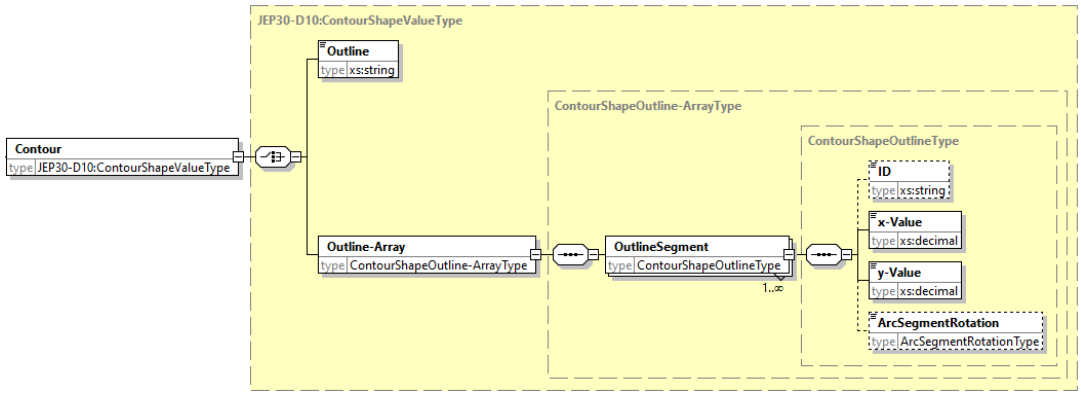
5.2.2.1.1 Area Region

path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/RuleCondition-Array/FeatureSelectionArea/AreaRegion**
diagram	
type	**FeatureSelectionAreaRegionType, JEP30-D10:RectangleValueType, ValueTye, JEP30-D10:ModifiedRectangleValueType, ImpactedCornerValueType, JEP30-D10:PointXYType, JEP30-D10:ContourShapeValueType,**

5.2.2.1.1.1 Impacted Corner

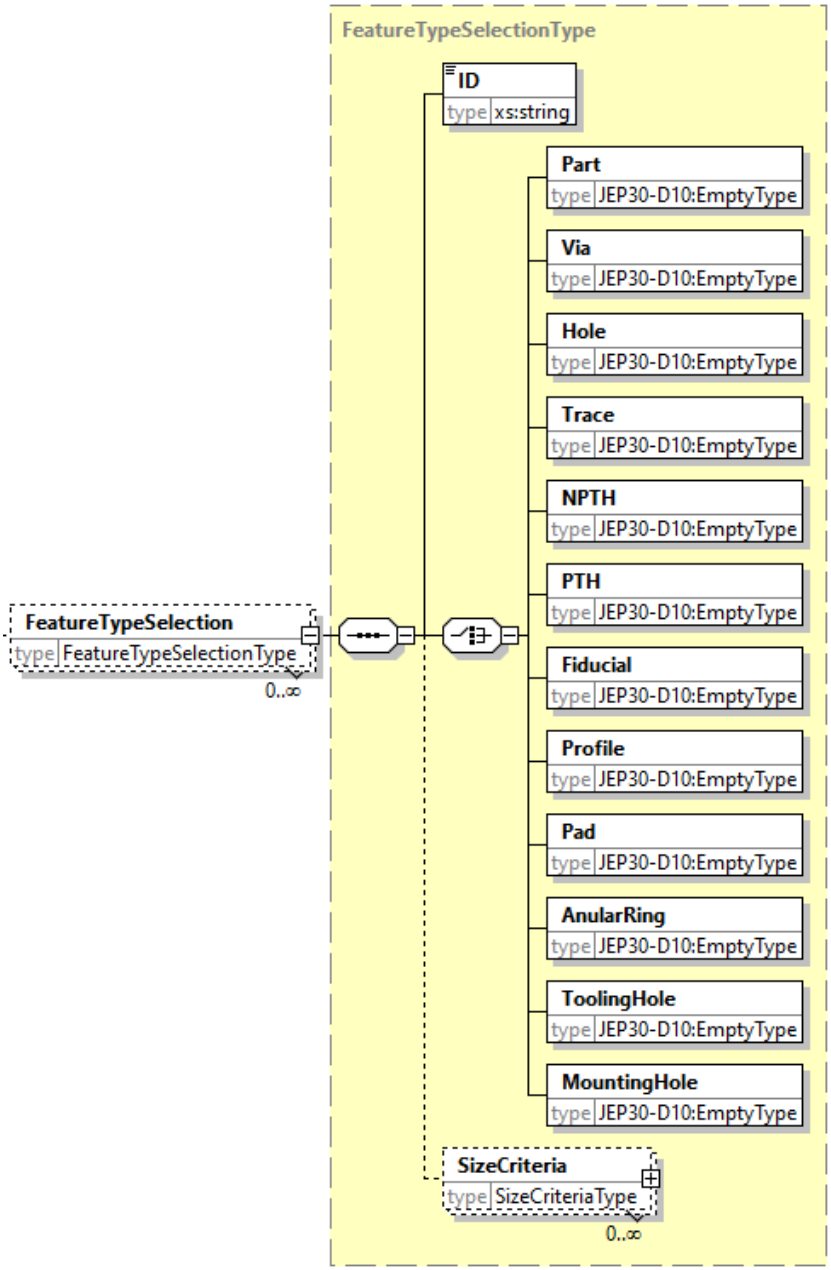
path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/RuleCondition-Array/FeatureSelectionArea/AreaRegion/ModifiedRectangle/ImpactedCorner**
diagram	
type	**ImpactedCornerValueType, CornerValueType, ChamferedCornerValueType, ConvexCornerValueType, ValueType.**

5.2.2.1.1.2 Contour

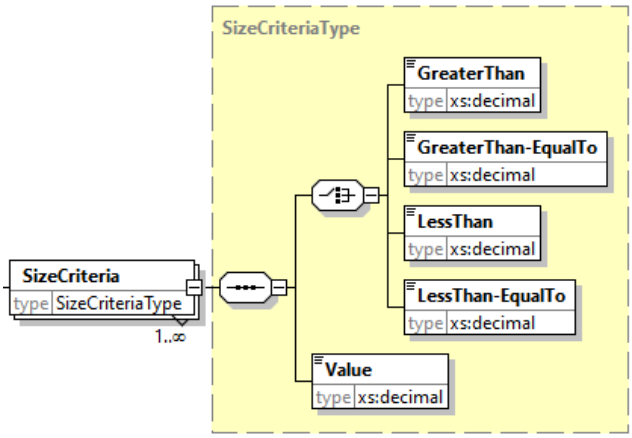
path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/RuleCondition-Array/FeatureSelectionArea/AreaRegion/ModifiedRectangle/Contour**
diagram	
type	**JEP30-D10:ContourShapeValueType, ContourShapeOutline-ArrayType, ContourShapeOutlineType, ArcSegmentRotationType**

The enumerated values for the *ArcSegmentRotation* are Clockwise and Anti-clockwise.

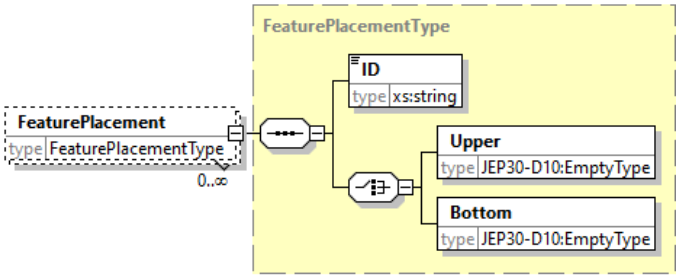
5.2.2.2 Feature Type Selection

path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/RuleCondition-Array/FeatureTypeSelection**
diagram	
type	**FeatureTypeSelectionType, JEP30-D10:EmptyType, SizeCriteriaType.**

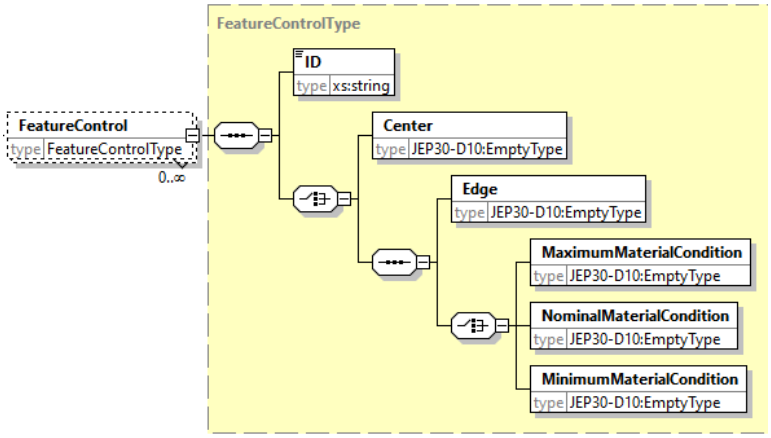
5.2.2.2.1 Size Criteria

path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/RuleCondition-Array/FeatureTypeSelection/SizeCriteria**
diagram	
type	**SizeCriteriaType**

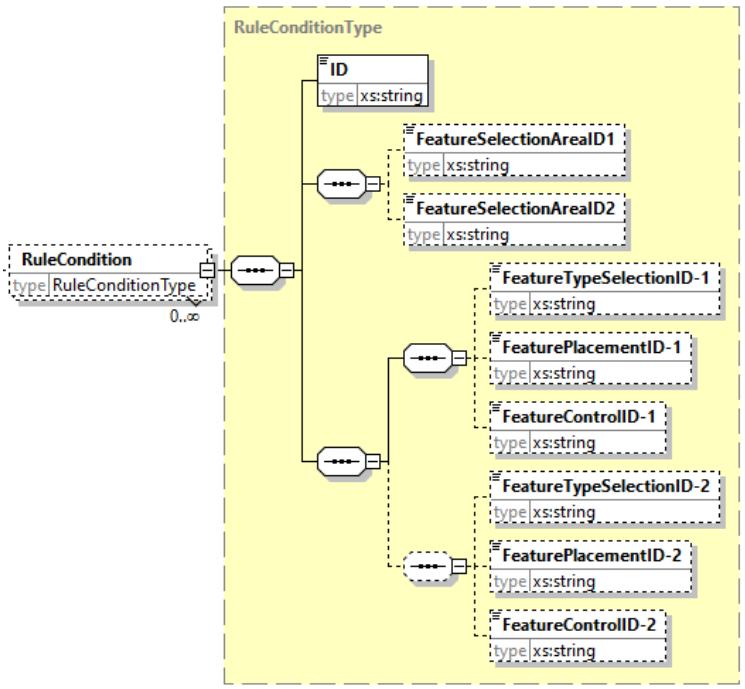
5.2.2.3 Feature Placement

path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/RuleCondition-Array/FeaturePlacement**
diagram	
type	**FeaturePlacementType, JEP30-D10:EmptyType**

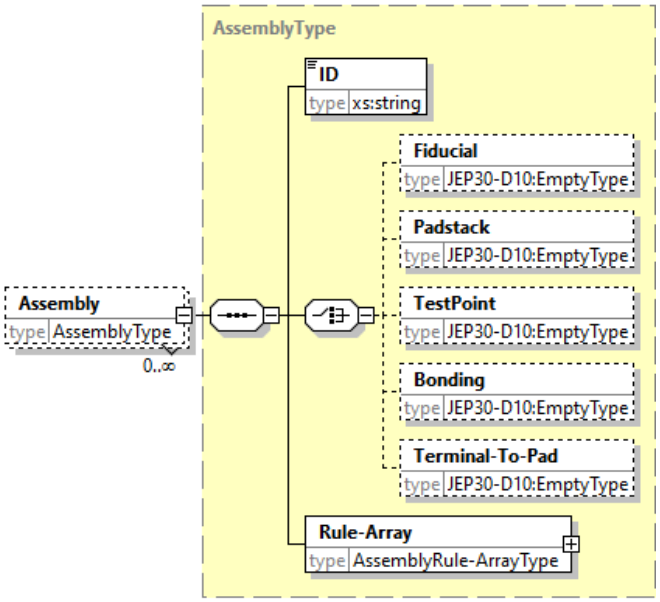
5.2.2.4 Feature Control

path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/RuleCondition-Array/FeatureControl**
diagram	
type	**FeatureControlType, JEP30-D10:EmptyType.**

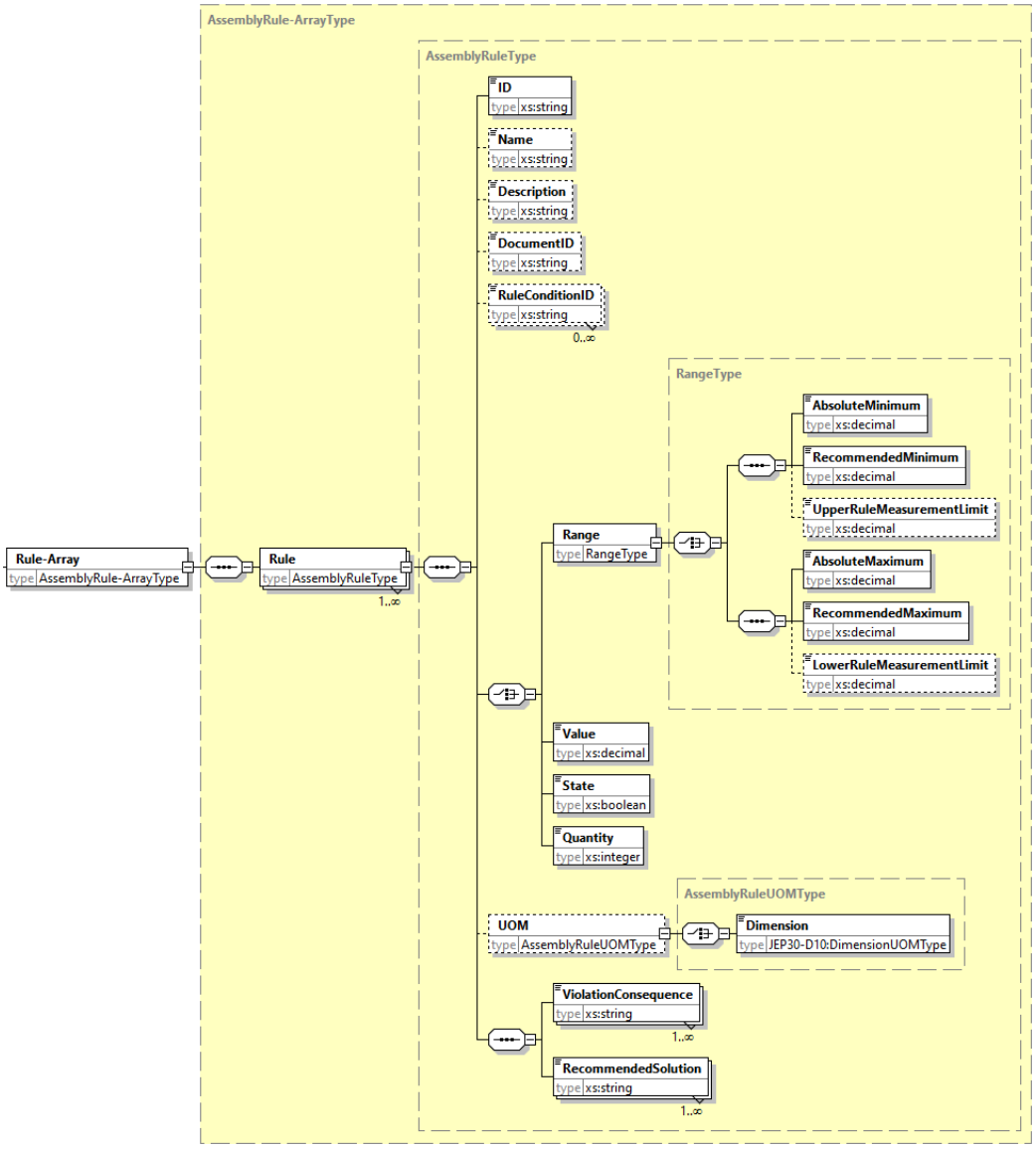
5.2.2.5 Rule Condition

path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/RuleCondition-Array/RuleCondition**
diagram	
type	**RuleConditionType.**

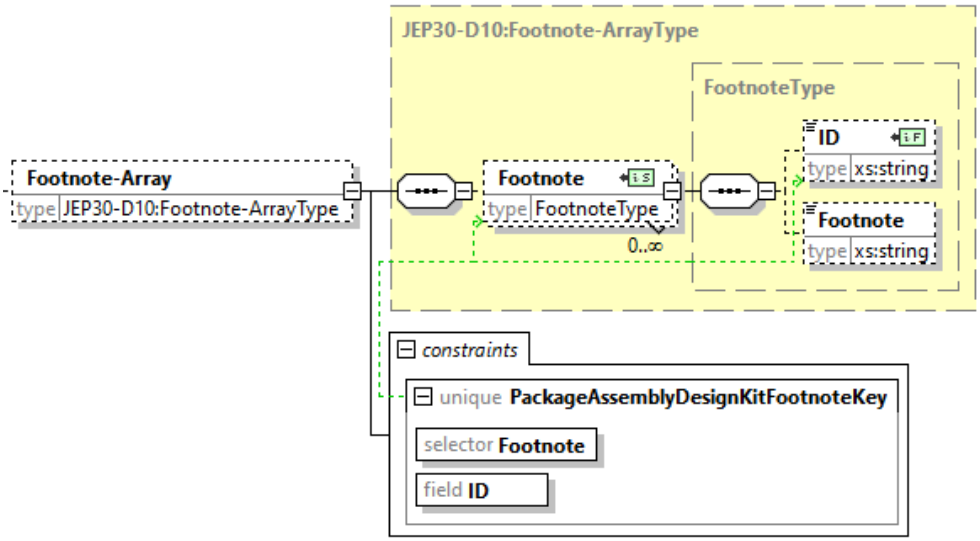
5.2.3 Assembly

path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/Assembly**
diagram	
type	**DesignClassification-ArrayType, RuleCondition-ArrayType, AssemblyType, JEP30-D10:Footnote-ArrayType, ds:SignatureType**

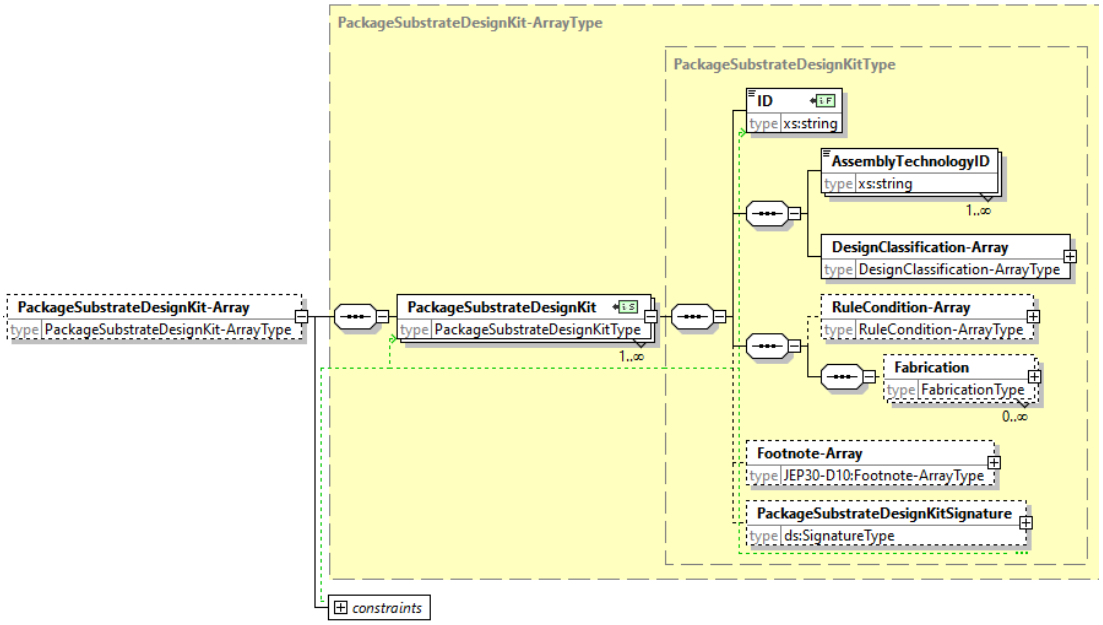
5.2.4 Rule - Array

path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/Assembly/Rule-Array**
diagram	
type	**AssemblyRule-ArrayType, AssemblyRuleType, RangeType, AssemblyRuleUOMType, JEP30-D10:DimensionUOMType**

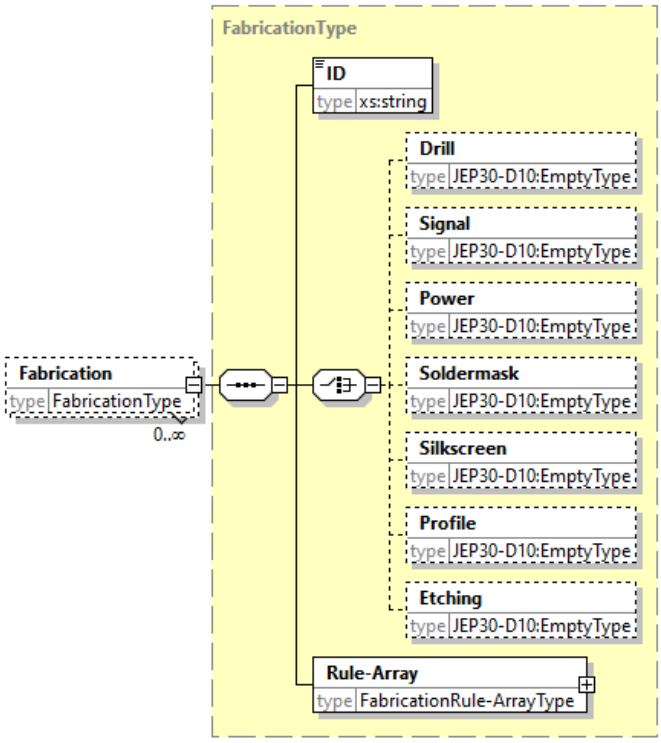
5.2.5 Footnote - Array

path	**PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/Footnote-Array**
diagram	
type	**JEP30-D10:Footnote-ArrayType, FootnoteType**

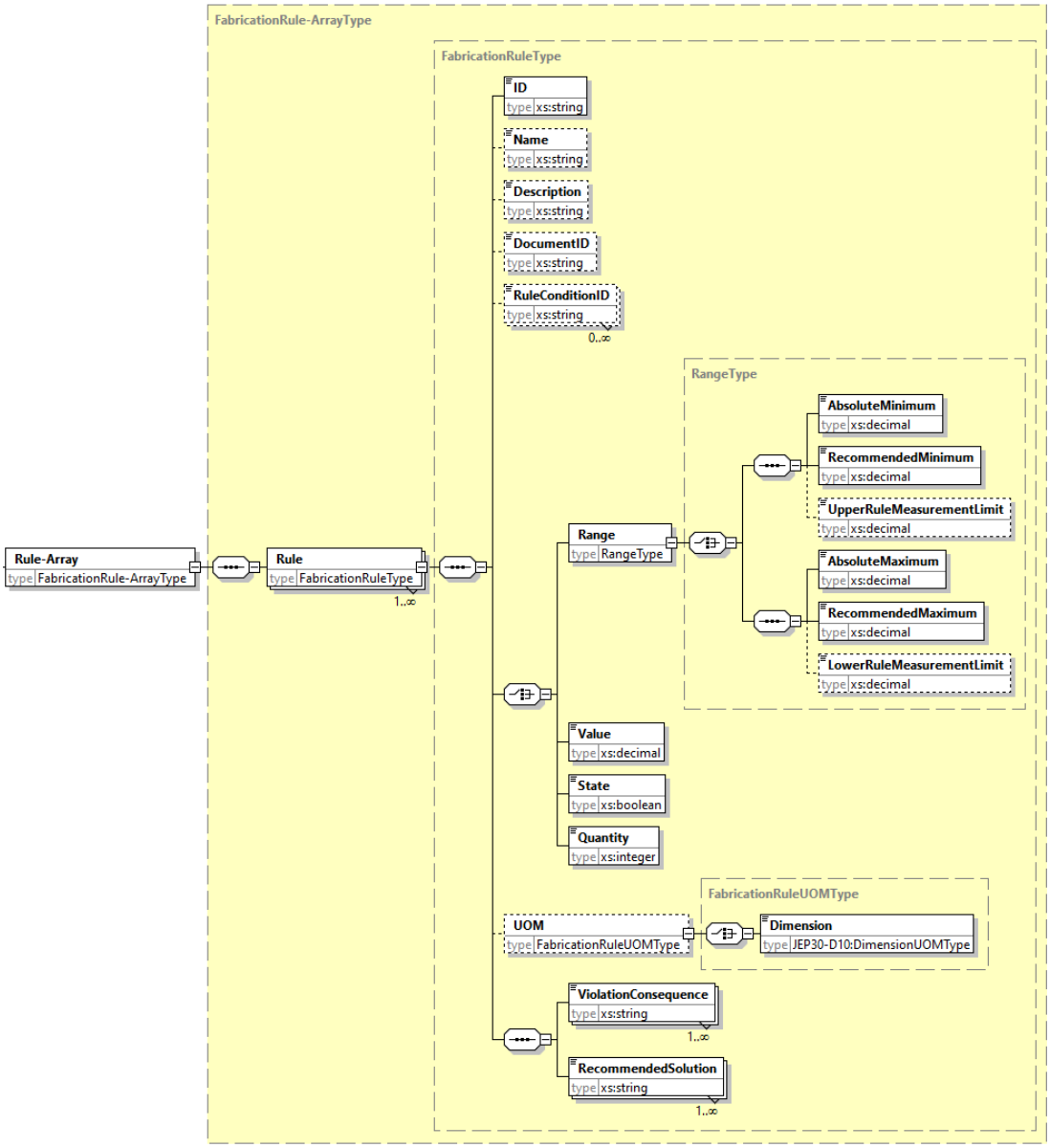
5.3 Package Substrate Design Kit - Array

path	**PartModel/DesignKitSection/PackageSubstrateDesignKit-Array**
diagram	
type	**PackageSubstrateDesignKit-ArrayType, PackageSubstrateDesignKitType, DesignClassification-ArrayType, RuleCondition-ArrayType, FabricationType, JEP30-D10:Footnote-ArrayType, ds:SignatureType**

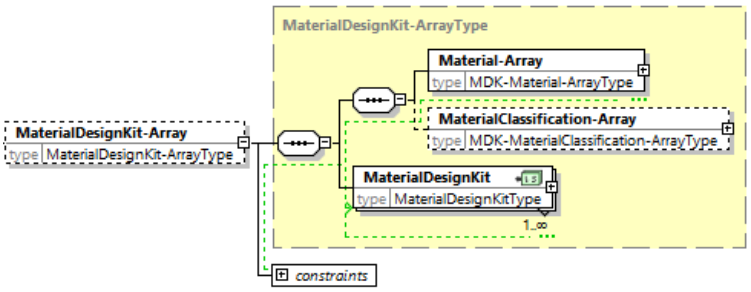
5.3.1 Fabrication

path	**PartModel/DesignKitSection/PackageSubstrateDesignKit-Array/PackageSubstrateDesignKit/Fabrication**
diagram	
type	**FabricationType, JEP30-D10:EmptyType, FabricationRule-ArrayType.**

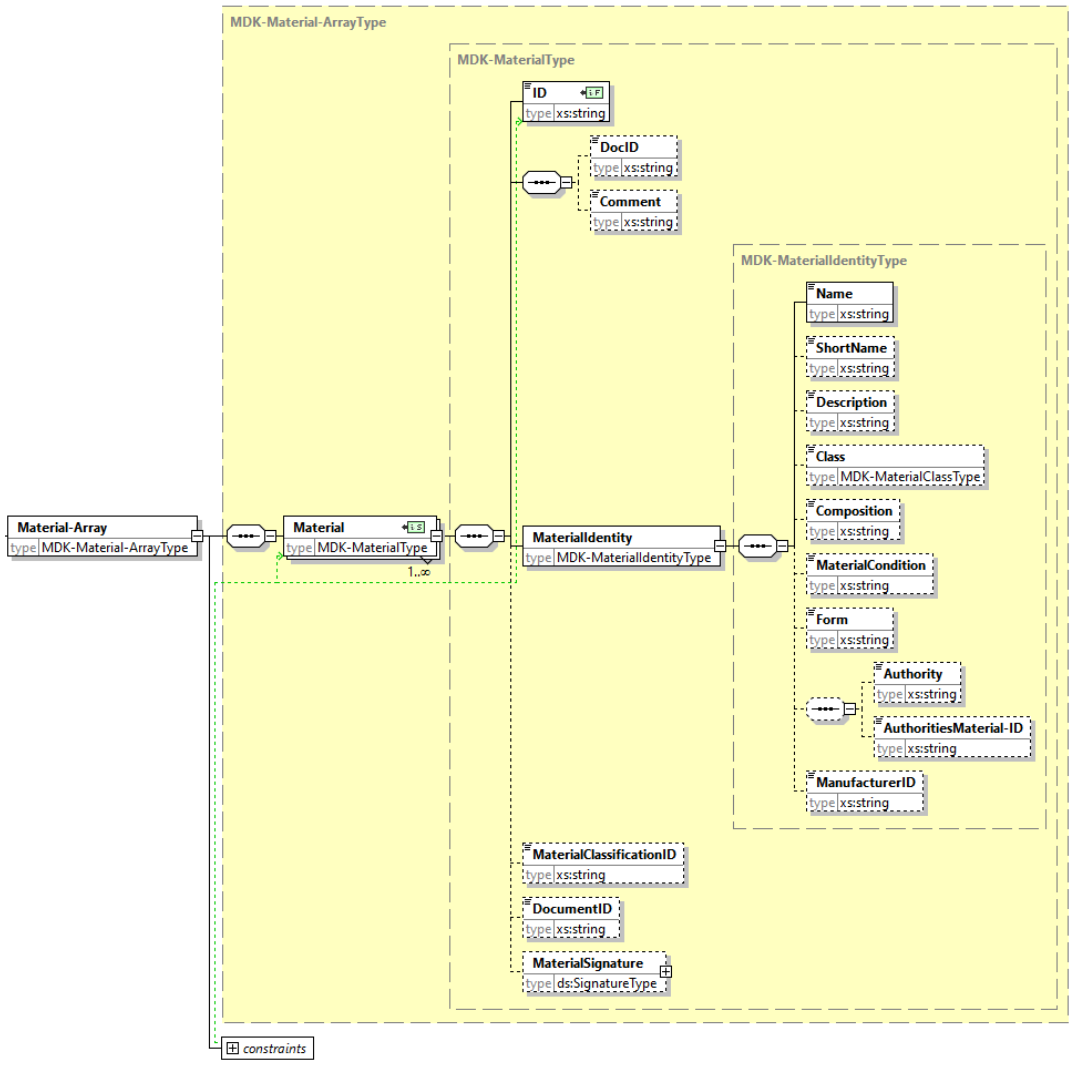
5.3.2 Rule - Array

path	**PartModel/DesignKitSection/PackageSubstrateDesignKit-Array/PackageSubstrateDesignKit/Fabrication/Rule-Array**
diagram	
type	**FabricationRule-ArrayType, FabricationRuleType, RangeType, FabricationRuleUOMType, JEP30-D10:DimensionUOMType**

5.4 Material Design Kit - Array

path	**PartModel/DesignKitSection/MaterialDesignKit-Array**
diagram	
type	**MaterialDesignKit-ArrayType, MDK-Material-ArrayType, MDK-MaterialClassification-ArrayType, MaterialDesignKitType,**

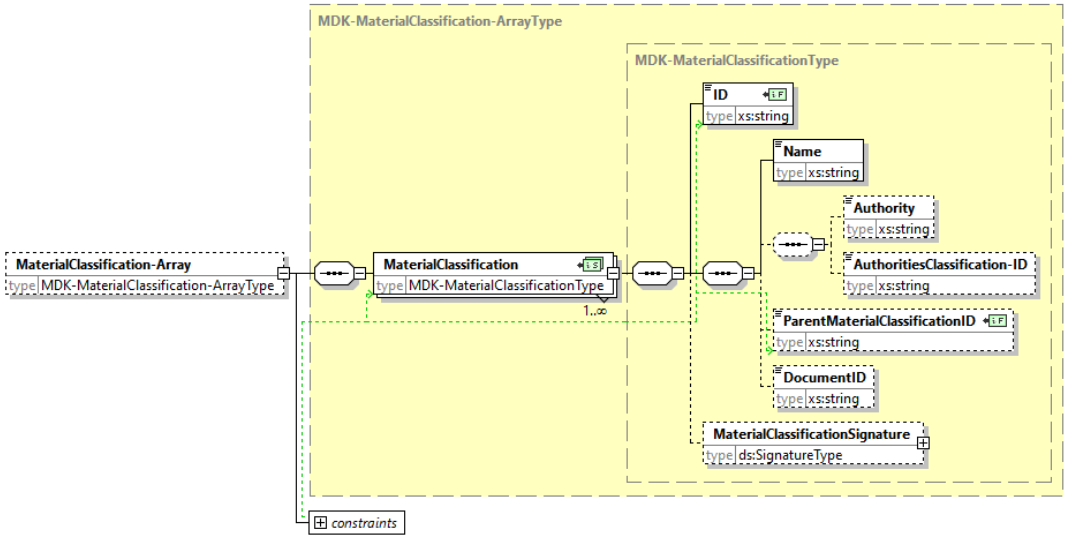
5.4.1 Material - Array

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/Material-Array**
diagram	
type	**MDK-Material-ArrayType, MDK-MaterialType, MDK-MaterialIdentityType, MDK-MaterialClassType, ds:SignatureType**

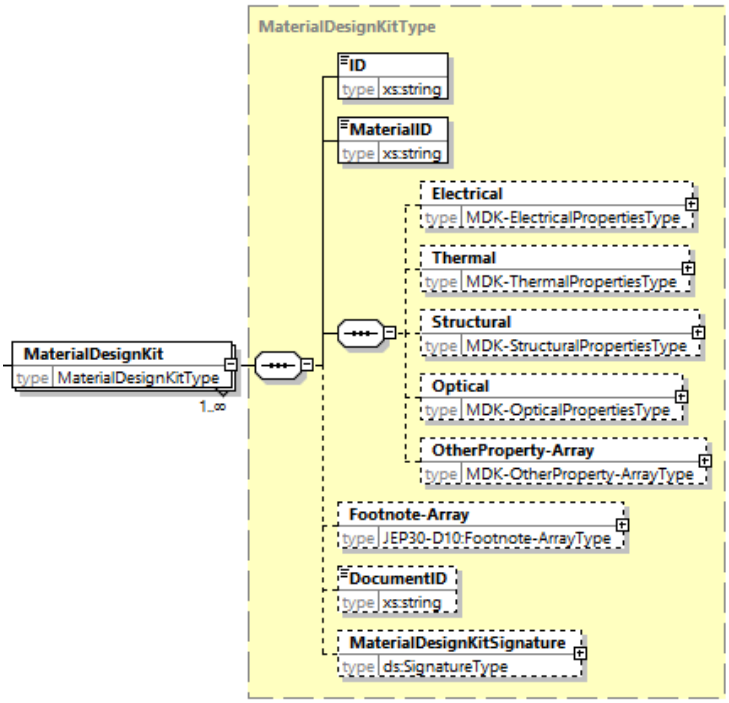
The enumerated values for the *MDK-MaterialClassType* are

- Ceramic,
- Composite,
- Fluid,
- Glass,
- Metal,
- Polymer,
- Semiconductor.

5.4.2 Material Classification - Array

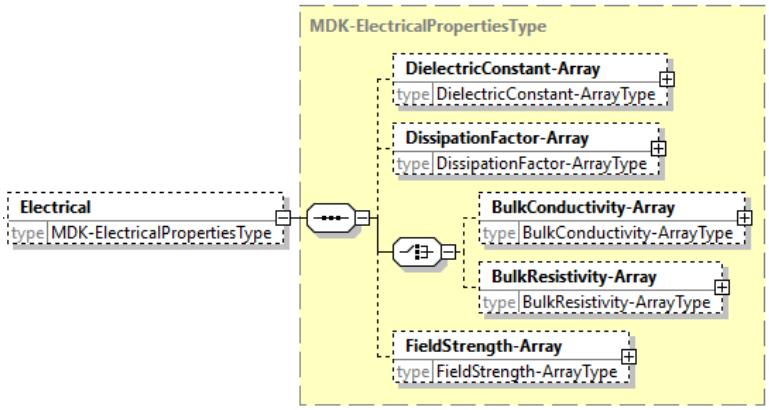
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialClassification-Array**
diagram	
type	**MDK-MaterialClassification-ArrayType, MDK-MaterialClassificationType, ds:SignatureType.**

5.4.3 Material Design Kit

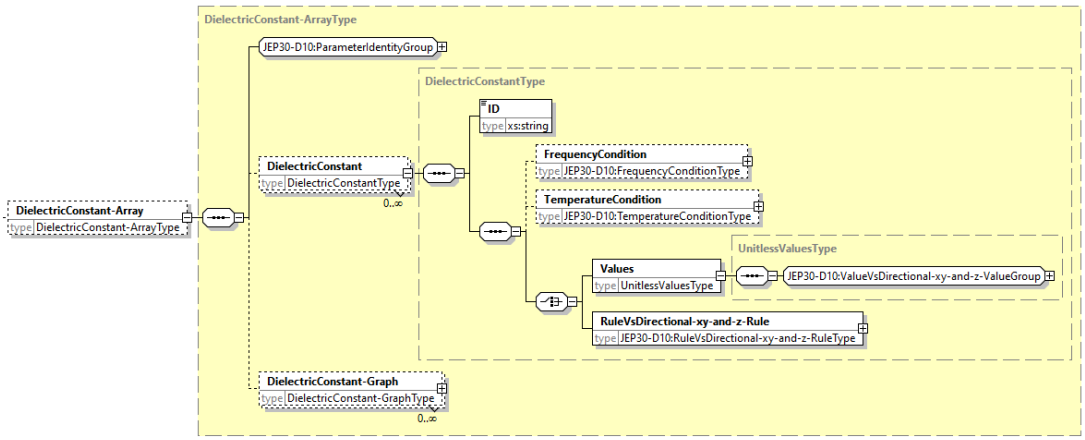
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit**
diagram	
type	**MaterialDesignKitType, MDK-ElectricalPropertiesType, MDK-ThermalPropertiesType, MDK-StructuralPropertiesType, MDK-OpticalPropertiesType, MDK-OtherProperty-ArrayType JEP30-D10:Footnote-ArrayType, ds:SignatureType**

The Conditional properties and the property units defined under the respective properties for Electrical, Thermal, Structural and Optical are specially configured to suit those properties, however they all have a common structure and common graph formatting. These common structures are defined in more detail in section 5.4.3.5 Common Structure applied to all Properties.

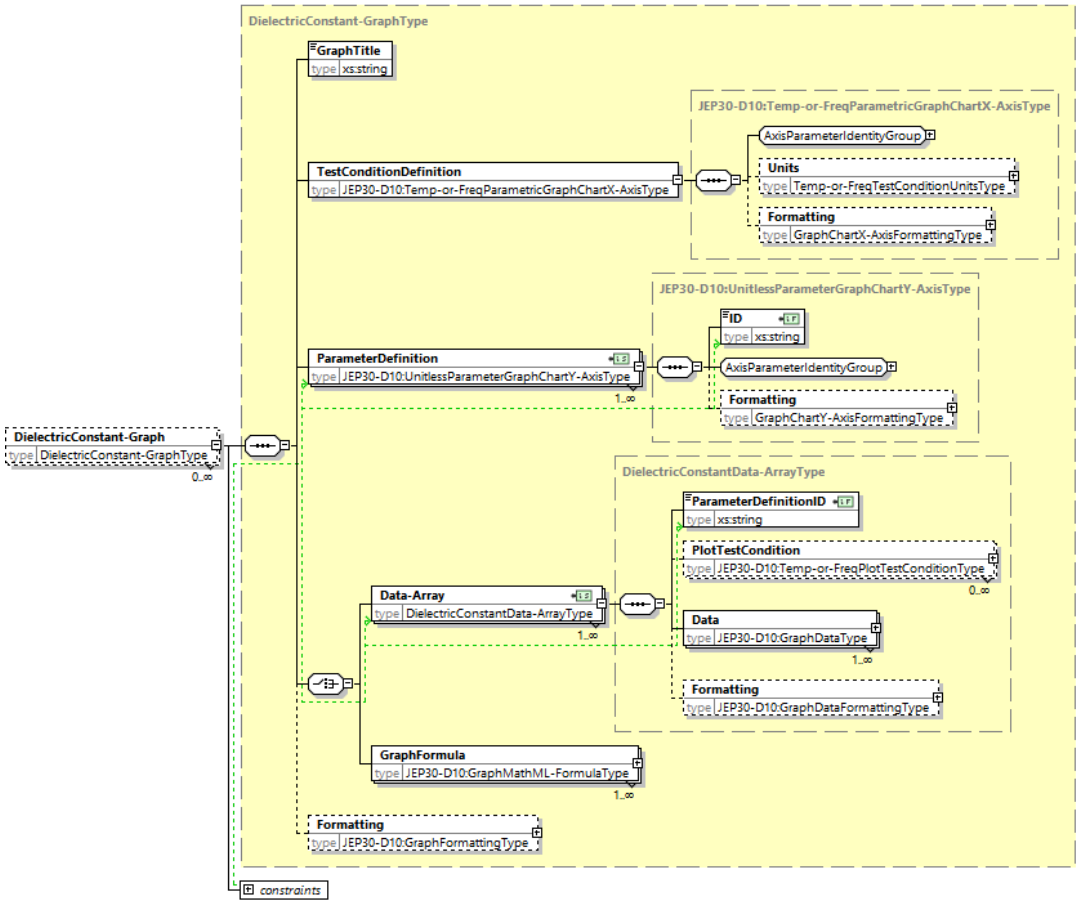
5.4.3.1 Electrical

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical
diagram	
type	MDK-ElectricalPropertiesType, DielectricConstant-ArrayType, DissipationFactor-ArrayType, BulkConductivity-ArrayType, BulkResistivity-ArrayType, FieldStrength-ArrayType

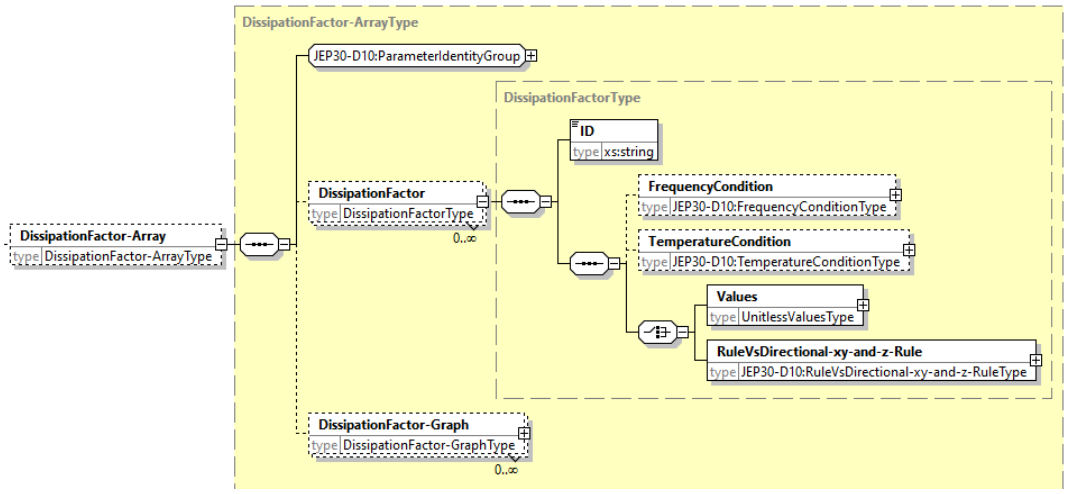
5.4.3.1.1 Dielectric Constant - Array

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/DielectricConstant-Array
diagram	
type	DielectricConstant-ArrayType, DielectricConstantType, JEP30-D10:FrequencyConditionType, JEP30-D10:TemperatureConditionType, UnitlessValuesType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, DielectricConstant-GraphType.
group	JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.

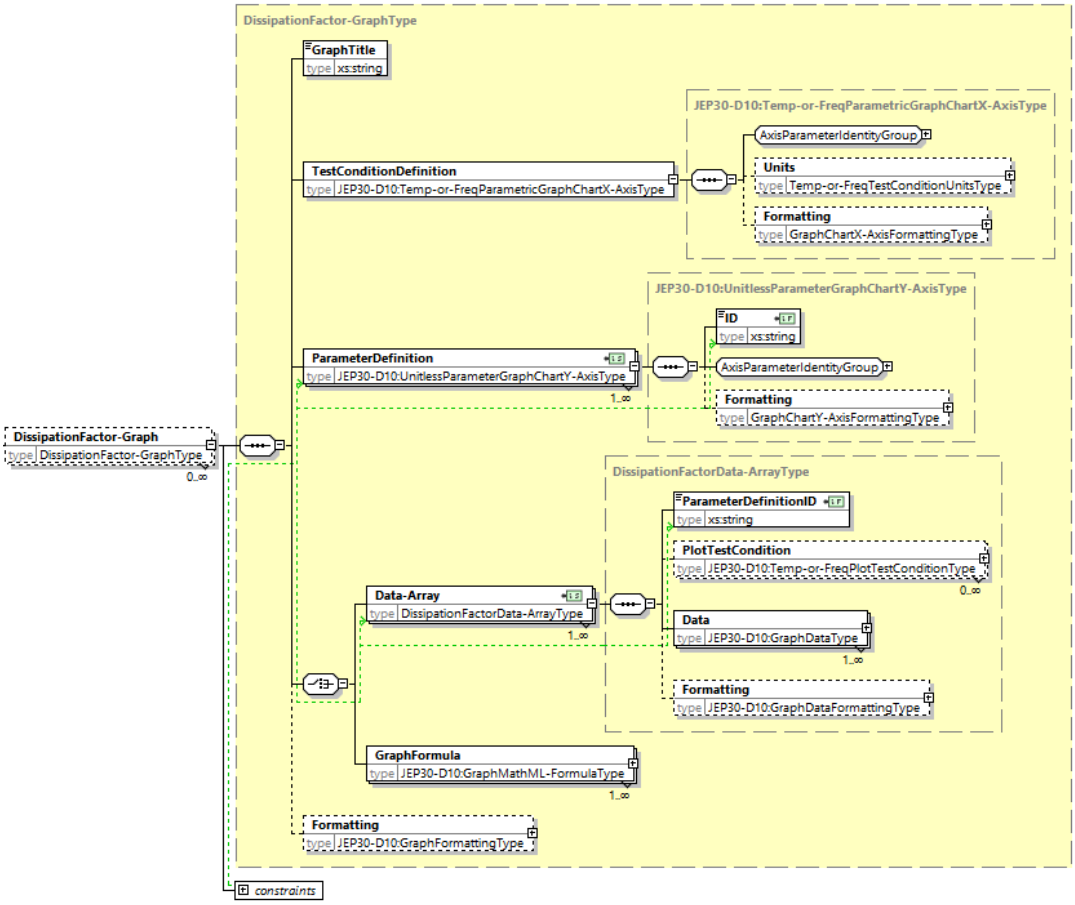
5.4.3.1.1.1 Dielectric Constant Graph

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/DielectricConstant-Array/DielectricConstant-Graph**
diagram	
type	**DielectricConstant-GraphType, JEP30-D10:Temp-or-FreqParametricGraphChartX-AxisType, Temp-or-FreqTestConditionUnitsType, GraphChartX-AxisFormattingType, JEP30-D10:UnitlessParameterGraphChartY-AxisType, GraphChartY-AxisFormattingType, DielectricConstantData-ArrayType, JEP30-D10:Temp-or-FreqPlotTestConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**AxisParameterIdentityGroup**

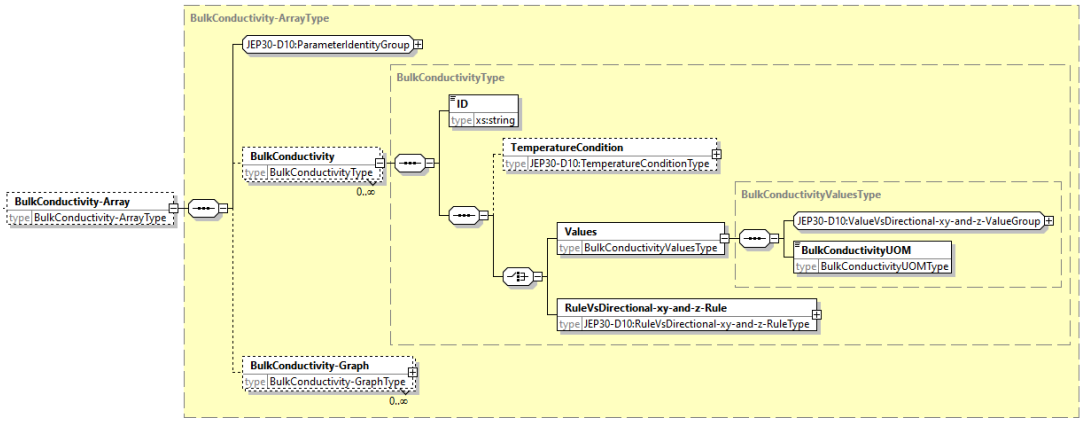
5.4.3.1.2 Dissipation Factor - Array

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/DissipationFactor-Array**
diagram	
type	**DissipationFactor-ArrayType, DissipationFactorType, JEP30-D10:FrequencyConditionType, JEP30-D10:TemperatureConditionType, UnitlessValuesType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, DissipationFactor-GraphType.**
group	**JEP30-D10:ParameterIdentityGroup'**

5.4.3.1.2.1 Dissipation Factor Graph

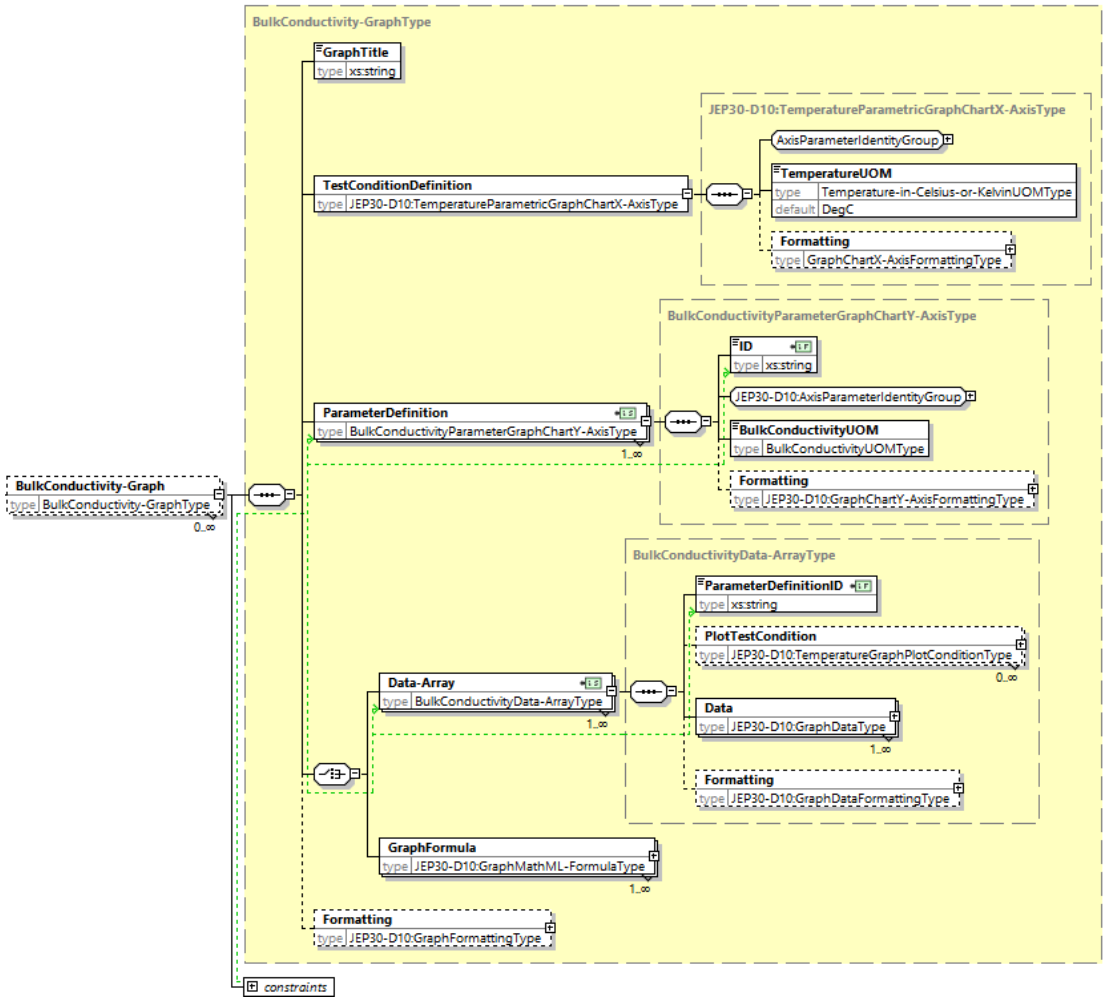
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/DissipationFactor-Array/DissipationFactor-Graph**
diagram	
type	**DissipationFactor-GraphType, JEP30-D10:Temp-or-FreqParametricGraphChartX-AxisType, Temp-or-FreqTestConditionUnitsType, GraphChartX-AxisFormattingType, JEP30-D10:UnitlessParameterGraphChartY-AxisType, GraphChartY-AxisFormattingType, DissipationFactorData-ArrayType, JEP30-D10:Temp-or-FreqPlotTestConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**AxisParameterIdentityGroup**

5.4.3.1.3 Bulk Conductivity - Array

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/BulkConductivity-Array**
diagram	
type	**BulkConductivity-ArrayType, BulkConductivityType, JEP30-D10:TemperatureConditionType, BulkConductivityValuesType, BulkConductivityUOMType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, BulkConductivity-GraphType.**
group	**JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.**

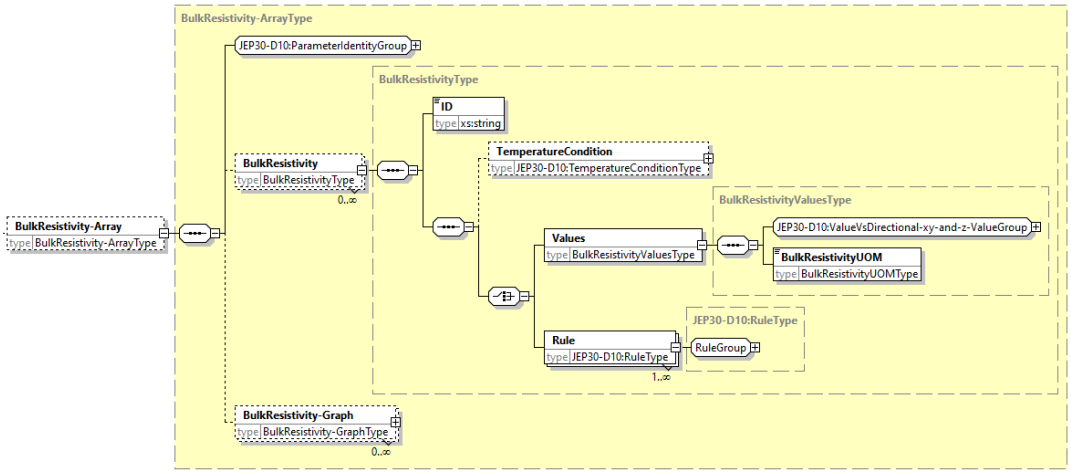
The *BulkConductivityUOM* enumerated value is S/m.

5.4.3.1.3.1 Bulk Conductivity Graph

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/BulkConductivity-Array/BulkConductivity-Graph**
diagram	
type	**BulkConductivity-GraphType, JEP30-D10:TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, BulkConductivityParameterGraphChartY-AxisType, BulkConductivityUOMType, BulkConductivityData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**AxisParameterIdentityGroup**

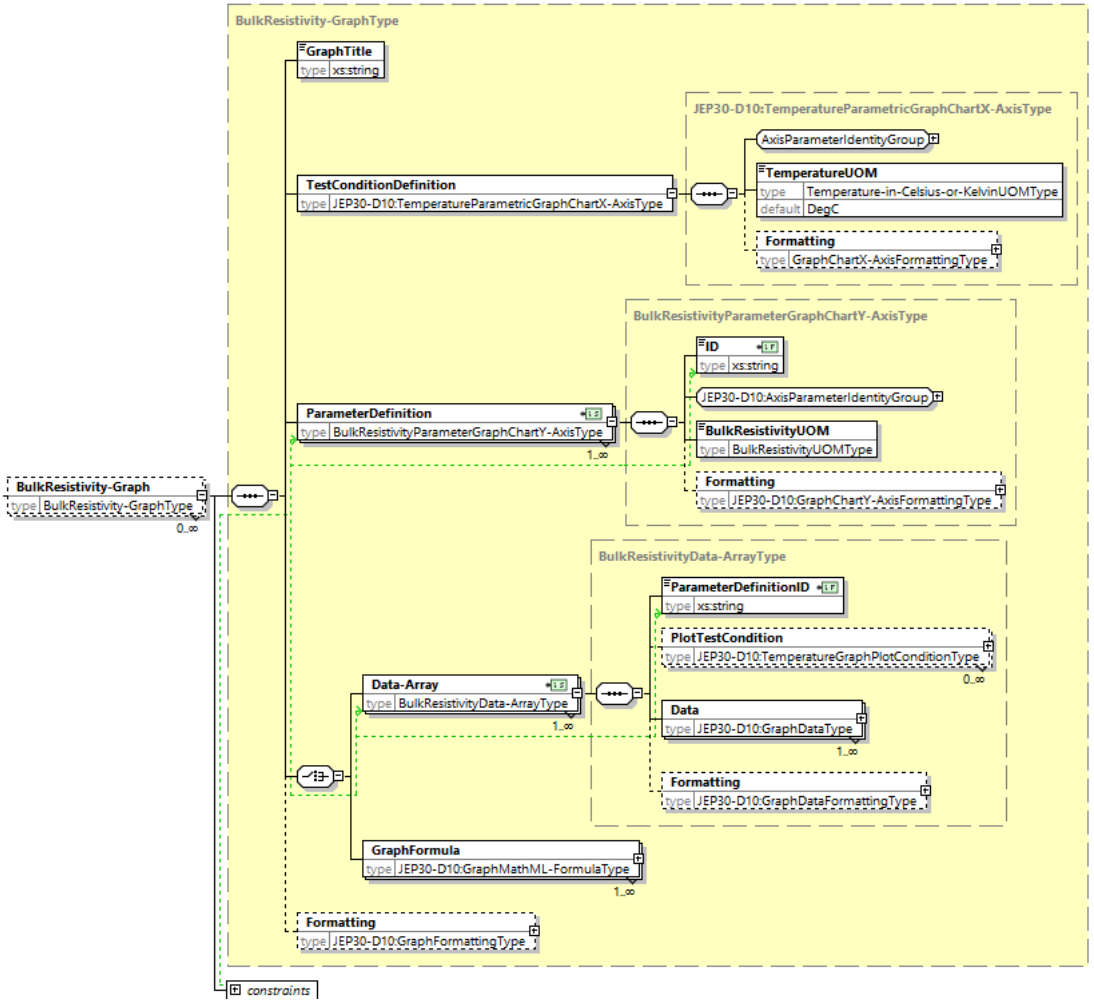
The enumerated values for *Temperature-in-Celsius-or-KelvinUOMType* are DegC and K

5.4.3.1.4 Bulk Resistivity - Array

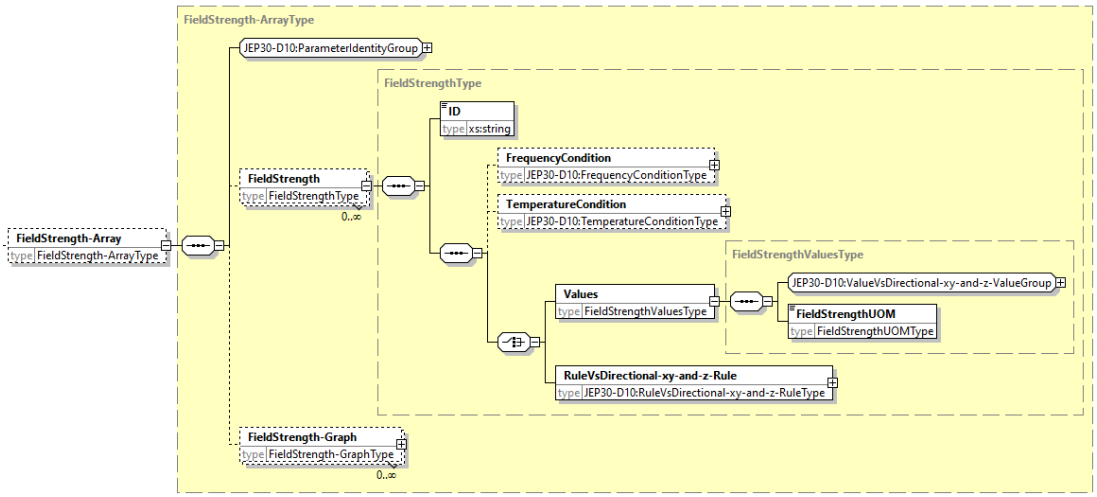
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/BulkResistivity-Array**
diagram	
type	**BulkResistivity-ArrayType, BulkResistivityType, JEP30-D10:TemperatureConditionType, BulkResistivityValuesType, BulkResistivityUOMType, JEP30-D10:RuleType, BulkResistivity-GraphType.**
group	**JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.**

The *BulkResistivityUOM* enumerated value is Ohm*m.

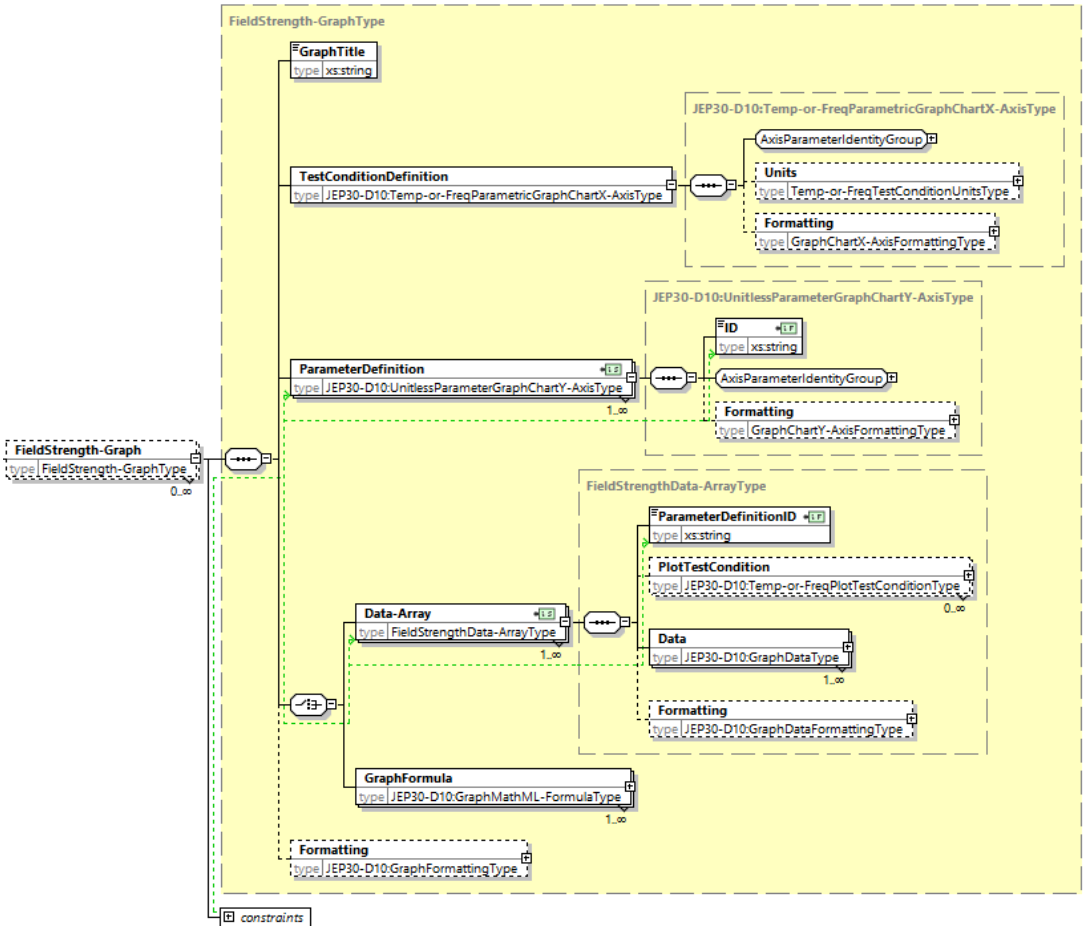
5.4.3.1.4.1 Bulk Resistivity Graph

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/BulkResistivity-Array/BulkResistivity-Graph**
diagram	
type	**BulkResistivity-GraphType, JEP30-D10:TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, BulkResistivityParameterGraphChartY-AxisType, BulkResistivityUOMType, BulkResistivityData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**AxisParameterIdentityGroup**

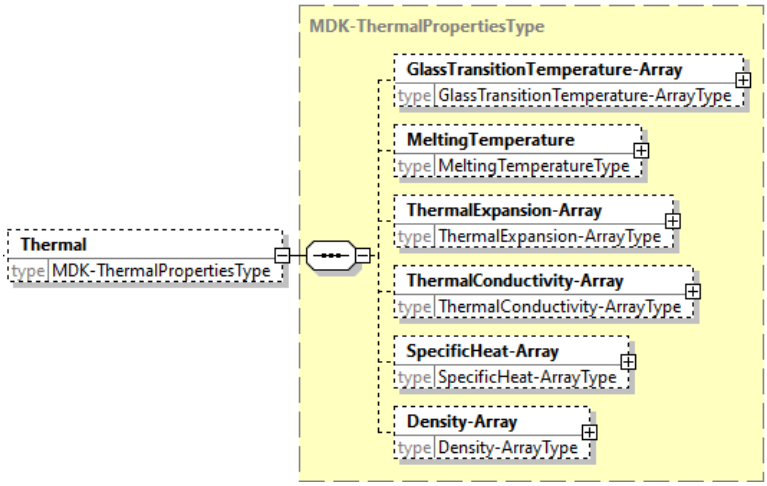
5.4.3.1.5 Field Strength - Array

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/FieldStrength-Array**
diagram	
type	**FieldStrength-ArrayType, FieldStrengthType, JEP30-D10:FrequencyConditionType, JEP30-D10:TemperatureConditionType, FieldStrengthValuesType, FieldStrengthUOMType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, FieldStrength-GraphType.**
group	**JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.**

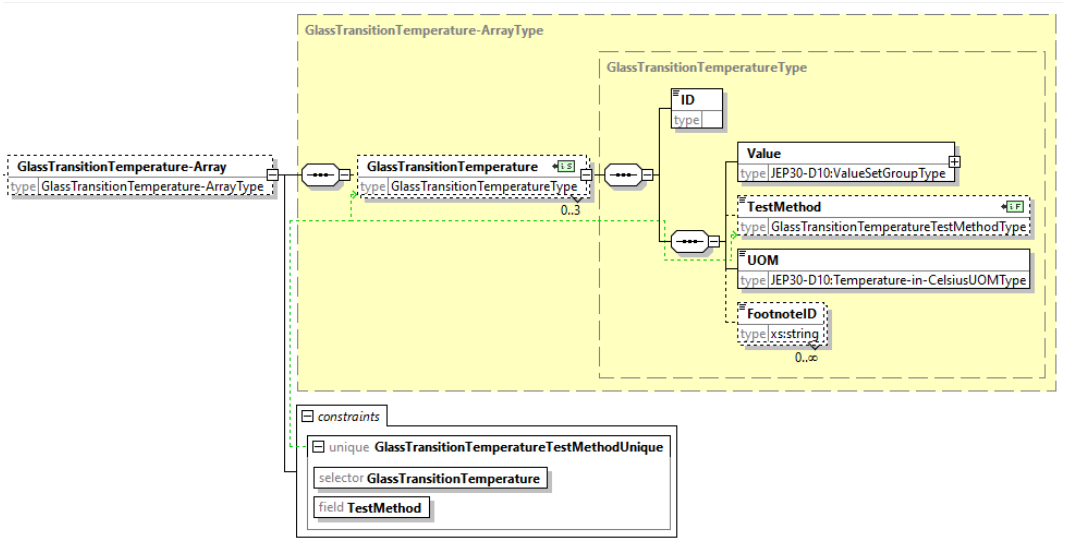
5.4.3.1.5.1 Field Strength Graph

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/FieldStrength-Array/FieldStrength-Graph**
diagram	
type	**FieldStrength-GraphType, JEP30-D10:Temp-or-FreqParametricGraphChartX-AxisType, Temp-or-FreqTestConditionUnitsType, GraphChartX-AxisFormattingType, JEP30-D10:UnitlessParameterGraphChartY-AxisType, GraphChartY-AxisFormattingType, FieldStrengthData-ArrayType, JEP30-D10:Temp-or-FreqPlotTestConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**AxisParameterIdentityGroup**

5.4.3.2 Thermal

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal**
diagram	
type	**MDK-ThermalPropertiesType, GlassTransitionTemperature-ArrayType, MeltingTemperatureType, ThermalExpansion-ArrayType, ThermalConductivity-ArrayType, SpecificHeat-ArrayType, Density-ArrayType**

5.4.3.2.1 Glass Transition Temperature - Array

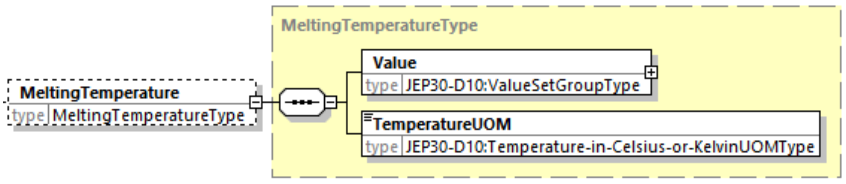
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/GlassTransitionTemperature-Array**
diagram	
type	**GlassTransitionTemperature-ArrayType, GlassTransitionTemperatureType, JEP30-D10:ValueSetGroupType, GlassTransitionTemperatureTestMethodType, JEP30-D10:Temperature-in-CelsiusUOMType.**

The enumerated values of the *TestMethod* are

- Dynamic Mechanical Analysis
- Differential Scanning Calorimeter
- Thermo-Mechanical Analysis

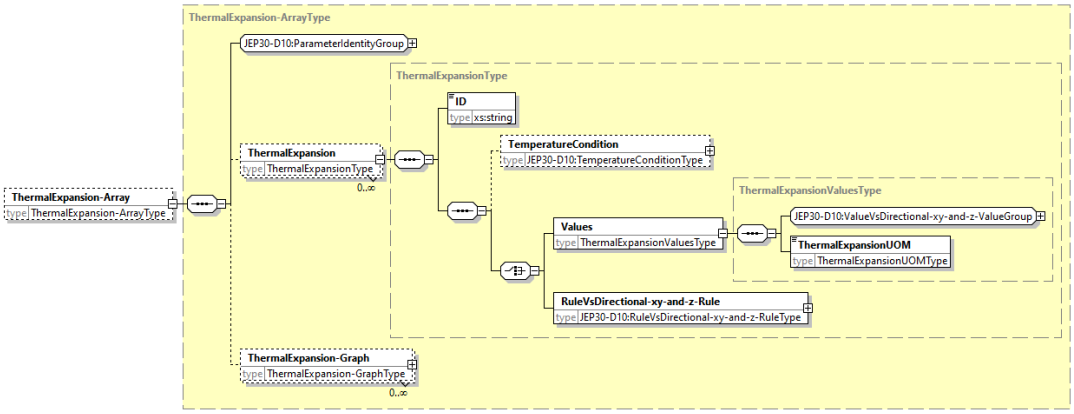
The temperature *UOM* is restricted to DegC for this parameter.

5.4.3.2.2 Melting Temperature - Array

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/MeltingTemperature**
diagram	
type	**MeltingTemperatureType, JEP30-D10:ValueSetGroupType, JEP30-D10:Temperature-in-Celsius-or-KelvinUOMType**

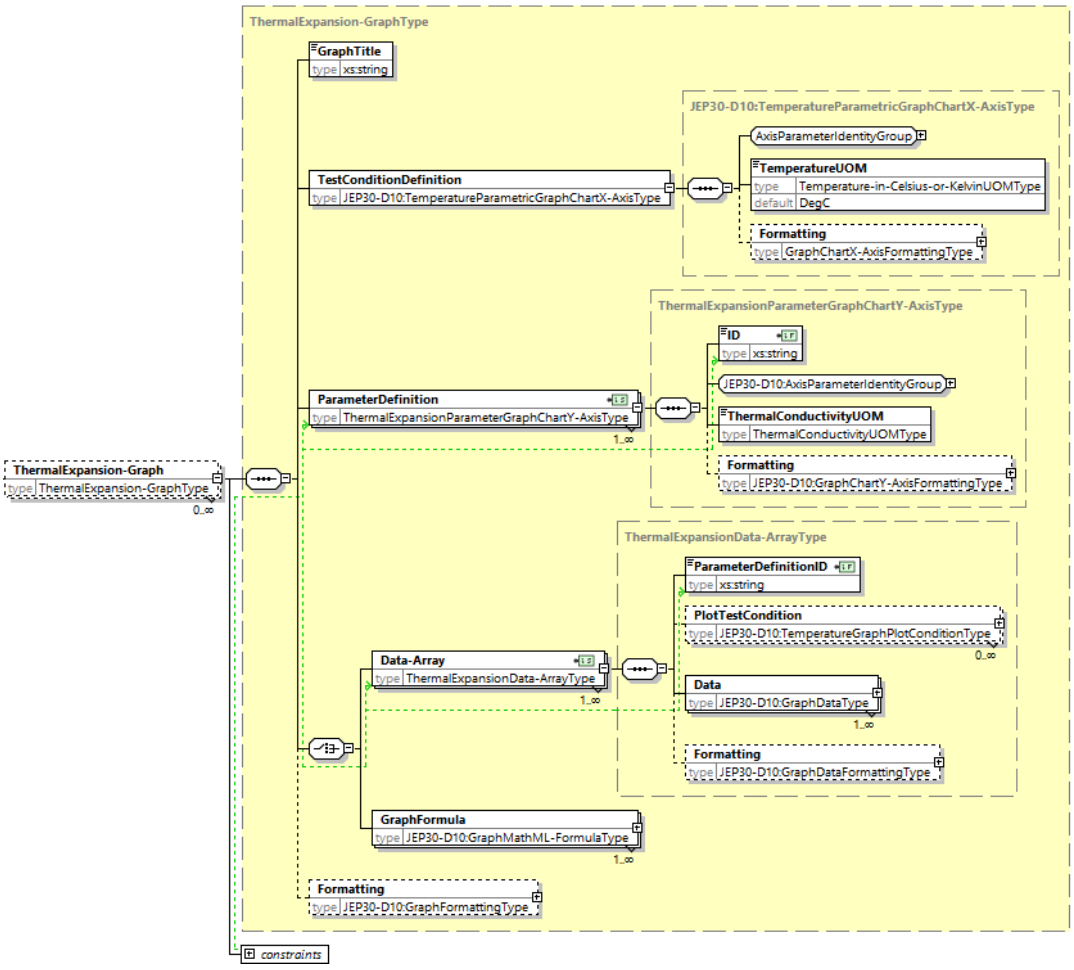
The temperature *UOM* is restricted to DegC and K for this parameter.

5.4.3.2.3 Thermal Expansion - Array

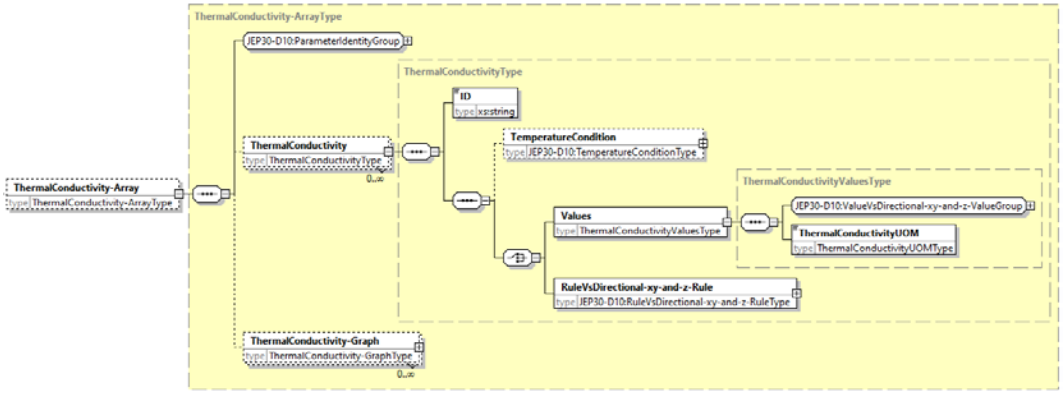
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/ThermalExpansion-Array**
diagram	
type	**ThermalExpansion-ArrayType, ThermalExpansionType, JEP30-D10:TemperatureConditionType, ThermalExpansionValuesType, ThermalExpansionUOMType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, ThermalExpansion-Graph**
group	**JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.**

The *ThermalExpansionUOM* is restricted to 1/DegC and 1/K for this parameter.

5.4.3.2.3.1 Thermal Expansion Graph

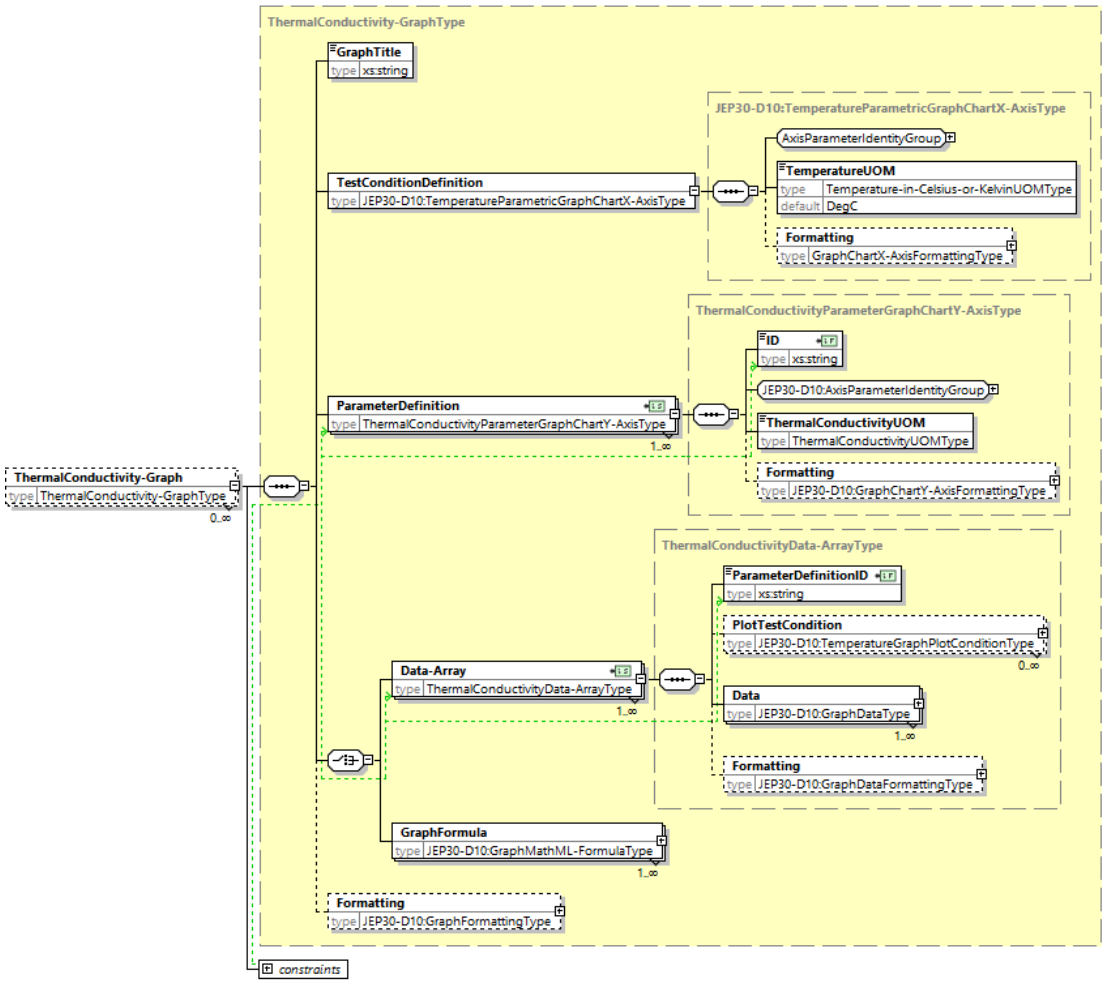
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/ThermalExpansion-Array/ThermalExpansion-Graph**
diagram	
type	**ThermalExpansion-GraphType, JEP30-D10:TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, ThermalExpansionParameterGraphChartY-AxisType, ThermalExpansionUOMType, ThermalExpansionData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**AxisParameterIdentityGroup**

5.4.3.2.4 Thermal Conductivity - Array

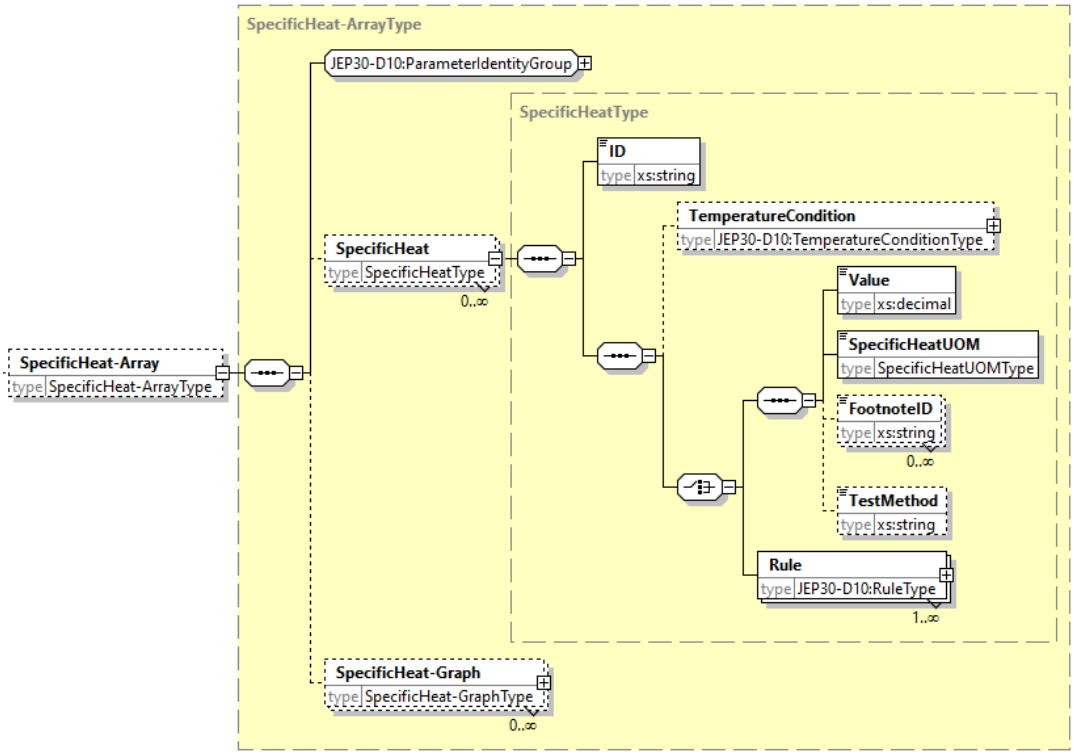
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/ThermalConductivity-Array**
diagram	
type	**ThermalConductivity-ArrayType, ThermalConductivityType, JEP30-D10:TemperatureConditionType, ThermalConductivityValuesType, ThermalConductivityUOMType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, ThermalConductivity-GraphType.**
group	**JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.**

The *ThermalConductivityUOM* is restricted to W/m.K for this parameter.

5.4.3.2.4.1 Thermal Conductivity Graph

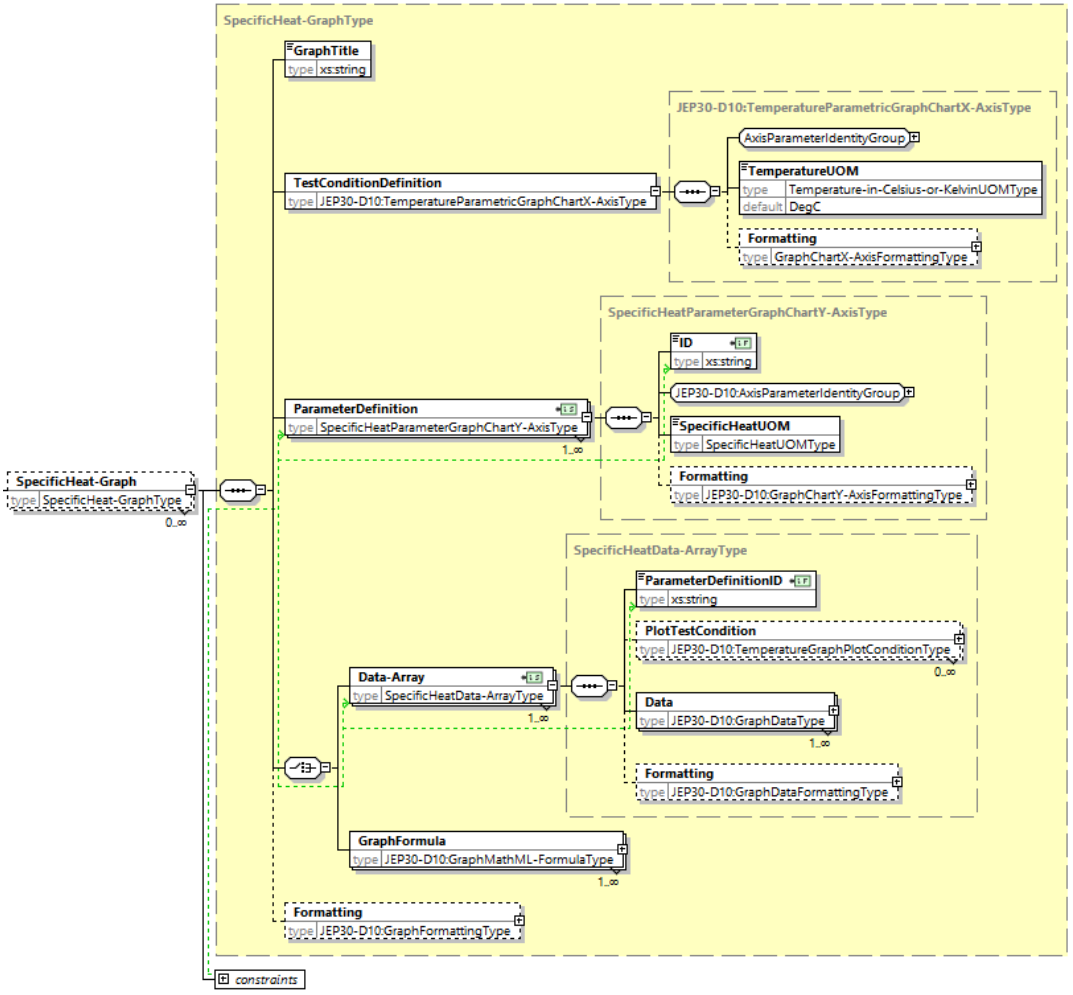
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/ThermalConductivity-Array/ThermalConductivity-Graph**
diagram	
type	**ThermalConductivity-GraphType, JEP30-D10:TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, ThermalConductivityParameterGraphChartY-AxisType, ThermalConductivityUOMType, ThermalConductivityData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**AxisParameterIdentityGroup**

5.4.3.2.5 Specific Heat - Array

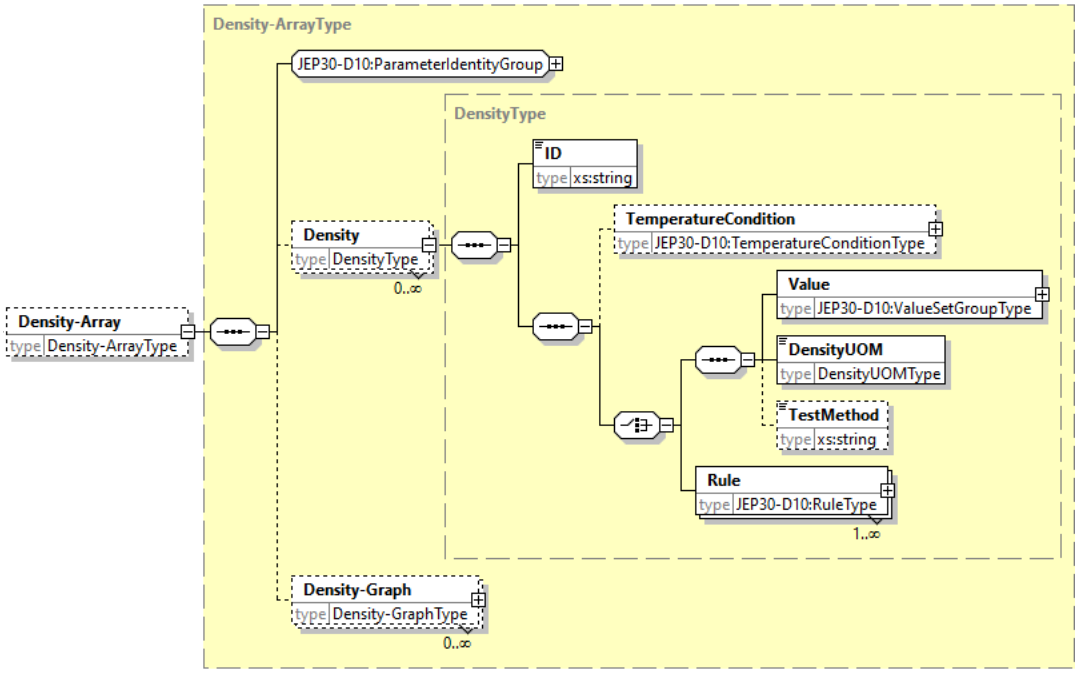
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/SpecificHeat-Array**
diagram	
type	**SpecificHeat-ArrayType, SpecificHeatType, JEP30-D10:TemperatureConditionType, SpecificHeat-UOMType, JEP30-D10:RuleType, SpecificHeat-GraphType.**
group	**JEP30-D10:ParameterIdentityGroup.**

The *SpecificHeatUOM* is restricted to J/(g*degC) and J/(g*K) for this parameter.

5.4.3.2.5.1 Specific Heat Graph

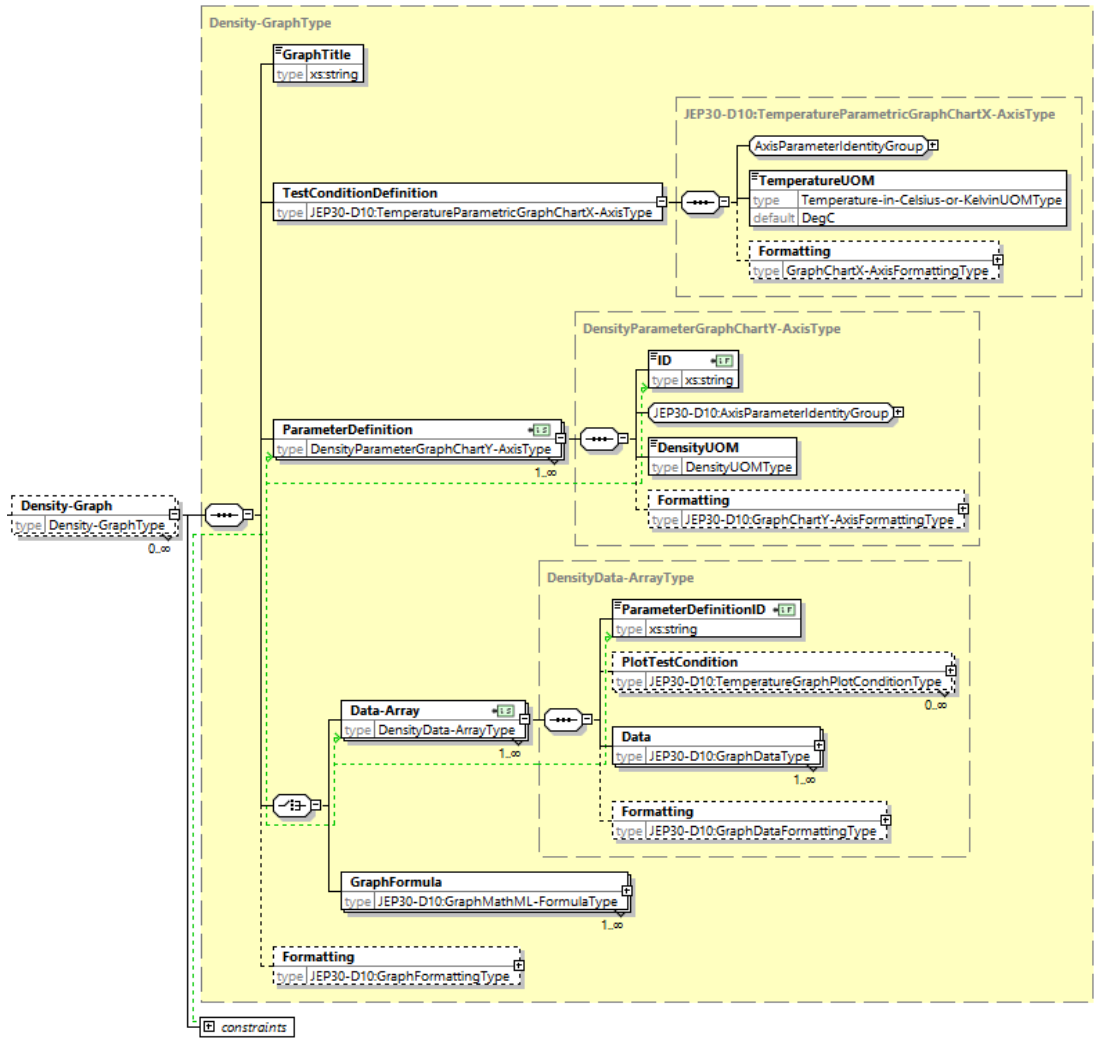
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/SpecificHeat-Array/SpecificHeat-Graph**
diagram	
type	**SpecificHeat-GraphType, JEP30-D10:TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, SpecificHeatParameterGraphChartY-AxisType, SpecificHeatUOMType, SpecificHeatData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**AxisParameterIdentityGroup**

5.4.3.2.6 Density - Array

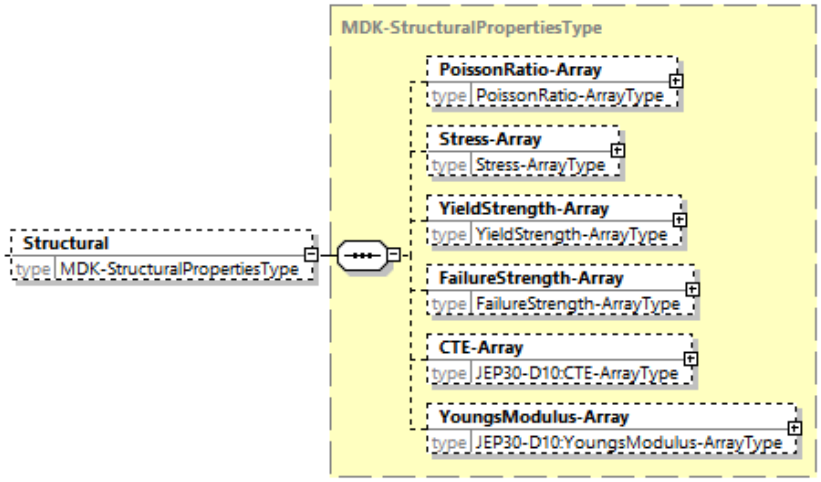
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/Density-Array**
diagram	
type	**Density-ArrayType, DensityType, JEP30-D10:TemperatureConditionType, JEP30-D10:ValueSetGroupType, Density-UOMType, JEP30-D10:RuleType, Density-GraphType,**
group	**JEP30-D10:ParameterIdentityGroup.**

The *DensityUOM* is restricted to kg/m^3 and g/cm^3 for this parameter.

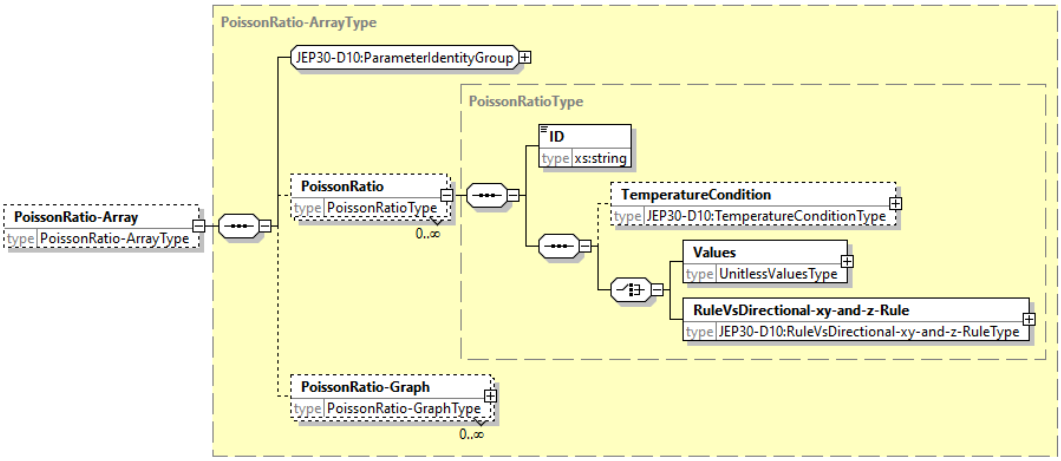
5.4.3.2.6.1 Density Graph

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/Density-Array/Density-Graph**
diagram	
type	**Density-GraphType, JEP30-D10:TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, DensityParameterGraphChartY-AxisType, DensityUOMType, DensityData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**AxisParameterIdentityGroup**

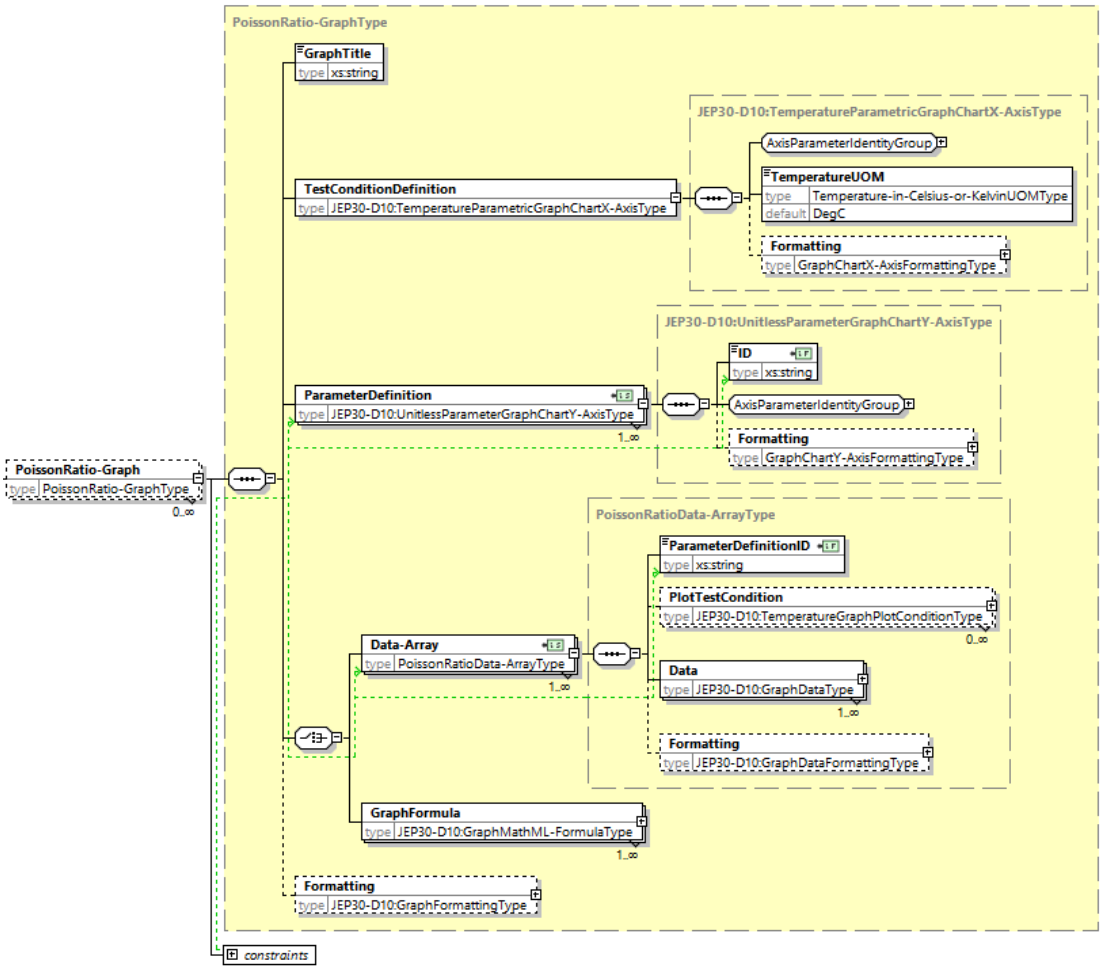
5.4.3.3 Structural

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural
diagram	
type	MDK-StructuralPropertiesType, PoissonRatio-ArrayType, Stress-ArrayType, YieldStrength-ArrayType, FailureStrength-ArrayType, JEP30-D10:CTE-ArrayType, JEP30-D10:YoungsModulus-ArrayType.

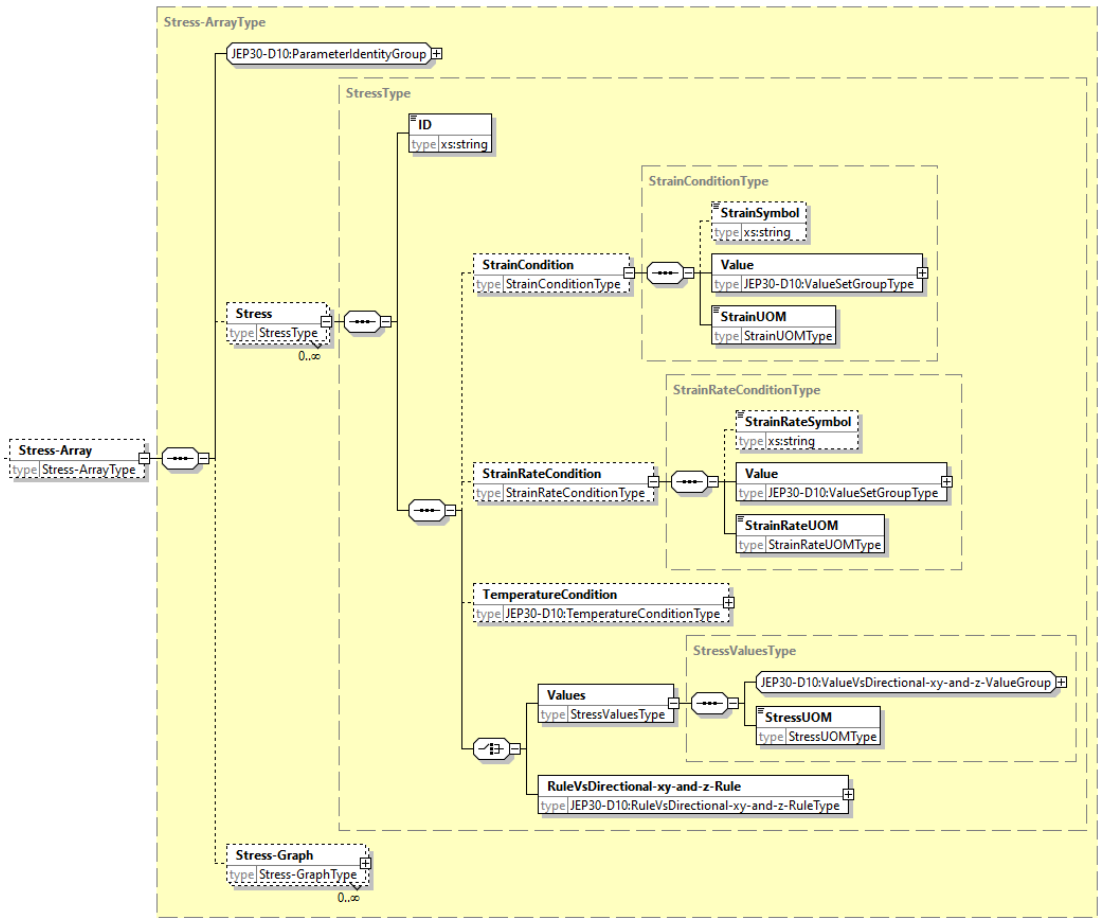
5.4.3.3.1 Poisson Ratio - Array

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/PoissonRatio-Array
diagram	
type	PoissonRatio-ArrayType, PoissonRatioType, JEP30-D10:TemperatureConditionType, UnitlessValuesType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, PoissonRatio-GraphType.
group	JEP30-D10:ParameterIdentityGroup.

5.4.3.3.1.1 Poisson Ratio Graph

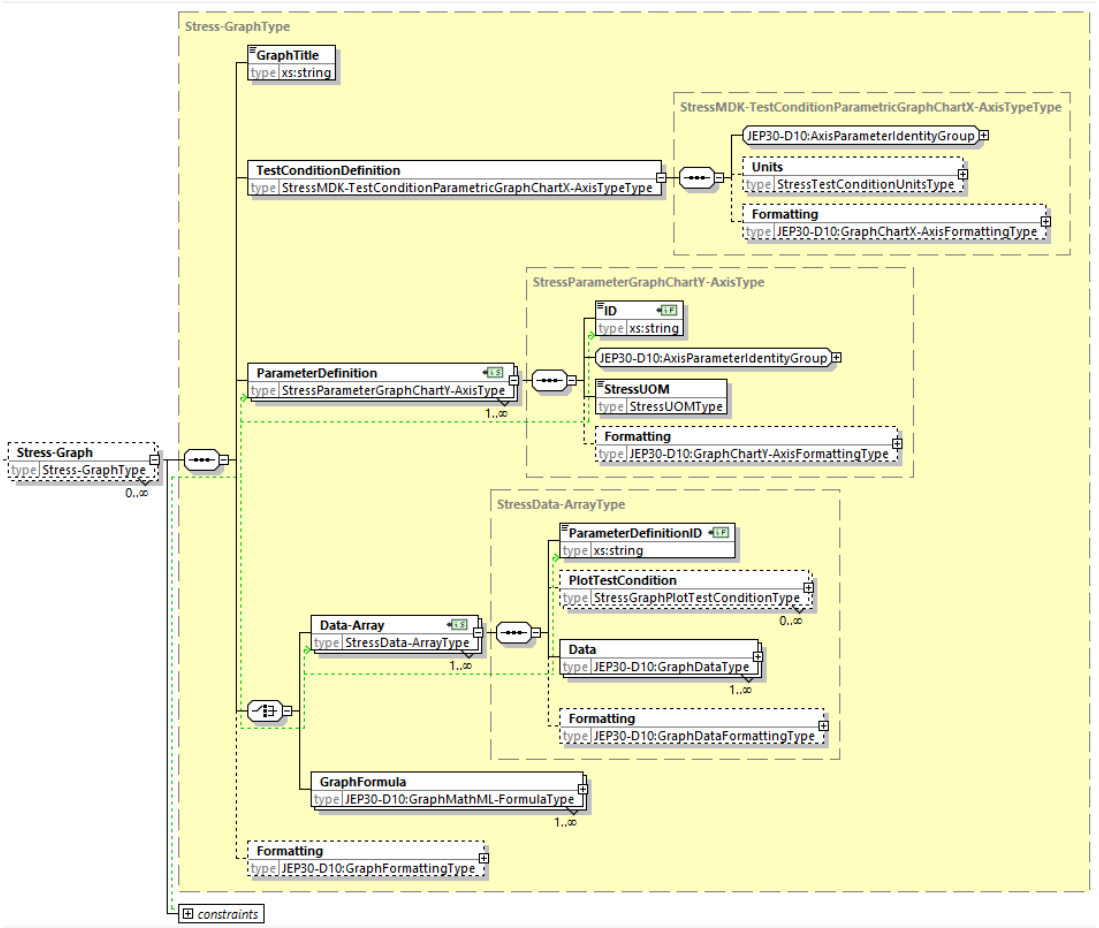
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/PoissonRatio-Array/PoissonRatio-Graph**
diagram	
type	**PoissonRatio-GraphType, JEP30-D10:TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, PoissonRatioParameterGraphChartY-AxisType, PoissonRatioData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**AxisParameterIdentityGroup**

5.4.3.3.2 Stress - Array

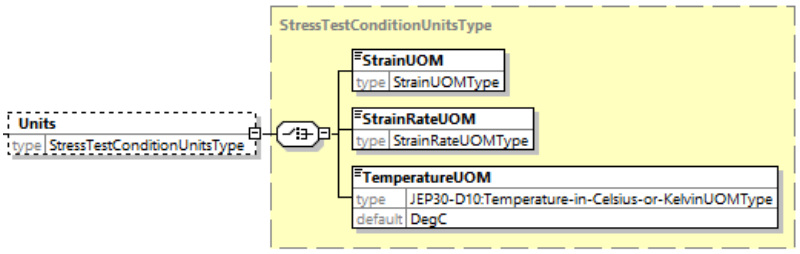
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/Stress-Array**
diagram	
type	**Stress-ArrayType, StressType, StrainConditionType, JEP30-D10:ValueSetGroupType, StrainUOMType, StrainRateConditionType, StrainRateUOMType, JEP30-D10:TemperatureConditionType, StressValuesType, StressUOMType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, Stress-GraphType.**
group	**JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.**

The *StressUOM* is restricted to Pa and MPa for this parameter.

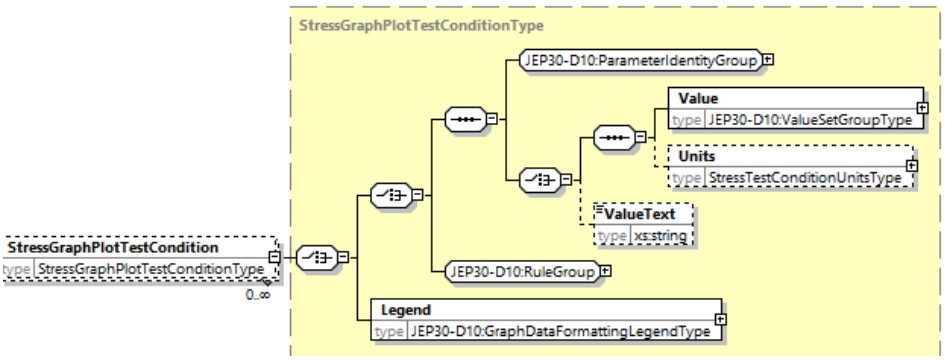
5.4.3.3.2.1 Stress Graph

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/Stress-Array/Stress-Graph**
diagram 1 of 2	
type	**Stress-GraphType, StressMDK-TestConditionParametricGraphChartX-AxisTypeType, StressTestConditionUnitsType, JEP30-D10:GraphChartX-AxisFormattingType StressParameterGraphChartY-AxisType, StressUOMType, JEP30-D10:GraphChartY-AxisFormattingType, StressData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**JEP30-D10:AxisParameterIdentityGroup**

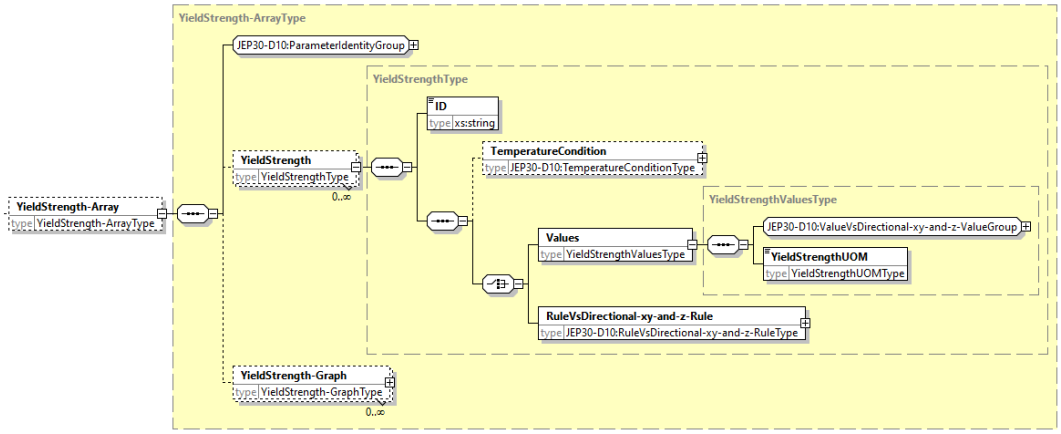
5.4.3.3.2.1.1 Units

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/Stress-Array/Stress-Graph/TestConditionDefinition/Units**
diagram	
type	**StressTestConditionUnitsType, StrainUOMType, StrainRateUOMType,** **JEP30-D10:Temperature-in-Celsius-or-KelvinUOMType,**

5.4.3.3.2.1.2 Stress Graph Plot Test Condition

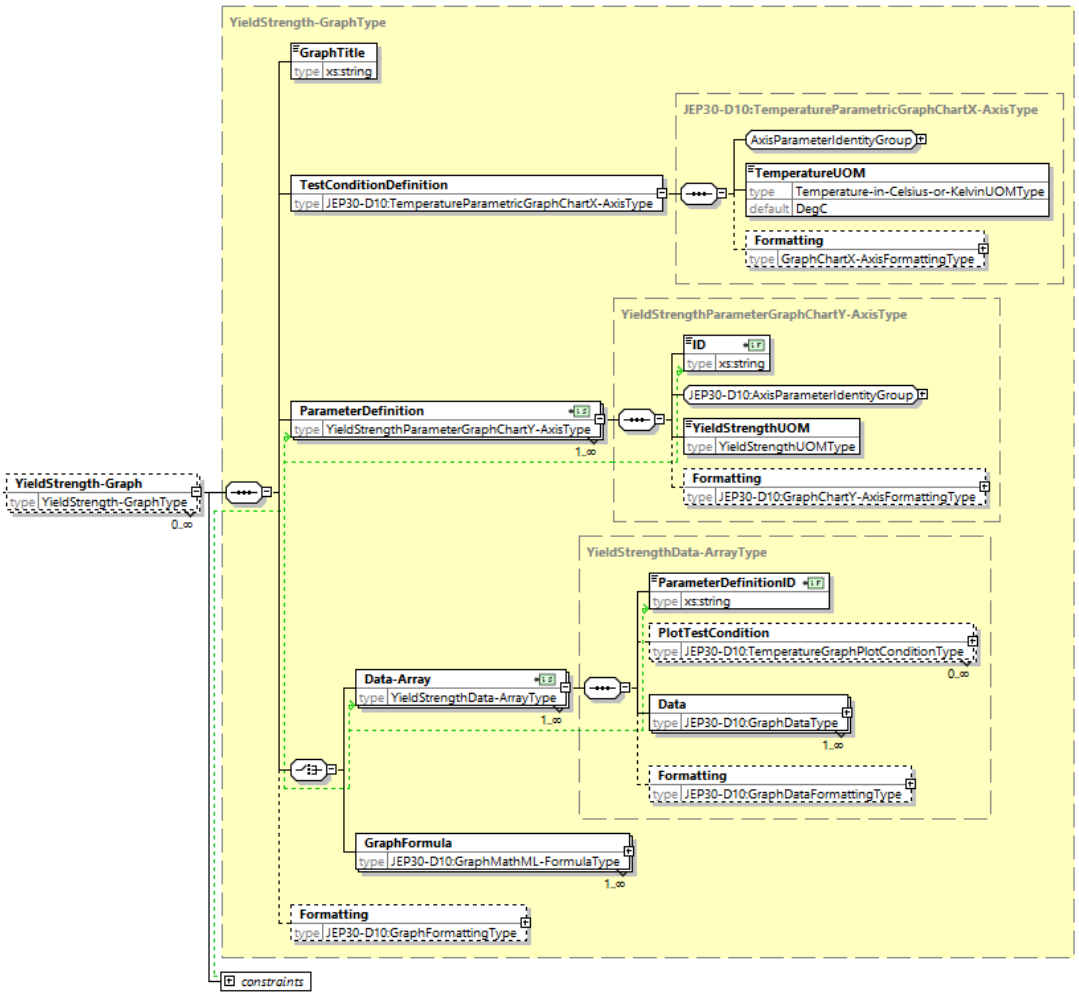
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/Stress-Array/Stress-Graph/Data-Array/PlotTestCondition**
diagram	
type	**StressGraphPlotTestConditionType, JEP30-D10:ValueSetGroupType, StressTestConditionUnitsType,** **JEP30-D10:GraphDataFormattingLegendType.**
group	**JEP30-D10:ParameterIdentityGroup, JEP30-D10:RuleGroup**

5.4.3.3.3 Yield Strength - Array

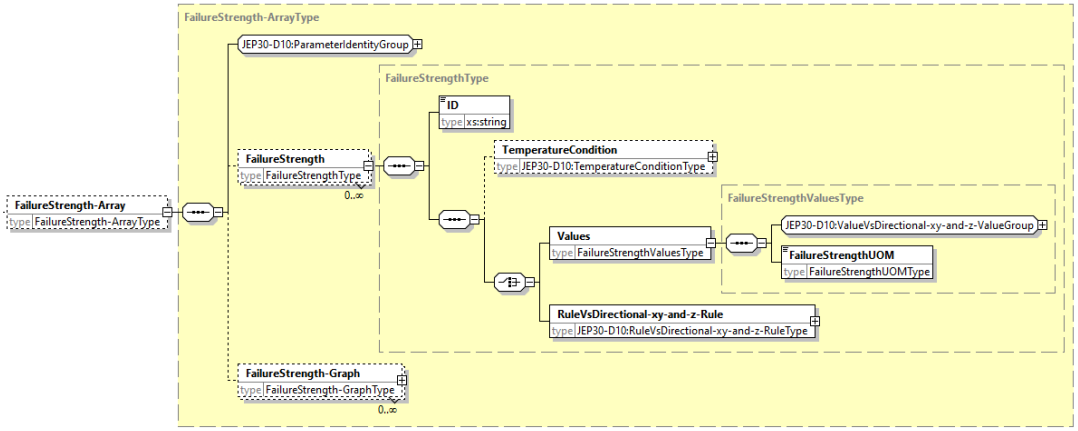
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/YieldStrength-Array**
diagram	
type	**YieldStrength-ArrayType, YieldStrengthType, JEP30-D10:TemperatureConditionType, YieldStrengthValuesType, YieldStrengthUOMType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, YieldStrength-GraphType.**
group	**JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.**

The *YieldStrengthUOM* is restricted to Pa and MPa for this parameter.

5.4.3.3.3.1 Yield Strength Graph

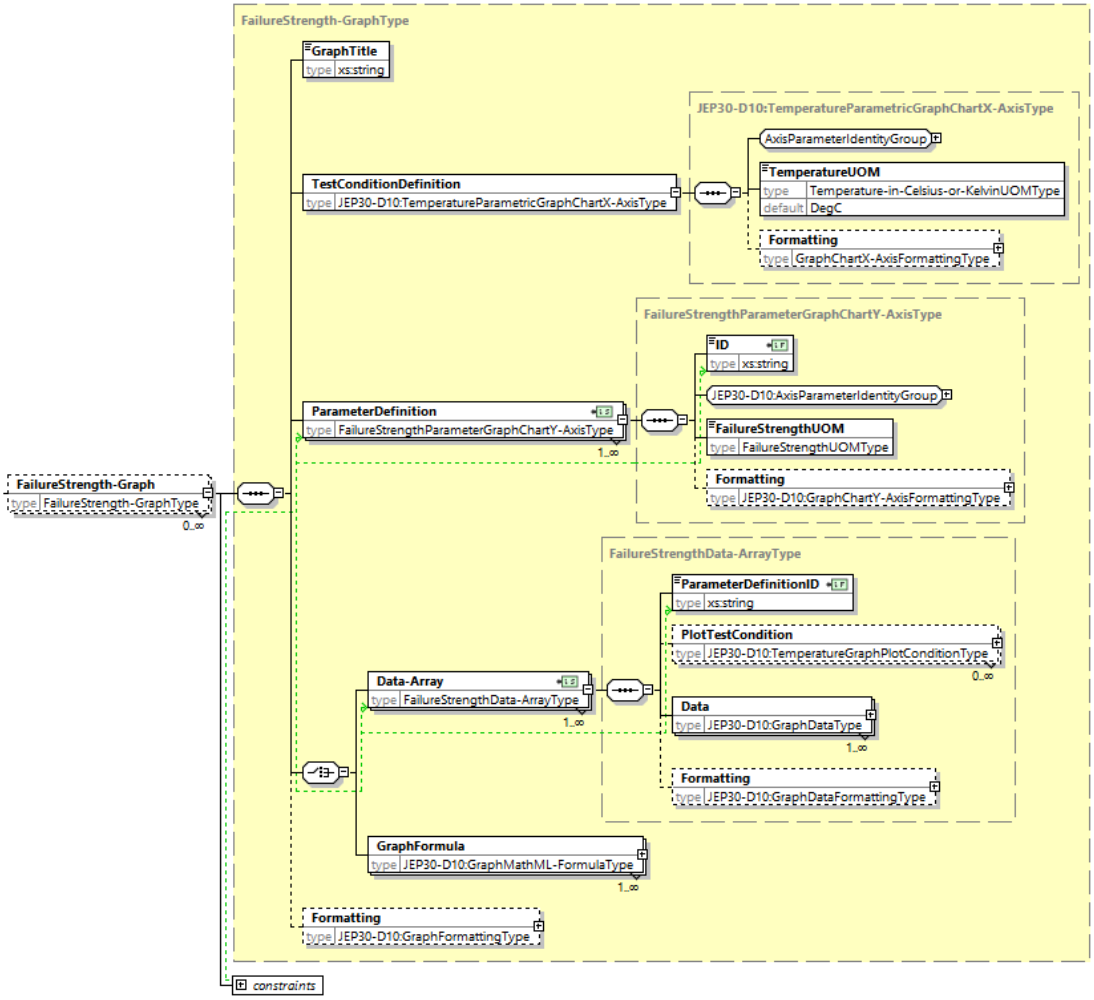
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/YieldStrength-Array/YieldStrength-Graph**
diagram	
type	**YieldStrength-GraphType, JEP30-D10:TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, YieldStrengthParameterGraphChartY-AxisType, YieldStrengthUOMType, YieldStrengthData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**AxisParameterIdentityGroup**

5.4.3.3.4 Failure Strength - Array

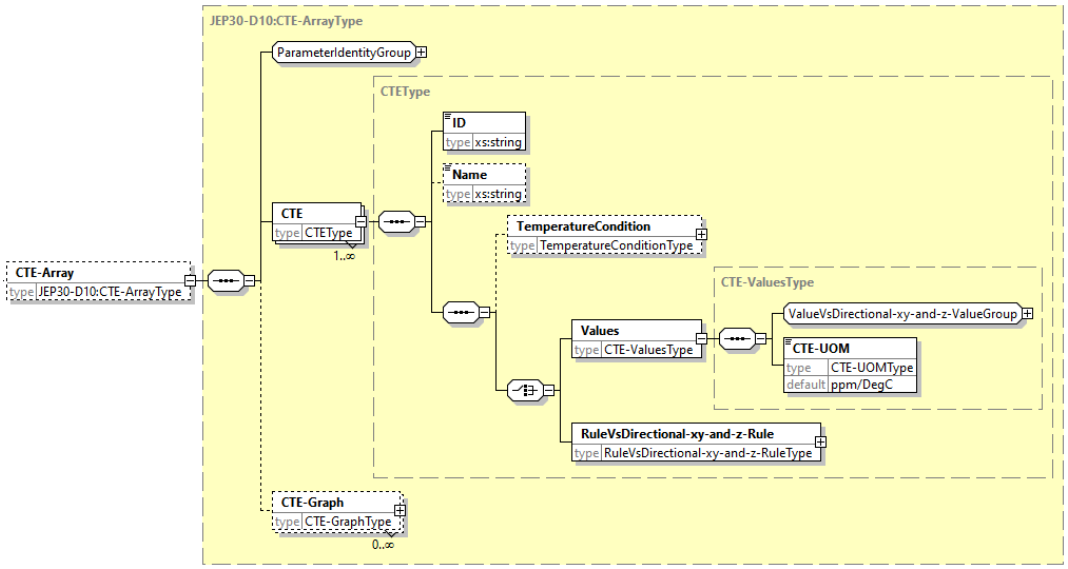
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/FailureStrength-Array**
diagram	
type	**FailureStrength-ArrayType, FailureStrengthType, JEP30-D10:TemperatureConditionType, FailureStrengthValuesType, FailureStrength-UOMType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, FailureStrength-GraphType.**
group	**JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.**

The Failure Strength UOM is restricted to Pa for this parameter.

5.4.3.3.4.1 Failure Strength Graph

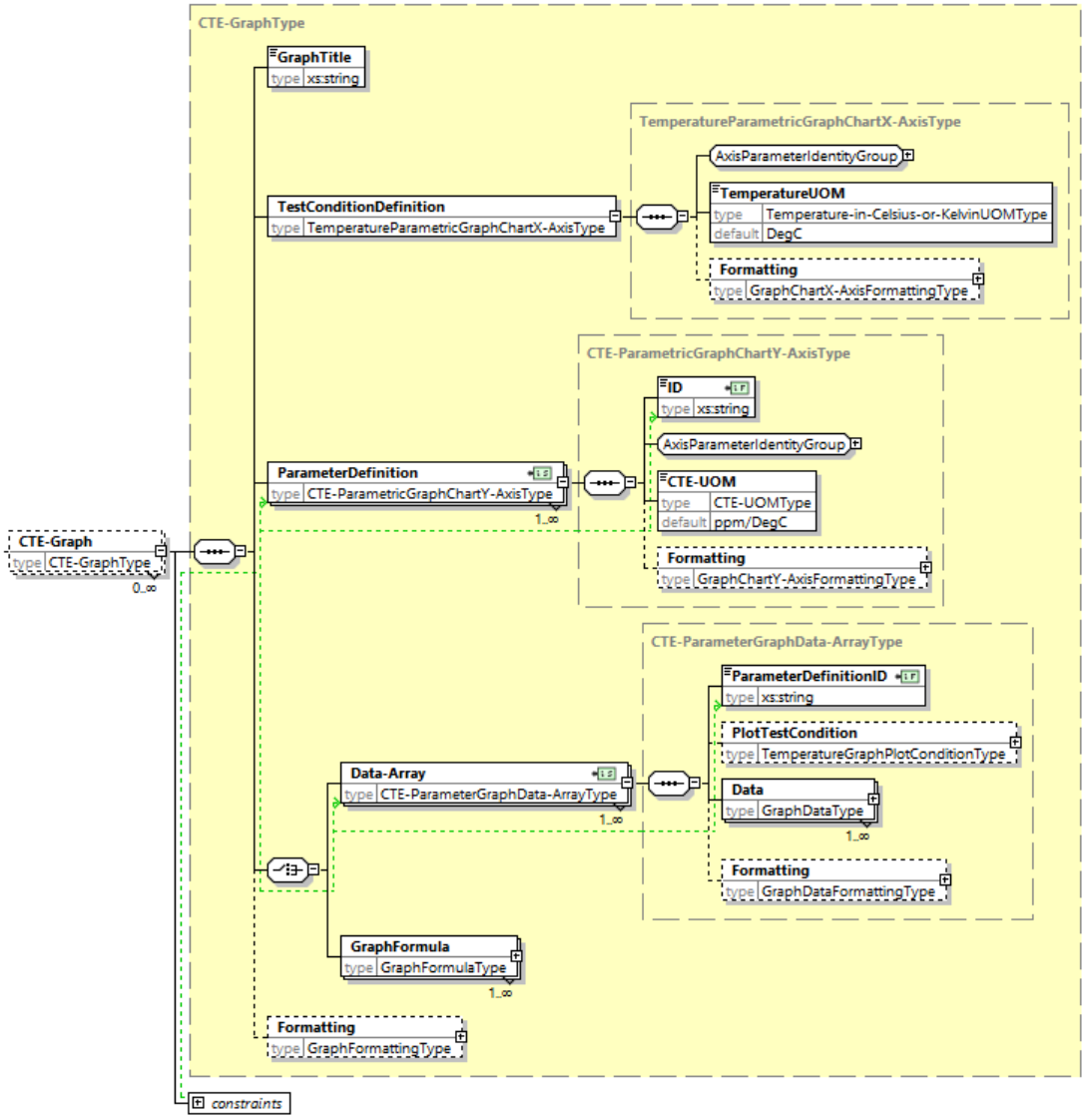
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/FailureStrength-Array/FailureStrength-Graph**
diagram	
type	**FailureStrength-GraphType, JEP30-D10:TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, FailureStrengthParameterGraphChartY-AxisType, FailureStrengthUOMType, FailureStrengthData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**AxisParameterIdentityGroup**

5.4.3.3.5 CTE - Array

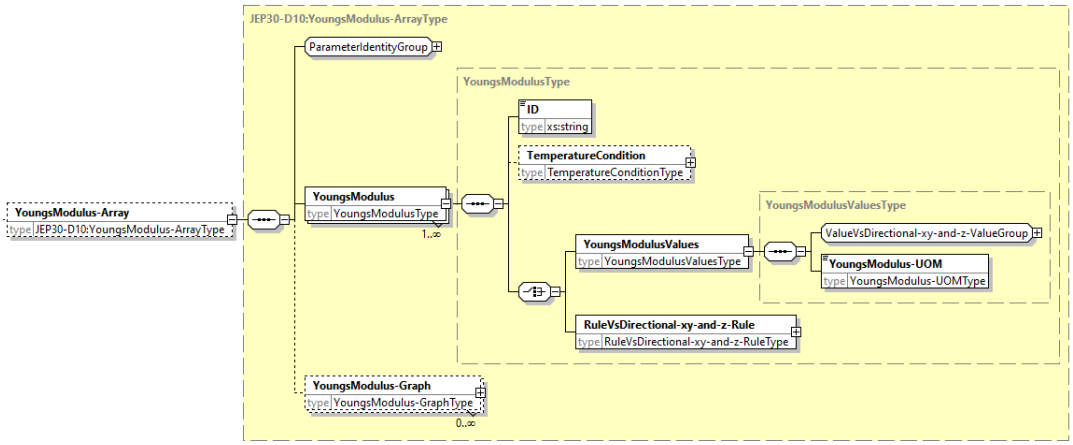
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/CTE-Array**
diagram	
type	**JEP30-D10:CTE-ArrayType, CTEType, TemperatureConditionType, CTE-ValuesType, CTE-UOMType, RuleVsDirectional-xy-and-z-RuleType, CTE-GraphType.**
group	**ParameterIdentityGroup, ValueVsDirectional-xy-and-z-ValueGroup.**

The *CTE-UOM* is restricted to ppm/DegC and ppm/K for this parameter and it is defaulted to ppm/DegC.

5.4.3.3.5.1 CTE Graph

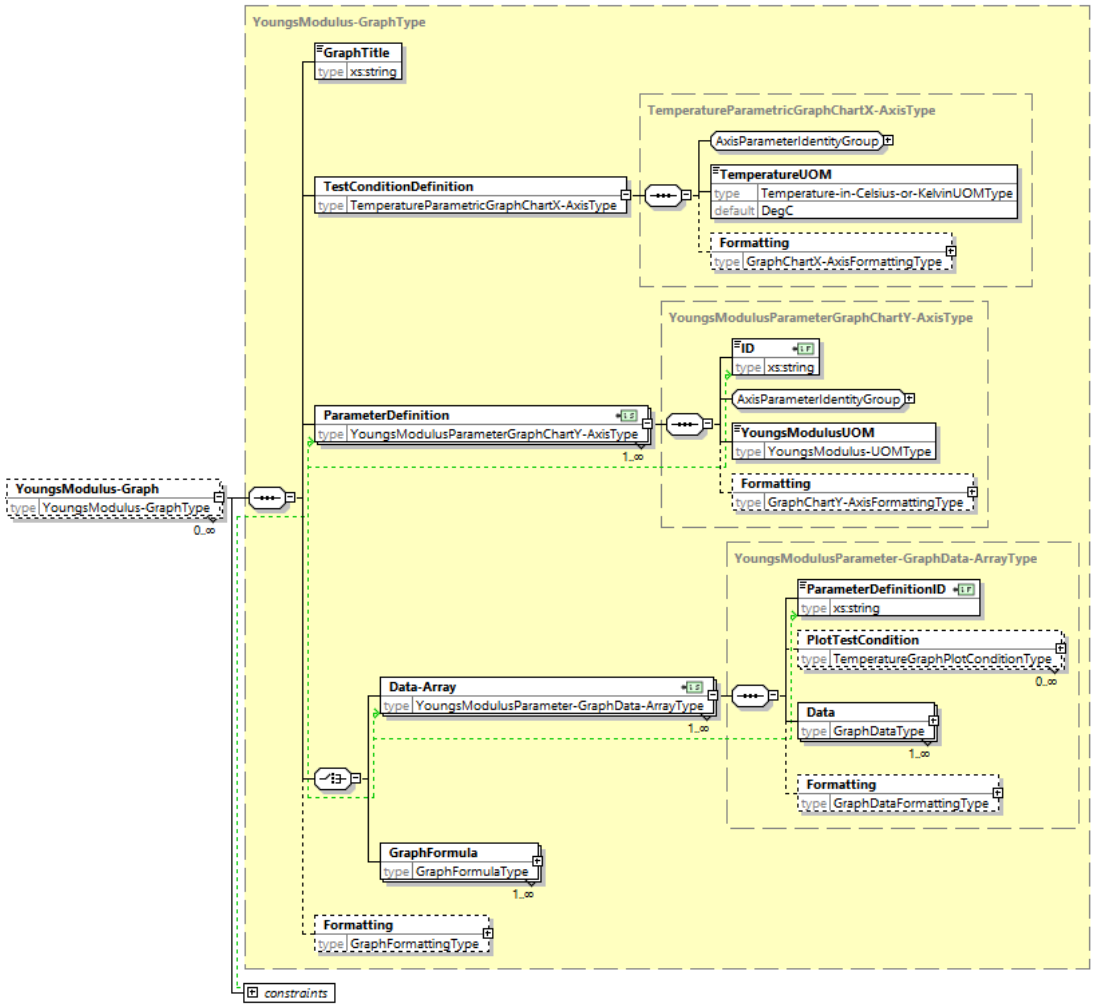
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/CTE-Array/CTE-Graph**
diagram	
type	**CTE-GraphType, TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, CTE-ParameterGraphChartY-AxisType, CTE-UOMType, CTE-Data-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**AxisParameterIdentityGroup**

5.4.3.3.6 Youngs Modulus- Array

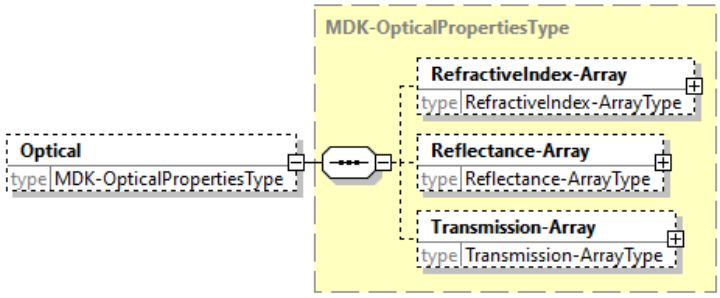
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/YoungsModulus-Array**
diagram	
type	**JEP30-D10:YoungsModulus-ArrayType, YoungsModulusType, YoungsModulusType,** **YoungsModulusValuesType, RuleVsDirectional-xy-and-z-RuleType, , YoungsModulus-GraphType.**
group	**ParameterIdentityGroup, ValueVsDirectional-xy-and-z-ValueGroup, RuleGroup.**

The *YoungsModulus-UOM* is restricted to N/m^2 and GPa for this parameter.

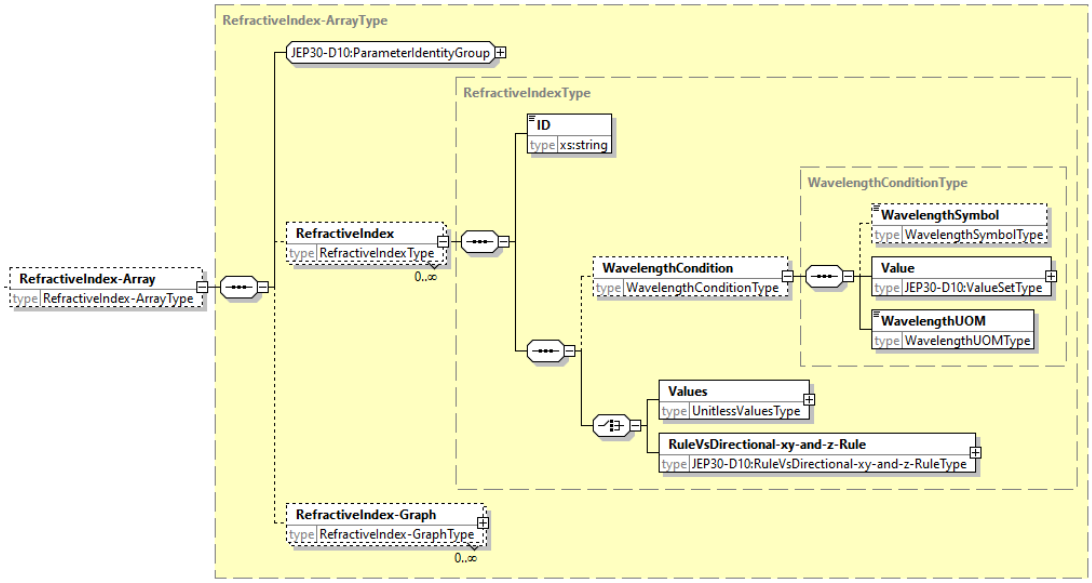
5.4.3.3.6.1 Youngs Modulus Graph

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/YoungsModulus-Array/YoungsModulus-Graph**
diagram	
type	**YoungsModulus-GraphType, TemperatureParametricGraphChartX-AxisType, Temperature-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, YoungsModulusParameterGraphChartY-AxisType, YoungsModulusUOMType, YoungsModulusData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType**
group	**AxisParameterIdentityGroup**

5.4.3.4 Optical

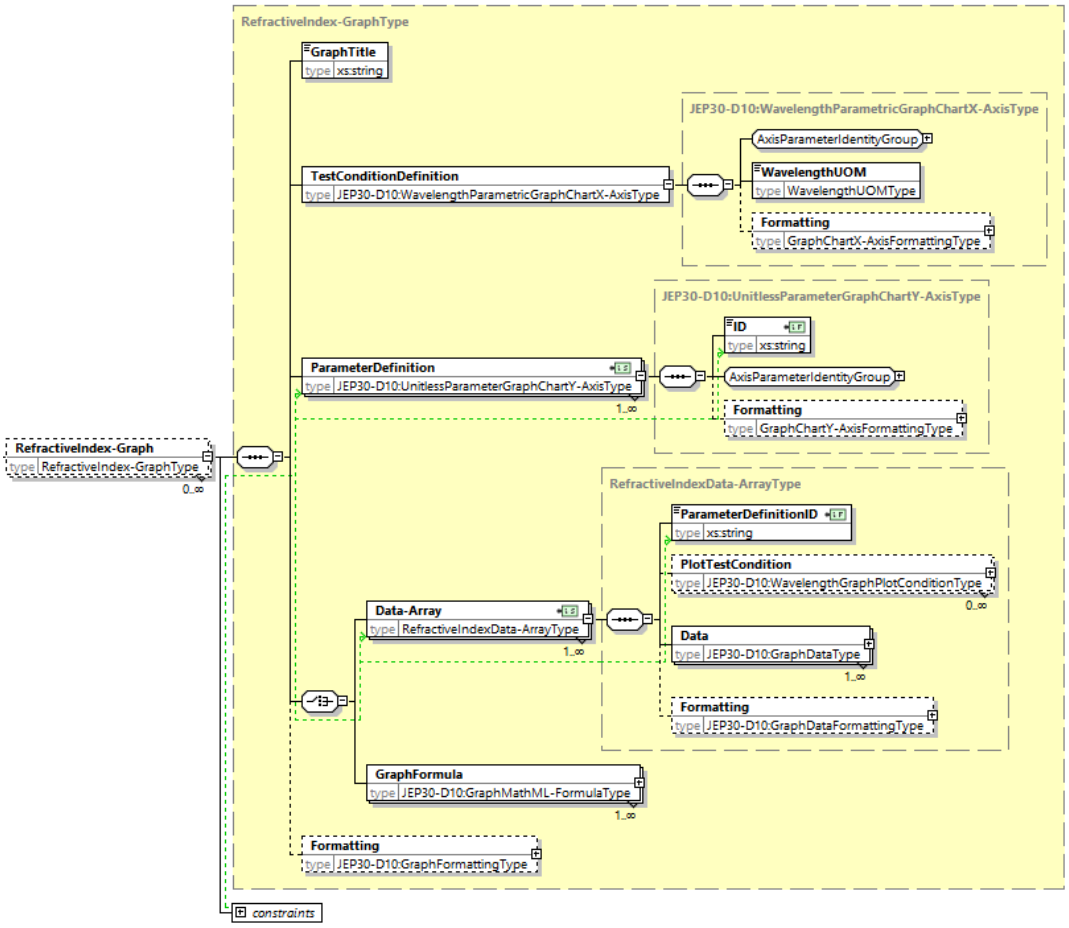
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Optical**
diagram	
type	**MDK-OpticalPropertiesType, RefractiveIndex-ArrayType, Reflectance-ArrayType, Transmission-ArrayType.**

5.4.3.4.1 Refractive Index - Array

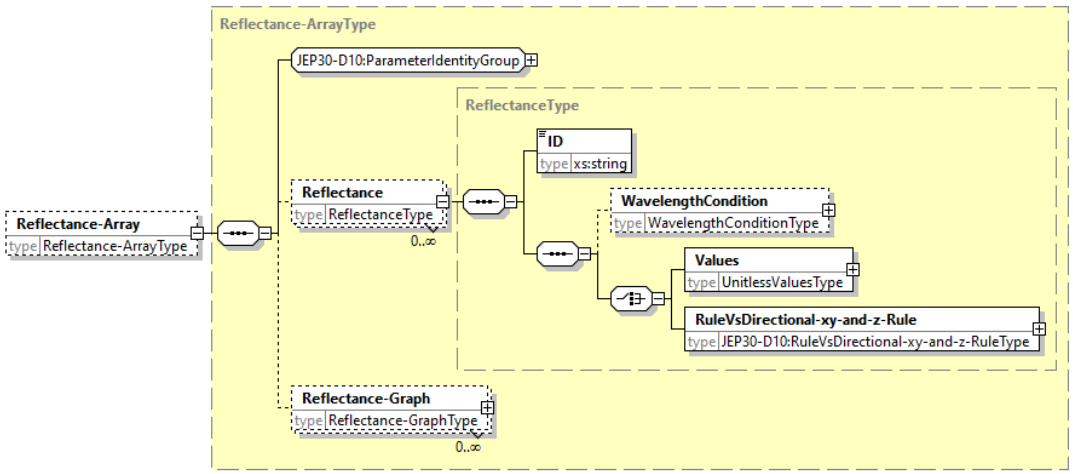
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Optical/RefractiveIndex-Array**
diagram	
type	**RefractiveIndex-ArrayType, RefractiveIndexType, WavelengthConditionType, WavelengthSymbolType, WavelengthUOMType, UnitlessValuesType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, RefractiveIndex-GraphType.**
group	**JEP30-D10:ParameterIdentityGroup.**

The Wavelength *Symbol* is restricted to Lamba, and the *WavelengthUOM* is restricted to nm for the *WavelengthCondition*.

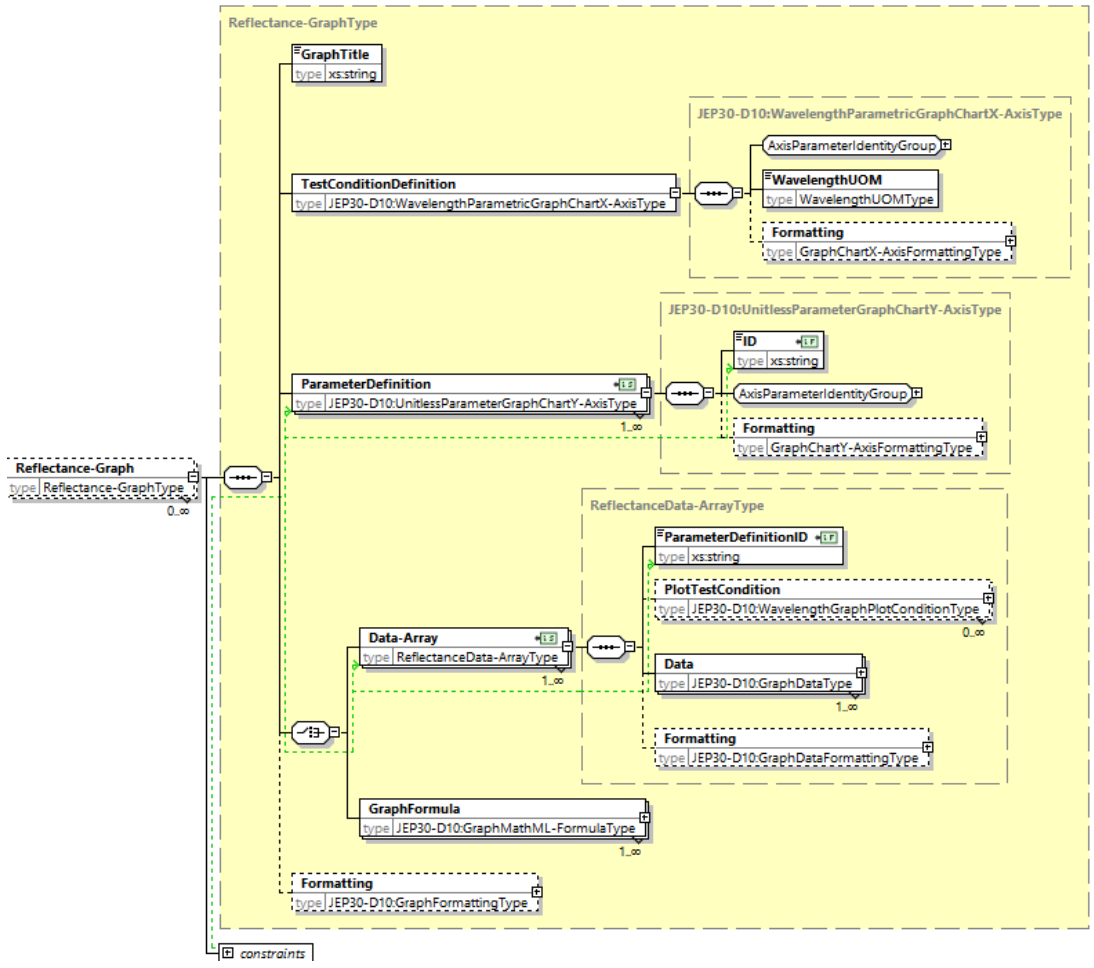
5.4.3.4.1.1 Refractive Index Graph

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Optical/RefractiveIndex-Array/RefractiveIndex-Graph**
diagram	
type	**RefractiveIndex-GraphType, JEP30-D10:WavelengthParametricGraphChartX-AxisType, WavelengthUOMType, GraphChartX-AxisFormattingType, JEP30-D10:UnitlessParameterGraphChartY-AxisType, GraphChartY-AxisFormattingType, RefractiveIndexData-ArrayType, JEP30-D10:WavelengthGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType.**
group	**AxisParameterIdentityGroup**

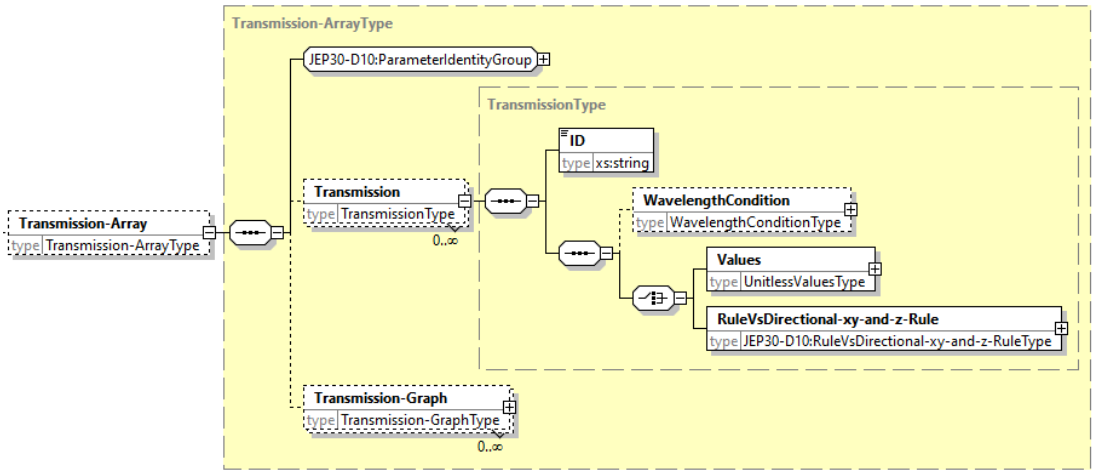
5.4.3.4.2 Reflectance - Array

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Optical/Reflectance-Array**
diagram	
type	**Reflectance-ArrayType, ReflectanceType, WavelengthConditionType, UnitlessValuesType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, Reflectance-GraphType.**
group	**JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup, JEP30-D10:RuleGroup.**

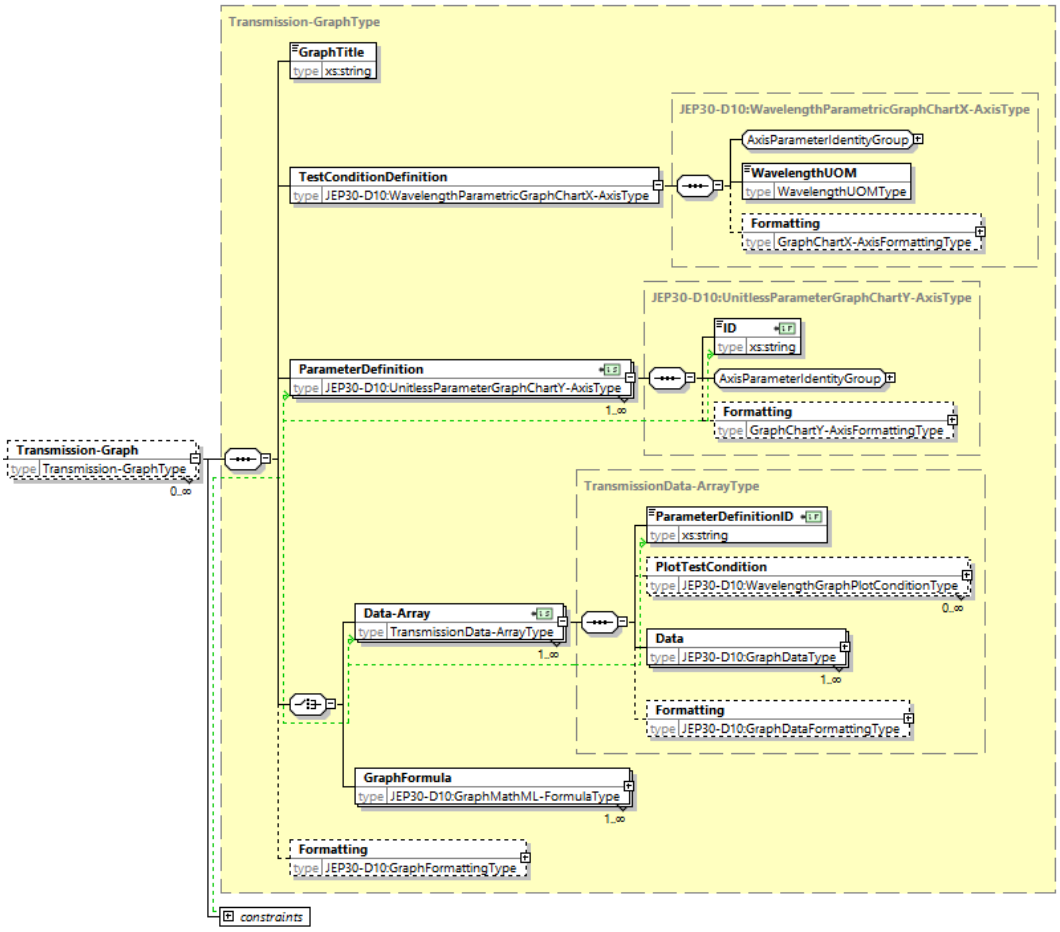
5.4.3.4.2.1 Reflectance Graph

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Optical/Reflectance-Array/Reflectance-Graph**
diagram	
type	**Reflectance-GraphType, JEP30-D10:WavelengthParametricGraphChartX-AxisType, WavelengthUOMType, GraphChartX-AxisFormattingType, JEP30-D10:UnitlessParameterGraphChartY-AxisType, GraphChartY-AxisFormattingType, ReflectanceData-ArrayType, JEP30-D10:WavelengthGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType.**
group	**AxisParameterIdentityGroup**

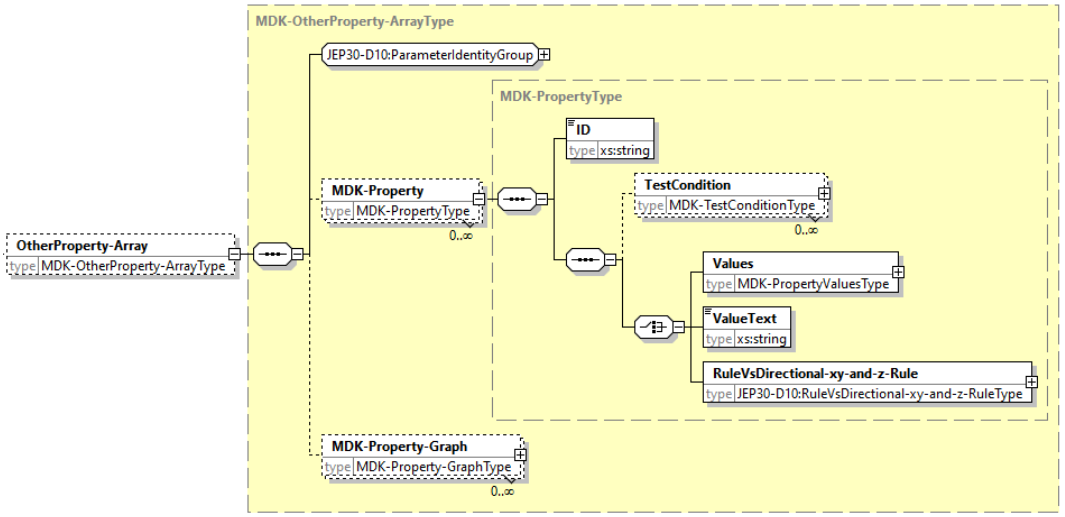
5.4.3.4.3 Transmission - Array

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Optical/Transmission-Array**
diagram	
type	**Transmission-ArrayType, TransmissionType, WavelengthConditionType, UnitlessValuesType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, Transmission-GraphType.**
group	**JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup, JEP30-D10:RuleGroup.**

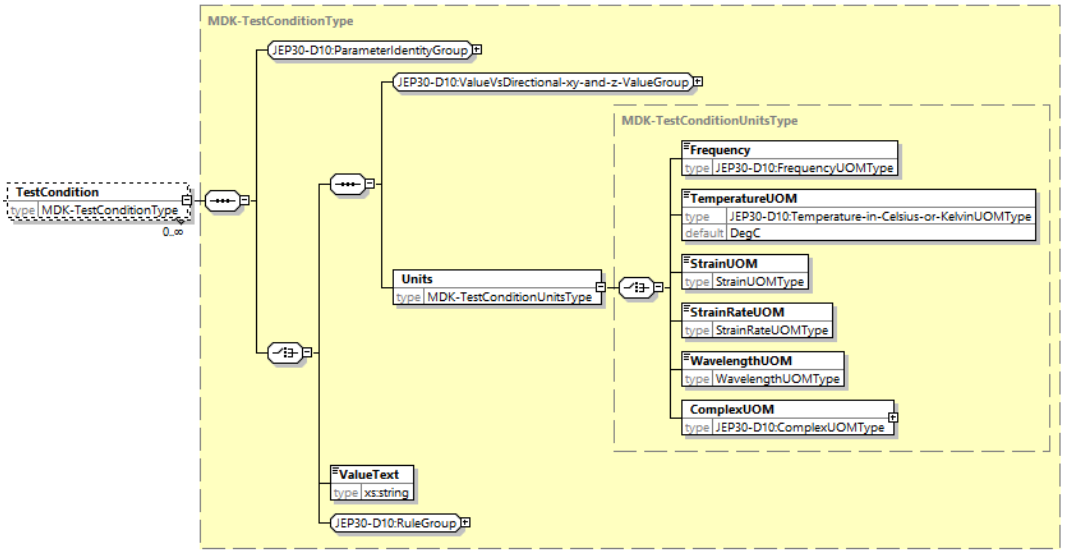
5.4.3.4.3.1 Transmission Graph

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Optical/Transmission-Array/Transmission-Graph**
diagram	
type	**Transmission-GraphType, JEP30-D10:WavelengthParametricGraphChartX-AxisType, WavelengthUOMType, GraphChartX-AxisFormattingType, JEP30-D10:UnitlessParameterGraphChartY-AxisType, GraphChartY-AxisFormattingType, TransmissionData-ArrayType, JEP30-D10:WavelengthGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType.**
group	**AxisParameterIdentityGroup**

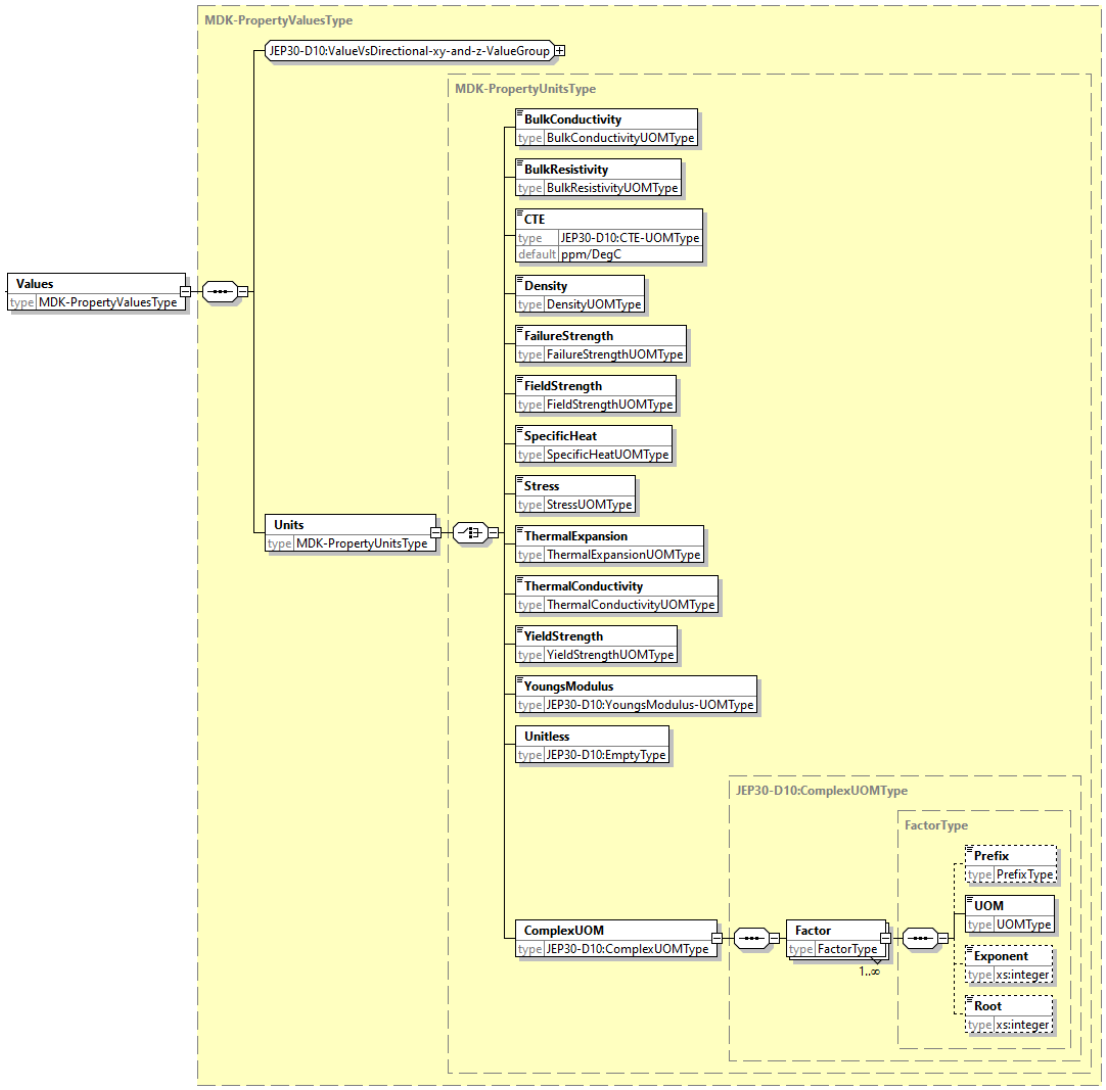
5.4.3.5 Other Property - Array

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/OtherProperty-Array**
diagram	
type	**MDK-OtherProperty-ArrayType, MDK-PropertyType, MDK-TestConditionType, MDK-PropertyValuesType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, MDK-Property-GraphType.**
group	**JEP30-D10:ParameterIdentityGroup.**

5.4.3.5.1 Test Condition

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/OtherProperty-Array/MDK-Property/TestCondition**
diagram	
type	**MDK- TestConditionType, MDK- TestConditionUnitsType, JEP30-D10:FrequencyUOMType, JEP30-D10:Temperature-in-Celsius-or-KelvinUOMType, StrainUOMType, StrainRateUOMType, WavelengthUOMType, JEP30-D10:ComplexUOMType**
group	**JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup, JEP30-D10:RuleGroup.**

5.4.3.5.2 Values

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/OtherProperty-Array/MDK-Property/Values**
diagram	
type	**MDK-PropertyValuesType, MDK-PropertyUnitsType, BulkConductivityUOMType, BulkResistivityUOMType, JEP30-D10:CTE-UOMType, DensityUOMType, FailureStrengthUOMType, FieldStrengthUOMType, SpecificHeatUOMType, StressUOMType, ThermalExpansionUOMType, ThermalConductivityUOMType, YieldStrengthUOMType, JEP30-D10:YoungsModulus-UOMType, JEP30-D10:EmptyType, JEP30-D10:ComplexUOMType, FactorType, PrefixType, UOMType.**
group	**JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.**

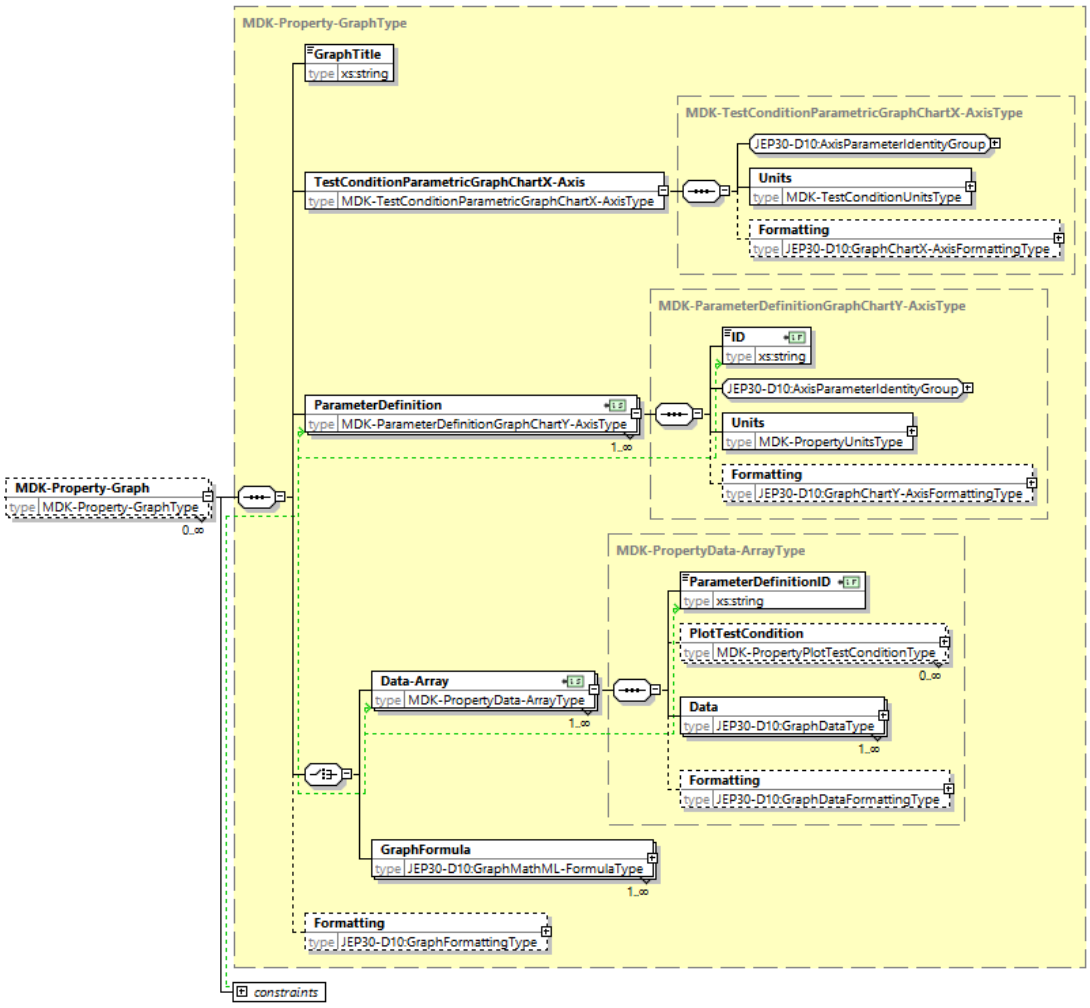
5.4.3.5.2. Values (cont'd)

The enumerated list of values for each of the UOM's specified above are identified in Table 1.

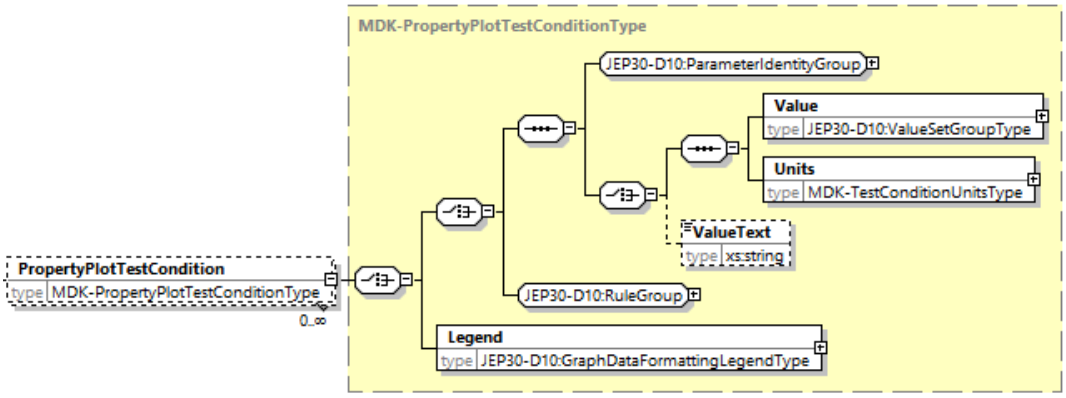
Table 1 — UOM Enumerated Lists

Unit	Enumerated Values									
Frequency	Hz	kHz	MHz	GHz						
Temperature	degC	K								
Strain	*με*: με									
StrainRate	*ε*: ε									
Wavelength	nm									
BulkConductivity	S/m									
BulkResistivity	Ohm*m									
CTE	ppm/degC		ppm/K							
Density	kg/m^3	g/cm^3								
FailureStrength	Pa	MPa								
FieldStrength	MV/cm	V/m								
SpecificHeat	J/(g*degC)		J/(g*K)							
Stress	Pa	MPa								
ThermalExpansion	1/DegC	1/K								
ThermalConductivity	W/m.K									
YieldStrength	Pa	MPa								
YoungsModulus	N/m^2	GPa								
ComplexUOM										
- Prefix	Femto	Pico	Nano	Micro	Milli	Unity	Kilo	Mega	Giga	Tera
- UOM	Ampere	Bits	Candela	Celsius	Decibel	Fahrenheit		Farad	Foot	Gram
	Henry	Hertz	Hour	Inch	Kelvin	Least-Significant-Bit			Lumen	
	Meter	Mil	Min	Newton	Ohm	Ounce	Pascal		Percent	
	PartsPerMillion		PartsPerBillion		Pound	Second		Tesla	Volt	Watt

5.4.3.5.3 MDK-Property Graph

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/OtherProperty-Array/MDK-Property-Graph**
diagram	
type	**MDK-Property-GraphType, MDK-TestConditionParametricGraphChartX-AxisType, MDK-TestConditionUnitsType, JEP30-D10:GraphChartX-AxisFormattingType, MDK-ParameterDefinitionGraphChartY-AxisType, MDK-PropertyUnitsType, JEP30-D10:GraphChartY-AxisFormattingType, MDK-PropertyData-ArrayType, MDK-PropertyPlotTestConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType.**
group	**AxisParameterIdentityGroup**

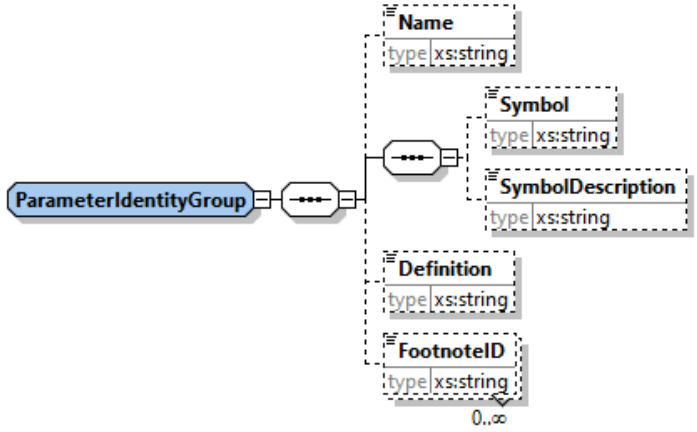
5.4.3.5.4 Property Plot Test Condition

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/OtherProperty-Array/MDK-Property-Graph/Data-Array/PropertyPlotTestCondition**
diagram	
type	**MDK-PropertyPlotTestConditionType, JEP30-D10:ValueSetGroupType, MDK-TestConditionUnitsType, JEP30-D10:GraphDataFormattingLegendType.**
group	**JEP30-D10:ParameterIdentityGroup, JEP30-D10:RuleGroup.**

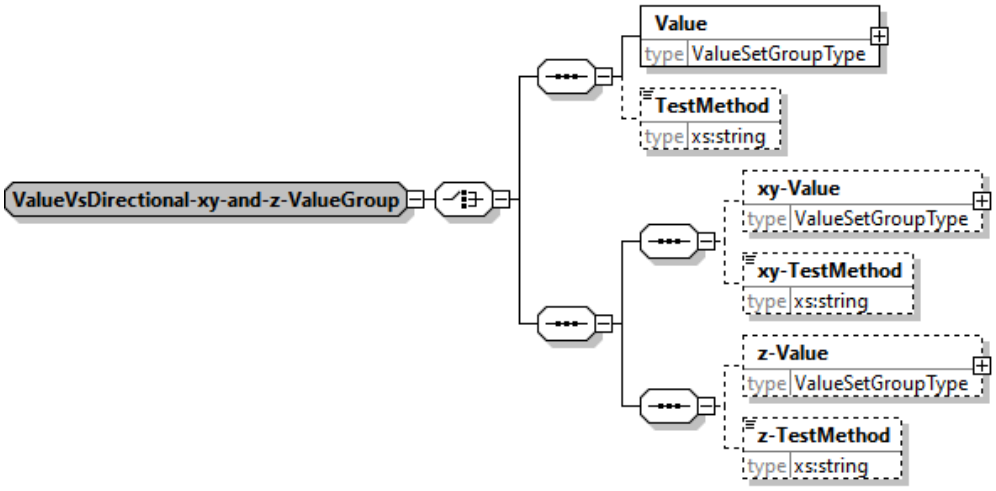
5.4.3.6 Common Structure applied to all Properties

The following sub-sections applies to most Material Properties under each of the Electrical, Thermal, Structural and Optical sections.

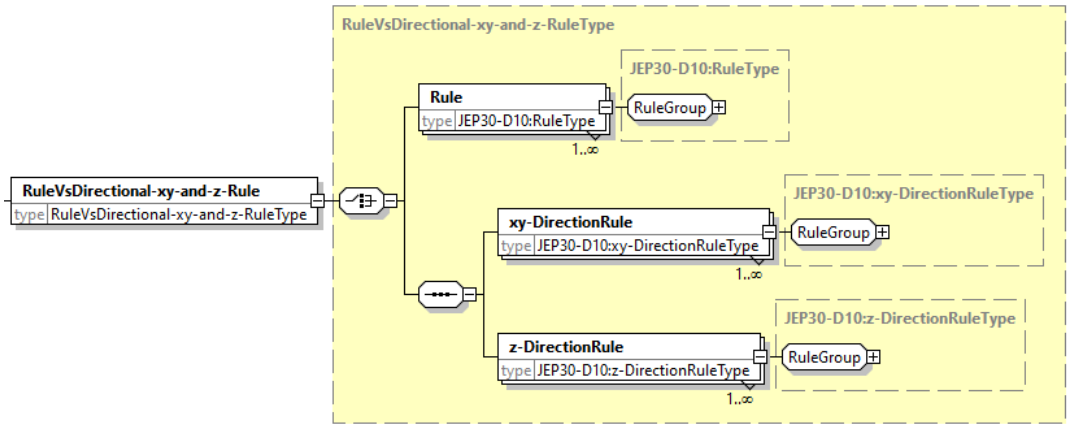
5.4.3.6.1 Parameter Identity Group

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/JEP30-D10:ParameterIdentityGroup**
diagram	
group	**ParameterIdentityGroup**

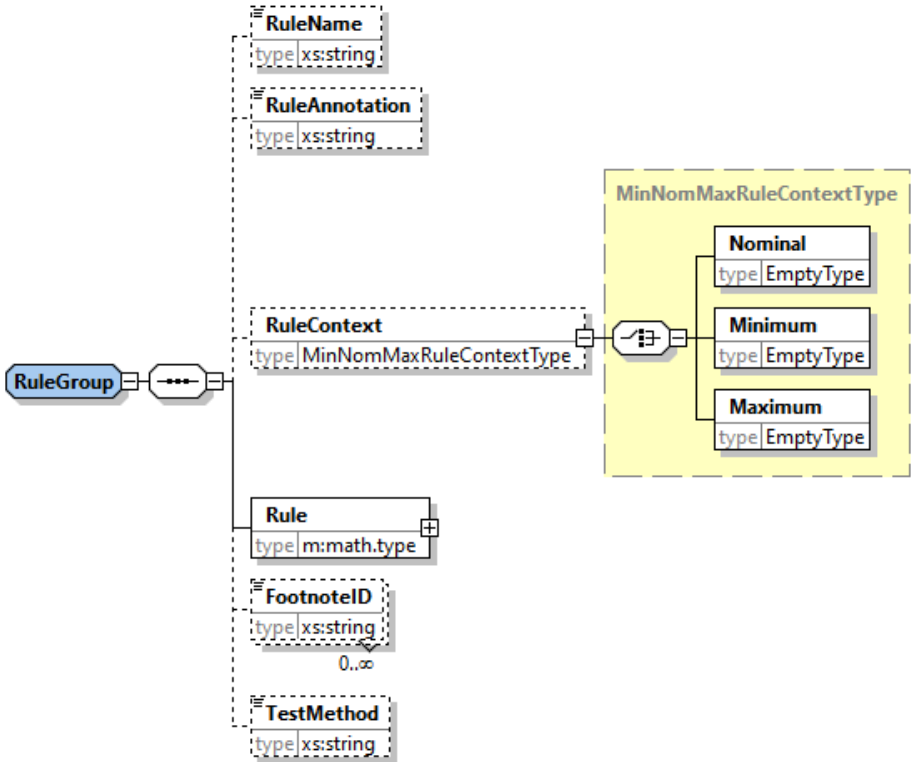
5.4.3.6.2 Value Vs Directional – xy – and – z – Value Group

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…/JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup
diagram	
type	ValueSetGroupType
group	ValueVsDirectional-xy-and-z-ValueGroup

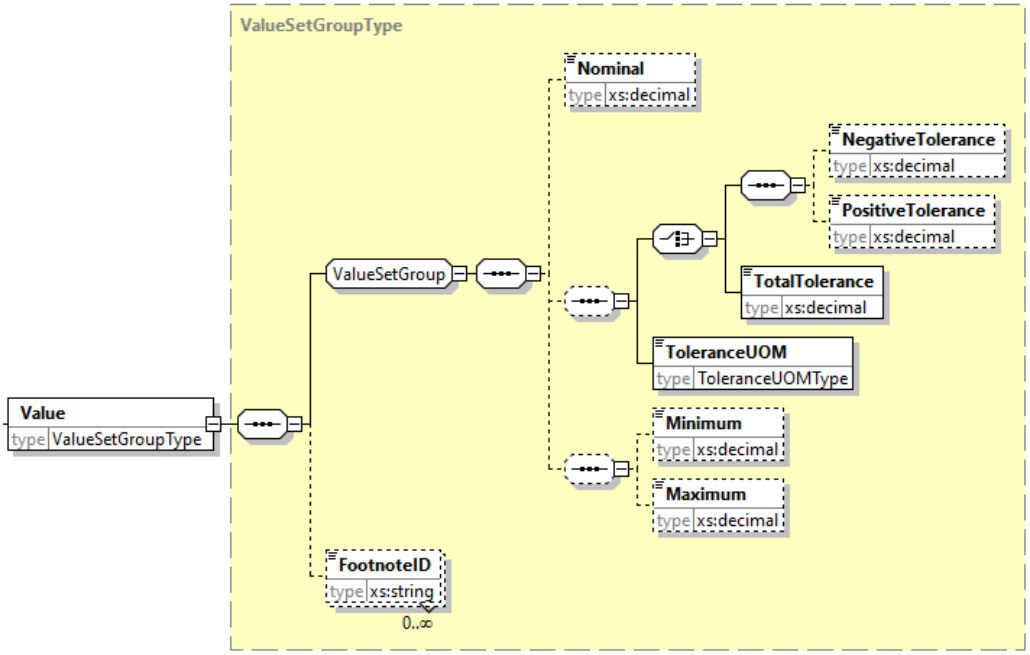
5.4.3.6.3 Rule Vs Directional – xy – and – z - Rule

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/DielectricConstant-Array/DielectricConstant/RuleVsDirectional-xy-and-z-Rule
diagram	
type	RuleVsDirectional-xy-and-z-RuleType, JEP30-D10:RuleType, JEP30-D10:xy-DirectionRuleType, JEP30-D10:z-DirectionRuleType
group	RuleGroup

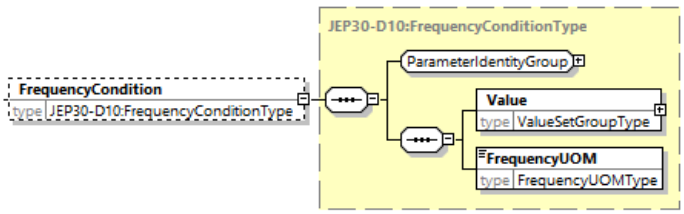
5.4.3.6.3.1 Rule Group

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…/Jep30-D10: RuleGroup**
diagram	
type	**MinNomMaxRuleContextType, EmptyType**
group	**RuleGroup**

5.4.3.6.4 Value Set Group Type

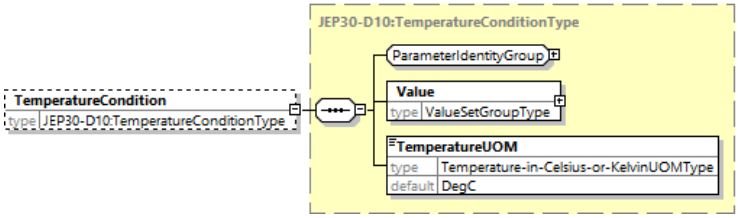
path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…/Value
diagram	
type	ValueSetGroupType, ToleranceUOMType
group	ValueSetGroup

5.4.3.6.5 Frequency Condition Type

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…/FrequencyCondition
diagram	
type	JEP30-D10:FrequencyConditionType, ValueSetGroupType, FrequencyUOMType.
group	ParameterIdentityGroup.

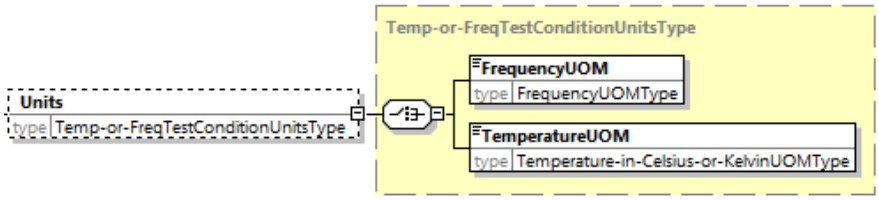
The enumerated values for *FrequencyUOM* are Hz, KHz, MHz, GHz, and sqrtHz

5.4.3.6.6 Temperature Condition Type

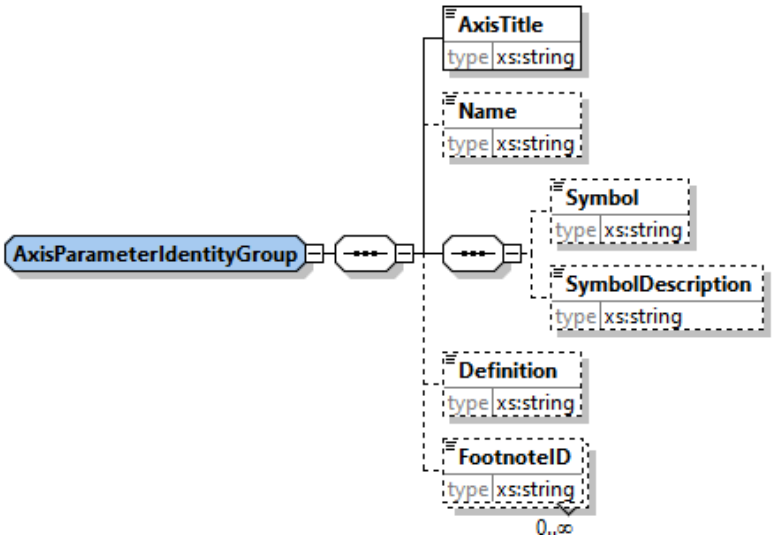
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…/TemperatureCondition**
diagram	
type	**JEP30-D10:TemperatureConditionType, ValueSetGroupType, Temperature-in-Celsius-or-KelvinUOMType.**
group	**ParameterIdentityGroup**

The enumerated values for *Temperature-in-Celsius-or-KelvinUOMType* are DegC and K

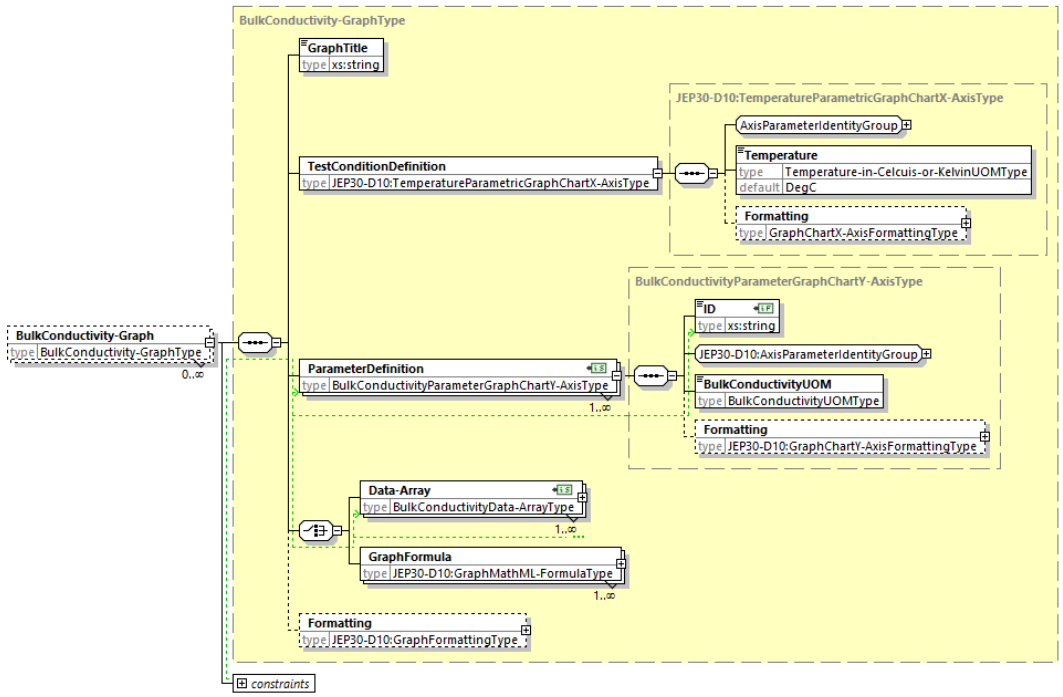
5.4.3.6.7 Temp-or-Freq Test Condition Units Type

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…-Graph/TestConditionDefinition/Units**
diagram	
type	**Temp-or-FreqTestConditionUnitsType, FrequencyUOMType, Temperature-in-Celsius-or-KelvinUOMType.**

5.4.3.6.8 Axis Parameter Identity Group

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/…-Array/…-Graph/TestConditionDefinition**
diagram	
group	**AxisParameterIdentityGroup**

5.4.3.6.9 Graph Structure applicable to Material Properties

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/…-Array/…-Graph**
diagram	
type	**…-GraphType, JEP30-D10:…ParametricGraphChartX-AxisType, …UOMType, GraphChartX-AxisFormattingType, …ParameterGraphChartY-AxisType, JEP30-D10:GraphChartY-AxisFormattingType, …Data-ArrayType, JEP30-D10:GraphMathML-FormulaType, JEP30-D10:GraphFormattingType.**
group	**AxisParameterIdentityGroup, JEP30-D10:AxisParameterIdentityGroup,**

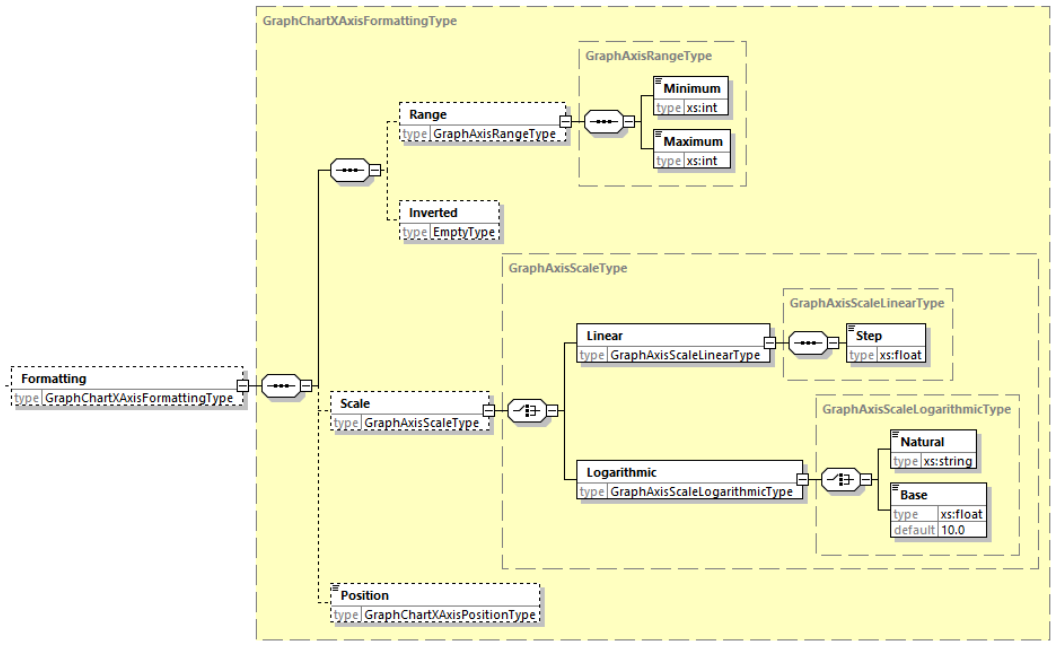
A *…Graph* has 2 axis that are defined by the *TestConditionType* (The X-axis definition), and the *ParameterType* (The Y-axis definition). Each axis is labelled by the *AxisTitle*. When possible, the *Symbol* which represents the *AxisTitle* should be added to the PartModel file and should represent a standards-based symbol as defined in the appropriate Terms and Definitions standards. If appropriate, a more detailed *Description* can be used to describe the definition of the *AxisTitle*. Each axis will also have a pre-defined set of *Units* but can be optionally excluded for those axis' which are unitless.

Note that the *ParameterDefinition* is unbounded whereas the *TestConditionDefinition* is bounded to a single instance. This is to cater for those graphs in which there are 2 or more y-axis, each with their own definition.

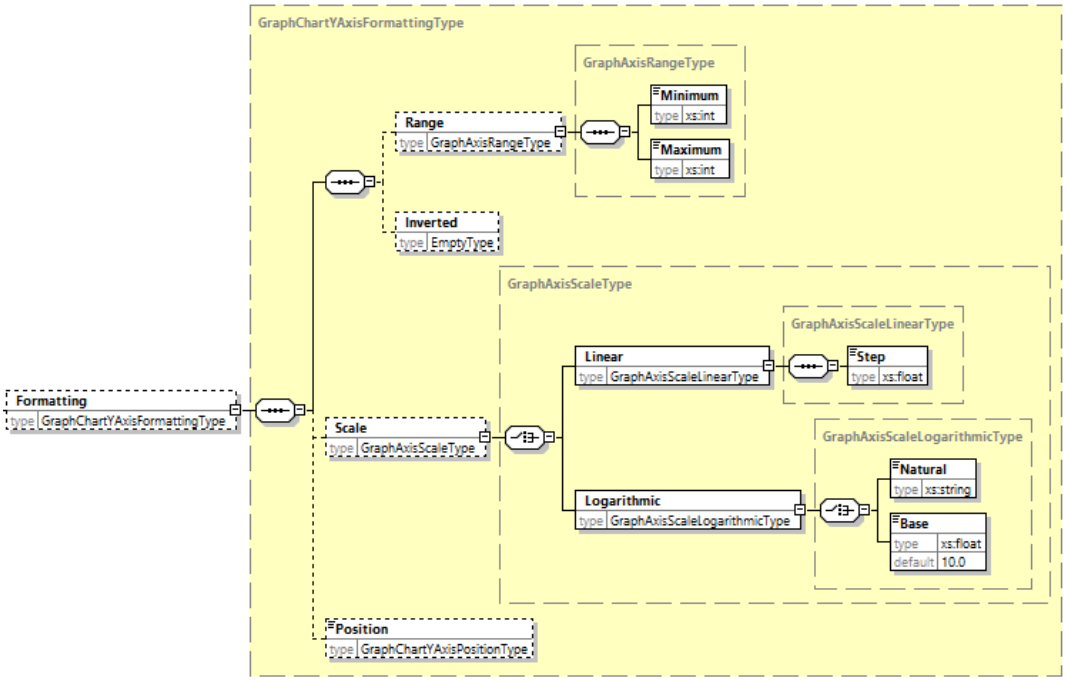
The graph can either be captured under the *Data-Array* or represented via a *GraphFormula (A string representing the equation of the ParameterDefinition relationship to the Test TestConditionDefinition).*

5.4.3.6.9.1 Graph Chart X Axis Formatting Type

The Formatting is an optional set of data that enables the user to re-create the graph for visualization purposes. Formatting applies to the following

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…-Graph/TestConditionDefinition/Formatting**
diagram	
type	**GraphChartXAxisFormattingType, GraphAxisRangeType, EmptyType, GraphAxisScaleType, GraphAxisScaleLinearType, GraphAxisScaleLogarithmicType, GraphChartXAxisPositionType.**

5.4.3.6.9.2 Graph Chart Y Axis Formatting Type

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…-Graph/ParameterDefinition/Formatting**
diagram	
type	**GraphChartYAxisFormattingType, GraphAxisRangeType, EmptyType, GraphAxisScaleType, GraphAxisScaleLinearType, GraphAxisScaleLogarithmicType, GraphChartYAxisPositionType.**

The axis range which is usually defined from minimum to maximum can be inverted to show a graph going from maximum to minimum. The scale can be defined in either a linear step amount, a natural logarithm, or a logarithm of the specified base. The *Base* log is set to a default of *Base 10* but can be defined to any base number.

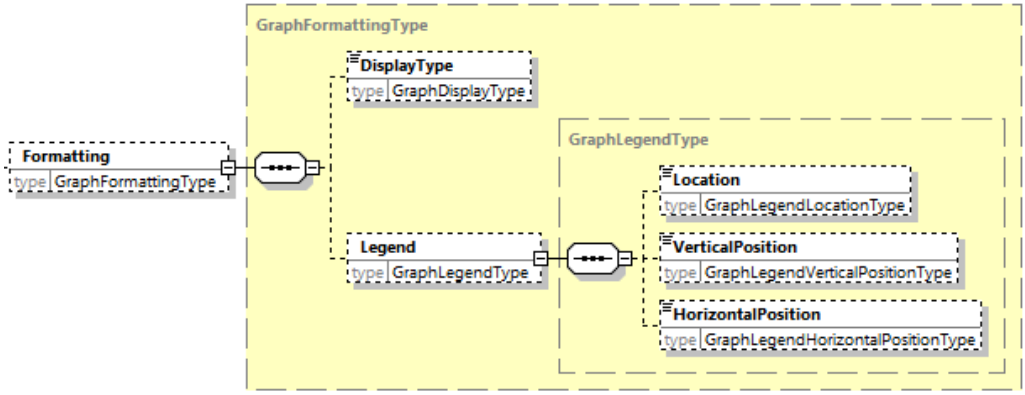
The *Position* enumerated list for the *GraphChartXAxisPositionType* is

- Top
- Bottom

And for the *GraphChartYAxisPositionType*, the enumerated values are

- Left
- Right

5.4.3.6.9.3 Graph Formatting Type

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…-Graph/Formatting**
diagram	
type	**GraphFormattingType, GraphDisplayType, GraphLegendType, GraphLegendLocationType, GraphLegendVerticalPositionType, GraphLegendHorizontalPositionType.**

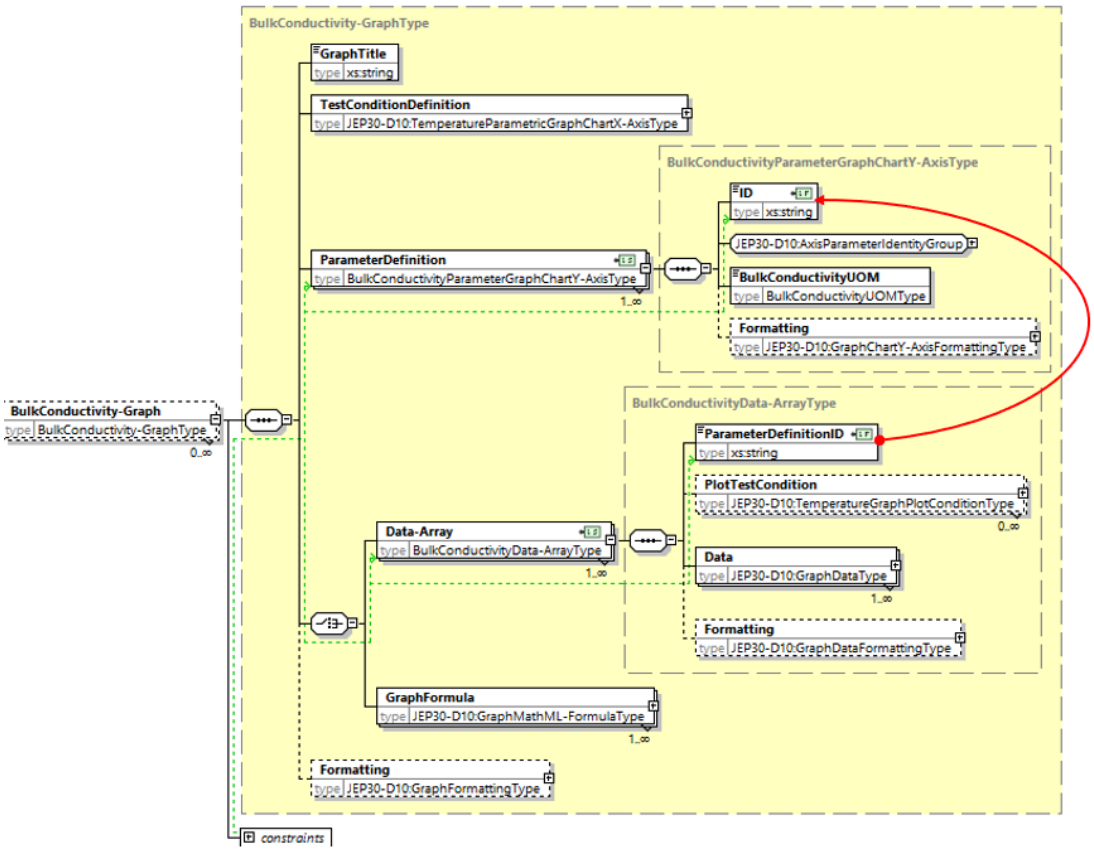
The body of the graph can be formatted under the *GraphFormattingType*. The *DisplayType* enumerated list is

- Line
- Bar

The graph Legend can also be positioned around the graph in any of the following locations:

- Location
  - Inside Graph,
  - Outside Graph,
- Vertical Position
  - Top,
  - Center,
  - Bottom,
- Horizontal Position
  - Left,
  - Center,
  - Right.

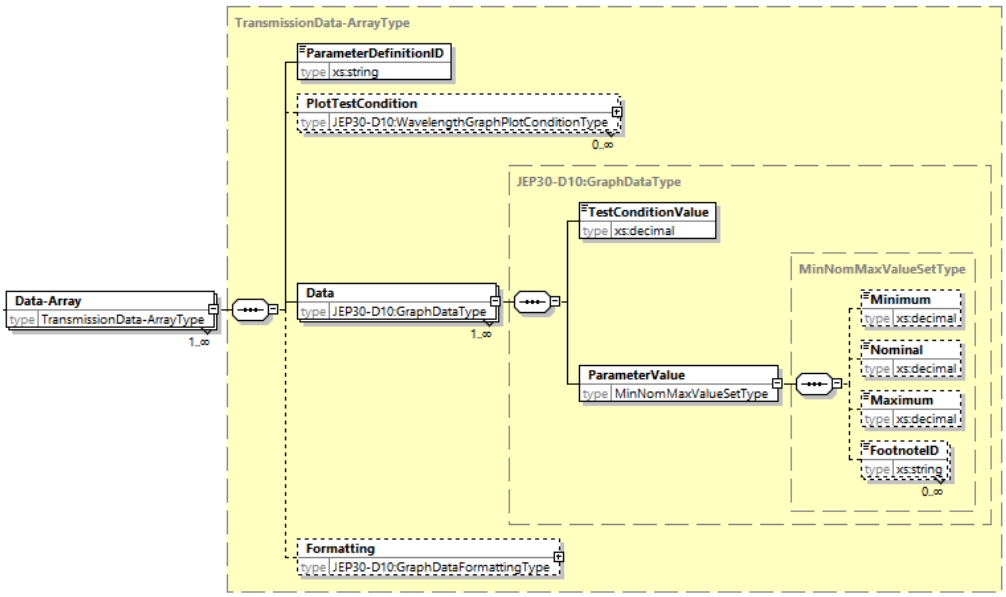
5.4.3.6.9.4 Linking the Data-Array to the Appropriate Parameter Definition

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…-Graph**
diagram	
type	**…GraphType, …ParametricGraphChartXAxisType ,…ParameterGraphChartYAxisType, …UOMType, JEP30-D10:GraphChartYAxisFormattingType, …Data-ArrayType, …GraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphFormattingType,**
group	**JEP30-D10:AxisParameterIdentityGroup**

When populating the *Data-Array* for a given graph, the set of data is referenced to the specific *ParameterDefinition* via the *ParameterDefinitionID*. *The process is replicated for each ParameterDefinition* if there are 2 or more vertical *ParameterDefinition* axis defined. Each set of data captured under the *Data-Array* is now tied to the appropriate *ParameterDefinition* axis.
The data plot on the graph, is a set of points associated with the intersection of these two axis and can be either captured under the *Data-Array* or represented via a *GraphFormula*.

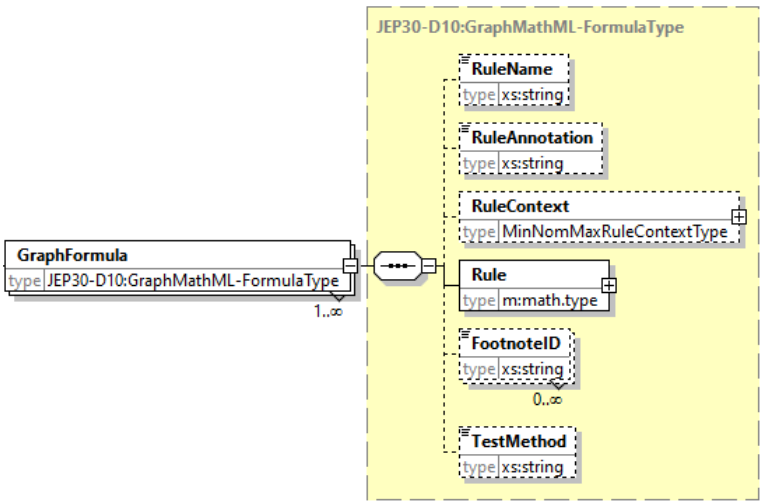
A rule may also be defined as a function on one parameter against a second test condition parameter.

5.4.3.6.9.5 Data-Array

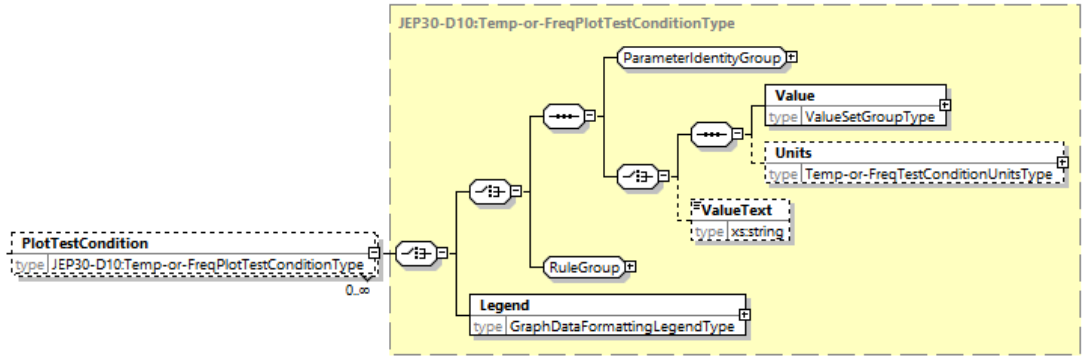
path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…-Graph/Data-Array
diagram	
type	…Data-ArrayType, JEP30-D10:…GraphPlotConditionType, JEP30-D10:GraphDataType, MinNomMaxValueSetType, JEP30-D10:GraphDataFormattingType.

Each *Data* set consisting of the *TestConditionValue*, and the *ParameterValue* represents one point of the data plot on the graph. Various examples of Parameter Graphs are shown below, and representation of those parameter graph examples accompany each graph.

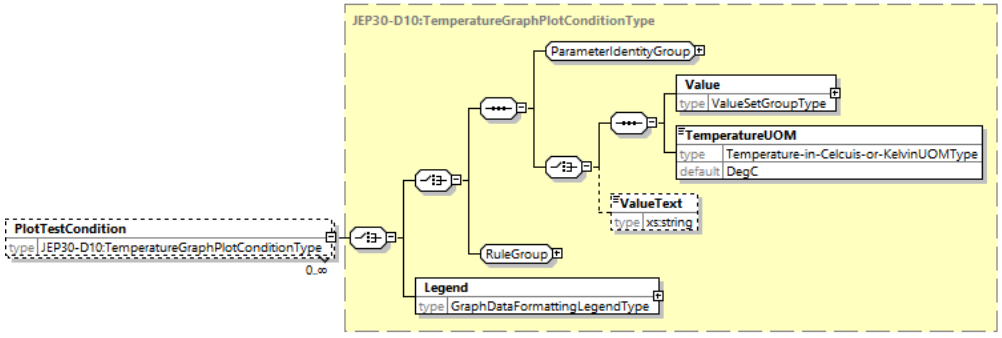
5.4.3.6.9.6 Graph Formula

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…-Graph/GraphFormula
diagram	
type	JEP30-D10:GraphMathML-FormulaType, MinNomMaxRuleContextType, m:math.type.

5.4.3.6.9.7 Temp-or-Freq Plot Test Condition Type

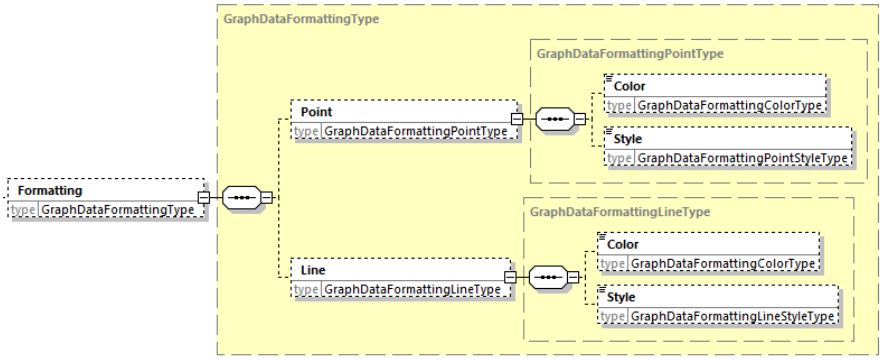
path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…-Graph/Data-Array/PlotTestCondition**
diagram	
type	**Temp-or-FreqPlotTestConditionType, ValueSetGroupType, Temp-or-FreqTestConditionUnitsType, GraphDataFormattingLegendType.**
group	**ParameterIdentityGroup, RuleGroup.**

5.4.3.6.9.8 Temperature Graph Plot Test Condition Type

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…-Graph/Data-Array/PlotTestCondition**
diagram	
type	**JEP30-D10:TemperatureGraphPlotConditionType, ValueSetGroupType, Temperature-in-Celsius-or-KelvinUOMType, GraphDataFormattingLegendType**
group	**ParameterIdentityGroup, RuleGroup.**

Depending upon the type of test condition, its value may be a string or label that describes the *PlotTestCondition*, in which case the value is populated under the *Legend* branch.
If, however, the *PlotTestCondition* can be represented by a *Symbol* or a *Rule*, then this should be written to the top branch under the *PlotTestCondition* as opposed to the *Legend* branch as a string. The *Symbol* should represent a standards-based symbol as defined in the appropriate Terms and Definitions standards. If appropriate, a more detailed *SymbolDescription* can be defined to describe the definition of the *PlotTestCondition*. The *Symbol* can have a pre-defined set of *Units* but can be optionally excluded for those *PlotTestCondition* which are unitless.

5.4.3.6.9.9 Graph Data Formatting Type

path	**PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/…/…-Array/…-Graph/Data-Array/Formatting.**
diagram	
type	**GraphDataFormattingType, GraphDataFormattingPointType. GraphDataFormattingLineType, GraphDataFormattingColorType, GraphDataFormattingPointStyleType, GraphDataFormattingLineStyleType.**

The data points can also be formatted. Individual data points can have the following styles

- Point Styles are
  - Circle,
  - Square,
  - Triangle,
  - None.
- Line Style are
  - Solid,
  - Dash,
  - Dot,
  - Dash-dot,
  - Dash-dash-dot,
  - None.
- Colors are
  - Red,
  - Green,
  - Blue,
  - Orange,
  - Brown,
  - Pink,
  - Purple,
  - Yellow,
  - Black.

The xml fragment shown below represents the data plotted in Figure 44 — Capacitance Value versus Temperature.

5.4.3.6.9.10 Example of a Stress vs Strain Graph

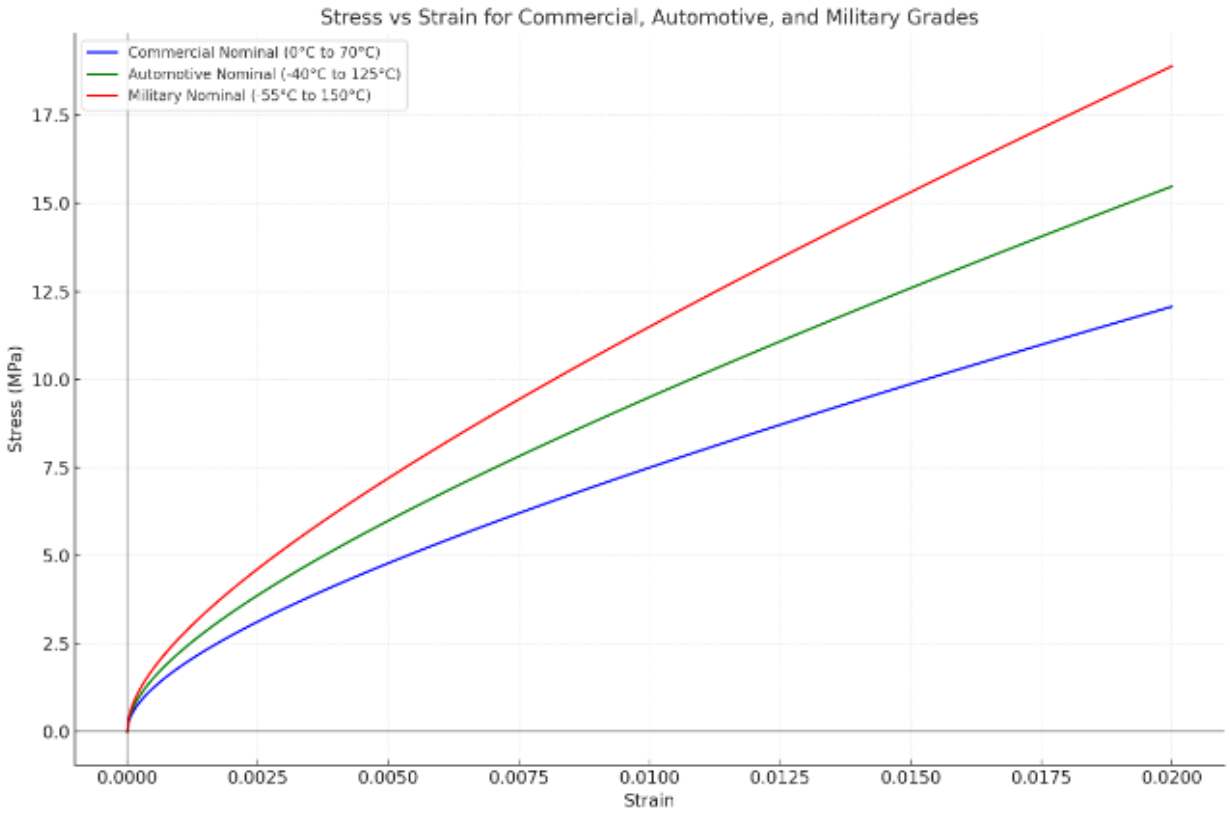


Figure 1 – Stress vs Strain

Below is an example of a Stress versus Strain graph in xml. The XML data would be located under the following path.

PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/Stress-Array

```
<Stress-Array>
        <GraphTitle>Capacitance Value versus Temperature</GraphTitle>
        <TestConditionDefinition>
                <AxisTitle>Strain</AxisTitle>
                <Name>Strain</Name>
                <Symbol>&#949;</Symbol>
                <Definition> Strain is the relative change in length: &#949; =
&#916;L/L&#8320;.</Definition>
                <Units>
                        <StrainUOM>&#949;</StrainUOM>
                </Units>
                <Formatting>
                        <Range>
                                <Minimum>0.0000</Minimum>
                                <Maximum>0.0200</Maximum>
                        </Range >
```

5.4.3.6.9.9 Example of a Stress vs Strain Graph (cont'd)

```
                    <Scale>
                        <Linear>
                            <Step>0.0025</Step>
                        </Linear>
                    </Scale>
                    <Position>Bottom</ Position >
                </Formatting>
            </TestConditionDefinition>
            <ParameterDefinition>
                <ID>Parameter Axis ID 1</ID >
                <AxisTitle>Stress (MPa)</AxisTitle>
                <Symbol>&#963;</Symbol>
                <Definition>Stress is defined as force per unit area: &#963; = F/A.</Definition>
                <StressUOM>
                    <MPa/>
                </StressUOM>
                <Formatting>
                    <Range>
                        <Minimum>0.0</Minimum>
                        <Maximum>17.5</Maximum>
                    </Range >
                    <Scale>
                        <Linear>
                            <Step>2.5</Step>
                        </Linear>
                    </Scale>
                    <Position>Left</ Position >
                </Formatting >
            </ParameterType>
            <Data-Array>
                <ParameterDefinitionID>Parameter Axis ID 1</ParameterDefinitionID>
                <_PlotConditionDefinition>
                    <Legend>
                        <Title>Commercial </Title >
                        <Description>Commercial Nominal (0&deg;C to 70
&deg;C).</Description>
                    </Legend>
                </PlotConditionDefinition>
                <Data>
                    <TestConditionValue>0.0000</TestConditionValue>
                    <ParameterValue>
                        <Nominal>0.0000</Nominal>
                    </ParameterValue>
                </Data>
                <Data>
                    <TestConditionValue>0.0025</TestConditionValue>
                    <ParameterValue>
                        <Nominal>3.125</Nominal>
                    </ParameterValue>
                </Data>
                <Data>
                    <TestConditionValue>0.0050</TestConditionValue>
                    <ParameterValue>
                        <Nominal>4.786</Nominal>
```

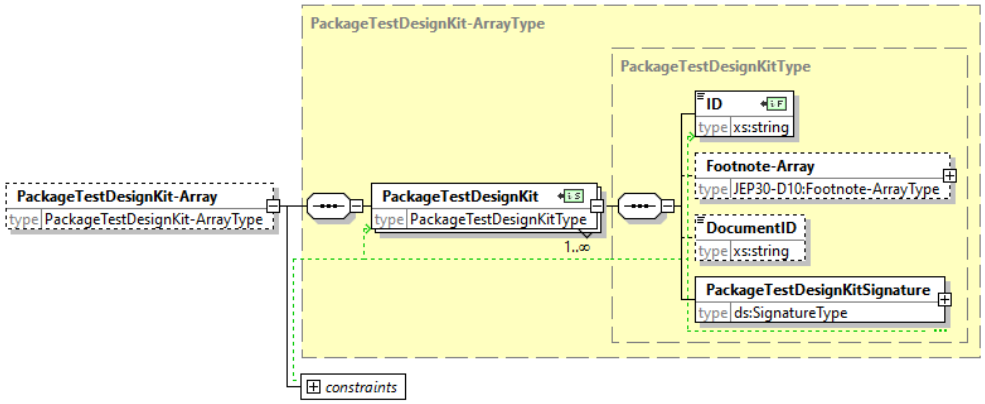
5.4.3.6.9.9 Example of a Stress vs Strain Graph (cont'd)

```
                    </ParameterValue>
                </Data>
                <Data>
                    :
                </Data>
                <Formatting>
                    <Line>
                        <Color>Blue</Color>
                        < Style>Solid</Style>
                    </ Line>
                </Formatting>
            </Data-Array>
            <Data-Array>
                <ParameterDefinitionID>Parameter Axis ID 1</ParameterDefinitionID>
                <_PlotConditionDefinition>
                    <Legend>
                        <Title>Automotive</Title >
                        <Description>Automotive Nominal (-40&#176;C to
125&#176;C).</Description>
                    </Legend>
                </PlotConditionDefinition>
                <Data>
                    <TestConditionValue>0.0000</TestConditionValue>
                    <ParameterValue>
                        <Nominal>0.0000</Nominal>
                    </ParameterValue>
                </Data>
                <Data>
                    <TestConditionValue>0.0025</TestConditionValue>
                    <ParameterValue>
                        <Nominal>3.875</Nominal>
                    </ParameterValue>
                </Data>
                <Data>
                    <TestConditionValue>0.0050</TestConditionValue>
                    <ParameterValue>
                        <Nominal>5.993</Nominal>
                    </ParameterValue>
                </Data>
                <Data>
                    :
                </Data>
                <Formatting>
                    <Line>
                        <Color>Green</Color>
                        < Style>Solid</Style>
                    </ Line>
                </Formatting>
            </Data-Array>
            <Data-Array>
                <ParameterDefinitionID>Parameter Axis ID 1</ParameterDefinitionID>
                <_PlotConditionDefinition>
                    <Legend>
                        <Title>Military</Title >
```

5.4.3.6.9.9 Example of a Stress vs Strain Graph (cont'd)

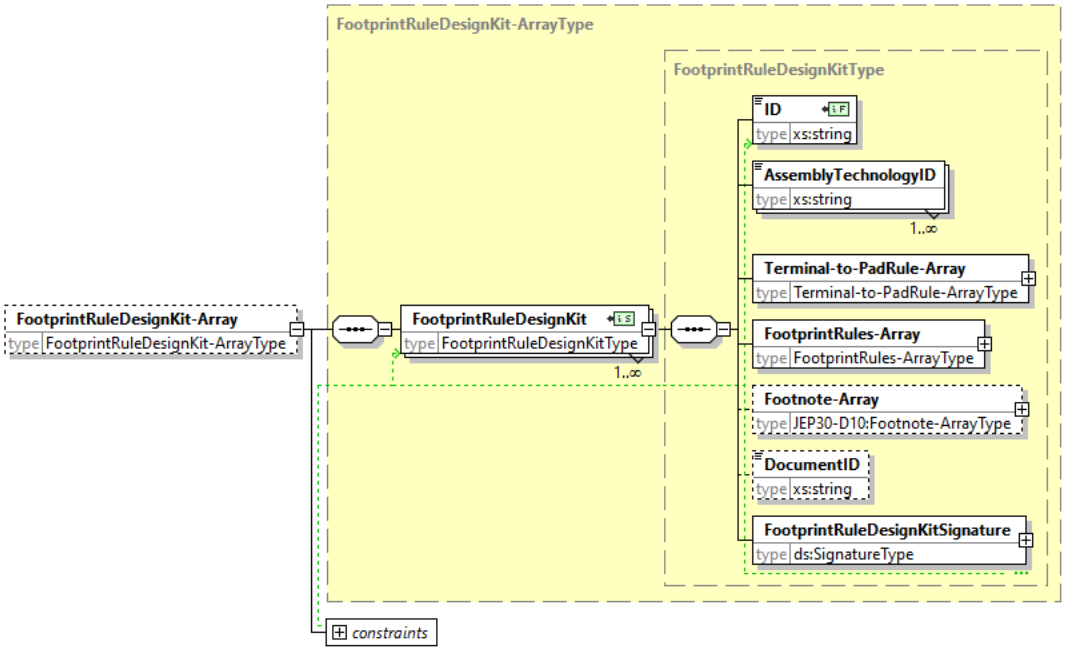
```
                        <Description>Military Nominal (-55&#176;C to
155&#176;C).</Description>
                    </Legend>
                </PlotConditionDefinition>
                <Data>
                    <TestConditionValue>0.0000</TestConditionValue>
                    <ParameterValue>
                        <Nominal>0.0000</Nominal>
                    </ParameterValue>
                </Data>
                <Data>
                    <TestConditionValue>0.0025</TestConditionValue>
                    <ParameterValue>
                        <Nominal>4.625</Nominal>
                    </ParameterValue>
                </Data>
                <Data>
                    <TestConditionValue>0.0050</TestConditionValue>
                    <ParameterValue>
                        <Nominal>7.200</Nominal>
                    </ParameterValue>
                </Data>
                <Data>
                   :
                </Data>
                <Formatting>
                    <Line>
                        <Color>Red</Color>
                        < Style>Solid</Style>
                    </ Line>
                </Formatting>
            </Data-Array>
            <Formatting>
                <DisplayType>Line</DisplayType>
                <Legend>
                    <Location>Line</Location>
                    <VerticalPosition>Top</VerticalPosition>
                    <HorizontalPosition>Left</HorizontalPosition>
                </ Legend>
            </Formatting>
        </ParameterGraph>
```

5.5 Package Test Design Kit - Array

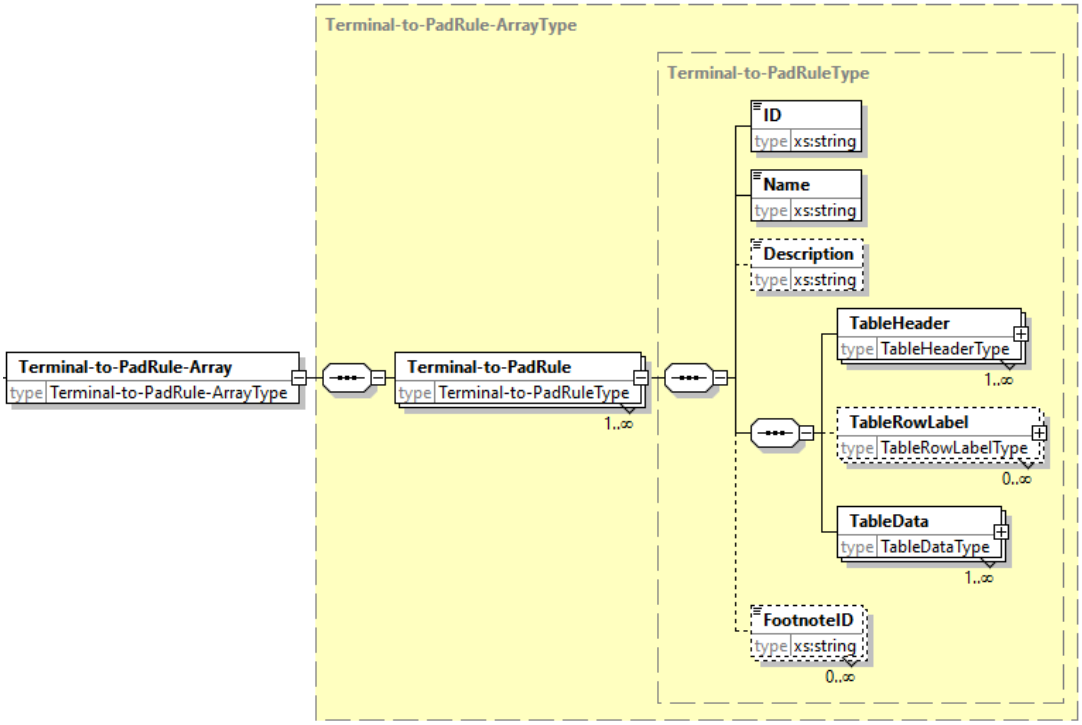
path	**PartModel/DesignKitSection/PackageTestDesignKit-Array**
diagram	
type	**PackageTestDesignKit-ArrayType, PackageTestDesignKitType, JEP30-D10:Footnote-ArrayType, ds:SignatureType**

This section will be developed in a future release of this document. The structure currently acts as a placeholder for the *PackageTestDesignKit*.

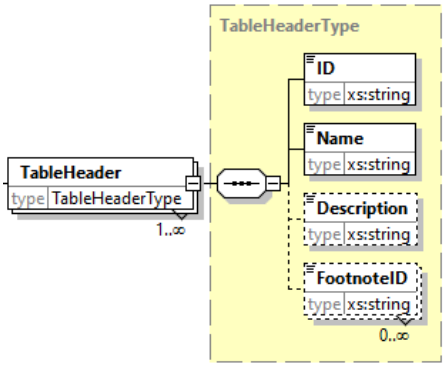
5.6 Footprint Rule Design Kit - Array

path	**PartModel/DesignKitSection/FootprintRuleDesignKit-Array**
diagram	
type	**FootprintRuleDesignKit-ArrayType, FootprintRuleDesignKitType, Terminal-to-PadRule-ArrayType, FootprintRules-ArrayType, JEP30-D10:Footnote-ArrayType, ds:SignatureType**

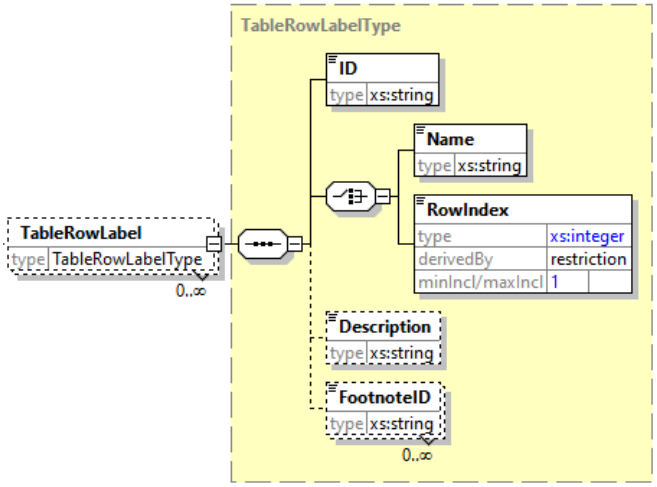
5.6.1 Terminal – to – Pad Rule - Array

path	**PartModel/DesignKitSection/FootprintRuleDesignKit-Array/FootprintRuleDesignKit/Terminal-to-PadRule-Array**
diagram	
type	**Terminal-to-PadRule-ArrayType, Terminal-to-PadRuleType, TableHeaderType, TableRowLabelType, TableDataType**

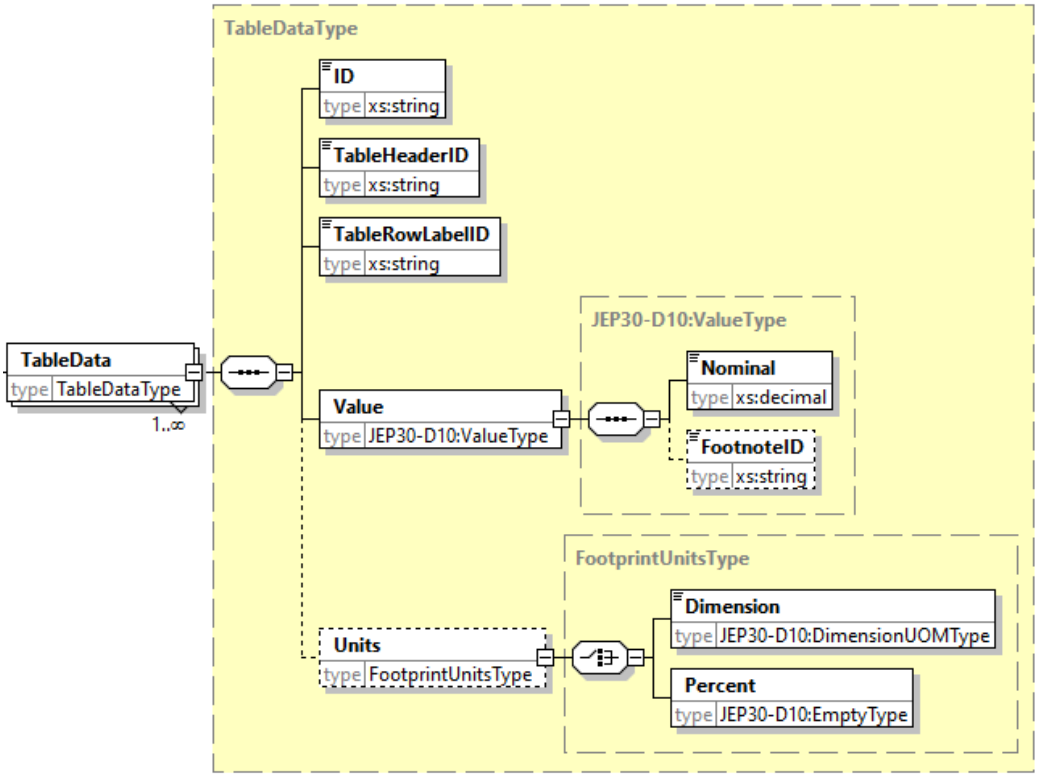
5.6.1.1 Table Header

path	**PartModel/DesignKitSection/FootprintRuleDesignKit-Array/FootprintRuleDesignKit/Terminal-to-PadRule-Array/Terminal-to-PadRule/TableHeader**
diagram	
type	**TableHeaderType, TableRowLabelType, TableDataType**

5.6.1.2 Table Row Label

path	**PartModel/DesignKitSection/FootprintRuleDesignKit-Array/FootprintRuleDesignKit/Terminal-to-PadRule-Array/Terminal-to-PadRule/TableRowLabel**
diagram	
type	**TableRowLabelType**

5.6.1.3 Table Data

path	**PartModel/DesignKitSection/FootprintRuleDesignKit-Array/FootprintRuleDesignKit/Terminal-to-PadRule-Array/Terminal-to-PadRule/TableData**
diagram	
type	**TableDataType, JEP30-D10:ValueType, FootprintUnitsType, JEP30-D10:DimensionUOMType, JEP30-D10:EmptyType.**

The following is a xml sample of the table structure for Ball Grid Array components as defined in IPC-7352 Generic Guideline for Land Pattern Design.

Table 2 — Ball Grid Array Components (unit: mm)

Terminal	Maximum (Most) Density Level A	Median (Nominal) Density Level B	Minimum (Least) Density Level C
Periphery Collapsing Ball	25% reduction below nominal ball diameter	20% reduction below nominal ball diameter	15% reduction below nominal ball diameter
Periphery Non-Collapsing Ball or Column	15% increase above the nominal ball or column diameter	10% increase above the nominal ball or column diameter	5% increase above the nominal ball or column diameter
Round-off factor	Round off to the nearest two place decimal, i.e., 1.00, 1.05, 1.10, 1.15		
Courtyard excess	2.00	1.00	0.50
Ball Grid Array BGA Construction and land pattern development are described in 14.1.1 and 14.1.2			

5.6.1.3 Table Data (cont'd)

```
<Terminal-to-PadRule-Array>
     <Terminal-to-PadRule>
          <ID>Terminal-to-PadRule 1</ID>
          <Name>Table 3-17</Name>
          <Description>Ball Grid Array Components</Description>
          <TableHeader>
               <ID>Table Header 1</ID>
               <Name>Maximum</Name>
               <Description>Maximum (Most) Density Level A</Description>
          </TableHeader>
          <TableHeader>
               <ID>Table Header 2</ID>
               <Name>Median</Name>
               <Description>Median (Nominal) Density Level B</Description>
          </TableHeader>
          <TableHeader>
               <ID>Table Header 3</ID>
               <Name>Minimum</Name>
               <Description>Minimum (Least) Density Level C</Description>
          </TableHeader>
          <TableRowLabel>
               <ID>Table Row Label 1</ID>
               <Name>Periphery Collapsing Ball</Name>
               <FootnoteID>Footnote 2</FootnoteID>
          </TableRowLabel>
          <TableRowLabel>
               <ID>Table Row Label 2</ID>
               <Name>Periphery Non-Collapsing Ball or Column</Name>
               <FootnoteID>Footnote 3</FootnoteID>
          </TableRowLabel>
          <TableRowLabel>
               <ID>Table Row Label 3</ID>
               <Name>Round-off factor</Name>
               <FootnoteID>Footnote 4</FootnoteID>
          </TableRowLabel>
          <TableRowLabel>
               <ID>Table Row Label 4</ID>
               <Name>Courtyard excess</Name>
          </TableRowLabel>
          <TableData>
               <ID>Table Data 1</ID>
               <TableHeaderID>Table Header 1</TableHeaderID>
               <TableRowLabelID>Table Row Label 1</TableRowLabelID>
               <Value>
                    <Nominal>-25</Nominal>
               </Value>
               <Units>
                    <Percent/>
               </Units>
          </TableData>
          <TableData>
               <ID>Table Data 2</ID>
               <TableHeaderID>Table Header 1</TableHeaderID>
```

5.6.1.3 Table Data (cont'd)

```
            <TableRowLabelID>Table Row Label 2</TableRowLabelID>
            <Value>
                  <Nominal>15</Nominal>
            </Value>
            <Units>
                  <Percent/>
            </Units>
      </TableData>
      <TableData>
            <ID>Table Data 3</ID>
            <TableHeaderID>Table Header 1</TableHeaderID>
            <TableRowLabelID>Table Row Label 3</TableRowLabelID>
            <Value>
                  <Nominal>0.01</Nominal>
            </Value>
      </TableData>
      <TableData>
            <ID>Table Data 4</ID>
            <TableHeaderID>Table Header 1</TableHeaderID>
            <TableRowLabelID>Table Row Label 4</TableRowLabelID>
            <Value>
                  <Nominal>2.00</Nominal>
            </Value>
            <Units>
                  <Dimension>mm</Dimension>
            </Units>
      </TableData>
      <TableData>
            <ID>Table Data 5</ID>
            <TableHeaderID>Table Header 2</TableHeaderID>
            <TableRowLabelID>Table Row Label 1</TableRowLabelID>
            <Value>
                  <Nominal>-20</Nominal>
            </Value>
            <Units>
                  <Percent/>
            </Units>
      </TableData>
      <TableData>
            <ID>Table Data 6</ID>
            <TableHeaderID>Table Header 2</TableHeaderID>
            <TableRowLabelID>Table Row Label 2</TableRowLabelID>
            <Value>
                  <Nominal>10</Nominal>
            </Value>
            <Units>
                  <Percent/>
            </Units>
      </TableData>
      <TableData>
            <ID>Table Data 7</ID>
            <TableHeaderID>Table Header 2</TableHeaderID>
            <TableRowLabelID>Table Row Label 3</TableRowLabelID>
```

5.6.1.3 Table Data (cont'd)

```
            <Value>
                  <Nominal>0.01</Nominal>
            </Value>
      </TableData>
      <TableData>
            <ID>Table Data 8</ID>
            <TableHeaderID>Table Header 2</TableHeaderID>
            <TableRowLabelID>Table Row Label 4</TableRowLabelID>
            <Value>
                  <Nominal>1.0</Nominal>
            </Value>
            <Units>
                  <Dimension>mm</Dimension>
            </Units>
      </TableData>
      <TableData>
            <ID>Table Data 9</ID>
            <TableHeaderID>Table Header 3</TableHeaderID>
            <TableRowLabelID>Table Row Label 1</TableRowLabelID>
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                  <Nominal>-15</Nominal>
            </Value>
            <Units>
                  <Percent/>
            </Units>
      </TableData>
      <TableData>
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            <TableHeaderID>Table Header 3</TableHeaderID>
            <TableRowLabelID>Table Row Label 2</TableRowLabelID>
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                  <Nominal>5</Nominal>
            </Value>
            <Units>
                  <Percent/>
            </Units>
      </TableData>
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            <TableRowLabelID>Table Row Label 3</TableRowLabelID>
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            </Value>
      </TableData>
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            <ID>Table Data 12</ID>
            <TableHeaderID>Table Header 3</TableHeaderID>
            <TableRowLabelID>Table Row Label 4</TableRowLabelID>
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            </Value>
            <Units>
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5.6.1.3 Table Data (cont'd)

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                </Units>
            </TableData>
            <FootnoteID>Footnote 4</FootnoteID>
      </Terminal-to-PadRule>
</Terminal-to-PadRule-Array>

:
<Footnote-Array>
      <Footnote>
            <ID>Footnote 1</ID>
            <Footnote>Ball Grid Array BGA Construction and land pattern development
are described in 14.1.1 &amp;amp; 14.1.2</Footnote>
      </Footnote>
      <Footnote>
            <ID>Footnote 2</ID>
            <Footnote>reduction below nominal ball diameter</Footnote>
      </Footnote>
      <Footnote>
            <ID>Footnote 3</ID>
            <Footnote>increase above the nominal ball or column diameter</Footnote>
      </Footnote>
      <Footnote>
            <ID>Footnote 4</ID>
            <Footnote>Round off to the nearest two place decimal, i.e., 1.00, 1.05,
1.10, 1.15</Footnote>
      </Footnote>
</Footnote-Array>
```
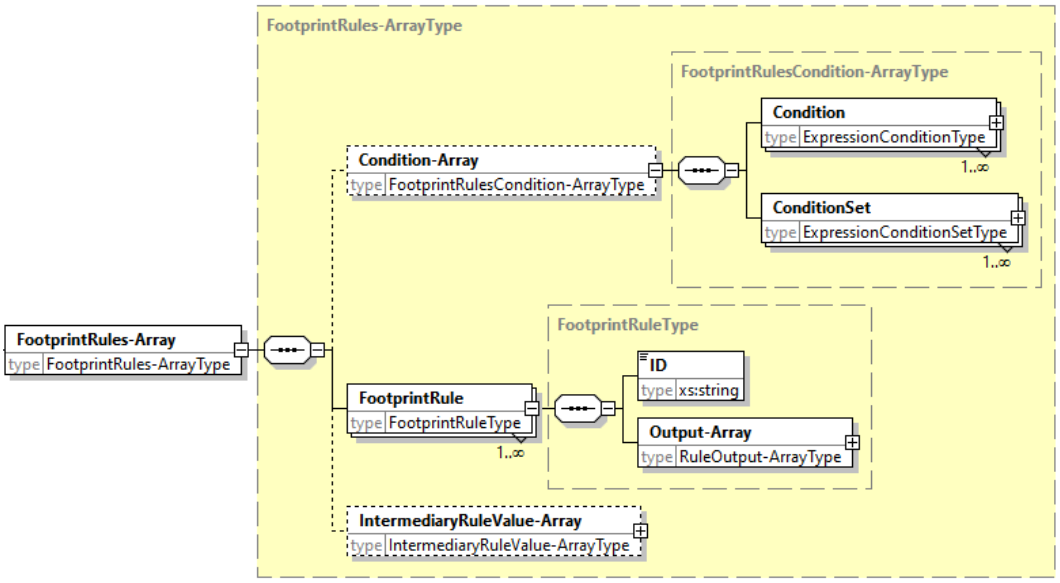
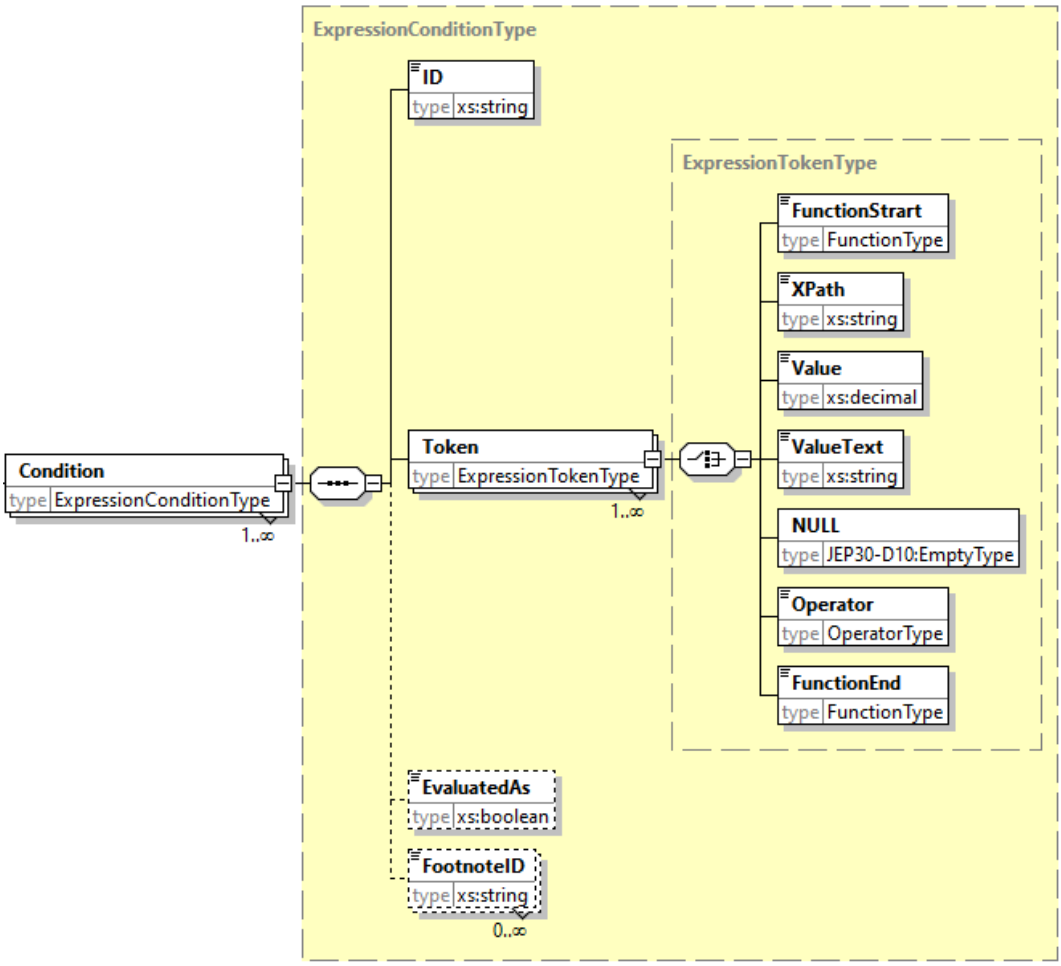
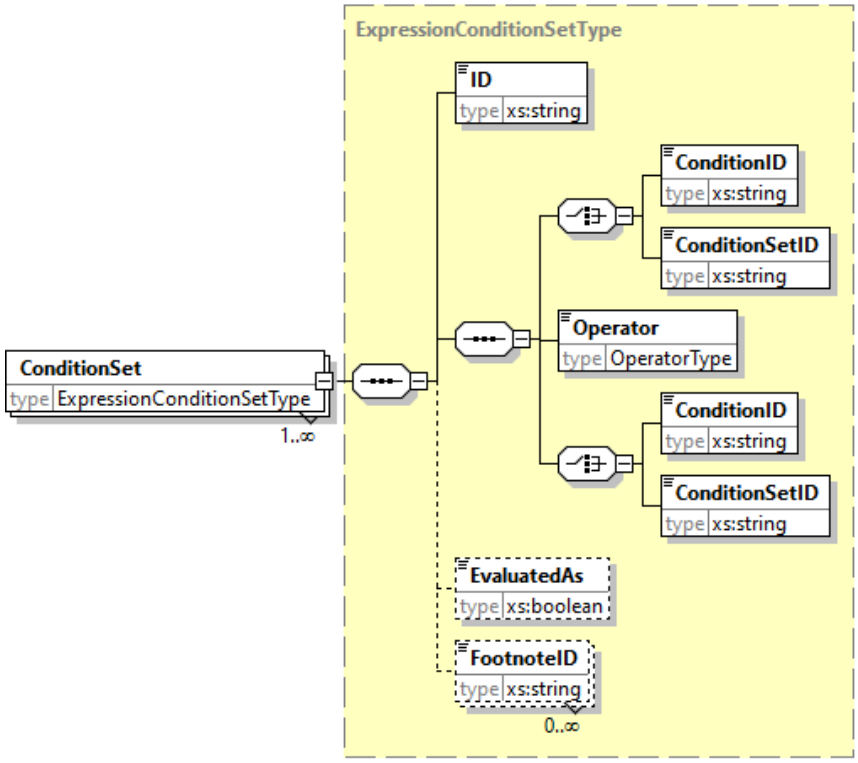

5.6.2 Footprint Rules - Array

path	**PartModel/DesignKitSection/FootprintRuleDesignKit-Array/FootprintRuleDesignKit/FootprintRules-Array**
diagram	
type	**FootprintRules-ArrayType, FootprintRulesCondition-ArrayType, ExpressionConditionType, ExpressionConditionSetType, FootprintRuleType, RuleOutput-ArrayType, IntermediaryRuleValue-ArrayType**

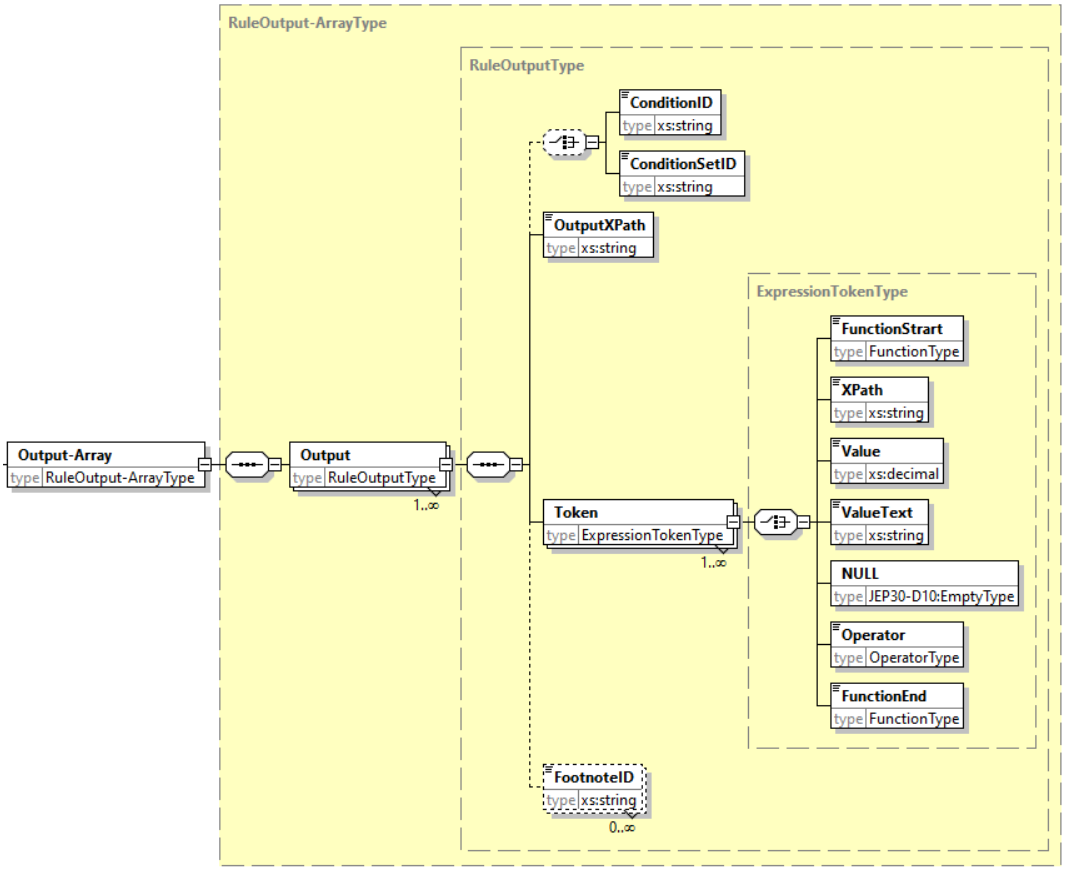
5.6.2.1 Condition

path	**PartModel/DesignKitSection/FootprintRuleDesignKit-Array/FootprintRuleDesignKit/FootprintRules-Array/Condition-Array/Condition**
diagram	
type	**ExpressionConditionType, ExpressionTokenType, FunctionType, JEP30-D10:EmptyType.**

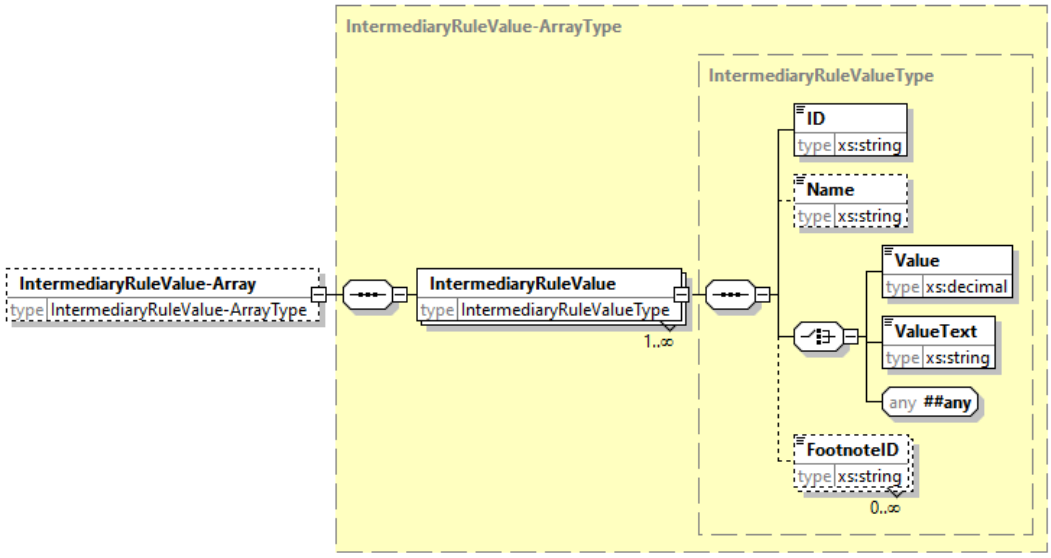
5.6.2.2 Condition Set

path	**PartModel/DesignKitSection/FootprintRuleDesignKit-Array/FootprintRuleDesignKit/FootprintRules-Array/Condition-Array/ConditionSet**
diagram	
type	**ExpressionConditionSetType, OperatorType,**

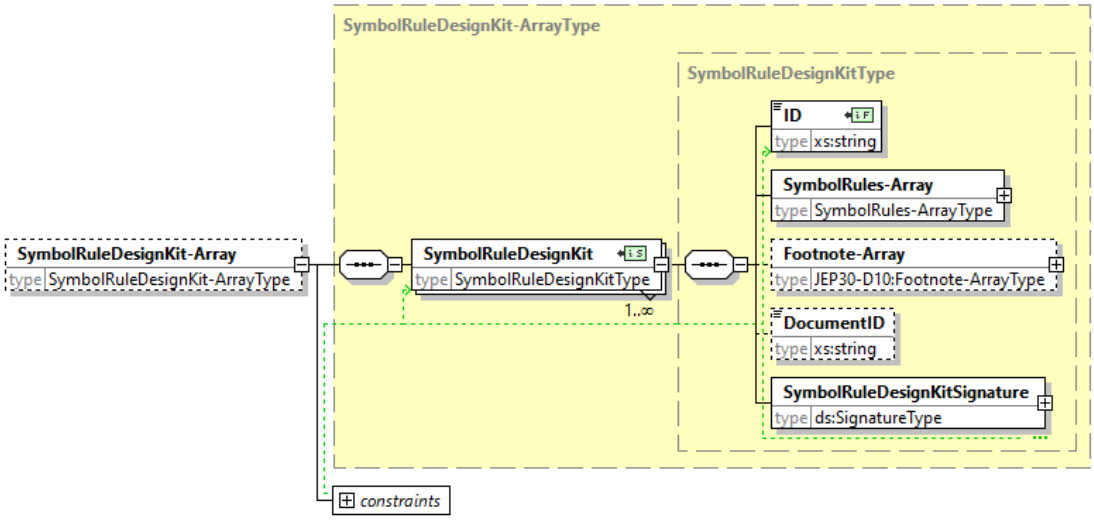
5.6.2.3 Output - Array

path	**PartModel/DesignKitSection/FootprintRuleDesignKit-Array/FootprintRuleDesignKit/FootprintRules-Array/FootprintRule/Output-Array**
diagram	
type	**RuleOutput-ArrayType, RuleOutputType, ExpressionTokenType, FunctionType, JEP30-D10:EmptyType, OperatorType.**

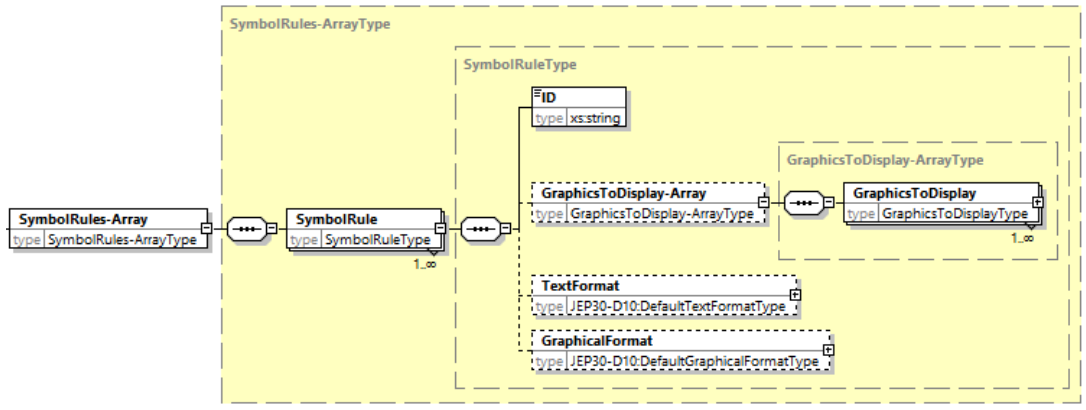
5.6.2.4 Intermediary Rule Value - Array

path	**PartModel/DesignKitSection/FootprintRuleDesignKit-Array/FootprintRuleDesignKit/FootprintRules-Array/IntermediaryRuleValue-Array**
diagram	
type	**IntermediaryRuleValue-ArrayType, IntermediaryRuleValueType.**

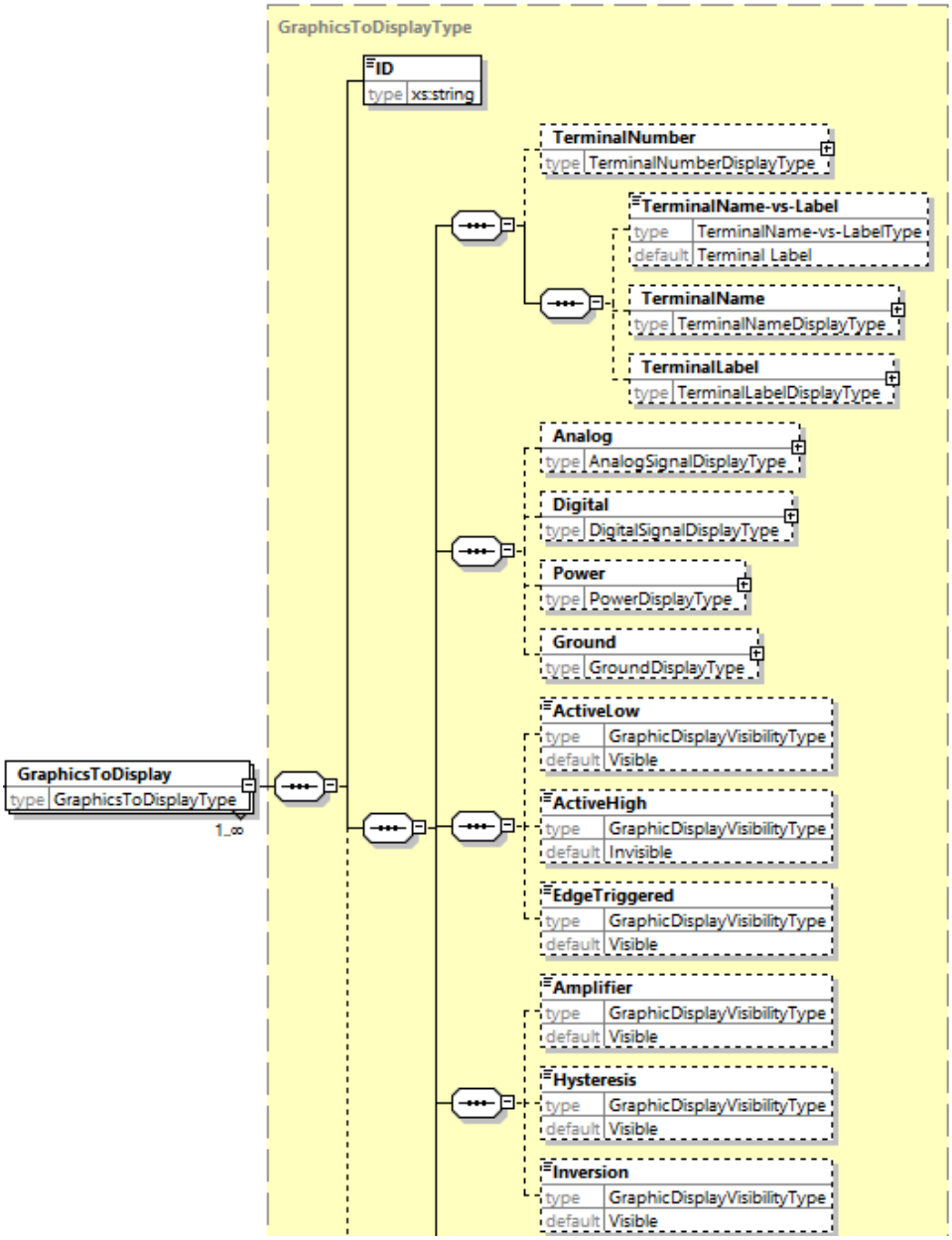
5.7 Symbol Rule Design Kit - Array

path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array**
diagram	
type	**SymbolRuleDesignKit-ArrayType, SymbolRuleDesignKitType, JEP30-D10:Footnote-ArrayType, ds:SignatureType**

5.7.1 Symbol Rule - Array

path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array**
diagram	
type	**SymbolRules-ArrayType, SymbolRuleType, GraphicsToDisplay-ArrayType, GraphicsToDisplayType, JEP30-D10:DefaultTextFormatType, JEP30-D10:DefaultGraphicalFormatType.**

5.7.1.1 Graphics To Display - Array

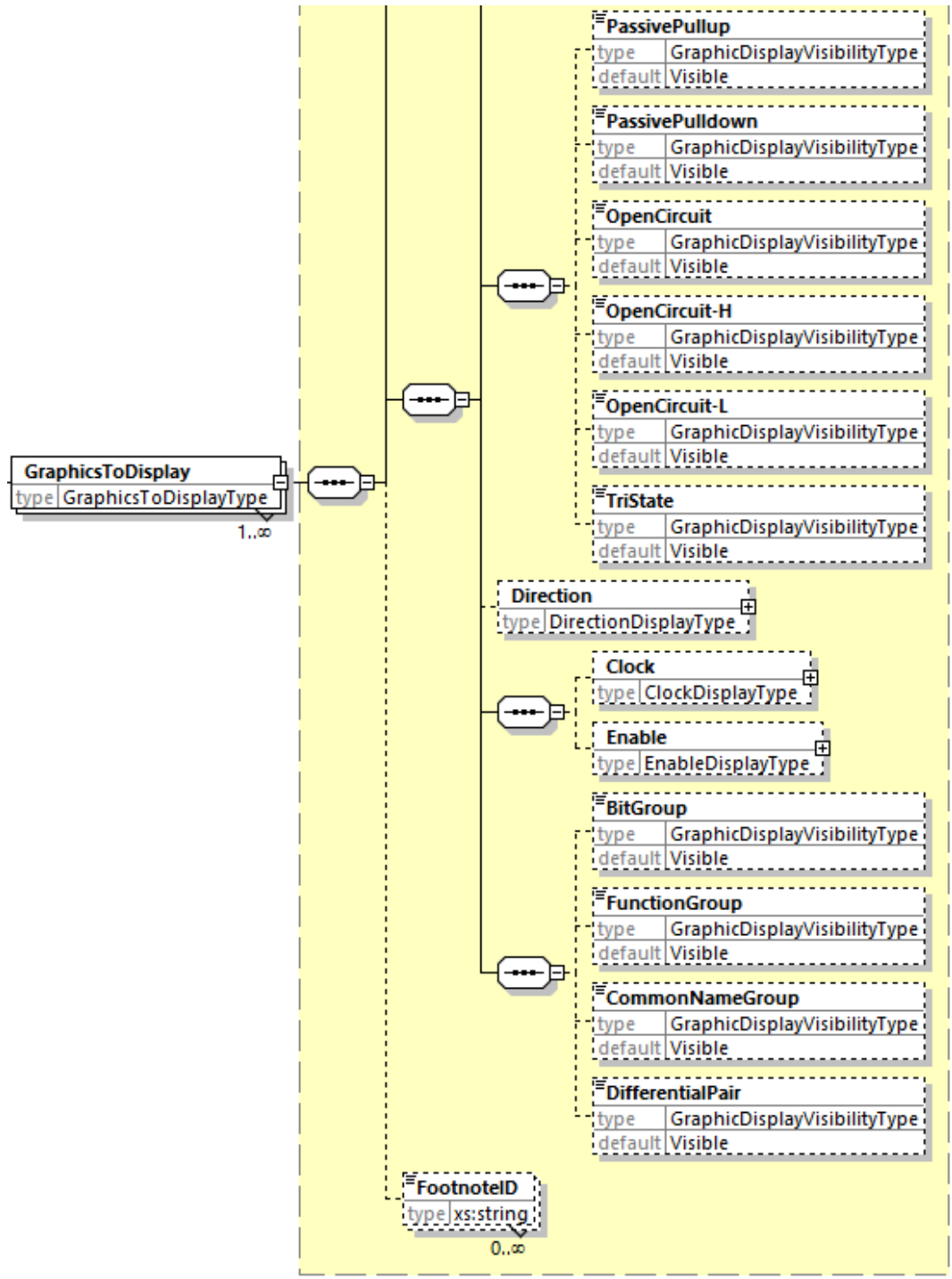
path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array**
diagram part 1 of 2	

The enumerated values of the *TerminalName-vs-LabelType* are *Terminal Name* and *Terminal Label*. This is set to a default of *Terminal Label* indicating that when a terminal name and a terminal label exists for a given terminal the display of the *Terminal Label* takes precedence over the *Terminal Name*. This typically applies to standard electronics discrete devices such as Diodes, Transistors, etc. where the terminal name of Base, Collector and Emitter are replaced by their terminal labels of B, C and E respectively.

The enumerated values of the *GraphicDisplayVisibilityType* are *Visible* and *Invisible.*

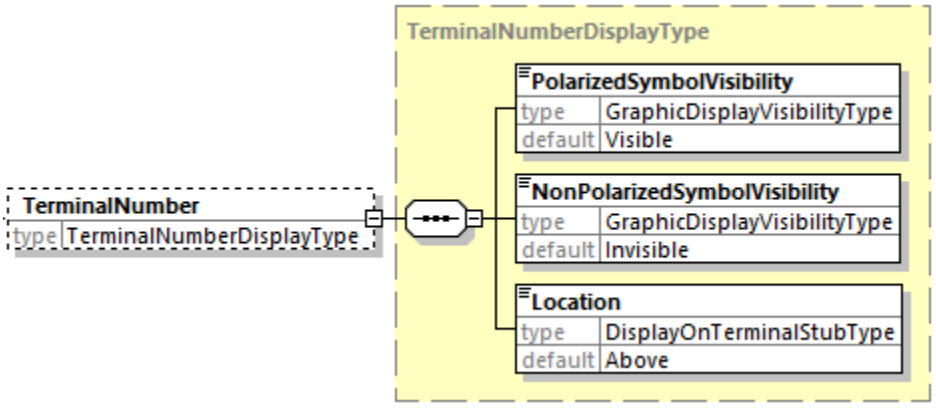
5.6.1.3 Graphic To Display - Array (cont'd)

diagram
part 2 of 2



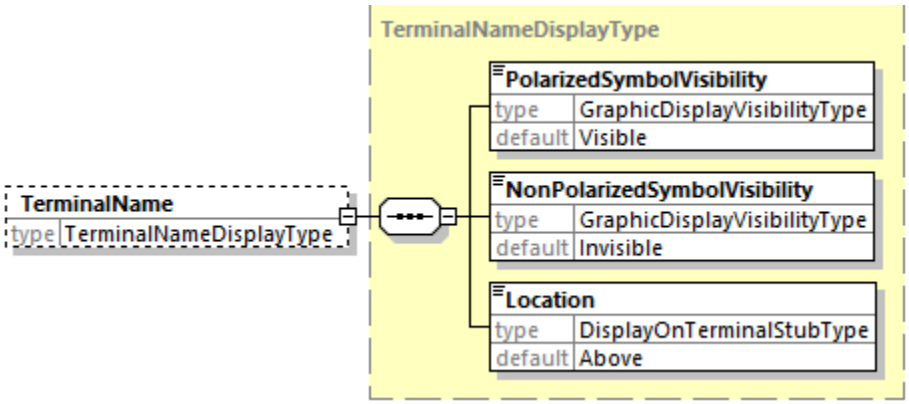
GraphicsToDisplayType, TerminalNumberDisplayType, TerminalName-vs-LabelType, TerminalNameDisplayType, TerminalNameDisplayType, TerminalLabelDisplayType, AnalogSignalDisplayType, DigitalSignalDisplayType, PowerDisplayType, GroundDisplayType, GraphicDisplayVisibilityType, DirectionDisplayType, ClockDisplayType, EnableDisplayType,

5.7.1.1.1 Terminal Number

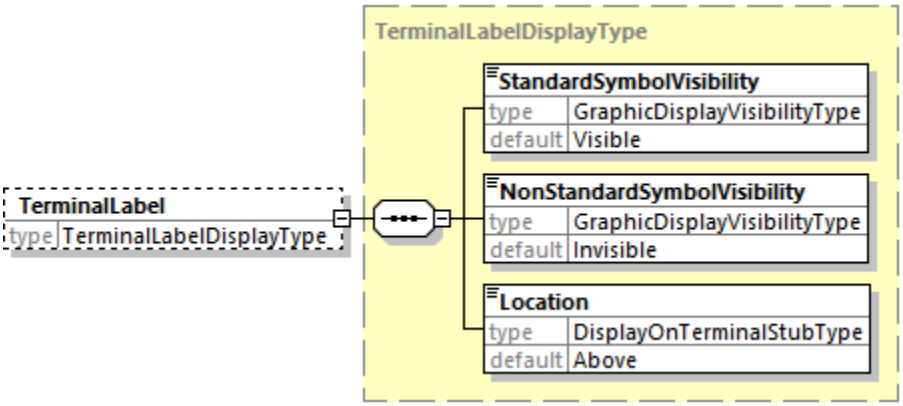
path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/TerminalNumber**
diagram	
type	**TerminalNumberDisplayType, GraphicDisplayVisibilityType, DisplayOnTerminalStubType.**

The enumerated values of the *DisplayOnTerminalStubType* are *Above* and *Below.*

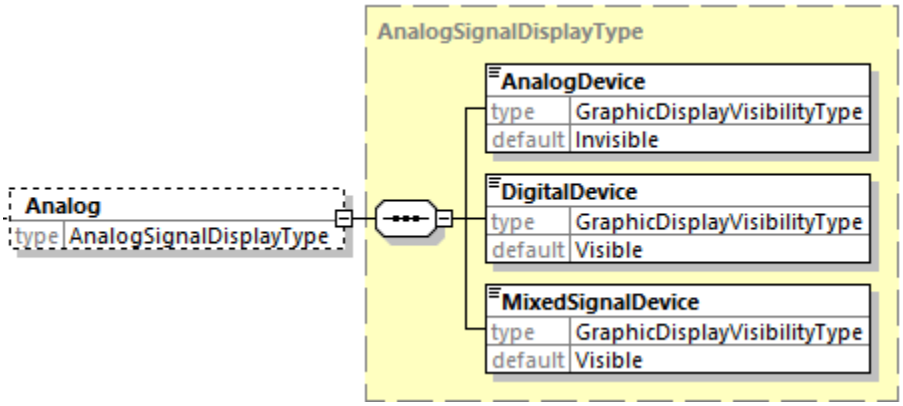
5.7.1.1.2 Terminal Name

path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/TerminalName**
diagram	
type	**TerminalNameDisplayType, GraphicDisplayVisibilityType, DisplayOnTerminalStubType.**

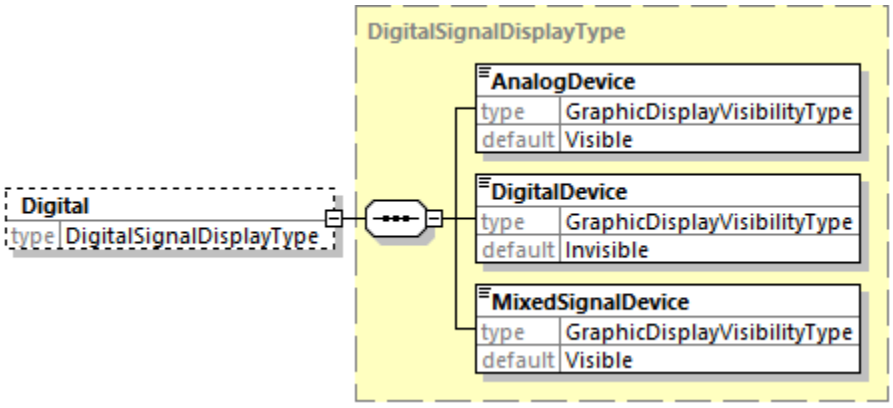
5.7.1.1.3 Terminal Label

path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/TerminalLabel**
diagram	
type	**TerminalLabelDisplayType, GraphicDisplayVisibilityType, DisplayOnTerminalStubType.**

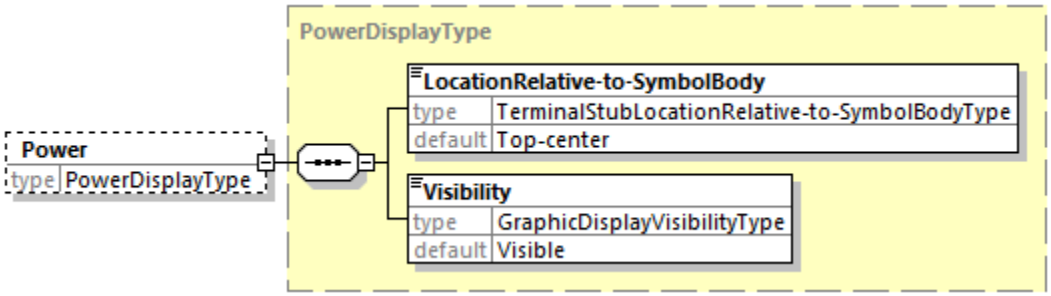
5.7.1.1.4 Analog

path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/Analog**
diagram	
type	**AnalogSignalDisplayType, GraphicDisplayVisibilityType.**

5.7.1.1.5 Digital

path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/Digital**
diagram	
type	**DigitalSignalDisplayType, GraphicDisplayVisibilityType.**

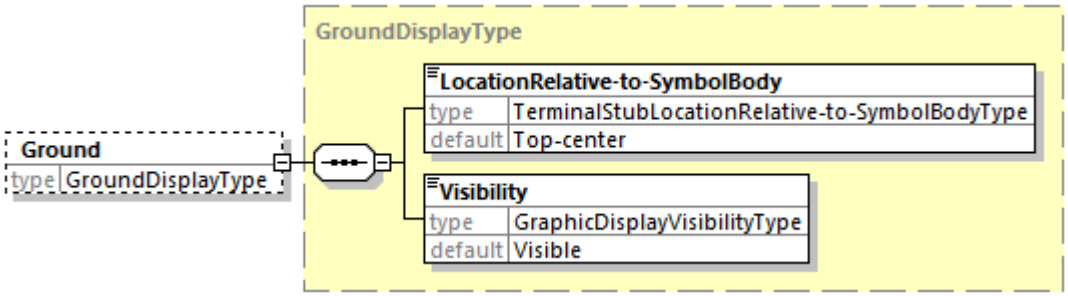
5.7.1.1.6 Power

path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/Power**
diagram	
type	**PowerDisplayType, TerminalStubLocationRelative-to-SymbolBodyType, GraphicDisplayVisibilityType.**

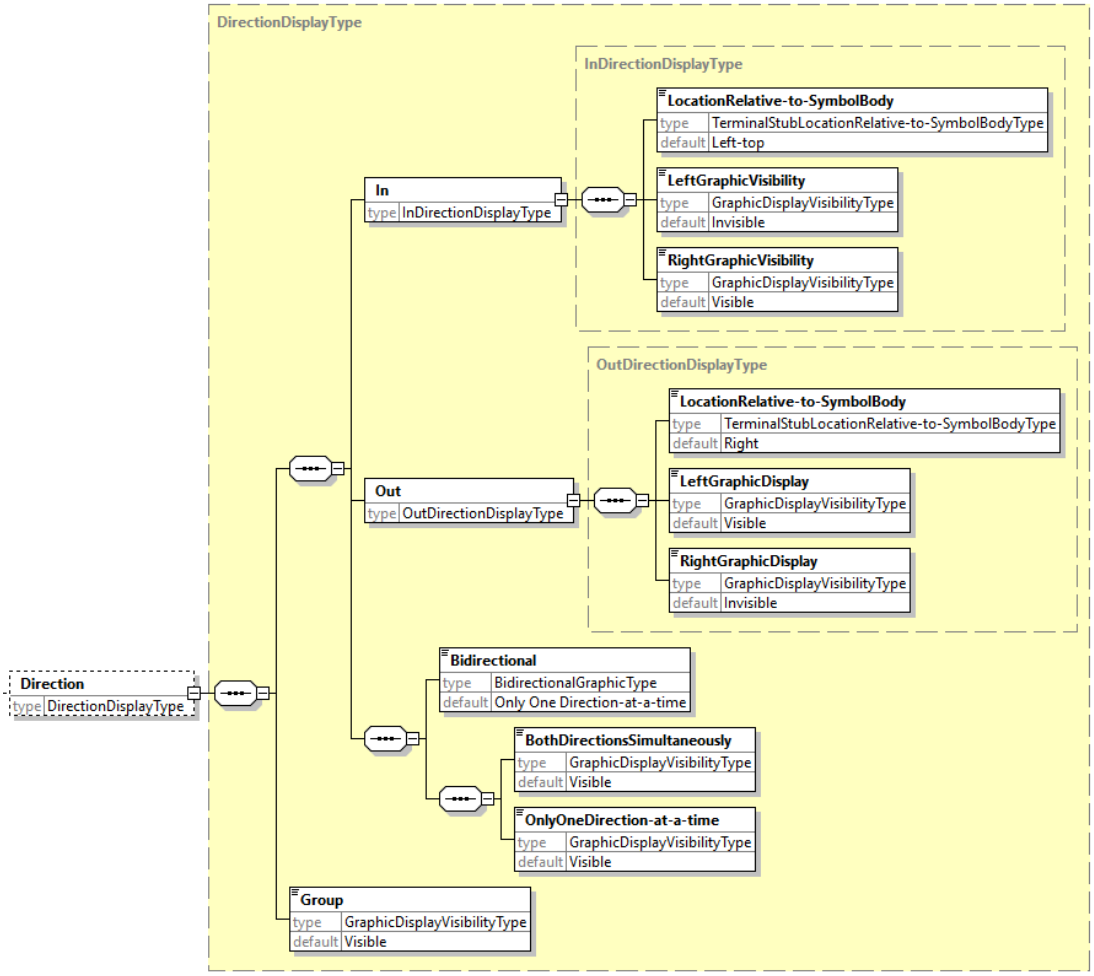
The enumerated values of the *TerminalStubLocationRelative-to-SymbolBodyType* are

Left-top,	*Right-top,*	*Top-left,*	*Bottom-left,*
Left-center,	*Right-center,*	*Top-center,*	*Bottom-center,*
Left-bottom,	*Right-bottom,*	*Top-right,*	*Bottom-right,*
Left,	*Right,*	*Top,*	*Bottom.*

5.7.1.1.7 Ground

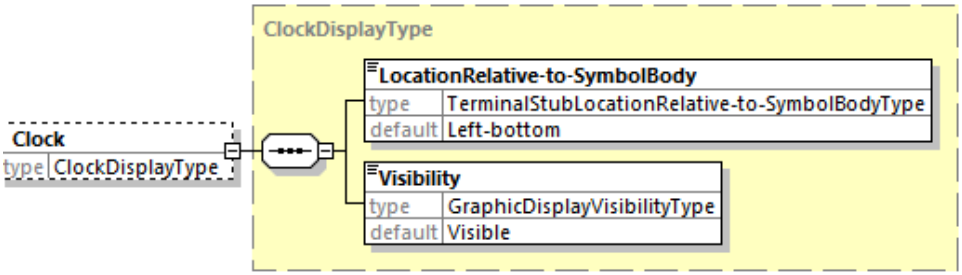
path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/Ground**
diagram	
type	**GroundDisplayType, TerminalStubLocationRelative-to-SymbolBodyType, GraphicDisplayVisibilityType.**

5.7.1.1.8 Direction

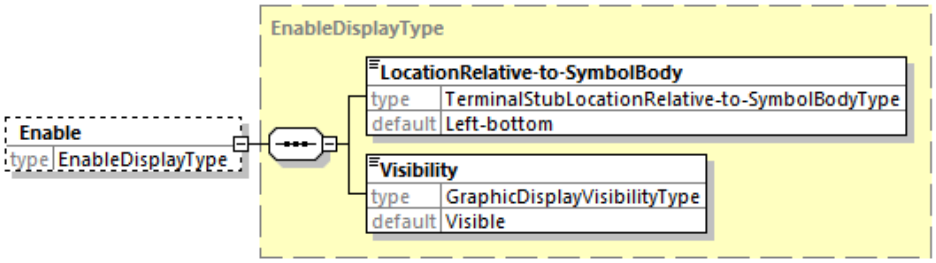
path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/Direction**
diagram	
type	**DirectionDisplayType, InDirectionDisplayType, TerminalStubLocationRelative-to-SymbolBodyType, GraphicDisplayVisibilityType, OutDirectionDisplayType, BidirectionalGraphicType.**

The enumerated values of the *BidirectionalGraphicType* are *Both Directions Simultaneously* and *Only One Direction-at-a-time.*

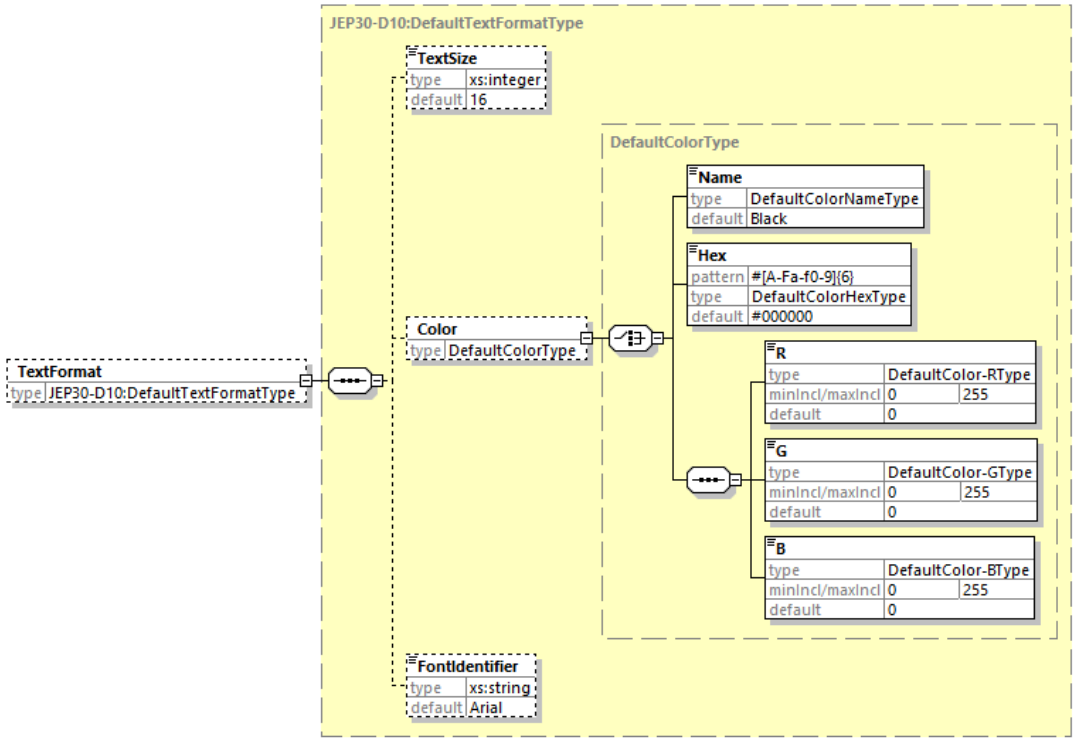
5.7.1.1.9 Clock

path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/Direction**
diagram	
type	**ClockDisplayType, TerminalStubLocationRelative-to-SymbolBodyType, GraphicDisplayVisibilityType.**

5.7.1.1.10 Enable

path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/Direction**
diagram	
type	**EnableDisplayType, TerminalStubLocationRelative-to-SymbolBodyType, GraphicDisplayVisibilityType.**

5.7.1.2 Text Format

path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/TextFormat**
diagram	
type	**JEP30-D10:DefaultTextFormatType, DefaultColorType, DefaultColorNameType,**

The *DefaultTextFormat* does not have a specific font style since the default font style is normal (i.e., Not Bold, nor Italics nor Underline).

ColorNameType as defined in the *Color/Name* element list the names of the Scalable Vector Graphics (SVG) Colors as defined by the Scalable Vector Graphics (SVG) Specification.

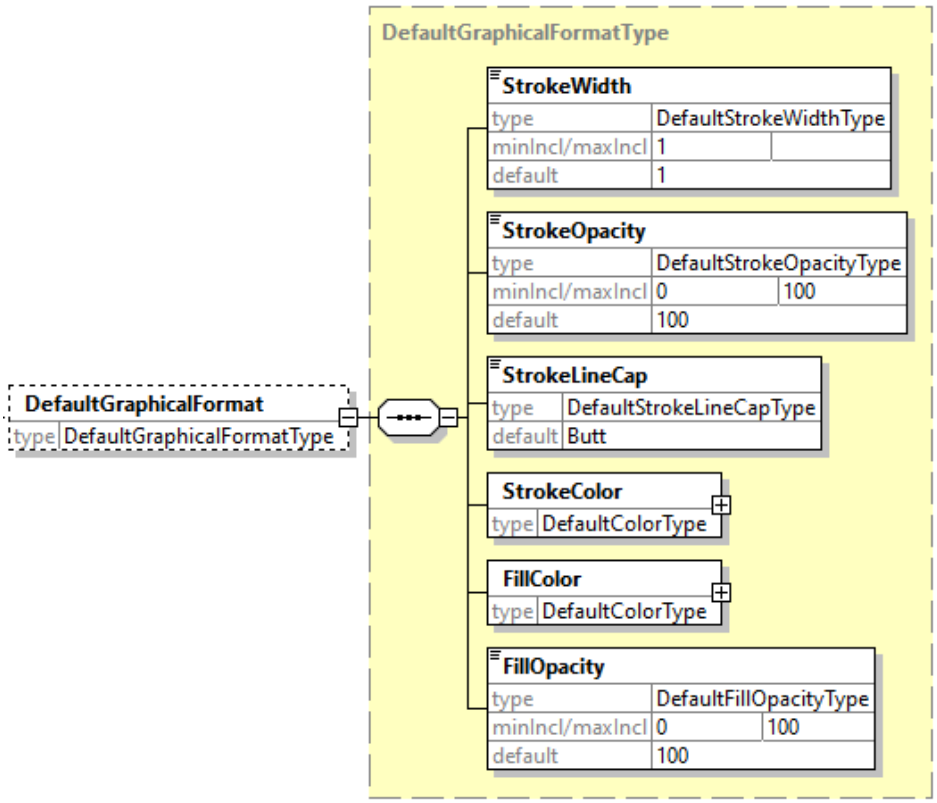
ColorHexType as defined in the *Color/Hex* element uses a regular expression pattern to recognize the six-digit hexadecimal representation of the Scalable Vector Graphics (SVG) Colors.

Color-RType, *Color-GType*, *Color-BType* allows the construction of all the colors from the combination of the red, green, and blue colors in the RGB Color Space. The red, green, and blue use 8 bits each, which have integer values from 0 to 255.

The default values as follows,

a. TextSize is defaulted to value “16”
b. Color is default to black or its equivalent in Hex or RGB color settings.
c. FontIdentifier is defaulted to value “Arial”

5.7.1.3 Graphical Format

path	**PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicalFormat**
diagram	
type	**JEP30-D10:DefaultGraphicalFormatType, DefaultStrokeWidthType, DefaultStrokeOpacityType, DefaultStrokeLineCapType, DefaultColorType, DefaultFillOpacityType.**

The *DefaultGraphicalFormat* will define the default values as follows,

a. *StrokeWidth* is defaulted to the value 1
b. *StrokeLineCap* is defaulted to value “Butt”
c. *StrokeColor/Name* is defaulted to value “Black”
d. *StrokeColor/Hex* is defaulted to value “#000000”
e. *StrokeColor/R*, *G* and *B* are defaulted to the value 0
f. *StrokeOpacity* and *FillOpacity* are defaulted to 100

Annex A (informative) Differences between JEP30-K100 and its predecessors

This table briefly describes most of the changes made to entries that appear in this standard, JEP30-K100, compared to its predecessor; Punctuation changes may or may not be included.

Initial Issue:	Date: February 2025	Item Number: 11.2-1073

Change Record History

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Standard Improvement Form **JEDEC Standard No. JEP30-K100**

The purpose of this form is to provide the Technical Committees of JEDEC with input from the industry regarding usage of the subject standard. Individuals or companies are invited to submit comments to JEDEC. All comments will be collected and dispersed to the appropriate committee(s).

If you can provide input, please complete this form and return to:

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1. I recommend changes to the following:

☐ Requirement, clause number _____

☐ Test method number _____ Clause number _____

The referenced clause number has proven to be:

☐ Unclear ☐ Too Rigid ☐ In Error

☐ Other _____

2. Recommendations for correction:

3. Other suggestions for document improvement:

Submitted by

Name: _____ Phone: _____

Company: _____ E-mail: _____

Address: _____

City/State/Zip: _____ Date _____


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