

# **JEDEC PUBLICATION**

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

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### **JEP30-K100A**

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September 2025

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**JEDEC SOLID STATE TECHNOLOGY ASSOCIATION**



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

### Contents

		Page
1	Scope .....	1
1.1	Purpose .....	1
2	Applicable Documents .....	2
2.1	JEDEC (www.jedec.org) .....	2
2.1.1	JEDEC PartModel Schema and Sub-Schemas .....	2
2.2	IPC (www.ipc.org) .....	2
3	Requirements .....	3
3.1	Terms and Definitions .....	3
3.2	XML Schema Key Terms and Definitions .....	3
4	PartModel Schema Definition .....	4
4.1	PartModel – Design Kit Section .....	4
4.2	Manufacturer Part Number-Array .....	6
4.3	Standards Identifier - Array .....	7
4.4	Process Technology Identifier - Array .....	8
4.5	Linking the Manufacturing Part Number to a specific Design Kit Data set .....	9
4.6	Linking the Manufacturing Part Number to a specific Design Kit Data set (cont'd) .....	10
4.6.1	Linking the Manufacturing Part Number to Package Assembly Design Kit .....	11
4.6.2	Linking the Manufacturing Part Number to Package Substrate Design Kit .....	12
4.6.3	Linking the Manufacturing Part Number to Material Design Kit .....	13
4.6.4	Linking the Manufacturing Part Number to Package Test Design Kit .....	14
4.6.5	Linking the Manufacturing Part Number to Footprint Rule Design Kit .....	15
4.6.6	Linking the Manufacturing Part Number to Symbol Rule Design Kit .....	16
5	Design Kit Section .....	17
5.1	Assembly Technology - Array .....	18
5.2	Package Assembly Design Kit - Array .....	19
5.2.1	Design Classification - Array .....	20
5.2.2	Rule Condition - Array .....	21
5.2.2.1	Feature Selection Area .....	22
5.2.2.1.1	Area Region .....	23
5.2.2.1.1.1	Impacted Corner .....	24
5.2.2.1.1.2	Contour .....	24
5.2.2.2	Feature Type Selection .....	25
5.2.2.2.1	Size Criteria .....	26
5.2.2.3	Feature Placement .....	26
5.2.2.4	Feature Control .....	27
5.2.2.5	Rule Condition .....	27
5.2.3	Assembly .....	28
5.2.3.1	Rule - Array .....	29
5.2.4	Footnote - Array .....	30
5.3	Package Substrate Design Kit - Array .....	31
5.3.1	Fabrication .....	32
5.3.1.1	Rule - Array .....	33
5.4	Material Design Kit - Array .....	34
5.4.1	Material - Array .....	35
5.4.2	Material Classification - Array .....	36
5.4.3	Material Design Kit .....	37
5.4.3.1	Electrical .....	38
5.4.3.1.1	Dielectric Constant - Array .....	38

## Contents (cont'd)

	Page
5.4.3.1.1.1 Dielectric Constant Graph .....	39
5.4.3.1.2 Dissipation Factor - Array .....	40
5.4.3.1.2.1 Dissipation Factor Graph .....	41
5.4.3.1.3 Electric Conductivity - Array .....	42
5.4.3.1.3.1 Electric Conductivity Graph .....	43
5.4.3.1.4 Electric Resistivity - Array .....	44
5.4.3.1.4.1 Electric Resistivity Graph .....	45
5.4.3.1.5 Electric Field Strength - Array .....	46
5.4.3.1.5.1 Electric Field Strength Graph .....	47
5.4.3.2 Thermal .....	48
5.4.3.2.1 Glass Transition Temperature - Array .....	49
5.4.3.2.2 Melting Temperature - Array .....	49
5.4.3.2.3 Linear Expansion Coefficient - Array .....	50
5.4.3.2.3.1 Linear Expansion Coefficient Graph .....	51
5.4.3.2.4 Cubic Expansion Coefficient - Array .....	52
5.4.3.2.4.1 Cubic Expansion Coefficient Graph .....	53
5.4.3.2.5 Thermal Conductivity - Array .....	54
5.4.3.2.5.1 Thermal Conductivity Graph .....	55
5.4.3.2.6 Specific Heat Capacity - Array .....	56
5.4.3.2.6.1 Specific Heat Capacity Graph .....	57
5.4.3.2.7 Density - Array .....	58
5.4.3.2.7.1 Density Graph .....	59
5.4.3.3 Structural .....	60
5.4.3.3.1 Poisson Ratio - Array .....	60
5.4.3.3.1.1 Poisson Ratio Graph .....	61
5.4.3.3.2 Stress - Array .....	62
5.4.3.3.2.1 Stress Graph .....	63
5.4.3.3.3 Yield Strength - Array .....	65
5.4.3.3.3.1 Yield Strength Graph .....	66
5.4.3.3.4 Failure Strength - Array .....	67
5.4.3.3.4.1 Failure Strength Graph .....	68
5.4.3.3.5 Elastic Modulus- Array .....	69
5.4.3.3.5.1 Elastic Modulus Graph .....	70
5.4.3.4 Optical .....	71
5.4.3.4.1 Refractive Index - Array .....	71
5.4.3.4.1.1 Refractive Index Graph .....	72
5.4.3.4.2 Reflectance - Array .....	73
5.4.3.4.2.1 Reflectance Graph .....	74
5.4.3.4.3 Transmission - Array .....	75
5.4.3.4.3.1 Transmission Graph .....	76
5.4.3.5 Other Property - Array .....	77
5.4.3.5.1 Test Condition .....	78
5.4.3.5.2 Values .....	79
5.4.3.5.3 MDK - Property Graph .....	83
5.4.3.5.4 Property Plot Test Condition .....	84
5.4.3.6 Common Structure applied to all Properties .....	84
5.4.3.6.1 Parameter Identity Group .....	84
5.4.3.6.2 Value Vs Directional – xy – and – z – Value Group .....	85
5.4.3.6.3 Rule Vs Directional – xy – and – z - Rule .....	85
5.4.3.6.3.1 LaTeX - and - MathML - Rule Group .....	86
5.4.3.6.4 Value Set Group Type .....	87
5.4.3.6.5 Frequency Condition Type .....	87

## Contents (cont'd)

	Page
5.4.3.6.6 Temperature Condition Type .....	88
5.4.3.6.7 Temp-or-Freq Test Condition Units Type .....	88
5.4.3.6.8 Axis Parameter Identity Group .....	89
5.4.3.6.9 Graph Structure applicable to Material Properties .....	90
5.4.3.6.9.1 Graph Chart X Axis Formatting Type .....	91
5.4.3.6.9.2 Graph Chart Y Axis Formatting Type .....	92
5.4.3.6.9.3 Graph Formatting Type .....	93
5.4.3.6.9.4 Linking the Data-Array to the Appropriate Parameter Definition .....	94
5.4.3.6.9.5 Data-Array .....	95
5.4.3.6.9.6 Graph Formula .....	95
5.4.3.6.9.7 Temp-or-Freq Plot Test Condition Type .....	96
5.4.3.6.9.8 Temperature Graph Plot Test Condition Type .....	96
5.4.3.6.9.9 Wavelength Graph Plot Test Condition Type .....	97
5.4.3.6.9.10 Graph Data Formatting Type .....	98
5.4.3.6.9.11 Example of a Stress vs Strain Graph .....	99
5.5 Package Test Design Kit - Array .....	103
5.6 Footprint Rule Design Kit - Array .....	104
5.6.1 Terminal – to – Pad Rule - Array .....	105
5.6.1.1 Table Header .....	105
5.6.1.2 Table Row Label .....	106
5.6.1.3 Table Data .....	106
5.6.2 Footprint Rules - Array .....	111
5.6.2.1 Condition .....	112
5.6.2.2 Condition Set .....	113
5.6.2.3 Output - Array .....	114
5.6.2.4 Intermediary Rule Value - Array .....	115
5.7 Symbol Rule Design Kit - Array .....	115
5.7.1 Symbol Rule - Array .....	116
5.7.1.1 Graphics To Display - Array .....	117
5.7.1.1.1 Terminal Number .....	119
5.7.1.1.2 Terminal Name .....	119
5.7.1.1.3 Terminal Label .....	120
5.7.1.1.4 Analog .....	120
5.7.1.1.5 Digital .....	121
5.7.1.1.6 Power .....	121
5.7.1.1.7 Ground .....	122
5.7.1.1.8 Direction .....	123
5.7.1.1.9 Clock .....	124
5.7.1.1.10 Enable .....	124
5.7.1.2 Text Format .....	125
5.7.1.3 Graphical Format .....	126
Annex A (informative) Differences between JEP30-K100 and its predecessors .....	127

## Figures

	Page
Figure 1 – Stress vs Strain .....	99

Tables	
	Page
Table 1 — UOM Enumerated Lists .....	81
Table 2 — Ball Grid Array Components (unit: mm) .....	107



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

(From JEDEC Board Ballots JCB-24-53 and JCB-25-59, formulated under the cognizance of the JC-11 Committee on Mechanical Standardization.)

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### 1 Scope

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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, design kit, generated ECAD models, product substrate and assemblies, and environment including material declaration. This document specifically focuses on the Design Kit sub-section of the PartModel.

All releases of the [DesignKit](#) sub-schema must be under the umbrella of the PartModel Schema to ensure that the PartModel schema is referencing the correct version of the [DesignKit](#) sub-schema. In addition, this will enable the [DesignKit](#) sub-schema to connect to the Manufacturer Part Number and the Manufacturer of the Part.

#### 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 principles:

- 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 purposes.

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.

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## **2 Applicable Documents**

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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](http://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](http://www.ipc.org))**

**IPC-7352**, Generic Guideline for Land Pattern Design

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## 3 Requirements

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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.

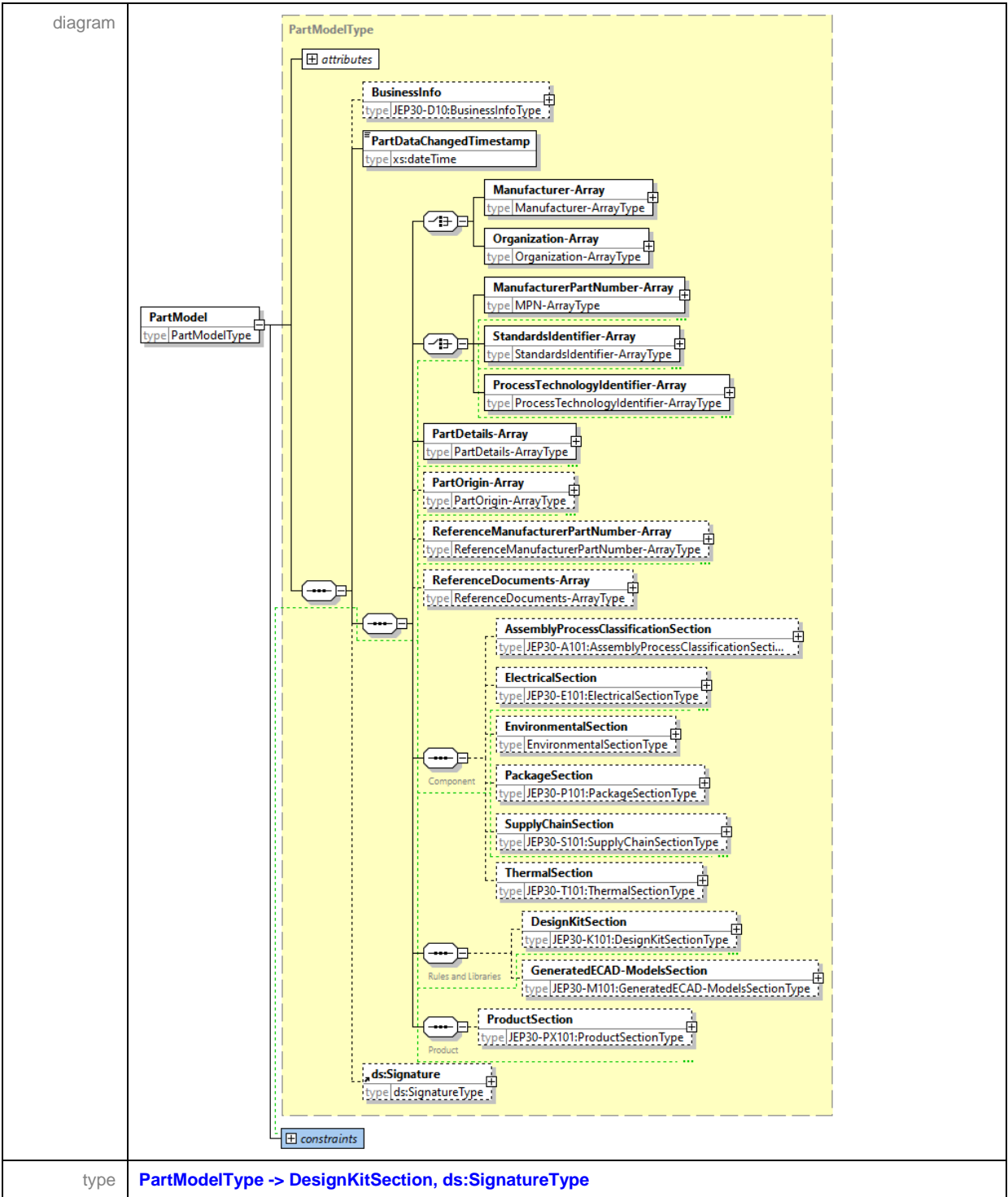
### 3.2 XML Schema Key Terms and Definitions

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



#### 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) or unique standards (Organization and Standards Identifier) or unique process technologies (Organization and Process Technology Identifier) 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 [ComplianceToJEP30-K101SchemaVersion](#) 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 are 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 [DesignKitContentRevision](#) 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 this [DesignKitSection](#).

The [PartModelDesignKitSectionStatus](#) attribute is a mandatory attribute that determines the status of the PartModel XML file. It has enumerated values of [Pre-Release](#), [Released](#), [Superseded](#), and [Withdrawn](#).

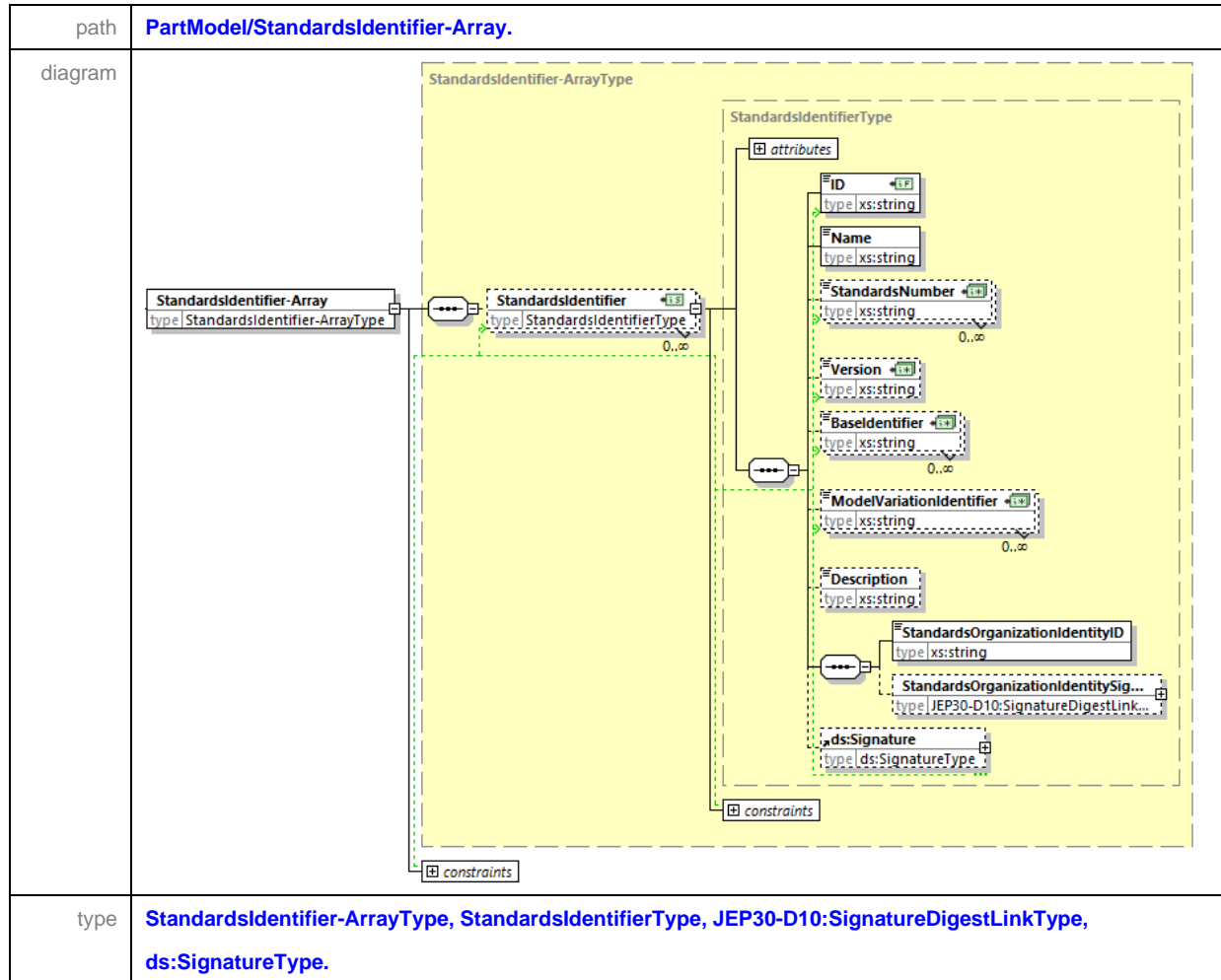
The [DocumentID](#) attribute provides a unique ID for the JEP30-P101 document that is being published.

4.2 Manufacturer Part Number-Array

path	PartModel/ManufacturerPartNumber-Array.
diagram	
type	MPN-ArrayType, ManufacturerPartNumbersType, JEP30-D10:PartNumberSeriesType, JEP30-D10:OrderablePartNumberType, FuturePartType, JEP30-D10:SignatureDigestLinkType, ds:SignatureType.

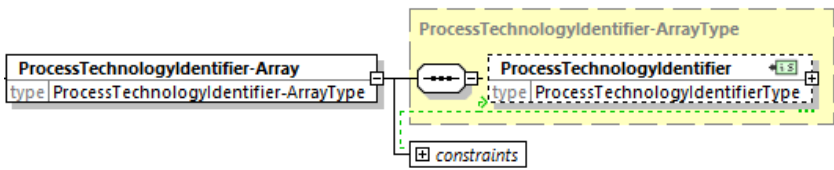
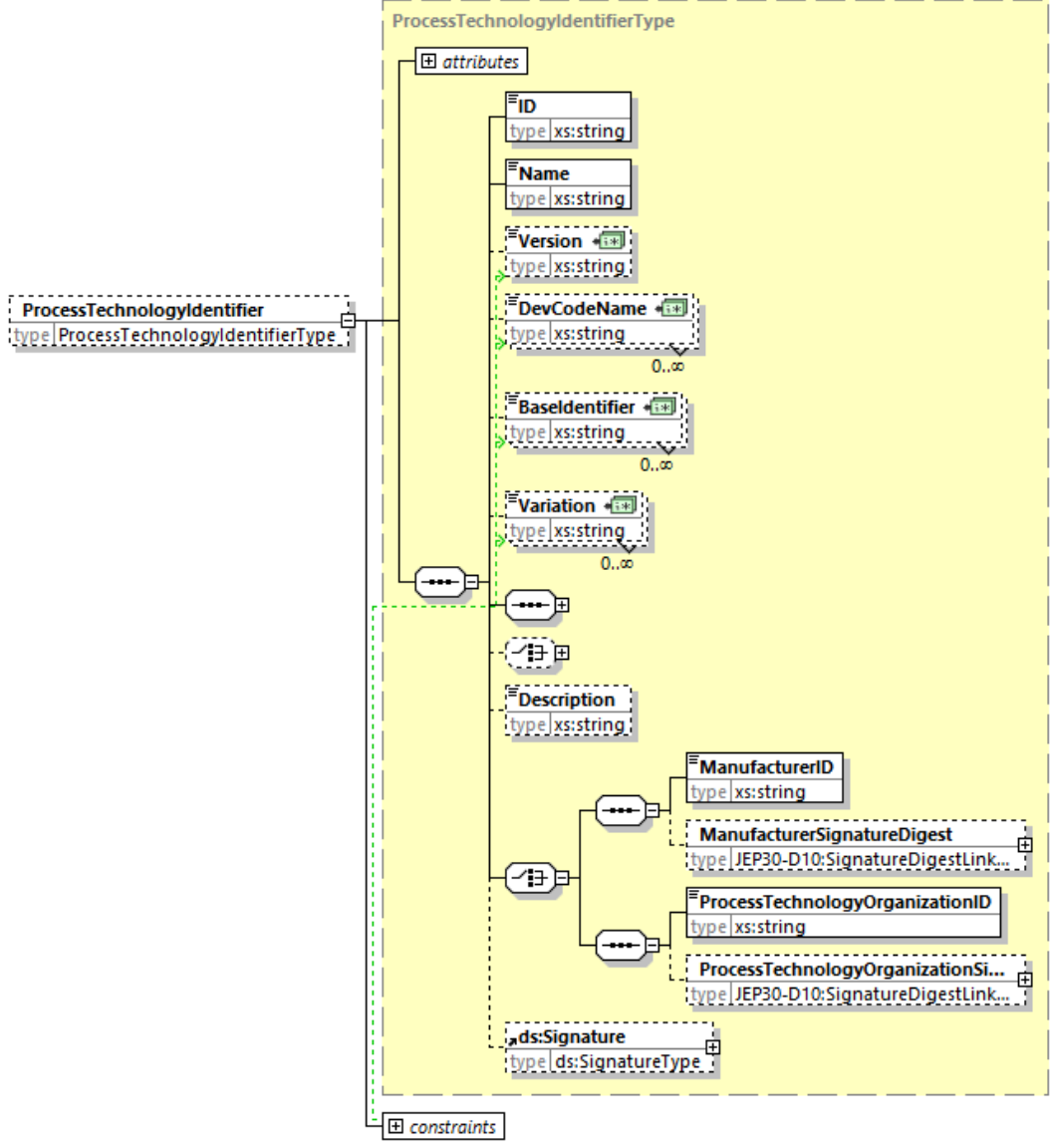
The *ManufacturerPartNumber-Array/ManufacturerPartNumbers* provides the definition of the part number, design kit, or a specific Standard, so that it can be connected to the technical specification details in the *DesignKitSection* via the *PartDetails-Array* section.

### 4.3 Standards Identifier - Array



The [StandardsIdentifier-Array/StandardsIdentifier](#) provides the definition of a specific Standard, so that it can be connected to the technical specification details in the [DesignKitSection](#) via the [PartDetails-Array](#) section.

#### 4.4 Process Technology Identifier - Array

path	<a href="#">PartModel/ProcessTechnologyIdentifier-Array.</a>
diagram 1 of 2	 <p>Diagram 1 of 2 shows the <b>ProcessTechnologyIdentifier-ArrayType</b> structure. It consists of a <b>ProcessTechnologyIdentifier-Array</b> (type <b>ProcessTechnologyIdentifier-ArrayType</b>) containing a <b>ProcessTechnologyIdentifier</b> (type <b>ProcessTechnologyIdentifierType</b>). A <b>constraints</b> box is also present.</p>
diagram 2 of 2	 <p>Diagram 2 of 2 shows the <b>ProcessTechnologyIdentifierType</b> structure. It includes an <b>attributes</b> box with the following elements:</p> <ul style="list-style-type: none"> <li><b>ID</b> (type <b>xs:string</b>)</li> <li><b>Name</b> (type <b>xs:string</b>)</li> <li><b>Version</b> (type <b>xs:string</b>, cardinality 1..4)</li> <li><b>DevCodeName</b> (type <b>xs:string</b>, cardinality 0..∞)</li> <li><b>BaseIdentifier</b> (type <b>xs:string</b>, cardinality 0..∞)</li> <li><b>Variation</b> (type <b>xs:string</b>, cardinality 0..∞)</li> <li><b>Description</b> (type <b>xs:string</b>)</li> <li><b>ManufacturerID</b> (type <b>xs:string</b>)</li> <li><b>ManufacturerSignatureDigest</b> (type <b>JEP30-D10:SignatureDigestLinkType</b>)</li> <li><b>ProcessTechnologyOrganizationID</b> (type <b>xs:string</b>)</li> <li><b>ProcessTechnologyOrganizationSignatureDigest</b> (type <b>JEP30-D10:SignatureDigestLinkType</b>)</li> <li><b>ds:Signature</b> (type <b>ds:SignatureType</b>)</li> </ul> <p>A <b>constraints</b> box is also present at the bottom.</p>
type	<a href="#">ProcessTechnologyIdentifier-ArrayType</a> , <a href="#">ProcessTechnologyIdentifier</a> , <a href="#">JEDEC-Stage-in-DevelopmentType</a> , <a href="#">JEP30-D10:SignatureDigestLinkType</a> , <a href="#">ds:SignatureType</a> .

The [ProcessTechnologyIdentifier-Array/ProcessTechnologyIdentifier](#) provides the definition of the process technology identifier, so that it can be connected to the technical specification details in the [DesignKitSection](#) via the [PartDetails-Array](#) section.



#### 4.5 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.

path	<a href="#">PartModel/PartDetails-Array/PartDetails/Association-Array/Association/DesignKit-Array</a>
diagram at the Association level	<pre> classDiagram     class DesignKitArray {         type DesignKitAssociation-ArrayType     }     class DesignKitAssociationArrayType {         PackageAssemblyDesignKit         PackageSubstrateKitDesignKit         MaterialDesignKit         PackageTestDesignKit         FootprintRuleDesignKit         SymbolRuleDesignKit     }     class PackageAssemblyDesignKit {         type PackageAssemblyDesignKitAssociationType     }     class PackageSubstrateKitDesignKit {         type PackageSubstrateKitDesignKitAssociationType     }     class MaterialDesignKit {         type MaterialDesignKitAssociationType     }     class PackageTestDesignKit {         type PackageTestDesignKitAssociationType     }     class FootprintRuleDesignKit {         type FootprintRuleDesignKitAssociationType     }     class SymbolRuleDesignKit {         type SymbolRuleDesignKitAssociationType     }      DesignKitArray --&gt; DesignKitAssociationArrayType     DesignKitAssociationArrayType --&gt; PackageAssemblyDesignKit     DesignKitAssociationArrayType --&gt; PackageSubstrateKitDesignKit     DesignKitAssociationArrayType --&gt; MaterialDesignKit     DesignKitAssociationArrayType --&gt; PackageTestDesignKit     DesignKitAssociationArrayType --&gt; FootprintRuleDesignKit     DesignKitAssociationArrayType --&gt; SymbolRuleDesignKit     PackageAssemblyDesignKit --&gt; PackageAssemblyDesignKitAssociationType     PackageSubstrateKitDesignKit --&gt; PackageSubstrateKitDesignKitAssociationType     MaterialDesignKit --&gt; MaterialDesignKitAssociationType     PackageTestDesignKit --&gt; PackageTestDesignKitAssociationType     FootprintRuleDesignKit --&gt; FootprintRuleDesignKitAssociationType     SymbolRuleDesignKit --&gt; SymbolRuleDesignKitAssociationType </pre>
type	<a href="#">DesignKitAssociation-ArrayType</a> , <a href="#">PackageAssemblyDesignKitAssociationType</a> , <a href="#">PackageSubstrateKitDesignKitAssociationType</a> , <a href="#">MaterialDesignKitAssociationType</a> , <a href="#">PackageTestDesignKitAssociationType</a> , <a href="#">FootprintRuleDesignKitAssociationType</a> , <a href="#">SymbolRuleDesignKitAssociationType</a> .

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

path	<b>PartModel/DesignKitSection</b>
diagram at the Design Kit Section level	<p>The diagram illustrates the structure of the <b>DesignKitSectionType</b>. It shows a <b>DesignKitSection</b> entity (type <b>DesignKitSectionType</b>) connected to a <b>DesignKitSectionType</b> container. This container holds an <b>AssemblyTechnology-Array</b> (type <b>JEP30-D10:AssemblyTechnology-ArrayType</b>) and a collection of six <b>DesignKit-Array</b> entities: <b>PackageAssemblyDesignKit-Array</b> (type <b>PackageAssemblyDesignKit-ArrayType</b>), <b>PackageSubstrateDesignKit-Array</b> (type <b>PackageSubstrateDesignKit-ArrayType</b>), <b>MaterialDesignKit-Array</b> (type <b>MaterialDesignKit-ArrayType</b>), <b>PackageTestDesignKit-Array</b> (type <b>PackageTestDesignKit-ArrayType</b>), <b>FootprintRuleDesignKit-Array</b> (type <b>FootprintRuleDesignKit-ArrayType</b>), and <b>SymbolRuleDesignKit-Array</b> (type <b>SymbolRuleDesignKit-ArrayType</b>). Each array entity has a '+' symbol indicating a collection.</p>
type	<b>JEP30-K101:DesignKitSectionType, JEP30-D10:AssemblyTechnology-ArrayType, PackageAssemblyDesignKit-ArrayType, PackageSubstrateDesignKit-ArrayType, MaterialDesignKit-ArrayType, PackageTestDesignKit-ArrayType, FootprintRuleDesignKit-ArrayType, SymbolRuleDesignKit-ArrayType.</b>

#### 4.6.1 Linking the Manufacturing Part Number to Package Assembly Design Kit

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

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](#).

#### 4.6.2 Linking the Manufacturing Part Number to Package Substrate Design Kit

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

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

### 4.6.3 Linking the Manufacturing Part Number to Material Design Kit

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

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](#).

#### 4.6.4 Linking the Manufacturing Part Number to Package Test Design Kit

path	<a href="#">PartModel/PartDetails-Array/PartDetails/Association-Array/Association/DesignKit-Array/PackageTestDesignKit</a>
diagram at the Package Test Design Kit Association level	
type	<a href="#">PackageTestDesignKitAssociationType</a> , <a href="#">JEP30-D10:SignatureDigestLinkType</a>
path	<a href="#">PartModel/DesignKitSection/PackageTestDesignKit-Array</a>
diagram at the Package Test Design Kit level.	
type	<a href="#">PackageTestDesignKit-ArrayType</a> , <a href="#">PackageTestDesignKit</a> , <a href="#">JEP30-D10:Footnote-ArrayType</a> , <a href="#">ds:SignatureType</a> .

The [PackageTestDesignKitID](#) references the [PackageTestDesignKit/ID](#) under the [DesignKitSection/PackageTestDesignKit-Array](#). This is enforced by the key named [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](#).



#### 4.6.5 Linking the Manufacturing Part Number to Footprint Rule Design Kit

path	<a href="#">PartModel/PartDetails-Array/PartDetails/Association-Array/Association/DesignKit-Array/FootprintRuleDesignKit</a>
diagram at the Footprint Rule Design Kit Association level	
type	<a href="#">FootprintRuleDesignKitAssociationType</a> , <a href="#">JEP30-D10:SignatureDigestLinkType</a>
path	<a href="#">PartModel/DesignKitSection/FootprintRuleDesignKit-Array</a>
diagram at the Footprint Rule Design Kit level.	
type	<a href="#">FootprintRuleDesignKit-ArrayType</a> , <a href="#">FootprintRuleDesignKit</a> , <a href="#">JEP30-D10:Footnote-ArrayType</a> , <a href="#">ds:SignatureType</a> .

The [FootprintRuleDesignKitID](#) references the [FootprintRuleDesignKit/ID](#) under the DesignKitSection/FootprintRuleDesignKit-Array. This is enforced by the key named [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](#).

#### 4.6.6 Linking the Manufacturing Part Number to Symbol Rule Design Kit

path	<a href="#">PartModel/PartDetails-Array/PartDetails/Association-Array/Association/DesignKit-Array/SymbolRuleDesignKit</a>
diagram at the Symbol Rule Design Kit Association level	
type	<a href="#">SymbolRuleDesignKitAssociationType</a> , <a href="#">JEP30-D10:SignatureDigestLinkType</a>
path	<a href="#">PartModel/DesignKitSection/SymbolRuleDesignKit-Array</a>
diagram at the Symbol Rule Design Kit level.	
type	<a href="#">SymbolRuleDesignKit-ArrayType</a> , <a href="#">SymbolRuleDesignKit</a> , <a href="#">JEP30-D10:Footnote-ArrayType</a> , <a href="#">ds:SignatureType</a> .

The [SymbolRuleDesignKitID](#) references the [SymbolRuleDesignKit/ID](#) under the [DesignKitSection/SymbolRuleDesignKit-Array](#). This is enforced by the key named [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	<a href="#">PartModel/DesignKitSection</a>
diagram	<pre> classDiagram     class DesignKitSection {         type JEP30-K101:DesignKitSectionType     }     class JEP30_K101_DesignKitSectionType {         AssemblyTechnology-Array type JEP30-D10:AssemblyTechnology-ArrayType         PackageAssemblyDesignKit-Array type PackageAssemblyDesignKit-ArrayType         PackageSubstrateDesignKit-Array type PackageSubstrateDesignKit-ArrayType         MaterialDesignKit-Array type MaterialDesignKit-ArrayType         PackageTestDesignKit-Array type PackageTestDesignKit-ArrayType         FootprintRuleDesignKit-Array type FootprintRuleDesignKit-ArrayType         SymbolRuleDesignKit-Array type SymbolRuleDesignKit-ArrayType     }     DesignKitSection -- JEP30_K101_DesignKitSectionType     JEP30_K101_DesignKitSectionType --&gt; AssemblyTechnology-Array     JEP30_K101_DesignKitSectionType --&gt; PackageAssemblyDesignKit-Array     JEP30_K101_DesignKitSectionType --&gt; PackageSubstrateDesignKit-Array     JEP30_K101_DesignKitSectionType --&gt; MaterialDesignKit-Array     JEP30_K101_DesignKitSectionType --&gt; PackageTestDesignKit-Array     JEP30_K101_DesignKitSectionType --&gt; FootprintRuleDesignKit-Array     JEP30_K101_DesignKitSectionType --&gt; SymbolRuleDesignKit-Array     JEP30_K101_DesignKitSectionType -- constraints </pre>
type	<a href="#">JEP30-K101:DesignKitSectionType</a> , <a href="#">JEP30-D10:AssemblyTechnology-ArrayType</a> , <a href="#">PackageAssemblyDesignKit-ArrayType</a> , <a href="#">PackageSubstrateDesignKit-ArrayType</a> , <a href="#">MaterialDesignKit-ArrayType</a> , <a href="#">PackageTestDesignKit-ArrayType</a> , <a href="#">FootprintRuleDesignKit-ArrayType</a> , <a href="#">SymbolRuleDesignKit-ArrayType</a> .

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.

Data associated with the [DesignKitSection](#) can be associated to any of the parts as defined by the [PartNumberSeries](#), [OrderablePartNumber-Array](#) or the [FuturePart](#), or be associated with a Standard Body as defined by the [StandardsIdentifier](#) or be associated with a [ProcessTechnologyIdentifier](#).

5.1 Assembly Technology - Array

path	PartModel/DesignKitSection/AssemblyTechnology-Array
diagram	<p>The diagram illustrates the XSD structure for the <code>AssemblyTechnology-Array</code>. It shows a sequence of <code>AssemblyTechnology</code> elements (1..∞) of type <code>AssemblyTechnologyType</code>. A detailed view of <code>AssemblyTechnologyType</code> is provided, showing a complex type with the following elements:</p> <ul style="list-style-type: none"><li><code>ID</code> (type <code>xs:string</code>)</li><li><code>SMT-MaskReflow</code> (type <code>EmptyType</code>)</li><li><code>Paste-in-Hole</code> (type <code>EmptyType</code>)</li><li><code>WaveSoldering</code> (type <code>EmptyType</code>)</li><li><code>SelectiveMini-WaveSoldering</code> (type <code>EmptyType</code>)</li><li><code>LaserSoldering</code> (type <code>EmptyType</code>)</li><li><code>ManualSoldering</code> (type <code>EmptyType</code>)</li><li><code>Pressfit</code> (type <code>EmptyType</code>)</li><li><code>WireBonding</code> (type <code>WireBondingType</code>)</li><li><code>Copper-to-CopperHybridBonding</code> (type <code>EmptyType</code>)</li><li><code>ThermoCompressionBonding</code> (type <code>EmptyType</code>)</li><li><code>Other</code> (type <code>xs:string</code>)</li><li><code>DocumentID</code> (type <code>xs:string</code>)</li></ul>
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	<b>PartModel/DesignKitSection/PackageAssemblyDesignKit-Array</b>
diagram	<p>The diagram illustrates the XML Schema (XSD) structure for the <b>PackageAssemblyDesignKit-Array</b>. The root element is <b>PackageAssemblyDesignKit-Array</b> (type <b>PackageAssemblyDesignKit-ArrayType</b>), which contains one or more <b>PackageAssemblyDesignKit</b> elements (type <b>PackageAssemblyDesignKitType</b>). Each <b>PackageAssemblyDesignKit</b> element has attributes <b>ID</b> (type <b>xs:string</b>) and <b>GeneralSummary</b> (type <b>xs:string</b>). It also contains one or more <b>DesignClassification-Array</b> elements (type <b>DesignClassification-ArrayType</b>), one or more <b>RuleCondition-Array</b> elements (type <b>RuleCondition-ArrayType</b>), one or more <b>Assembly</b> elements (type <b>AssemblyType</b>), one or more <b>Footnote-Array</b> elements (type <b>JEP30-D10:Footnote-ArrayType</b>), and one or more <b>ds:Signature</b> elements (type <b>ds:SignatureType</b>).</p>
type	<b>PackageAssemblyDesignKit-ArrayType, PackageAssemblyDesignKitType, DesignClassification-ArrayType, RuleCondition-ArrayType, AssemblyType, JEP30-D10:Footnote-ArrayType, ds:SignatureType</b>

5.2.1 Design Classification - Array

path	PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/DesignClassification-Array
diagram	<p>The diagram illustrates the XML Schema (XSD) structure for the Design Classification - Array. It consists of two main components: <b>DesignClassification-ArrayType</b> and <b>DesignClassificationType</b>.</p> <ul style="list-style-type: none"><li><b>DesignClassification-ArrayType</b> is a container type that holds an array of <b>DesignClassification</b> elements. It is defined as <code>type DesignClassification-ArrayType</code>.</li><li><b>DesignClassification</b> is a complex type that contains the following elements:<ul style="list-style-type: none"><li><b>ID</b>: A required element of type <code>xs:string</code>.</li><li><b>Standard</b>: An optional element of type <code>JEP30-D10:EmptyType</code>.</li><li><b>Advanced</b>: An optional element of type <code>JEP30-D10:EmptyType</code>.</li><li><b>Complex</b>: An optional element of type <code>JEP30-D10:EmptyType</code>.</li><li><b>Micro</b>: An optional element of type <code>JEP30-D10:EmptyType</code>.</li><li><b>Other</b>: An optional element of type <code>xs:string</code>.</li><li><b>Description</b>: An optional element of type <code>xs:string</code>.</li><li><b>DocumentID</b>: An optional element of type <code>xs:string</code>.</li><li><b>FootnoteID</b>: An optional element of type <code>xs:string</code>.</li></ul></li></ul> <p>The <b>DesignClassification</b> type is defined as <code>type DesignClassificationType</code>. The <b>DesignClassification-ArrayType</b> is defined as <code>type DesignClassification-ArrayType</code>.</p>
type	DesignClassification-ArrayType, DesignClassificationType.

## 5.2.2 Rule Condition - Array

path	<a href="#">PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/RuleCondition-Array</a>
diagram	<pre> classDiagram     class RuleConditionArray {         type RuleCondition-ArrayType     }     class RuleConditionArrayType {         FeatureSelectionArea 0..∞         FeatureTypeSelection 0..∞         FeaturePlacement 0..∞         FeatureControl 0..∞         RuleCondition 0..∞     }     RuleConditionArray "1" *-- "0..∞" RuleConditionArrayType     </pre>
type	<a href="#">RuleCondition-ArrayType</a> , <a href="#">FeatureSelectionAreaType</a> , <a href="#">FeatureTypeSelectionType</a> , <a href="#">FeaturePlacementType</a> , <a href="#">FeatureControlType</a> , <a href="#">RuleConditionType</a> .

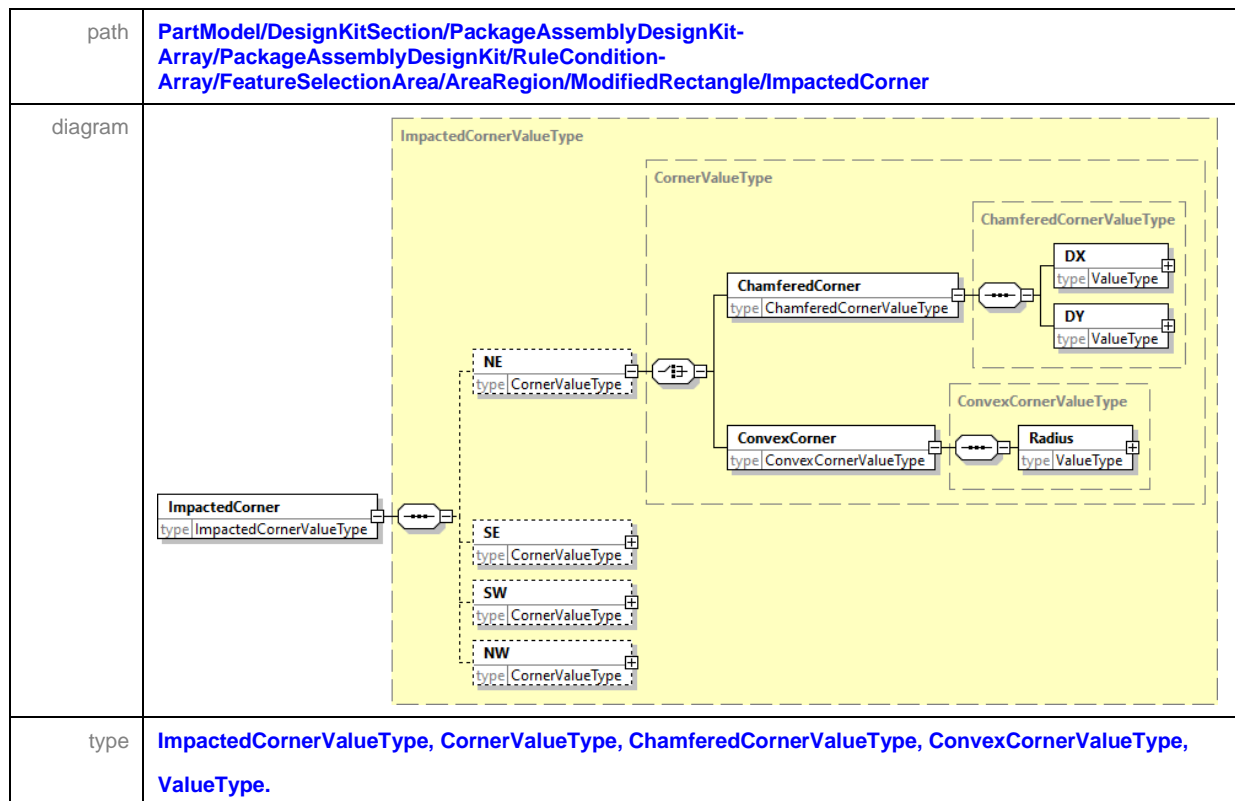
5.2.2.1 Feature Selection Area

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

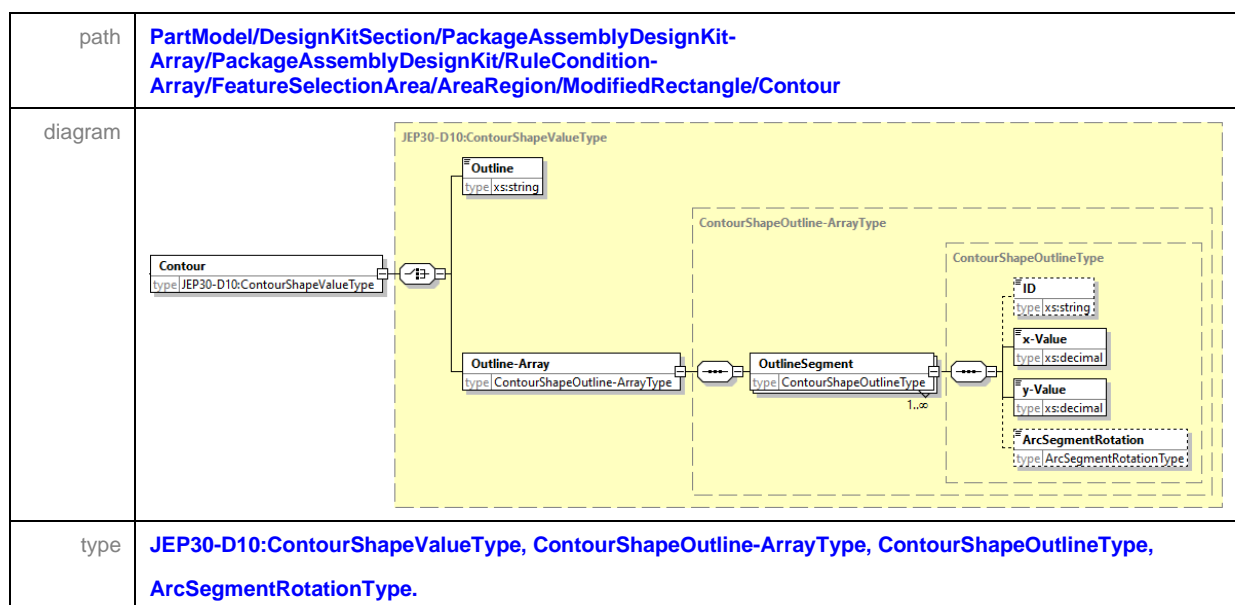
## 5.2.2.1.1 Area Region

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

#### 5.2.2.1.1.1 Impacted Corner



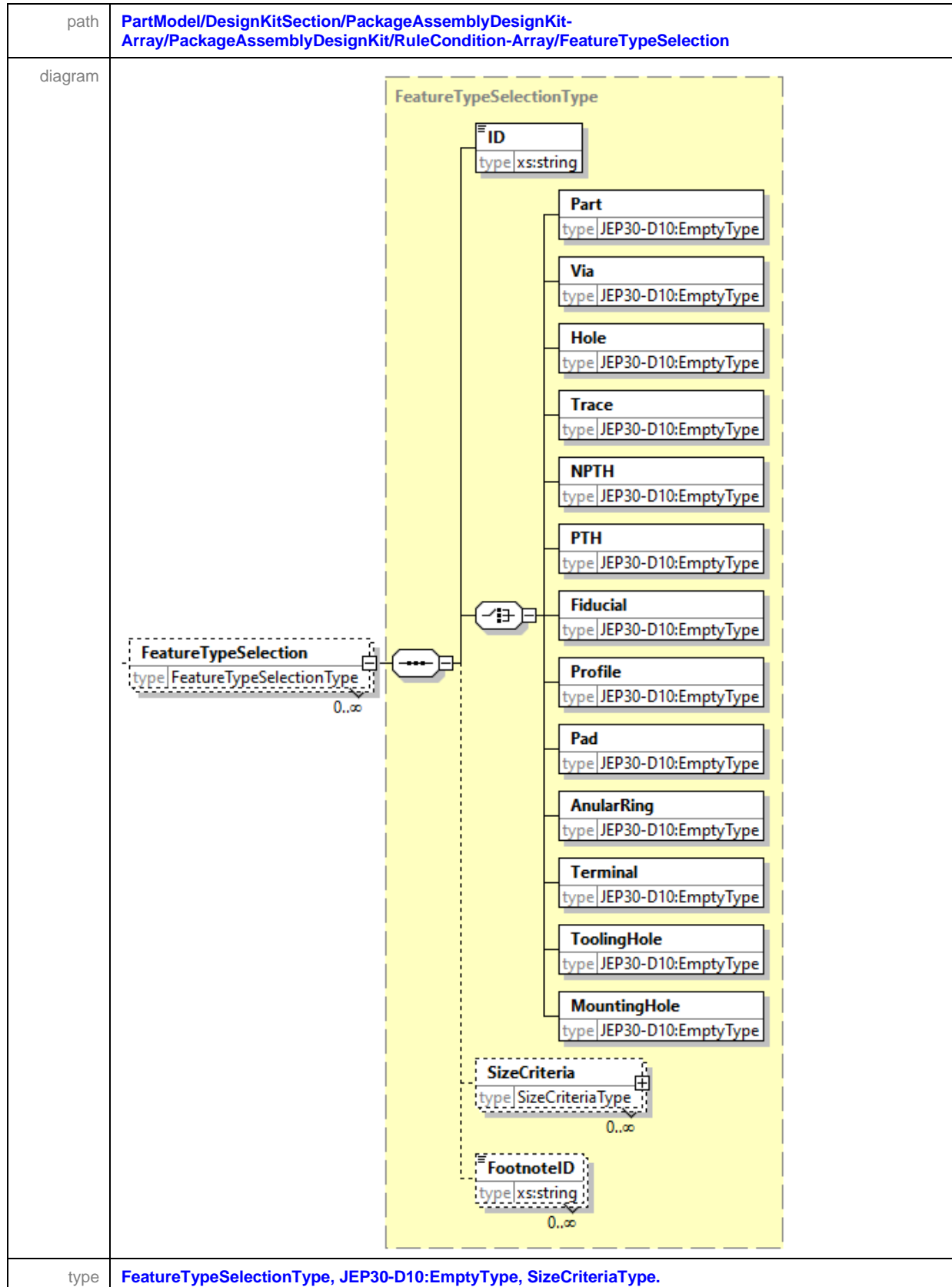
#### 5.2.2.1.1.2 Contour



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



## 5.2.2.2 Feature Type Selection



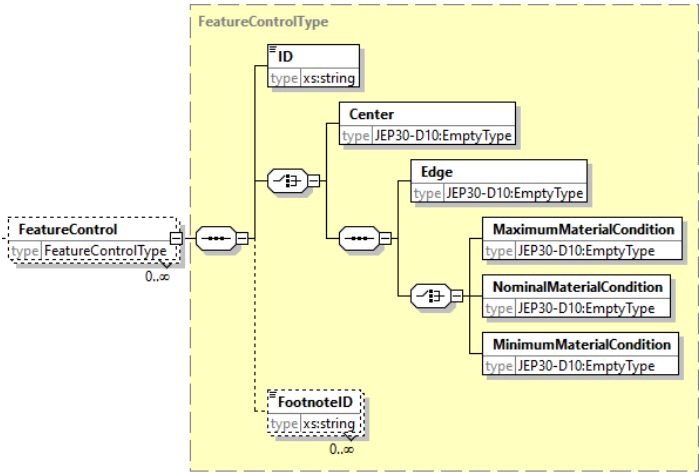
5.2.2.2.1 Size Criteria

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

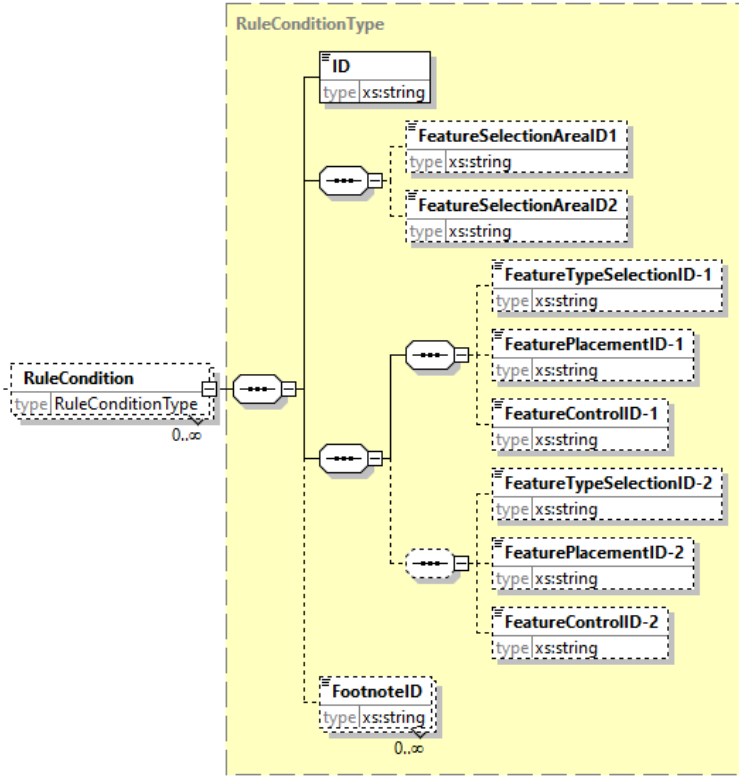
5.2.2.3 Feature Placement

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

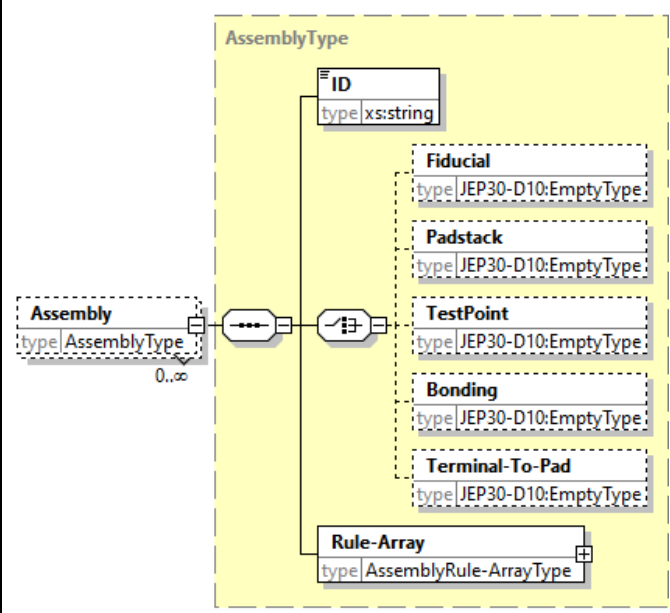
### 5.2.2.4 Feature Control

path	<a href="#">PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/RuleCondition-Array/FeatureControl</a>
diagram	 <p>The diagram illustrates the structure of the <b>FeatureControlType</b>. It is a dashed box containing several elements:         <ul style="list-style-type: none"> <li><b>FeatureControl</b>: A dashed box representing the main type, with a multiplicity of 0..∞.</li> <li><b>ID</b>: A solid box representing the identifier, with type <code>xs:string</code>.</li> <li><b>Center</b>: A solid box representing the center feature, with type <code>JEP30-D10:EmptyType</code>.</li> <li><b>Edge</b>: A solid box representing the edge feature, with type <code>JEP30-D10:EmptyType</code>.</li> <li><b>MaximumMaterialCondition</b>: A solid box representing the maximum material condition, with type <code>JEP30-D10:EmptyType</code>.</li> <li><b>NominalMaterialCondition</b>: A solid box representing the nominal material condition, with type <code>JEP30-D10:EmptyType</code>.</li> <li><b>MinimumMaterialCondition</b>: A solid box representing the minimum material condition, with type <code>JEP30-D10:EmptyType</code>.</li> <li><b>FootnoteID</b>: A dashed box representing the footnote identifier, with type <code>xs:string</code> and a multiplicity of 0..∞.</li> </ul>         The structure is organized with <b>ID</b> at the top, followed by <b>Center</b> and <b>Edge</b> (which are grouped together), then <b>MaximumMaterialCondition</b>, <b>NominalMaterialCondition</b>, and <b>MinimumMaterialCondition</b> (which are grouped together), and finally <b>FootnoteID</b> at the bottom.       </p>
type	<a href="#">FeatureControlType</a> , <a href="#">JEP30-D10:EmptyType</a> .

### 5.2.2.5 Rule Condition

path	<a href="#">PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/RuleCondition-Array/RuleCondition</a>
diagram	 <p>The diagram illustrates the structure of the <b>RuleConditionType</b>. It is a dashed box containing several elements:         <ul style="list-style-type: none"> <li><b>RuleCondition</b>: A dashed box representing the main type, with a multiplicity of 0..∞.</li> <li><b>ID</b>: A solid box representing the identifier, with type <code>xs:string</code>.</li> <li><b>FeatureSelectionAreaID1</b>: A dashed box representing the first feature selection area, with type <code>xs:string</code>.</li> <li><b>FeatureSelectionAreaID2</b>: A dashed box representing the second feature selection area, with type <code>xs:string</code>.</li> <li><b>FeatureTypeSelectionID-1</b>: A dashed box representing the first feature type selection, with type <code>xs:string</code>.</li> <li><b>FeaturePlacementID-1</b>: A dashed box representing the first feature placement, with type <code>xs:string</code>.</li> <li><b>FeatureControlID-1</b>: A dashed box representing the first feature control, with type <code>xs:string</code>.</li> <li><b>FeatureTypeSelectionID-2</b>: A dashed box representing the second feature type selection, with type <code>xs:string</code>.</li> <li><b>FeaturePlacementID-2</b>: A dashed box representing the second feature placement, with type <code>xs:string</code>.</li> <li><b>FeatureControlID-2</b>: A dashed box representing the second feature control, with type <code>xs:string</code>.</li> <li><b>FootnoteID</b>: A dashed box representing the footnote identifier, with type <code>xs:string</code> and a multiplicity of 0..∞.</li> </ul>         The structure is organized with <b>ID</b> at the top, followed by <b>FeatureSelectionAreaID1</b> and <b>FeatureSelectionAreaID2</b> (grouped), then <b>FeatureTypeSelectionID-1</b>, <b>FeaturePlacementID-1</b>, and <b>FeatureControlID-1</b> (grouped), then <b>FeatureTypeSelectionID-2</b>, <b>FeaturePlacementID-2</b>, and <b>FeatureControlID-2</b> (grouped), and finally <b>FootnoteID</b> at the bottom.       </p>
type	<a href="#">RuleConditionType</a> .

5.2.3 Assembly

path	PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/Assembly
diagram	 <p>The diagram illustrates the structure of the <b>AssemblyType</b> element. It is a complex type containing several child elements. The <b>Assembly</b> element is shown as a separate entity with a cardinality of 0..∞, connected to the main structure. The <b>AssemblyType</b> element itself contains an <b>ID</b> attribute (type xs:string), a <b>Fiducial</b> element (type JEP30-D10:EmptyType), a <b>Padstack</b> element (type JEP30-D10:EmptyType), a <b>TestPoint</b> element (type JEP30-D10:EmptyType), a <b>Bonding</b> element (type JEP30-D10:EmptyType), a <b>Terminal-To-Pad</b> element (type JEP30-D10:EmptyType), and a <b>Rule-Array</b> element (type AssemblyRule-ArrayType).</p>
type	AssemblyType, AssemblyRule-ArrayType.

## 5.2.3.1 Rule - Array

path	PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/Assembly/Rule-Array
diagram	<p>The diagram illustrates the XSD structure for the Rule-Array. It begins with a sequence of elements: <b>Rule-Array</b> (type <i>AssemblyRule-ArrayType</i>), followed by <b>Rule</b> (type <i>AssemblyRuleType</i>, 1..∞), and a choice between <b>Range</b> (type <i>RangeType</i>) and <b>UOM</b> (type <i>AssemblyRuleUOMType</i>). The <b>Range</b> complex type includes <b>AbsoluteMinimum</b>, <b>RecommendedMinimum</b>, <b>UpperRuleMeasurementLimit</b>, <b>AbsoluteMaximum</b>, <b>RecommendedMaximum</b>, and <b>LowerRuleMeasurementLimit</b>. The <b>AssemblyRuleUOMType</b> complex type includes <b>Dimension</b> (type <i>JEP30-D10:LengthUOMType</i>). The <b>Rule</b> complex type includes <b>ID</b>, <b>Name</b>, <b>Description</b>, <b>DocumentID</b>, <b>RuleConditionID</b>, <b>Value</b>, <b>State</b>, <b>Quantity</b>, <b>ViolationConsequence</b>, <b>RecommendedSolution</b>, and <b>FootnoteID</b>.</p>
type	AssemblyRule-ArrayType, AssemblyRuleType, RangeType, AssemblyRuleUOMType, JEP30-D10:LengthUOMType

The enumerated values for the *Dimension* are shown in Table 1 - UOM Enumerated Lists below.

5.2.4 Footnote - Array

path	PartModel/DesignKitSection/PackageAssemblyDesignKit-Array/PackageAssemblyDesignKit/Footnote-Array
diagram	<p>The diagram illustrates the structure of the <b>Footnote-Array</b> type. It is defined as an array of <b>FootnoteType</b> objects, with a cardinality of <b>0..∞</b>. The <b>FootnoteType</b> is a complex type containing two fields: <b>ID</b> (type <b>xs:string</b>) and <b>Footnote</b> (type <b>xs:string</b>). A constraint is defined for the <b>Footnote</b> field, requiring unique <b>PackageAssemblyDesignKitFootnoteKey</b> values. The constraint is named <b>unique PackageAssemblyDesignKitFootnoteKey</b> and has a selector <b>Footnote</b> and a field <b>ID</b>.</p>
type	JEP30-D10:Footnote-ArrayType, FootnoteType

### 5.3 Package Substrate Design Kit - Array

path	<b>PartModel/DesignKitSection/PackageSubstrateDesignKit-Array</b>
diagram	<p>The diagram illustrates the structure of the <b>PackageSubstrateDesignKit-Array</b> type. It is composed of the following elements:</p> <ul style="list-style-type: none"> <li><b>PackageSubstrateDesignKit-Array</b> (type <code>PackageSubstrateDesignKit-ArrayType</code>):       <ul style="list-style-type: none"> <li>Contains a <b>PackageSubstrateDesignKit</b> (type <code>PackageSubstrateDesignKitType</code>) with a cardinality of <code>1..∞</code>.</li> <li>Contains a <b>constraints</b> element.</li> </ul> </li> <li><b>PackageSubstrateDesignKit</b> (type <code>PackageSubstrateDesignKitType</code>):       <ul style="list-style-type: none"> <li>Contains an <b>attributes</b> element.</li> <li>Contains an <b>ID</b> (type <code>xs:string</code>) with a cardinality of <code>1..∞</code>.</li> <li>Contains an <b>AssemblyTechnologyID</b> (type <code>xs:string</code>) with a cardinality of <code>1..∞</code>.</li> <li>Contains a <b>DesignClassification-Array</b> (type <code>DesignClassification-ArrayType</code>) with a cardinality of <code>1..∞</code>.</li> <li>Contains a <b>RuleCondition-Array</b> (type <code>RuleCondition-ArrayType</code>) with a cardinality of <code>1..∞</code>.</li> <li>Contains a <b>Fabrication</b> (type <code>FabricationType</code>) with a cardinality of <code>0..∞</code>.</li> <li>Contains a <b>Footnote-Array</b> (type <code>JEP30-D10:Footnote-ArrayType</code>) with a cardinality of <code>1..∞</code>.</li> <li>Contains a <b>ds:Signature</b> (type <code>ds:SignatureType</code>) with a cardinality of <code>1..∞</code>.</li> <li>Contains a <b>constraints</b> element.</li> </ul> </li> </ul>
type	<b>PackageSubstrateDesignKit-ArrayType, PackageSubstrateDesignKitType, DesignClassification-ArrayType, RuleCondition-ArrayType, FabricationType, JEP30-D10:Footnote-ArrayType, ds:SignatureType</b>

5.3.1 Fabrication

path	PartModel/DesignKitSection/PackageSubstrateDesignKit-Array/PackageSubstrateDesignKit/Fabrication
diagram	<p>The diagram illustrates the structure of the <b>FabricationType</b> class. It is a base class with an <b>ID</b> attribute of type <code>xs:string</code>. The class is composed of several optional attributes, each represented by a dashed box: <b>Drill</b>, <b>Signal</b>, <b>Power</b>, <b>Soldermask</b>, <b>Silkscreen</b>, <b>Profile</b>, and <b>Etching</b>. All these attributes have a type of <code>JEP30-D10:EmptyType</code>. Additionally, there is a <b>Rule-Array</b> attribute of type <code>FabricationRule-ArrayType</code>. The <b>FabricationType</b> class is associated with a <b>Fabrication</b> class (type <code>FabricationType</code>) via a dashed line with a multiplicity of <code>0..∞</code>. The <b>Fabrication</b> class is also associated with the <b>FabricationType</b> class via a dashed line with a multiplicity of <code>0..∞</code>.</p>
type	FabricationType, JEP30-D10:EmptyType, FabricationRule-ArrayType.

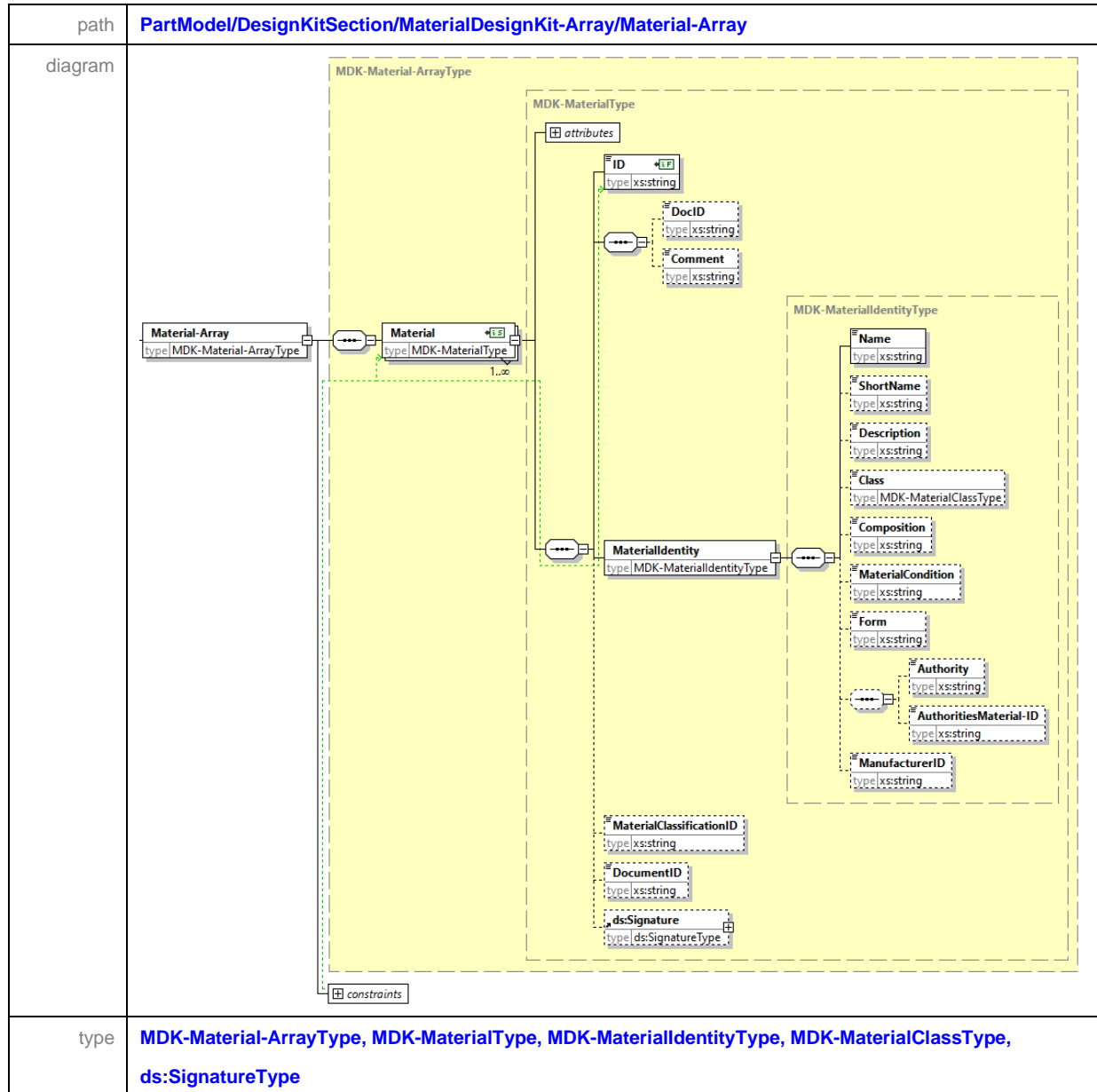


## 5.3.1.1 Rule - Array

path	PartModel/DesignKitSection/PackageSubstrateDesignKit-Array/PackageSubstrateDesignKit/Fabrication/Rule-Array
diagram	<p>The diagram illustrates the structure of the Rule-Array. It is composed of the following elements and their attributes:</p> <ul style="list-style-type: none"> <li><b>Rule-Array</b> (type: FabricationRule-ArrayType)       <ul style="list-style-type: none"> <li><b>Rule</b> (type: FabricationRuleType) [1..∞]           <ul style="list-style-type: none"> <li><b>ID</b> (type: xs:string)</li> <li><b>Name</b> (type: xs:string)</li> <li><b>Description</b> (type: xs:string)</li> <li><b>DocumentID</b> (type: xs:string)</li> <li><b>RuleConditionID</b> (type: xs:string)</li> <li><b>Range</b> (type: RangeType)               <ul style="list-style-type: none"> <li><b>AbsoluteMinimum</b> (type: xs:decimal)</li> <li><b>RecommendedMinimum</b> (type: xs:decimal)</li> <li><b>UpperRuleMeasurementLimit</b> (type: xs:decimal)</li> <li><b>AbsoluteMaximum</b> (type: xs:decimal)</li> <li><b>RecommendedMaximum</b> (type: xs:decimal)</li> <li><b>LowerRuleMeasurementLimit</b> (type: xs:decimal)</li> </ul> </li> <li><b>Value</b> (type: xs:decimal)</li> <li><b>State</b> (type: xs:boolean)</li> <li><b>Quantity</b> (type: xs:integer)</li> <li><b>UOM</b> (type: FabricationRuleUOMType)               <ul style="list-style-type: none"> <li><b>Dimension</b> (type: JEP30-D10:LengthUOMType)</li> </ul> </li> <li><b>ViolationConsequence</b> (type: xs:string) [1..∞]</li> <li><b>RecommendedSolution</b> (type: xs:string) [1..∞]</li> <li><b>FootnoteID</b> (type: xs:string) [0..∞]</li> </ul> </li> </ul> </li> </ul>
type	FabricationRule-ArrayType, FabricationRuleType, RangeType, FabricationRuleUOMType, JEP30-D10:LengthUOMType

path	PartModel/DesignKitSection/MaterialDesignKit-Array
diagram	<pre> classDiagram     class MaterialDesignKit_ArrayType {         type  MaterialDesignKit-ArrayType     }     class Material_Array {         type  MDK-Material-ArrayType     }     class MaterialClassification_Array {         type  MDK-MaterialClassification-ArrayType     }     class MaterialDesignKit {         type  MaterialDesignKitType     }     MaterialDesignKit_ArrayType "0..*" -- "*" Material_Array     MaterialDesignKit_ArrayType "0..*" -- "*" MaterialClassification_Array     MaterialDesignKit_ArrayType "0..*" -- "1..∞" MaterialDesignKit     </pre> <p>The diagram illustrates the structure of the <b>MaterialDesignKit-Array</b>. It is represented by a dashed box labeled <b>MaterialDesignKit-Array</b> with the type <code> MaterialDesignKit-ArrayType</code>. This array contains three elements:</p> <ul style="list-style-type: none"> <li><b>Material-Array</b>: Type <code> MDK-Material-ArrayType</code>, connected via a multiplicity of <code>0..*</code>.</li> <li><b>MaterialClassification-Array</b>: Type <code> MDK-MaterialClassification-ArrayType</code>, connected via a multiplicity of <code>0..*</code>.</li> <li><b>MaterialDesignKit</b>: Type <code> MaterialDesignKitType</code>, connected via a multiplicity of <code>1..∞</code>.</li> </ul> <p>A separate box labeled <b>constraints</b> is also shown.</p>
type	<b>MaterialDesignKit-ArrayType</b> , <b>MDK-Material-ArrayType</b> , <b>MDK-MaterialClassification-ArrayType</b> , <b>MaterialDesignKitType</b> ,

### 5.4.1 Material - Array



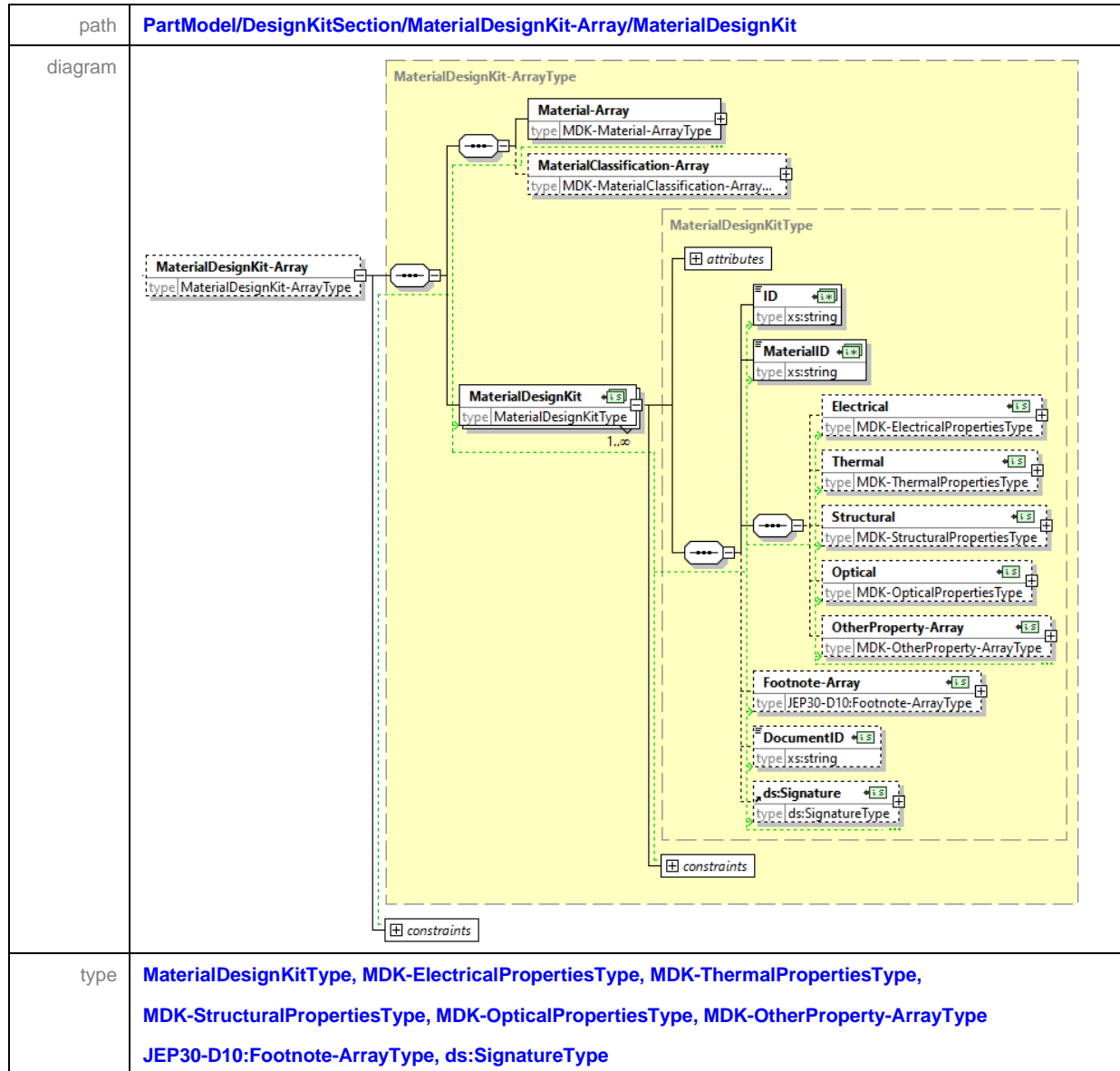
The enumerated values for the *MDK-MaterialClassType* are

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

5.4.2 Material Classification - Array

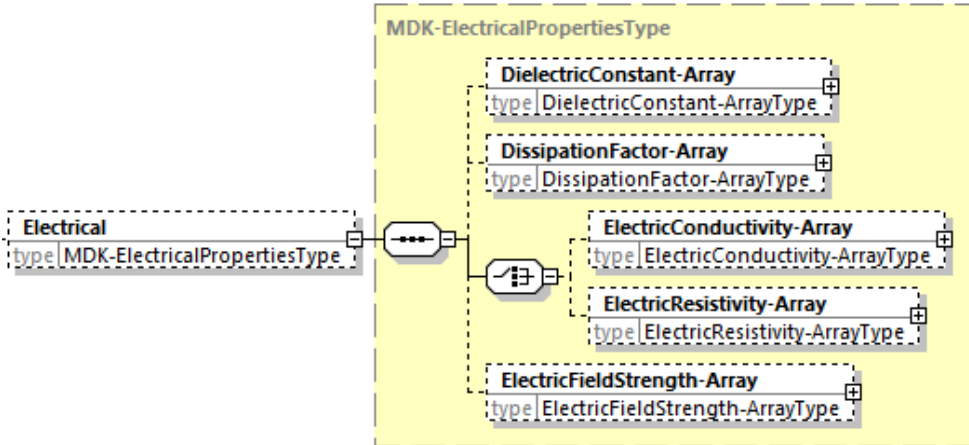
path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialClassification-Array
diagram	<p>The diagram illustrates the XML Schema (XSD) structure for the <code>MaterialClassification-Array</code>. It is composed of the following elements:</p> <ul style="list-style-type: none"><li><b>MaterialClassification-Array</b>: An array container (indicated by dashed lines and a '1' in a box) for the <code>MaterialClassification</code> elements. Its type is <code>MDK-MaterialClassification-ArrayType</code>.</li><li><b>MaterialClassification</b>: An element (indicated by a solid line and a '1' in a box) that is part of the array. Its type is <code>MDK-MaterialClassificationType</code>. It has a cardinality of <code>1..∞</code>.</li><li><b>MDK-MaterialClassificationType</b>: A complex type (indicated by a dashed box) that defines the structure of the <code>MaterialClassification</code> element. It includes:<ul style="list-style-type: none"><li><b>attributes</b>: A container for the following attributes:<ul style="list-style-type: none"><li><b>ID</b>: A required attribute (indicated by a green box) of type <code>xs:string</code>.</li><li><b>Name</b>: A required attribute of type <code>xs:string</code>.</li><li><b>Authority</b>: A required attribute of type <code>xs:string</code>.</li><li><b>AuthoritiesClassification-ID</b>: A required attribute of type <code>xs:string</code>.</li><li><b>ParentMaterialClassificationID</b>: A required attribute of type <code>xs:string</code>.</li><li><b>DocumentID</b>: A required attribute of type <code>xs:string</code>.</li><li><b>ds:Signature</b>: A required attribute of type <code>ds:SignatureType</code>.</li></ul></li><li><b>constraints</b>: A container for any constraints (indicated by a dashed box).</li></ul></li></ul>
type	MDK-MaterialClassification-ArrayType, MDK-MaterialClassificationType, ds:SignatureType.

### 5.4.3 Material Design Kit

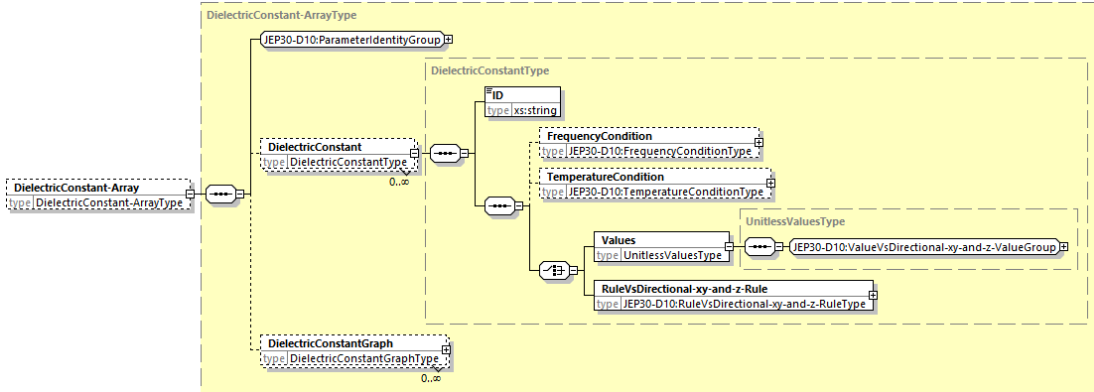


The Conditional properties and the property units defined under the respective properties for Electrical, Thermal, Structural and Optical are specially configured to suit those properties, however they all have a common structure and common graph formatting. These common structures are defined in more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

### 5.4.3.1 Electrical

path	<b>PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical</b>
diagram	 <p>The diagram shows the structure of the MDK-ElectricalPropertiesType. It is a dashed box containing several sub-elements: DielectricConstant-Array, DissipationFactor-Array, ElectricConductivity-Array, ElectricResistivity-Array, and ElectricFieldStrength-Array. Each sub-element has a 'type' attribute pointing to its respective ArrayType. The MDK-ElectricalPropertiesType is also linked to an Electrical element, which has a type attribute pointing to MDK-ElectricalPropertiesType.</p>
type	<b>MDK-ElectricalPropertiesType, DielectricConstant-ArrayType, DissipationFactor-ArrayType, ElectricConductivity-ArrayType, ElectricResistivity-ArrayType, ElectricFieldStrength-ArrayType</b>

#### 5.4.3.1.1 Dielectric Constant - Array

path	<b>PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/DielectricConstant-Array</b>
diagram	 <p>The diagram shows the structure of the DielectricConstant-ArrayType. It is a dashed box containing several sub-elements: DielectricConstant, DielectricConstantGraph, FrequencyCondition, TemperatureCondition, Values, and RuleVsDirectional-xy-and-z-Rule. Each sub-element has a 'type' attribute pointing to its respective type. The DielectricConstant-ArrayType is also linked to a DielectricConstant element, which has a type attribute pointing to DielectricConstantType. The DielectricConstant element is further linked to a JEP30-D10:ParameterIdentityGroup element, which has a type attribute pointing to JEP30-D10:ParameterIdentityGroupType. The DielectricConstant element is also linked to a DielectricConstantGraph element, which has a type attribute pointing to DielectricConstantGraphType. The DielectricConstant element is also linked to a FrequencyCondition element, which has a type attribute pointing to JEP30-D10:FrequencyConditionType. The DielectricConstant element is also linked to a TemperatureCondition element, which has a type attribute pointing to JEP30-D10:TemperatureConditionType. The DielectricConstant element is also linked to a Values element, which has a type attribute pointing to UnitlessValueType. The DielectricConstant element is also linked to a RuleVsDirectional-xy-and-z-Rule element, which has a type attribute pointing to JEP30-D10:RuleVsDirectional-xy-and-z-RuleType. The DielectricConstant element is also linked to a JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup element, which has a type attribute pointing to JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroupType.</p>
type	<b>DielectricConstant-ArrayType, DielectricConstantType, JEP30-D10:FrequencyConditionType, JEP30-D10:TemperatureConditionType, UnitlessValueType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, DielectricConstantGraphType.</b>
group	<b>JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.</b>

## 5.4.3.1.1.1 Dielectric Constant Graph

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/DielectricConstant-Array/DielectricConstantGraph
diagram	
type	DielectricConstantGraphType, 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:GraphFormulaType, 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, DissipationFactorGraphType.
group	JEP30-D10:ParameterIdentityGroup'



## 5.4.3.1.2.1 Dissipation Factor Graph

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/DissipationFactor-Array/DissipationFactorGraph
diagram	
type	DissipationFactorGraphType, 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:GraphFormulaType, JEP30-D10:GraphFormattingType
group	AxisParameterIdentityGroup

### 5.4.3.1.3 Electric Conductivity - Array

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/ElectricConductivity-Array
diagram	
type	ElectricConductivity-ArrayType, ElectricConductivityType, JEP30-D10:TemperatureConditionType, ElectricConductivityValuesType, JEP30-D10:ElectricConductivityUOMType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, ElectricConductivityGraphType.
group	JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.

The enumerated values for *ElectricConductivityUOM* are shown in Table 1 - UOM Enumerated Lists below.

## 5.4.3.1.3.1 Electric Conductivity Graph

path	<a href="#">PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/ElectricConductivity-Array/ElectricConductivityGraph</a>
diagram	<p>The diagram illustrates the structure of the ElectricConductivityGraphType. It includes a main class with several attributes and associations to other types. The main class has a GraphTitle (xs:string), a TestConditionDefinition (JEP30-D10:TemperatureParametricGraphChartX-AxisType), a ParameterDefinition (ElectricConductivityParameterGraphChartY-AxisType), a Data-Array (ElectricConductivityData-ArrayType), a GraphFormula (JEP30-D10:GraphFormulaType), and a Formatting (JEP30-D10:GraphFormattingType). The TestConditionDefinition is associated with JEP30-D10:TemperatureParametricGraphChartX-AxisType, which has a TemperatureUOM (Temperature-in-Celsius-or-KelvinUOMType) and a Formatting (GraphChartX-AxisFormattingType). The ParameterDefinition is associated with ElectricConductivityParameterGraphChartY-AxisType, which has an ID (xs:string), an ElectricConductivityUOM (JEP30-D10:ElectricConductivityUOMType), and a Formatting (JEP30-D10:GraphChartY-AxisFormattingType). The Data-Array is associated with ElectricConductivityData-ArrayType, which has a ParameterDefinitionID (xs:string), a PlotTestCondition (JEP30-D10:TemperatureGraphPlotConditionType), a Data (JEP30-D10:GraphDataType), and a Formatting (JEP30-D10:GraphDataFormattingType).</p>
type	<a href="#">ElectricConductivityGraphType</a> , <a href="#">JEP30-D10:TemperatureParametricGraphChartX-AxisType</a> , <a href="#">Temperature-in-Celsius-or-KelvinUOMType</a> , <a href="#">GraphChartX-AxisFormattingType</a> , <a href="#">ElectricConductivityParameterGraphChartY-AxisType</a> , <a href="#">JEP30-D10:ElectricConductivityUOMType</a> , <a href="#">ElectricConductivityData-ArrayType</a> , <a href="#">JEP30-D10:TemperatureGraphPlotConditionType</a> , <a href="#">JEP30-D10:GraphDataType</a> , <a href="#">JEP30-D10:GraphDataFormattingType</a> , <a href="#">JEP30-D10:GraphFormulaType</a> , <a href="#">JEP30-D10:GraphFormattingType</a>
group	<a href="#">AxisParameterIdentityGroup</a>

The enumerated values for [Temperature-in-Celsius-or-KelvinUOMType](#) are shown in Table 1 - UOM Enumerated Lists below.

### 5.4.3.1.4 Electric Resistivity - Array

path	<b>PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/ElectricResistivity-Array</b>
diagram	
type	<b>ElectricResistivity-ArrayType, ElectricResistivityType, JEP30-D10:TemperatureConditionType, ElectricResistivityValuesType, JEP30-D10:ElectricResistivityUOMType, JEP30-D10:RuleType, ElectricResistivityGraphType.</b>
group	<b>JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.</b>

The enumerated values for *ElectricResistivityUOM* are shown in Table 1 - UOM Enumerated Lists below.

## 5.4.3.1.4.1 Electric Resistivity Graph

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/ElectricResistivity-Array/ElectricResistivityGraph
diagram	
type	ElectricResistivityGraphType, JEP30-D10:TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, ElectricResistivityParameterGraphChartY-AxisType, JEP30-D10 ElectricResistivityUOMType, ElectricResistivityData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphFormulaType, JEP30-D10:GraphFormattingType
group	AxisParameterIdentityGroup

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/ElectricFieldStrength-Array
diagram	
type	ElectricFieldStrength-ArrayType, ElectricFieldStrengthType, JEP30-D10:FrequencyConditionType, JEP30-D10:TemperatureConditionType, ElectricFieldStrengthValuesType, ElectricFieldStrengthUOMType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, ElectricFieldStrengthGraphType.
group	JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.

The enumerated values for *ElectricFieldStrengthUOMType* are shown in Table 1 - UOM Enumerated Lists below.

## 5.4.3.1.5.1 Electric Field Strength Graph

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Electrical/ElectricFieldStrength-Array/ElectricFieldStrengthGraph
diagram	
type	ElectricFieldStrengthGraphType, JEP30-D10:Temp-or-FreqParametricGraphChartX-AxisType, Temp-or-FreqTestConditionUnitsType, GraphChartX-AxisFormattingType, ElectricFieldStrengthParameterGraphChartY-AxisType, JEP30-D10:ElectricFieldStrengthUOMType, JEP30-D10:GraphChartY-AxisFormattingType, ElectricFieldStrengthData-ArrayType, JEP30-D10:Temp-or-FreqPlotTestConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphFormulaType, JEP30-D10:GraphFormattingType
group	AxisParameterIdentityGroup

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

## 5.4.3.2 Thermal

path	<a href="#">PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal</a>
diagram	<pre> classDiagram     class Thermal {         type MDK-ThermalPropertiesType     }     class MDK-ThermalPropertiesType {         GlassTransitionTemperature-Array         MeltingTemperature         LinearExpansionCoefficient-Array         CubicExpansionCoefficient-Array         ThermalConductivity-Array         SpecificHeatCapacity-Array         Density-Array     }     class GlassTransitionTemperature-Array {         type GlassTransitionTemperature-ArrayType     }     class MeltingTemperature {         type MeltingTemperatureType     }     class LinearExpansionCoefficient-Array {         type JEP30-D10:LinearExpansionCoefficient-ArrayType     }     class CubicExpansionCoefficient-Array {         type JEP30-D10:CubicExpansionCoefficient-ArrayType     }     class ThermalConductivity-Array {         type ThermalConductivity-ArrayType     }     class SpecificHeatCapacity-Array {         type SpecificHeatCapacity-ArrayType     }     class Density-Array {         type Density-ArrayType     }     Thermal "1" -- "*" MDK-ThermalPropertiesType     MDK-ThermalPropertiesType "1" -- "*" GlassTransitionTemperature-Array     MDK-ThermalPropertiesType "1" -- "*" MeltingTemperature     MDK-ThermalPropertiesType "1" -- "*" LinearExpansionCoefficient-Array     MDK-ThermalPropertiesType "1" -- "*" CubicExpansionCoefficient-Array     MDK-ThermalPropertiesType "1" -- "*" ThermalConductivity-Array     MDK-ThermalPropertiesType "1" -- "*" SpecificHeatCapacity-Array     MDK-ThermalPropertiesType "1" -- "*" Density-Array </pre> <p>The diagram illustrates the structure of the Thermal class. It is composed of several arrays, each with its own type definition. The Thermal class is represented by a dashed box labeled 'Thermal' with the type 'MDK-ThermalPropertiesType'. It is connected to a larger dashed box labeled 'MDK-ThermalPropertiesType' which contains the following arrays:</p> <ul style="list-style-type: none"> <li><b>GlassTransitionTemperature-Array</b>: type GlassTransitionTemperature-ArrayType</li> <li><b>MeltingTemperature</b>: type MeltingTemperatureType</li> <li><b>LinearExpansionCoefficient-Array</b>: type JEP30-D10:LinearExpansionCoefficient-ArrayType</li> <li><b>CubicExpansionCoefficient-Array</b>: type JEP30-D10:CubicExpansionCoefficient-ArrayType</li> <li><b>ThermalConductivity-Array</b>: type ThermalConductivity-ArrayType</li> <li><b>SpecificHeatCapacity-Array</b>: type SpecificHeatCapacity-ArrayType</li> <li><b>Density-Array</b>: type Density-ArrayType</li> </ul>
type	<a href="#">MDK-ThermalPropertiesType</a> , <a href="#">GlassTransitionTemperature-ArrayType</a> , <a href="#">MeltingTemperatureType</a> , <a href="#">JEP30-D10:LinearExpansionCoefficient-ArrayType</a> , <a href="#">JEP30-D10:CubicExpansionCoefficient-ArrayType</a> , <a href="#">ThermalConductivity-ArrayType</a> , <a href="#">SpecificHeatCapacity-ArrayType</a> , <a href="#">Density-ArrayType</a>



### 5.4.3.2.1 Glass Transition Temperature - Array

path	<b>PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/GlassTransitionTemperature-Array</b>
diagram	<p>The diagram illustrates the structure of the <b>GlassTransitionTemperature-ArrayType</b>. It is an array of <b>GlassTransitionTemperature</b> objects. Each object contains the following elements:</p> <ul style="list-style-type: none"> <li><b>ID</b>: type</li> <li><b>Value</b>: type JEP30-D10:ValueSetType</li> <li><b>TestMethod</b>: type GlassTransitionTemperatureTestMethodType</li> <li><b>TemperatureUOM</b>: type JEP30-D10:Temperature-in-CelsiusUOMType</li> <li><b>FootnoteID</b>: type xs:string</li> </ul> <p>A <b>constraints</b> section is also present at the bottom of the diagram.</p>
type	<b>GlassTransitionTemperature-ArrayType, GlassTransitionTemperatureType, JEP30-D10:ValueSetType, GlassTransitionTemperatureTestMethodType, JEP30-D10:Temperature-in-CelsiusUOMType.</b>

The enumerated values of the *TestMethod* are

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

The *TemperatureUOM* is restricted to °C for this parameter.

### 5.4.3.2.2 Melting Temperature - Array

path	<b>PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/MeltingTemperature</b>
diagram	<p>The diagram illustrates the structure of the <b>MeltingTemperatureType</b>. It is an array of <b>MeltingTemperature</b> objects. Each object contains the following elements:</p> <ul style="list-style-type: none"> <li><b>Value</b>: type JEP30-D10:ValueSetType</li> <li><b>TemperatureUOM</b>: type JEP30-D10:Temperature-in-Celsius-or-KelvinUOMType</li> </ul>
type	<b>MeltingTemperatureType, JEP30-D10:ValueSetType, JEP30-D10:Temperature-in-Celsius-or-KelvinUOMType</b>

The *TemperatureUOM* is restricted to °C and K for this parameter.

5.4.3.2.3 Linear Expansion Coefficient - Array

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/LinearExpansionCoefficient-Array
diagram	
type	JEP30-D10:LinearExpansionCoefficient-ArrayType, LinearExpansionCoefficientType, TemperatureConditionType, LinearExpansionCoefficientValuesType, LinearExpansionCoefficientUOMType, RuleVsDirectional-xy-and-z-RuleType, LinearExpansionCoefficientGraph
group	JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.

The enumerated values for *LinearExpansionCoefficientUOM* are shown in Table 1 - UOM Enumerated Lists below.

## 5.4.3.2.3.1 Linear Expansion Coefficient Graph

path	<b>PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/LinearExpansionCoefficient-Array/ LinearExpansionCoefficientGraph</b>
diagram	<p>The diagram illustrates the structure of the <b>LinearExpansionCoefficientGraphType</b>. It is composed of several key elements:</p> <ul style="list-style-type: none"> <li><b>LinearExpansionCoefficientGraphType</b> (Root):       <ul style="list-style-type: none"> <li><b>GraphTitle</b> (xs:string)</li> <li><b>TestConditionDefinition</b> (TemperatureParametricGraphChartX-AxisType) - associated with <b>TemperatureUOM</b> (Temperature-in-Celsius-or-KelvinUOMType, default: °C) and <b>Formatting</b> (GraphChartX-AxisFormattingType).</li> <li><b>ParameterDefinition</b> (LinearExpansionCoefficientParametricGraphChartY-AxisType) - associated with <b>LinearExpansionCoefficientUOM</b> (LinearExpansionCoefficientUOMType) and <b>Formatting</b> (GraphChartY-AxisFormattingType).</li> <li><b>Data-Array</b> (LinearExpansionCoefficientParameterGraphData-ArrayType) - associated with <b>Data</b> (GraphDataType) and <b>Formatting</b> (GraphDataFormattingType).</li> <li><b>GraphFormula</b> (GraphFormulaType) - associated with <b>TestMethod</b> (xs:string).</li> <li><b>Formatting</b> (GraphFormattingType)</li> </ul> </li> <li><b>TemperatureParametricGraphChartX-AxisType</b> (Nested):       <ul style="list-style-type: none"> <li><b>AxisParameterIdentityGroup</b></li> <li><b>TemperatureUOM</b> (Temperature-in-Celsius-or-KelvinUOMType, default: °C)</li> <li><b>Formatting</b> (GraphChartX-AxisFormattingType)</li> </ul> </li> <li><b>LinearExpansionCoefficientParametricGraphChartY-AxisType</b> (Nested):       <ul style="list-style-type: none"> <li><b>ID</b> (xs:string)</li> <li><b>AxisParameterIdentityGroup</b></li> <li><b>LinearExpansionCoefficientUOM</b> (LinearExpansionCoefficientUOMType)</li> <li><b>Formatting</b> (GraphChartY-AxisFormattingType)</li> </ul> </li> <li><b>LinearExpansionCoefficientParameterGraphData-ArrayType</b> (Nested):       <ul style="list-style-type: none"> <li><b>ParameterDefinitionID</b> (xs:string)</li> <li><b>PlotTestCondition</b> (TemperatureGraphPlotConditionType)</li> <li><b>Data</b> (GraphDataType)</li> <li><b>Formatting</b> (GraphDataFormattingType)</li> </ul> </li> <li><b>GraphFormulaType</b> (Nested):       <ul style="list-style-type: none"> <li><b>LaTeX-and-MathML-RuleGroup</b></li> <li><b>TestMethod</b> (xs:string)</li> </ul> </li> </ul>
type	<b>LinearExpansionCoefficientGraphType</b> , JEP30-D10:TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, LinearExpansionCoefficientParametricGraphChartY-AxisType, LinearExpansionCoefficientUOMType, LinearExpansionCoefficientData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphFormulaType, JEP30-D10:GraphFormattingType
group	<b>AxisParameterIdentityGroup</b>

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/CubicExpansionCoefficient-Array
diagram	
type	JEP30-D10:CubicExpansionCoefficient-ArrayType, CubicExpansionCoefficientType, TemperatureConditionType, CubicExpansionCoefficientValuesType, CubicExpansionCoefficientUOMType, RuleVsDirectional-xy-and-z-RuleType, CubicExpansionCoefficientGraph
group	JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.

The enumerated values for *CubicExpansionCoefficientUOM* are shown in Table 1 - UOM Enumerated Lists below.

### 5.4.3.2.4.1 Cubic Expansion Coefficient Graph

path	<b>PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/CubicExpansionCoefficient-Array/ CubicExpansionCoefficientGraph</b>
diagram	
type	<b>CubicExpansionCoefficientGraphType, JEP30-D10:TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, CubicExpansionCoefficientParameterGraphChartY-AxisType, CubicExpansionCoefficientUOMType, CubicExpansionCoefficientData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphFormulaType, JEP30-D10:GraphFormattingType</b>
group	<b>AxisParameterIdentityGroup</b>

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

#### 5.4.3.2.5 Thermal Conductivity - Array

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/ThermalConductivity-Array
diagram	<pre> classDiagram     class ThermalConductivityArrayType {         JEP30-D10:ParameterIdentityGroup     }     class ThermalConductivityType {         ID JEP30-D10:ParameterIdentityGroup         TemperatureCondition JEP30-D10:TemperatureConditionType         Values JEP30-D10:ThermalConductivityValuesType         RuleVsDirectional-xy-and-z-Rule JEP30-D10:RuleVsDirectional-xy-and-z-RuleType     }     class ThermalConductivityArray {         ThermalConductivityArrayType     }     class ThermalConductivity {         ThermalConductivityType     }     class ThermalConductivityGraph {         ThermalConductivityGraphType     }     class ThermalConductivityValuesType {         JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup         ThermalConductivityUOM JEP30-D10:ThermalConductivityUOMType     }     ThermalConductivityArrayType -- ThermalConductivityArray     ThermalConductivityArrayType -- ThermalConductivity     ThermalConductivityArrayType -- ThermalConductivityGraph     ThermalConductivityType -- ThermalConductivity     ThermalConductivityType -- ThermalConductivityValuesType     ThermalConductivityType -- ThermalConductivityGraph     ThermalConductivityValuesType -- ThermalConductivityUOM     </pre> <p>The diagram illustrates the structure of the ThermalConductivity-ArrayType. It is composed of several subtypes and associated data types. The ThermalConductivity-ArrayType is the root, which includes a JEP30-D10:ParameterIdentityGroup. It is associated with ThermalConductivityArray, ThermalConductivity, and ThermalConductivityGraph. ThermalConductivityType is a subtype of ThermalConductivity-ArrayType, which includes an ID (JEP30-D10:ParameterIdentityGroup), a TemperatureCondition (JEP30-D10:TemperatureConditionType), Values (JEP30-D10:ThermalConductivityValuesType), and a RuleVsDirectional-xy-and-z-Rule (JEP30-D10:RuleVsDirectional-xy-and-z-RuleType). ThermalConductivityArray is a subtype of ThermalConductivity-ArrayType, which includes ThermalConductivityArrayType. ThermalConductivity is a subtype of ThermalConductivity-ArrayType, which includes ThermalConductivityType. ThermalConductivityGraph is a subtype of ThermalConductivity-ArrayType, which includes ThermalConductivityGraphType. ThermalConductivityValuesType is a subtype of ThermalConductivityType, which includes JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup and ThermalConductivityUOM (JEP30-D10:ThermalConductivityUOMType).</p>
type	ThermalConductivity-ArrayType, ThermalConductivityType, JEP30-D10:TemperatureConditionType, ThermalConductivityValuesType, ThermalConductivityUOMType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, ThermalConductivityGraphType.
group	JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.

The enumerated value for *ThermalConductivityUOM* is shown in Table 1 - UOM Enumerated Lists below.

### 5.4.3.2.5.1 Thermal Conductivity Graph

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/ThermalConductivity-Array/ThermalConductivityGraph
diagram	
type	ThermalConductivityGraphType, 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:GraphFormulaType, JEP30-D10:GraphFormattingType
group	AxisParameterIdentityGroup

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

### 5.4.3.2.6 Specific Heat Capacity - Array

path	<b>PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/SpecificHeatCapacity-Array</b>
diagram	
type	<b>SpecificHeatCapacity-ArrayType, SpecificHeatCapacityType, JEP30-D10:TemperatureConditionType, SpecificHeatCapacity-UOMType, JEP30-D10:RuleType, SpecificHeatGraphType.</b>
group	<b>JEP30-D10:ParameterIdentityGroup.</b>

The enumerated values for *SpecificHeatCapacityUOM* are shown in Table 1 - UOM Enumerated Lists below.



## 5.4.3.2.6.1 Specific Heat Capacity Graph

path	<b>PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/SpecificHeat-Array/SpecificHeatCapacityGraph</b>
diagram	
type	<b>SpecificHeatCapacityGraphType, JEP30-D10:TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, SpecificHeatCapacityParameterGraphChartY-AxisType, SpecificHeatCapacityUOMType, SpecificHeatCapacityData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphFormulaType, JEP30-D10:GraphFormattingType</b>
group	<b>AxisParameterIdentityGroup</b>

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

5.4.3.2.7 Density - Array

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/Density-Array
diagram	<p>The diagram illustrates the structure of the <b>Density-Array</b> element. It is a container for multiple <b>DensityType</b> elements (indicated by the <b>0..∞</b> cardinality). Each <b>DensityType</b> element contains an <b>ID</b> (type <b>xs:string</b>), a <b>TemperatureCondition</b> (type <b>JEP30-D10:TemperatureConditionType</b>), a <b>Value</b> (type <b>JEP30-D10:ValueSetType</b>), a <b>DensityUOM</b> (type <b>DensityUOMType</b>), a <b>TestMethod</b> (type <b>xs:string</b>), and a <b>Rule</b> (type <b>JEP30-D10:RuleType</b>). Additionally, there is a <b>DensityGraph</b> element (type <b>DensityGraphType</b>) associated with the <b>DensityType</b> element.</p>
type	Density-ArrayType, DensityType, JEP30-D10:TemperatureConditionType, JEP30-D10:ValueSetType, Density-UOMType, JEP30-D10:RuleType, DensityGraphType,
group	JEP30-D10:ParameterIdentityGroup.

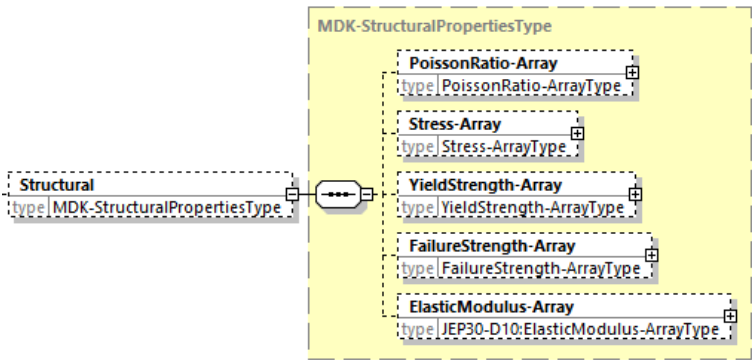
The enumerated values for *DensityUOM* are shown in Table 1 - UOM Enumerated Lists below.

## 5.4.3.2.7.1 Density Graph

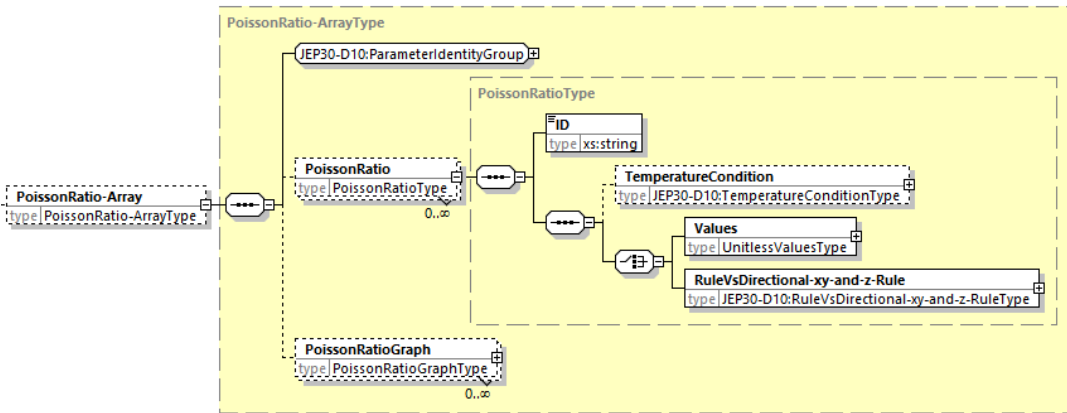
path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Thermal/Density-Array/DensityGraph
diagram	
type	DensityGraphType, JEP30-D10:TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, DensityParameterGraphChartY-AxisType, DensityUOMType, DensityData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphFormulaType, JEP30-D10:GraphFormattingType.
group	AxisParameterIdentityGroup

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

### 5.4.3.3 Structural

path	<a href="#">PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural</a>
diagram	 <p>The diagram shows a dashed box labeled <b>MDK-StructuralPropertiesType</b>. Inside, there are five sub-structures: <b>PoissonRatio-Array</b> (type: PoissonRatio-ArrayType), <b>Stress-Array</b> (type: Stress-ArrayType), <b>YieldStrength-Array</b> (type: YieldStrength-ArrayType), <b>FailureStrength-Array</b> (type: FailureStrength-ArrayType), and <b>ElasticModulus-Array</b> (type: JEP30-D10:ElasticModulus-ArrayType). A <b>Structural</b> box (type: MDK-StructuralPropertiesType) is connected to the main container via a multiplicity of 1.</p>
type	<a href="#">MDK-StructuralPropertiesType</a> , <a href="#">PoissonRatio-ArrayType</a> , <a href="#">Stress-ArrayType</a> , <a href="#">YieldStrength-ArrayType</a> , <a href="#">FailureStrength-ArrayType</a> , <a href="#">JEP30-D10:ElasticModulus-ArrayType</a> .

#### 5.4.3.3.1 Poisson Ratio - Array

path	<a href="#">PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/PoissonRatio-Array</a>
diagram	 <p>The diagram shows a dashed box labeled <b>PoissonRatio-ArrayType</b>. It contains a <b>JEP30-D10:ParameterIdentityGroup</b> and a <b>PoissonRatio</b> box (type: PoissonRatioType) with a multiplicity of 0..∞. The <b>PoissonRatio</b> box is connected to a <b>PoissonRatioType</b> box. The <b>PoissonRatioType</b> box has an <b>ID</b> (type: xs:string) and is connected to a <b>TemperatureCondition</b> box (type: JEP30-D10:TemperatureConditionType). The <b>TemperatureCondition</b> box is connected to a <b>Values</b> box (type: UnitlessValuesType). The <b>Values</b> box is connected to a <b>RuleVsDirectional-xy-and-z-Rule</b> box (type: JEP30-D10:RuleVsDirectional-xy-and-z-RuleType). A <b>PoissonRatioGraph</b> box (type: PoissonRatioGraphType) with a multiplicity of 0..∞ is also shown.</p>
type	<a href="#">PoissonRatio-ArrayType</a> , <a href="#">PoissonRatioType</a> , <a href="#">JEP30-D10:TemperatureConditionType</a> , <a href="#">UnitlessValuesType</a> , <a href="#">JEP30-D10:RuleVsDirectional-xy-and-z-RuleType</a> , <a href="#">PoissonRatioGraphType</a> .
group	<a href="#">JEP30-D10:ParameterIdentityGroup</a> .

## 5.4.3.3.1.1 Poisson Ratio Graph

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/PoissonRatio-Array/PoissonRatioGraph
diagram	<p>The diagram illustrates the structure of the PoissonRatioGraphType. It is composed of several nested and associated types:</p> <ul style="list-style-type: none"> <li><b>PoissonRatioGraphType</b> (Root Type):       <ul style="list-style-type: none"> <li><b>GraphTitle</b> (type: xs:string)</li> <li><b>TestConditionDefinition</b> (type: JEP30-D10:TemperatureParametricGraphChartX-AxisType)</li> <li><b>ParameterDefinition</b> (type: JEP30-D10:UnitlessParameterGraphChartY-AxisType)</li> <li><b>Data-Array</b> (type: PoissonRatioData-ArrayType)</li> <li><b>GraphFormula</b> (type: JEP30-D10:GraphFormulaType)</li> <li><b>Formatting</b> (type: JEP30-D10:GraphFormattingType)</li> </ul> </li> <li><b>JEP30-D10:TemperatureParametricGraphChartX-AxisType</b>:       <ul style="list-style-type: none"> <li><b>AxisParameterIdentityGroup</b></li> <li><b>TemperatureUOM</b> (type: Temperature-in-Celsius-or-KelvinUOMType, default: °C)</li> <li><b>Formatting</b> (type: GraphChartX-AxisFormattingType)</li> </ul> </li> <li><b>JEP30-D10:UnitlessParameterGraphChartY-AxisType</b>:       <ul style="list-style-type: none"> <li><b>ID</b> (type: xs:string)</li> <li><b>AxisParameterIdentityGroup</b></li> <li><b>Formatting</b> (type: GraphChartY-AxisFormattingType)</li> </ul> </li> <li><b>PoissonRatioData-ArrayType</b>:       <ul style="list-style-type: none"> <li><b>ParameterDefinitionID</b> (type: xs:string)</li> <li><b>PlotTestCondition</b> (type: JEP30-D10:TemperatureGraphPlotConditionType)</li> <li><b>Data</b> (type: JEP30-D10:GraphDataType)</li> <li><b>Formatting</b> (type: JEP30-D10:GraphDataFormattingType)</li> </ul> </li> </ul>
type	PoissonRatioGraphType, 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:GraphFormulaType, JEP30-D10:GraphFormattingType.
group	AxisParameterIdentityGroup

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

## 5.4.3.3.2 Stress - Array

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

The enumerated values for *StressUOM* are shown in Table 1 - UOM Enumerated Lists below.

## 5.4.3.3.2.1 Stress Graph

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/Stress-Array/StressGraph
diagram 1 of 2	<pre> classDiagram     class StressGraphType {         GraphTitle : type xs:string         TestConditionDefinition : type StressMDK-TestConditionParametricGraphChartX-AxisType         ParameterDefinition : type StressParameterGraphChartY-AxisType         Data-Array : type StressData-ArrayType         GraphFormula : type JEP30-D10:GraphFormulaType         Formatting : type JEP30-D10:GraphFormattingType     }     class StressMDK-TestConditionParametricGraphChartX-AxisType {         JEP30-D10:AxisParameterIdentityGroup         Units : type StressTestConditionUnitsType         Formatting : type JEP30-D10:GraphChartX-AxisFormattingType     }     class StressParameterGraphChartY-AxisType {         ID : type xs:string         JEP30-D10:AxisParameterIdentityGroup         StressUOM : type StressUOMType         Formatting : type JEP30-D10:GraphChartY-AxisFormattingType     }     class StressData-ArrayType {         ParameterDefinitionID : type xs:string         PlotTestCondition : type StressGraphPlotTestConditionType         Data : type JEP30-D10:GraphDataType         Formatting : type JEP30-D10:GraphDataFormattingType     }     class GraphTitle {         type xs:string     }     class TestConditionDefinition {         type StressMDK-TestConditionParametricGraphChartX-AxisType     }     class ParameterDefinition {         type StressParameterGraphChartY-AxisType     }     class Data-Array {         type StressData-ArrayType     }     class GraphFormula {         type JEP30-D10:GraphFormulaType     }     class Formatting {         type JEP30-D10:GraphFormattingType     }     class JEP30-D10:AxisParameterIdentityGroup     class StressTestConditionUnitsType {         type StressTestConditionUnitsType     }     class JEP30-D10:GraphChartX-AxisFormattingType {         type JEP30-D10:GraphChartX-AxisFormattingType     }     class JEP30-D10:AxisParameterIdentityGroup     class StressUOMType {         type StressUOMType     }     class JEP30-D10:GraphChartY-AxisFormattingType {         type JEP30-D10:GraphChartY-AxisFormattingType     }     class JEP30-D10:AxisParameterIdentityGroup     class StressGraphPlotTestConditionType {         type StressGraphPlotTestConditionType     }     class JEP30-D10:GraphDataType {         type JEP30-D10:GraphDataType     }     class JEP30-D10:GraphDataFormattingType {         type JEP30-D10:GraphDataFormattingType     }      StressGraphType "0..∞" -- "1..∞" TestConditionDefinition     StressGraphType "0..∞" -- "1..∞" ParameterDefinition     StressGraphType "0..∞" -- "1..∞" Data-Array     StressGraphType "0..∞" -- "1..∞" GraphFormula     StressGraphType "0..∞" -- "1..∞" Formatting     StressGraphType "0..∞" -- "1..∞" JEP30-D10:AxisParameterIdentityGroup     StressGraphType "0..∞" -- "1..∞" StressTestConditionUnitsType     StressGraphType "0..∞" -- "1..∞" JEP30-D10:GraphChartX-AxisFormattingType     StressGraphType "0..∞" -- "1..∞" JEP30-D10:AxisParameterIdentityGroup     StressGraphType "0..∞" -- "1..∞" StressUOMType     StressGraphType "0..∞" -- "1..∞" JEP30-D10:GraphChartY-AxisFormattingType     StressGraphType "0..∞" -- "1..∞" JEP30-D10:AxisParameterIdentityGroup     StressGraphType "0..∞" -- "1..∞" StressGraphPlotTestConditionType     StressGraphType "0..∞" -- "1..∞" JEP30-D10:GraphDataType     StressGraphType "0..∞" -- "1..∞" JEP30-D10:GraphDataFormattingType     </pre>
type	StressGraphType, StressMDK-TestConditionParametricGraphChartX-AxisTypeType, StressTestConditionUnitsType, JEP30-D10:GraphChartX-AxisFormattingType, StressParameterGraphChartY-AxisType, StressUOMType, JEP30-D10:GraphChartY-AxisFormattingType, StressData-ArrayType, StressGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphFormulaType, JEP30-D10:GraphFormattingType.
group	JEP30-D10:AxisParameterIdentityGroup

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

### 5.4.3.3.2.1.1 Units

path	<a href="#">PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/Stress-Array/StressGraph/TestConditionDefinition/Units</a>
diagram	
type	<a href="#">StressTestConditionUnitsType</a> , <a href="#">StrainUOMType</a> , <a href="#">StrainRateUOMType</a> , <a href="#">JEP30-D10:Temperature-in-Celsius-or-KelvinUOMType</a> ,

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

### 5.4.3.3.2.1.2 Plot Test Condition

path	<a href="#">PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/Stress-Array/StressGraph/Data-Array/PlotTestCondition</a>
diagram	
type	<a href="#">StressGraphPlotTestConditionType</a> , <a href="#">JEP30-D10:ValueSetType</a> , <a href="#">StressTestConditionUnitsType</a> , <a href="#">JEP30-D10:GraphDataFormattingLegendType</a> .
group	<a href="#">JEP30-D10:ParameterIdentityGroup</a> , <a href="#">JEP30-D10:LaTeX-and-MathML-RuleGroup</a> .



### 5.4.3.3.3 Yield Strength - Array

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

The enumerated values for *YieldStrengthUOM* which refers to the *StressUOMType* are shown in Table 1 - UOM Enumerated Lists below.

## 5.4.3.3.3.1 Yield Strength Graph

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/YieldStrength-Array/YieldStrengthGraph
diagram	
type	YieldStrengthGraphType, 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:GraphFormulaType, JEP30-D10:GraphFormattingType
group	AxisParameterIdentityGroup

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

#### 5.4.3.3.4 Failure Strength - Array

path	<b>PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/FailureStrength-Array</b>
diagram	<pre> classDiagram     class FailureStrengthArrayType {         FailureStrength-Array FailureStrength-ArrayType         FailureStrengthType FailureStrengthType     }     class FailureStrengthType {         ID xs:string         TemperatureCondition JEP30-D10:TemperatureConditionType         Values FailureStrengthValuesType         RuleVsDirectional-xy-and-z-Rule JEP30-D10:RuleVsDirectional-xy-and-z-RuleType     }     class FailureStrengthValuesType {         FailureStrengthUOM StressUOMType     }     class FailureStrengthGraphType {     }     FailureStrengthArrayType --&gt; FailureStrengthType     FailureStrengthType --&gt; FailureStrengthValuesType     FailureStrengthType --&gt; FailureStrengthGraphType     FailureStrengthValuesType --&gt; FailureStrengthUOM     </pre>
type	<b>FailureStrength-ArrayType, FailureStrengthType, JEP30-D10:TemperatureConditionType, FailureStrengthValuesType, FailureStrength-UOMType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, FailureStrengthGraphType.</b>
group	<b>JEP30-D10:ParameterIdentityGroup, JEP30-D10:ValueVsDirectional-xy-and-z-ValueGroup.</b>

The enumerated values for *FailureStrengthUOM* which refers to the *StressUOMType* are shown in Table 1 - UOM Enumerated Lists below.

## 5.4.3.3.4.1 Failure Strength Graph

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/FailureStrength-Array/FailureStrengthGraph
diagram	<p>The diagram illustrates the structure of the FailureStrengthGraphType. It includes a self-association for GraphTitle (xs:string). It is associated with TestConditionDefinition (JEP30-D10:TemperatureParametricGraphChartX-AxisType) via an AxisParameterIdentityGroup. It is associated with ParameterDefinition (FailureStrengthParameterGraphChartY-AxisType) via an AxisParameterIdentityGroup. It is associated with Data-Array (FailureStrengthData-ArrayType) via an AxisParameterIdentityGroup. It is associated with GraphFormula (JEP30-D10:GraphFormulaType) via an AxisParameterIdentityGroup. It is associated with Formatting (JEP30-D10:GraphFormattingType) via an AxisParameterIdentityGroup. The diagram also shows nested structures for TemperatureParametricGraphChartX-AxisType, FailureStrengthParameterGraphChartY-AxisType, FailureStrengthData-ArrayType, and JEP30-D10:GraphFormulaType, each containing their own attributes and formatting rules.</p>
type	FailureStrengthGraphType, 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:GraphFormulaType, JEP30-D10:GraphFormattingType
group	AxisParameterIdentityGroup

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

### 5.4.3.3.5 Elastic Modulus- Array

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/ElasticModulus-Array
diagram	
type	JEP30-D10:ElasticModulus-ArrayType, ElasticModulusType, ElasticModulusType, ElasticModulusValuesType, RuleVsDirectional-xy-and-z-RuleType, ElasticModulusGraphType.
group	ParameterIdentityGroup, ValueVsDirectional-xy-and-z-ValueGroup,

The enumerated values for *ElasticModulus-UOM* are shown in Table 1 - UOM Enumerated Lists below.

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Structural/YoungsModulus-Array/ElasticModulusGraph
diagram	
type	ElasticModulusGraphType, TemperatureParametricGraphChartX-AxisType, Temperature-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, ElasticModulusParameterGraphChartY-AxisType, ElasticModulusUOMType, ElasticModulusData-ArrayType, JEP30-D10:TemperatureGraphPlotConditionType, JEP30-D10:GraphDataType, JEP30-D10:GraphDataFormattingType, JEP30-D10:GraphFormulaType, JEP30-D10:GraphFormattingType
group	AxisParameterIdentityGroup

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

### 5.4.3.4 Optical

path	<a href="#">PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Optical</a>
diagram	
type	<a href="#">MDK-OpticalPropertiesType</a> , <a href="#">RefractiveIndex-ArrayType</a> , <a href="#">Reflectance-ArrayType</a> , <a href="#">Transmission-ArrayType</a> .

#### 5.4.3.4.1 Refractive Index - Array

path	<a href="#">PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Optical/RefractiveIndex-Array</a>
diagram	
type	<a href="#">RefractiveIndex-ArrayType</a> , <a href="#">RefractiveIndexType</a> , <a href="#">WavelengthConditionType</a> , <a href="#">WavelengthSymbolType</a> , <a href="#">WavelengthUOMType</a> , <a href="#">UnitlessValuesType</a> , <a href="#">JEP30-D10:RuleVsDirectional-xy-and-z-RuleType</a> , <a href="#">RefractiveIndexGraphType</a> .
group	<a href="#">JEP30-D10:ParameterIdentityGroup</a> .

The enumerated value for Wavelength *Symbol* is “Lamba” although its identity can be defined under the *ParameterIdentityGroup*. The enumerated values for *WavelengthUOM* are shown in Table 1 - UOM Enumerated Lists below.

## 5.4.3.4.1.1 Refractive Index Graph

path	<a href="#">PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Optical/RefractiveIndex-Array/RefractiveIndexGraph</a>
diagram	
type	<a href="#">RefractiveIndexGraphType</a> , <a href="#">JEP30-D10:WavelengthParametricGraphChartX-AxisType</a> , <a href="#">WavelengthUOMType</a> , <a href="#">GraphChartX-AxisFormattingType</a> , <a href="#">JEP30-D10:UnitlessParameterGraphChartY-AxisType</a> , <a href="#">GraphChartY-AxisFormattingType</a> , <a href="#">RefractiveIndexData-ArrayType</a> , <a href="#">JEP30-D10:WavelengthGraphPlotConditionType</a> , <a href="#">JEP30-D10:GraphDataType</a> , <a href="#">JEP30-D10:GraphDataFormattingType</a> , <a href="#">JEP30-D10:GraphFormulaType</a> , <a href="#">JEP30-D10:GraphFormattingType</a> .
group	<a href="#">AxisParameterIdentityGroup</a>

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.



## 5.4.3.4.2 Reflectance - Array

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Optical/Reflectance-Array
diagram	<p>The diagram illustrates the structure of the Reflectance-ArrayType. It shows a hierarchy of classes and their associations. The Reflectance-Array class (type Reflectance-ArrayType) is associated with the Reflectance class (type ReflectanceType) with a multiplicity of 0..∞. The Reflectance class is associated with the ReflectanceType class (type ReflectanceType) with a multiplicity of 0..∞. The ReflectanceType class is associated with the WavelengthCondition class (type WavelengthConditionType) with a multiplicity of 0..∞. The WavelengthCondition class is associated with the Values class (type UnitlessValuesType) with a multiplicity of 0..∞. The Values class is associated with the RuleVsDirectional-xy-and-z-Rule class (type JEP30-D10:RuleVsDirectional-xy-and-z-RuleType) with a multiplicity of 0..∞. A JEP30-D10:ParameterIdentityGroup is also shown associated with the Reflectance-Array class.</p>
type	Reflectance-ArrayType, ReflectanceType, WavelengthConditionType, UnitlessValuesType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, ReflectanceGraphType.
group	JEP30-D10:ParameterIdentityGroup.

## 5.4.3.4.2.1 Reflectance Graph

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Optical/Reflectance-Array/ReflectanceGraph
diagram	<pre> classDiagram     class ReflectanceGraphType {         GraphTitle xs:string         TestConditionDefinition WavelengthParametricGraphChartX-AxisType         ParameterDefinition JEP30-D10:UnitlessParameterGraphChartY-AxisType         Data-Array ReflectanceData-ArrayType         GraphFormula JEP30-D10:GraphFormulaType         Formatting JEP30-D10:GraphFormattingType     }     class WavelengthParametricGraphChartX-AxisType {         JEP30-D10:AxisParameterIdentityGroup         WavelengthUOM WavelengthUOMType         Formatting JEP30-D10:GraphChartX-AxisFormattingType     }     class JEP30-D10:UnitlessParameterGraphChartY-AxisType {         ID xs:string         AxisParameterIdentityGroup         Formatting GraphChartY-AxisFormattingType     }     class ReflectanceData-ArrayType {         ParameterDefinitionID xs:string         PlotTestCondition WavelengthGraphPlotConditionType         Data JEP30-D10:GraphDataType         Formatting JEP30-D10:GraphDataFormattingType     }     ReflectanceGraphType "0..∞" -- "1..∞" WavelengthParametricGraphChartX-AxisType     ReflectanceGraphType "0..∞" -- "1..∞" JEP30-D10:UnitlessParameterGraphChartY-AxisType     ReflectanceGraphType "0..∞" -- "1..∞" ReflectanceData-ArrayType     ReflectanceGraphType "0..∞" -- "1..∞" GraphFormula     ReflectanceGraphType "0..∞" -- "1..∞" Formatting     WavelengthParametricGraphChartX-AxisType "1..∞" -- "1..∞" JEP30-D10:AxisParameterIdentityGroup     WavelengthParametricGraphChartX-AxisType "1..∞" -- "1..∞" WavelengthUOMType     WavelengthParametricGraphChartX-AxisType "1..∞" -- "1..∞" JEP30-D10:GraphChartX-AxisFormattingType     JEP30-D10:UnitlessParameterGraphChartY-AxisType "1..∞" -- "1..∞" ID     JEP30-D10:UnitlessParameterGraphChartY-AxisType "1..∞" -- "1..∞" AxisParameterIdentityGroup     JEP30-D10:UnitlessParameterGraphChartY-AxisType "1..∞" -- "1..∞" GraphChartY-AxisFormattingType     ReflectanceData-ArrayType "0..∞" -- "0..∞" ParameterDefinitionID     ReflectanceData-ArrayType "0..∞" -- "0..∞" PlotTestCondition     ReflectanceData-ArrayType "0..∞" -- "1..∞" Data     ReflectanceData-ArrayType "0..∞" -- "1..∞" JEP30-D10:GraphDataFormattingType     GraphFormula "1..∞" -- "1..∞" JEP30-D10:GraphFormulaType     Formatting "1..∞" -- "1..∞" JEP30-D10:GraphFormattingType     </pre> <p>constraints</p>
type	ReflectanceGraphType, 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:GraphFormulaType, JEP30-D10:GraphFormattingType.
group	AxisParameterIdentityGroup

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

## 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, TransmissionGraphType.
group	JEP30-D10:ParameterIdentityGroup.

## 5.4.3.4.3.1 Transmission Graph

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/Optical/Transmission-Array/TransmissionGraph
diagram	
type	TransmissionGraphType, 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:GraphFormulaType, JEP30-D10:GraphFormattingType.
group	AxisParameterIdentityGroup

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

## 5.4.3.5 Other Property - Array

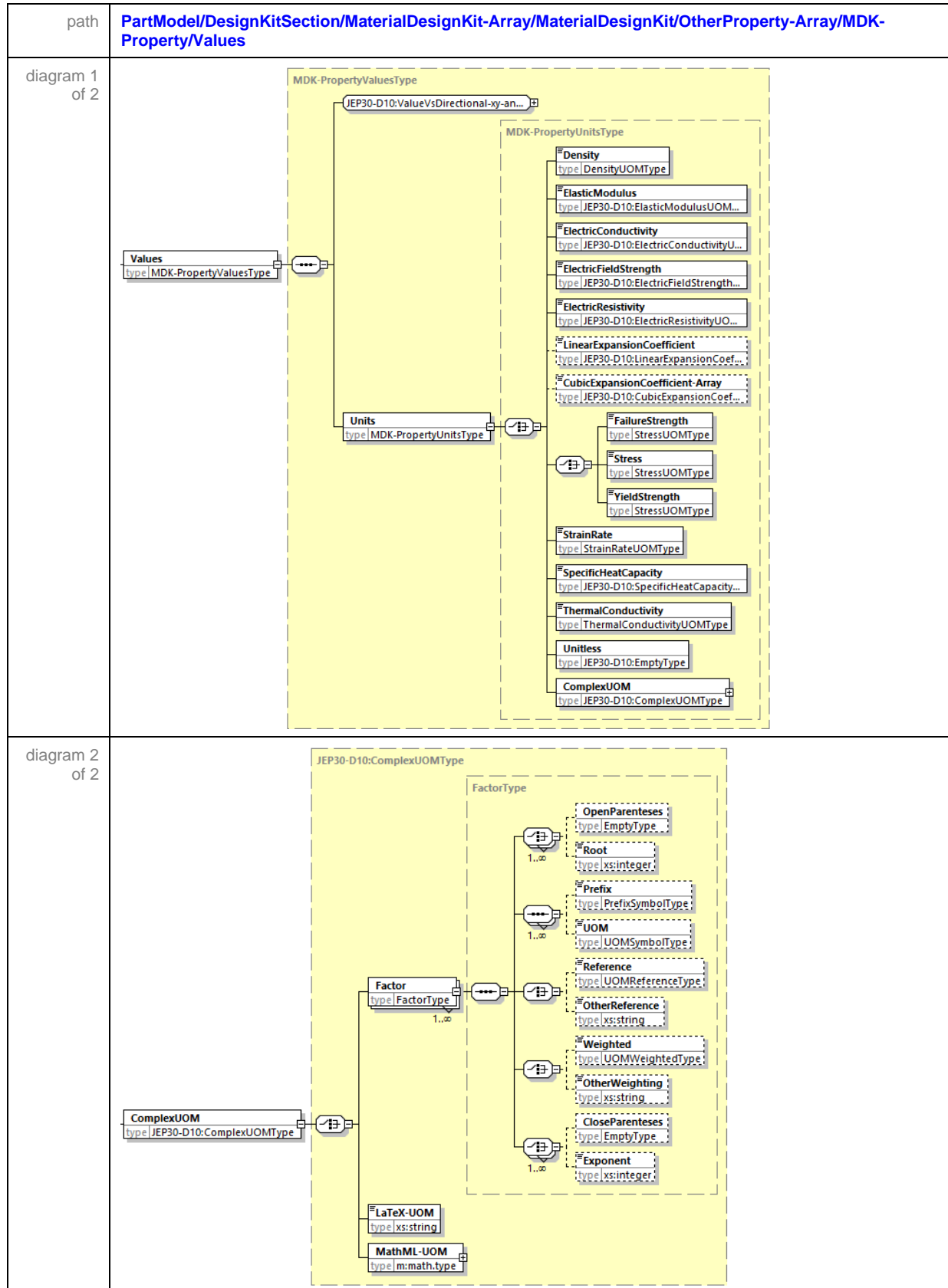
path	<b>PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/OtherProperty-Array</b>
diagram	<p>The diagram illustrates the structure of the <b>OtherProperty-Array</b> element. It is an array of <b>MDK-Property</b> elements. Each <b>MDK-Property</b> element contains an <b>ID</b>, a <b>TestCondition</b>, and <b>Values</b>. The <b>TestCondition</b> element contains a <b>ValueText</b> and a <b>RuleVsDirectional-xy-and-z-Rule</b>. The <b>Values</b> element contains a <b>RuleVsDirectional-xy-and-z-Rule</b>. The <b>MDK-Property</b> element also contains an <b>MDK-PropertyGraph</b>.</p>
type	<b>MDK-OtherProperty-ArrayType, MDK-PropertyType, MDK-TestConditionType, MDK-PropertyValuesType, JEP30-D10:RuleVsDirectional-xy-and-z-RuleType, MDK-PropertyGraphType.</b>
group	<b>JEP30-D10:ParameterIdentityGroup.</b>

## 5.4.3.5.1 Test Condition

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

The enumerated values for the various UOM types are shown in Table 1 - UOM Enumerated Lists below.

## 5.4.3.5.2 Values



**5.4.3.5.2. Values (cont'd)**

type	MDK-PropertyValuesType, MDK-PropertyUnitsType, DensityUOMType, JEP30-D10:ElasticModulus-UOMType, JEP30-D10:ElectricConductivityUOMType, JEP30-D10:ElectricResistivityUOMType, JEP30-D10:LinearExpansionCoefficient-ArrayType, JEP30-D10:CubicExpansionCoefficient-ArrayType, JEP30-D10:ElectricFieldStrengthUOMType, StressUOMType, JEP30-D10:SpecificHeatCapacityUOMType, ThermalConductivityUOMType, JEP30-D10:EmptyType, JEP30-D10:ComplexUOMType, FactorType, PrefixSymbolType, UOMSymbolType, UOMReferenceType, UOMWeightedType.
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 1.

**Table 1 — UOM Enumerated Lists**

Unit	Enumerated Values									
Density	kg/m <sup>3</sup>	g/cm <sup>3</sup>								
Dimension	nm	μm	mm	m	μin	mil	in			
Electric Conductivity	S/m									
Electric Field Strength	μV/m	mV/m	V/m	kV/m	MV/m	V/cm	kV/cm	MV/cm		
Electric Resistivity	Ω·m									
Force	Pa	MPa	GPa							
Elastic Modulus ( <i>Restriction based on Force</i> )				Pa	GPa					
Stress ( <i>Restriction based on Force</i> )				Pa	MPa					
Frequency	mHz	Hz	kHz	MHz	GHz	THz				
Linear Expansion Coefficient		°C <sup>-1</sup>	K <sup>-1</sup>							
Cubic Expansion Coefficient		°C <sup>-1</sup>	K <sup>-1</sup>							
Specific Heat Capacity	J/(g·K)	J/(kg·K)	J/(g·°C)	J/(kg·°C)	calIT/(g·K)		kcalIT/(g·K)		calIT/(g·°C)	
	kcalIT/(g·°C)		calth/(g·K)		kcalth/(g·K)		calth/(g·°C)		kcalth/(g·°C)	
Strain	μm/m	mm/m	m/m							
Strain Rate	ms <sup>-1</sup>	s <sup>-1</sup>								
Temperature	°C	°F	K							
Temperature-in-Celsius ( <i>Restriction based on Temperature</i> )					°C					
Temperature-in-Celsius-or-Kelvin ( <i>Restriction based on Temperature</i> )					°C	K				
Thermal Conductivity	W/(m·K)									
Wavelength	pm	nm	μm							

**5.4.3.5.2. Values (cont'd)****Table 1 - UOM Enumerated Lists (cont'd)**

Unit	Enumerated Values									
Complex UOM										
- Prefix	a	f	p	n	μ	c	m	k	M	G
	T									
- UOM	%	°C	°F	A	bar	bit	byte	C	cd	cycles
	dB	dpi	e <sup>-</sup>	F	fc	ft	g	gn	H	h
	Hz	in	J	K	lm	LSB	lx	m	min	N
	Pa	ppm	ppb	ppt	ppq	ppcm	ppi	px	rad	rev
	S	s	T	t	Torr	V	VAR	W	Wb	γ
	ε	Ω								
- Reference	c	d	i	rn						
- Weighted	(A)	(C)	(O)	(Z)						

### 5.4.3.5.3 MDK - Property Graph

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/OtherProperty-Array/MDK-PropertyGraph
diagram	<pre> classDiagram     class MDK_PropertyGraphType {         type xs:string     }     class GraphTitle {         type xs:string     }     class TestConditionParametricGraphChartX_Axis {         type MDK_TestConditionParametricGraphChartX_AxisType     }     class ParameterDefinition {         type MDK_ParameterDefinitionGraphChartY_AxisType     }     class Data_Array {         type MDK_PropertyData_ArrayType     }     class GraphFormula {         type JEP30-D10:GraphFormulaType     }     class Formatting1 {         type JEP30-D10:GraphFormattingType     }     class MDK_TestConditionParametricGraphChartX_AxisType {         type JEP30-D10:AxisParameterIdentityGroup         type MDK_TestConditionUnitsType         type JEP30-D10:GraphChartX-AxisFormattingType     }     class MDK_ParameterDefinitionGraphChartY_AxisType {         type xs:string         type JEP30-D10:AxisParameterIdentityGroup         type MDK_PropertyUnitsType         type JEP30-D10:GraphChartY-AxisFormattingType     }     class MDK_PropertyData_ArrayType {         type xs:string         type MDK_PropertyPlotTestConditionType         type JEP30-D10:GraphDataType         type JEP30-D10:GraphDataFormattingType     }     class JEP30-D10:GraphChartX-AxisFormattingType     class JEP30-D10:GraphChartY-AxisFormattingType     class JEP30-D10:GraphDataType     class JEP30-D10:GraphDataFormattingType     class JEP30-D10:GraphFormulaType      MDK_PropertyGraphType "1" -- "1..∞" GraphTitle     MDK_PropertyGraphType "1" -- "1..∞" TestConditionParametricGraphChartX_Axis     MDK_PropertyGraphType "1" -- "1..∞" ParameterDefinition     MDK_PropertyGraphType "1" -- "1..∞" Data_Array     MDK_PropertyGraphType "1" -- "1..∞" GraphFormula     MDK_PropertyGraphType "1" -- "1..∞" Formatting1     TestConditionParametricGraphChartX_Axis "1" -- "1..∞" MDK_TestConditionParametricGraphChartX_AxisType     ParameterDefinition "1" -- "1..∞" MDK_ParameterDefinitionGraphChartY_AxisType     Data_Array "1" -- "1..∞" MDK_PropertyData_ArrayType     MDK_TestConditionParametricGraphChartX_AxisType "1" -- "1..∞" MDK_TestConditionUnitsType     MDK_TestConditionParametricGraphChartX_AxisType "1" -- "1..∞" JEP30-D10:GraphChartX-AxisFormattingType     MDK_ParameterDefinitionGraphChartY_AxisType "1" -- "1..∞" xs:string     MDK_ParameterDefinitionGraphChartY_AxisType "1" -- "1..∞" JEP30-D10:AxisParameterIdentityGroup     MDK_ParameterDefinitionGraphChartY_AxisType "1" -- "1..∞" MDK_PropertyUnitsType     MDK_ParameterDefinitionGraphChartY_AxisType "1" -- "1..∞" JEP30-D10:GraphChartY-AxisFormattingType     MDK_PropertyData_ArrayType "1" -- "1..∞" MDK_PropertyPlotTestConditionType     MDK_PropertyData_ArrayType "1" -- "1..∞" JEP30-D10:GraphDataType     MDK_PropertyData_ArrayType "1" -- "1..∞" JEP30-D10:GraphDataFormattingType     JEP30-D10:GraphChartX-AxisFormattingType "1" -- "1..∞" JEP30-D10:GraphChartX-AxisFormattingType     JEP30-D10:GraphChartY-AxisFormattingType "1" -- "1..∞" JEP30-D10:GraphChartY-AxisFormattingType     JEP30-D10:GraphDataType "1" -- "1..∞" JEP30-D10:GraphDataType     JEP30-D10:GraphDataFormattingType "1" -- "1..∞" JEP30-D10:GraphDataFormattingType     JEP30-D10:GraphFormulaType "1" -- "1..∞" JEP30-D10:GraphFormulaType     </pre>
type	MDK-PropertyGraphType, 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:GraphFormulaType, JEP30-D10:GraphFormattingType.
group	AxisParameterIdentityGroup

#### 5.4.3.5.4 Property Plot Test Condition

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/OtherProperty-Array/MDK-PropertyGraph/Data-Array/PropertyPlotTestCondition
diagram	
type	MDK-PropertyPlotTestConditionType, JEP30-D10:ValueSetType, MDK-TestConditionUnitsType, JEP30-D10:GraphDataFormattingLegendType.
group	JEP30-D10:ParameterIdentityGroup, JEP30-D10:LaTeX-and-MathML-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	<pre> classDiagram     class ParameterIdentityGroup {         Name xs:string         StandardsAuthorityBodyID xs:string         Property-ID xs:string         LaTeX-Symbol xs:string         MathML-Symbol m:math.type         SymbolDescription xs:string         Definition xs:string         FootnoteID xs:string     }     ParameterIdentityGroup "0..∞" -- "*" ParameterIdentityGroup     </pre>
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	ValueSetType
group	ValueVsDirectional-xy-and-z-ValueGroup

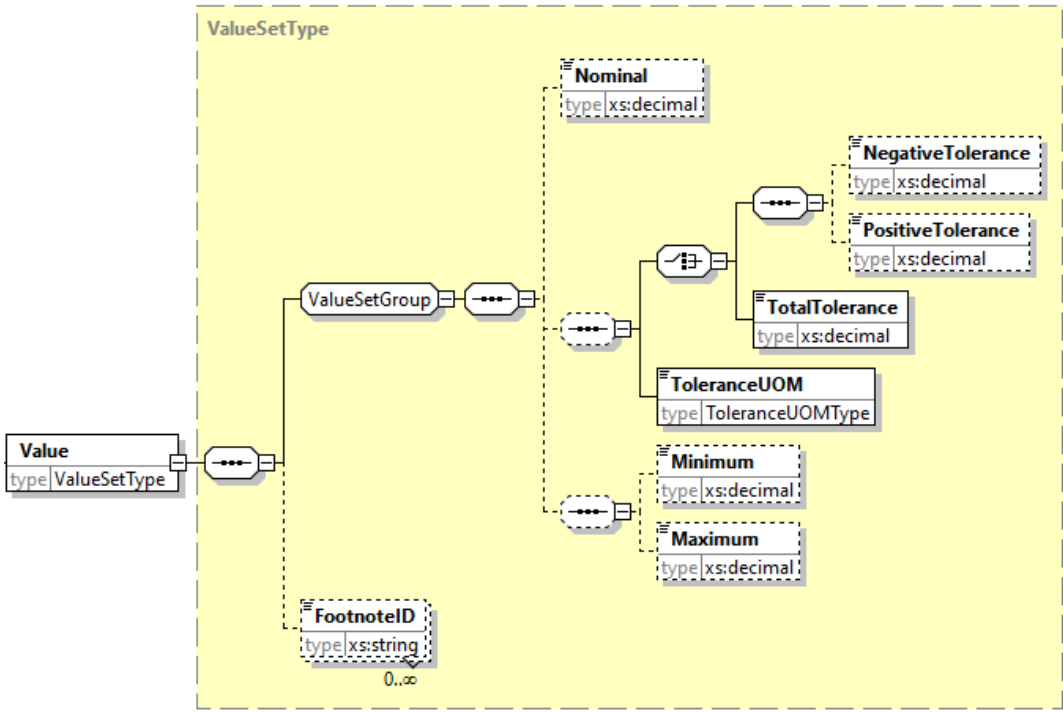
#### 5.4.3.6.3 Rule Vs Directional – xy – and – z - Rule

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	LaTeX-and-MathML-RuleGroup.

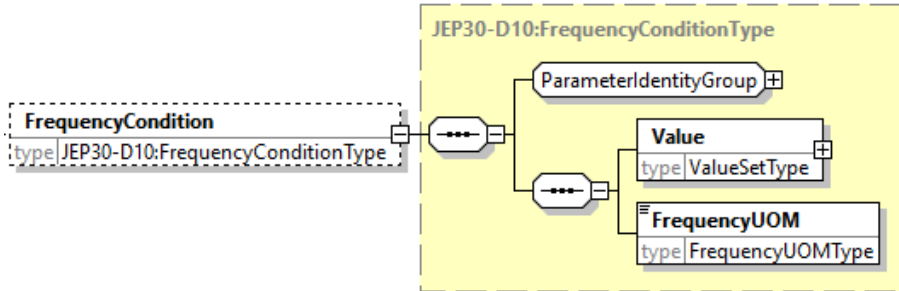
5.4.3.6.3.1 LaTeX - and - MathML - Rule Group

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/.../...-Array/.../Jep30-D10:LaTeX-and-MathML-RuleGroup
diagram	
type	MinNomMaxRuleContextType, EmptyType.
group	LaTeX-and-MathML-RuleGroup.

#### 5.4.3.6.4 Value Set Group Type

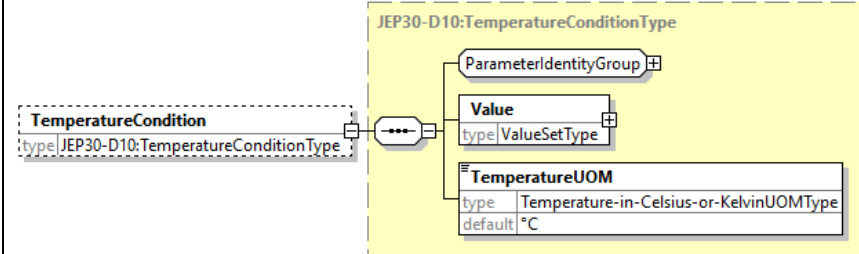
path	<a href="#">PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/...-Array/.../Value</a>
diagram	 <p>The diagram illustrates the structure of the <b>ValueSetType</b>. It is a dashed box containing several elements:         <ul style="list-style-type: none"> <li><b>Value</b>: A box with <code>type ValueSetType</code>.</li> <li><b>ValueSetGroup</b>: A box with a dashed line and a plus sign, connected to the <b>Value</b> box.</li> <li><b>FootnoteID</b>: A dashed box with <code>type xs:string</code> and a range of <code>0..∞</code>.</li> <li><b>Nominal</b>: A box with <code>type xs:decimal</code>.</li> <li><b>NegativeTolerance</b>: A box with <code>type xs:decimal</code>.</li> <li><b>PositiveTolerance</b>: A box with <code>type xs:decimal</code>.</li> <li><b>TotalTolerance</b>: A box with <code>type xs:decimal</code>.</li> <li><b>ToleranceUOM</b>: A box with <code>type ToleranceUOMType</code>.</li> <li><b>Minimum</b>: A box with <code>type xs:decimal</code>.</li> <li><b>Maximum</b>: A box with <code>type xs:decimal</code>.</li> </ul>         The <b>ValueSetGroup</b> box is connected to the <b>Nominal</b>, <b>NegativeTolerance</b>, <b>PositiveTolerance</b>, <b>TotalTolerance</b>, <b>ToleranceUOM</b>, <b>Minimum</b>, and <b>Maximum</b> boxes.       </p>
type	<a href="#">ValueSetType</a> , <a href="#">ToleranceUOMType</a>
group	<a href="#">ValueSetGroup</a>

#### 5.4.3.6.5 Frequency Condition Type

path	<a href="#">PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/...-Array/.../FrequencyCondition</a>
diagram	 <p>The diagram illustrates the structure of the <b>JEP30-D10:FrequencyConditionType</b>. It is a dashed box containing several elements:         <ul style="list-style-type: none"> <li><b>FrequencyCondition</b>: A dashed box with <code>type JEP30-D10:FrequencyConditionType</code>.</li> <li><b>ParameterIdentityGroup</b>: A box with a dashed line and a plus sign.</li> <li><b>Value</b>: A box with <code>type ValueSetType</code>.</li> <li><b>FrequencyUOM</b>: A box with <code>type FrequencyUOMType</code>.</li> </ul>         The <b>FrequencyCondition</b> box is connected to the <b>ParameterIdentityGroup</b> box, which is then connected to the <b>Value</b> and <b>FrequencyUOM</b> boxes.       </p>
type	<a href="#">JEP30-D10:FrequencyConditionType</a> , <a href="#">ValueSetType</a> , <a href="#">FrequencyUOMType</a> .
group	<a href="#">ParameterIdentityGroup</a> .

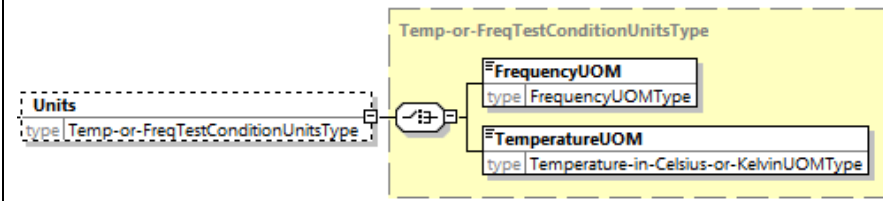
The enumerated values for [FrequencyUOM](#) are shown in Table 1 — UOM Enumerated Lists above.

5.4.3.6.6 Temperature Condition Type

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

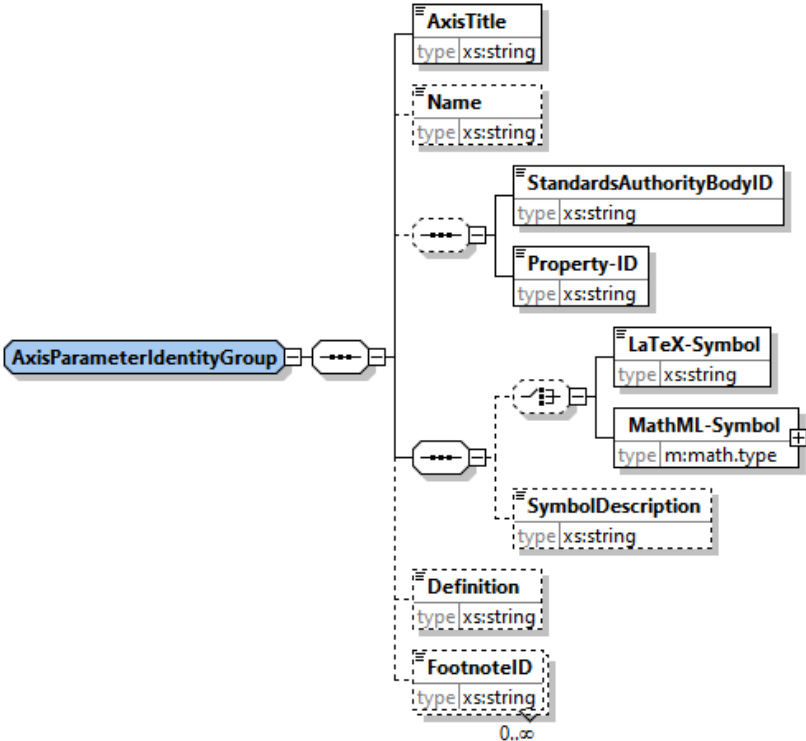
The enumerated values for *TemperatureUOM* is further restricted via *Temperature-in-Celsius-or-KelvinUOMType* to °C and K for this parameter.

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	 <p>The diagram illustrates the structure of the <b>AxisParameterIdentityGroup</b> class. It is a container class, indicated by a blue rounded rectangle. The class contains several attributes and methods, represented by boxes with dashed borders and solid borders respectively. The attributes are: <b>AxisTitle</b> (type xs:string), <b>Name</b> (type xs:string), <b>StandardsAuthorityBodyID</b> (type xs:string), <b>Property-ID</b> (type xs:string), <b>LaTeX-Symbol</b> (type xs:string), <b>MathML-Symbol</b> (type m:math.type), <b>SymbolDescription</b> (type xs:string), <b>Definition</b> (type xs:string), and <b>FootnoteID</b> (type xs:string). The methods are: <b>StandardsAuthorityBodyID</b> (type xs:string), <b>Property-ID</b> (type xs:string), <b>LaTeX-Symbol</b> (type xs:string), <b>MathML-Symbol</b> (type m:math.type), <b>SymbolDescription</b> (type xs:string), <b>Definition</b> (type xs:string), and <b>FootnoteID</b> (type xs:string). The class is associated with a <b>TestConditionDefinition</b> class, which is represented by a box with a dashed border and a plus sign in the bottom right corner. The association is labeled with the cardinality <b>0..∞</b>.</p>
group	AxisParameterIdentityGroup

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:GraphFormulaType, 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.

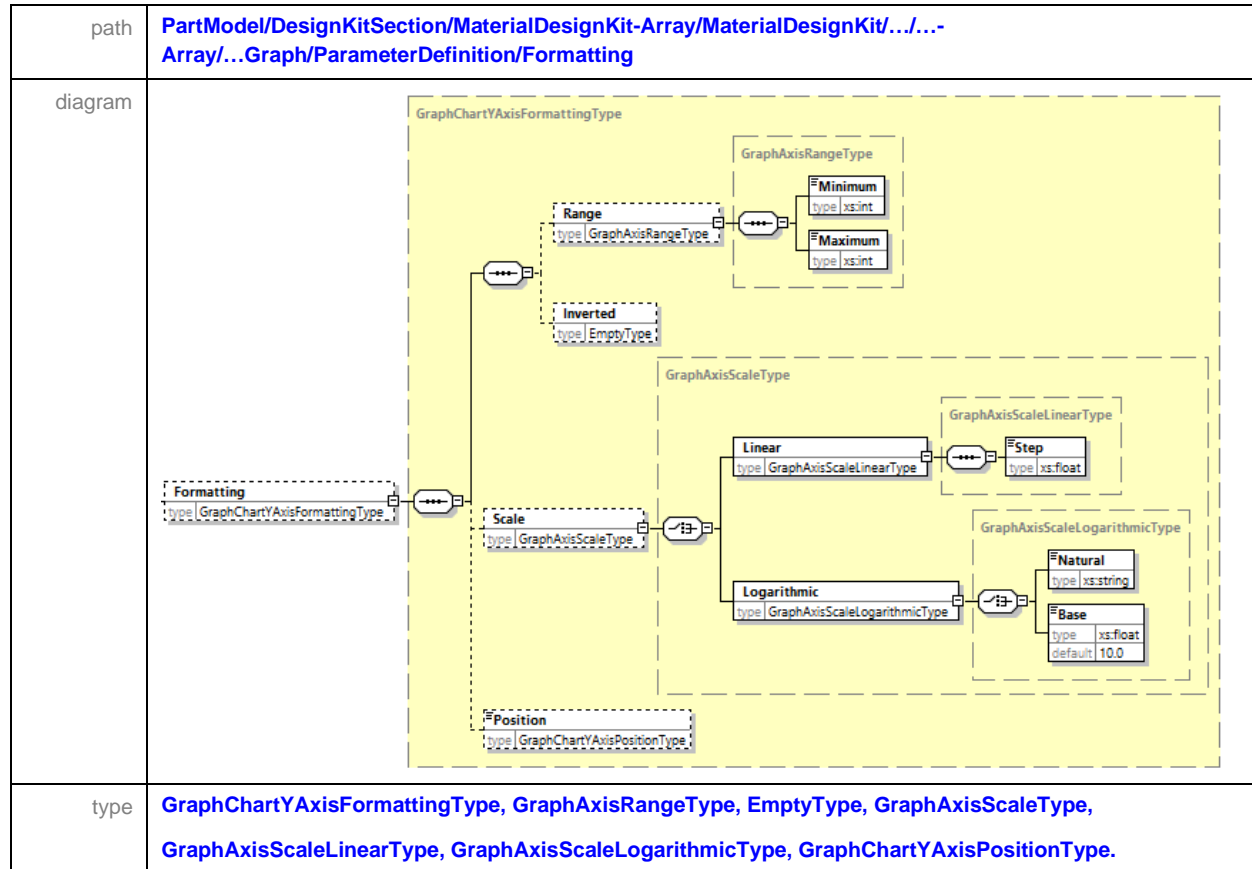
The graph can either be captured under the *Data-Array* or represented via a *GraphFormula* (A string representing the equation of the *ParameterDefinition* relationship to the Test *TestConditionDefinition*).

### 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	<b>PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/.../...-Array/...Graph/TestConditionDefinition/Formatting</b>
diagram	<pre> classDiagram     class GraphChartXAxisFormattingType {         type GraphChartXAxisFormattingType     }     class Range {         type GraphAxisRangeType     }     class Inverted {         type EmptyType     }     class Scale {         type GraphAxisScaleType     }     class Position {         type GraphChartXAxisPositionType     }     class GraphAxisRangeType {         Minimum type xs:int         Maximum type xs:int     }     class GraphAxisScaleType {     }     class Linear {         type GraphAxisScaleLinearType     }     class Logarithmic {         type GraphAxisScaleLogarithmicType     }     class GraphAxisScaleLinearType {         Step type xs:float     }     class GraphAxisScaleLogarithmicType {         Natural type xs:string         Base type xs:float default 10.0     }      GraphChartXAxisFormattingType --&gt; Range     GraphChartXAxisFormattingType --&gt; Inverted     GraphChartXAxisFormattingType --&gt; Scale     GraphChartXAxisFormattingType --&gt; Position     Range --&gt; Minimum     Range --&gt; Maximum     Scale --&gt; Linear     Scale --&gt; Logarithmic     Linear --&gt; Step     Logarithmic --&gt; Natural     Logarithmic --&gt; Base </pre>
type	<b>GraphChartXAxisFormattingType, GraphAxisRangeType, EmptyType, GraphAxisScaleType, GraphAxisScaleLinearType, GraphAxisScaleLogarithmicType, GraphChartXAxisPositionType.</b>

### 5.4.3.6.9.2 Graph Chart Y Axis Formatting Type



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	<p>The diagram illustrates the structure of the Graph Formatting Type. A <b>GraphFormattingType</b> class (yellow background) contains two main components: <b>DisplayType</b> and <b>Legend</b>. <b>DisplayType</b> is a dashed box containing a <b>GraphDisplayType</b> class. <b>Legend</b> is a dashed box containing a <b>GraphLegendType</b> class. <b>GraphLegendType</b> further contains three sub-components: <b>Location</b>, <b>VerticalPosition</b>, and <b>HorizontalPosition</b>, each represented by a dashed box and a corresponding class (e.g., <b>GraphLegendLocationType</b>). A <b>Formatting</b> class (dashed box) is shown on the left, containing a <b>GraphFormattingType</b> class. A line with a circle and arrows connects the <b>Formatting</b> class to the <b>GraphFormattingType</b> class.</p>
type	GraphFormattingType, GraphDisplayType, GraphLegendType, GraphLegendLocationType, GraphLegendVerticalPositionType, GraphLegendHorizontalPositionType.

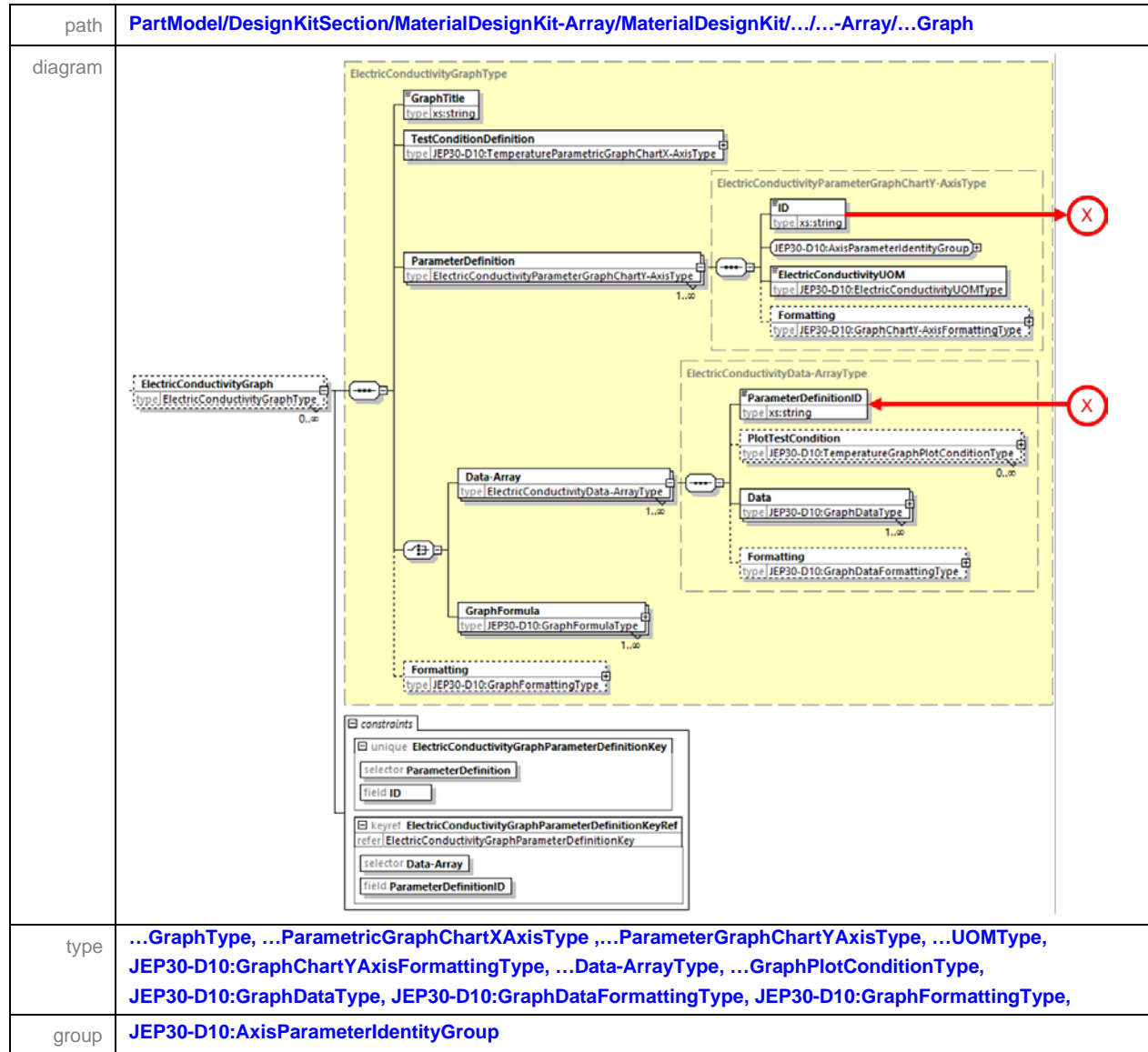
The body of the graph can be formatted under the *GraphFormattingType*. The *DisplayType* enumerated list is

- 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



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, MinNomMaxValueType, 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:GraphFormulaType, MinNomMaxRuleContextType, m:math.type.
group	LaTeX-and-MathML-RuleGroup.

### 5.4.3.6.9.7 Temp-or-Freq Plot Test Condition Type

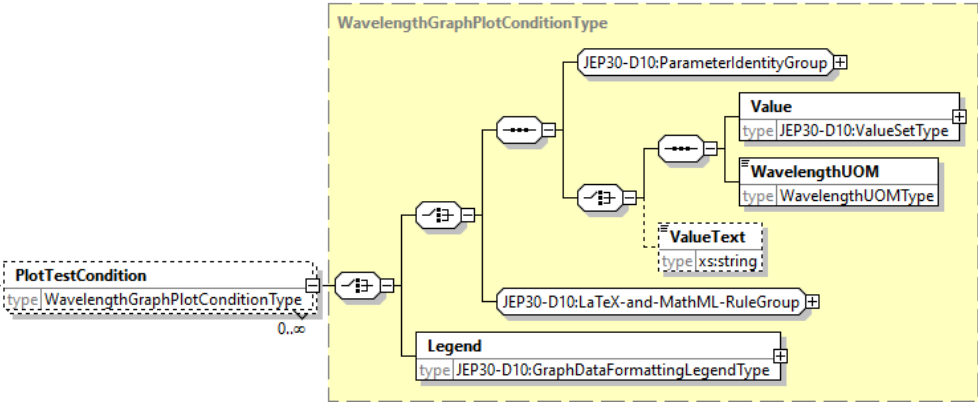
path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/.../...-Array/...Graph/Data-Array/PlotTestCondition
diagram	
type	Temp-or-FreqPlotTestConditionType, ValueSetType, Temp-or-FreqTestConditionUnitsType, GraphDataFormattingLegendType.
group	ParameterIdentityGroup, LaTeX-and-MathML-RuleGroup .

### 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, ValueSetType, Temperature-in-Celsius-or-KelvinUOMType, GraphDataFormattingLegendType
group	ParameterIdentityGroup, LaTeX-and-MathML-RuleGroup.



5.4.3.6.9.9      Wavelength Graph Plot Test Condition Type

path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/.../...-Array/...Graph/Data-Array/PlotTestCondition
diagram	 <p>The diagram illustrates the structure of the <b>WavelengthGraphPlotConditionType</b>. It shows a root node <b>PlotTestCondition</b> (type: WavelengthGraphPlotConditionType) with a cardinality of 0..∞. This node branches into two main paths: a top path and a bottom path. The top path leads to a <b>JEP30-D10:ParameterIdentityGroup</b> node, which further branches into a <b>Value</b> node (type: JEP30-D10:ValueSetType) and a <b>ValueText</b> node (type: xs:string). The <b>Value</b> node branches into a <b>WavelengthUOM</b> node (type: WavelengthUOMType). The bottom path leads to a <b>JEP30-D10:LaTeX-and-MathML-RuleGroup</b> node, which branches into a <b>Legend</b> node (type: JEP30-D10:GraphDataFormattingLegendType).</p>
type	WavelengthGraphPlotConditionType, ValueSetType, JEP30-D10:GraphDataFormattingLegendType
group	JEP30-D10:ParameterIdentityGroup, JEP30-D10:LaTeX-and-MathML-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.

5.4.3.6.9.10 Graph Data Formatting Type

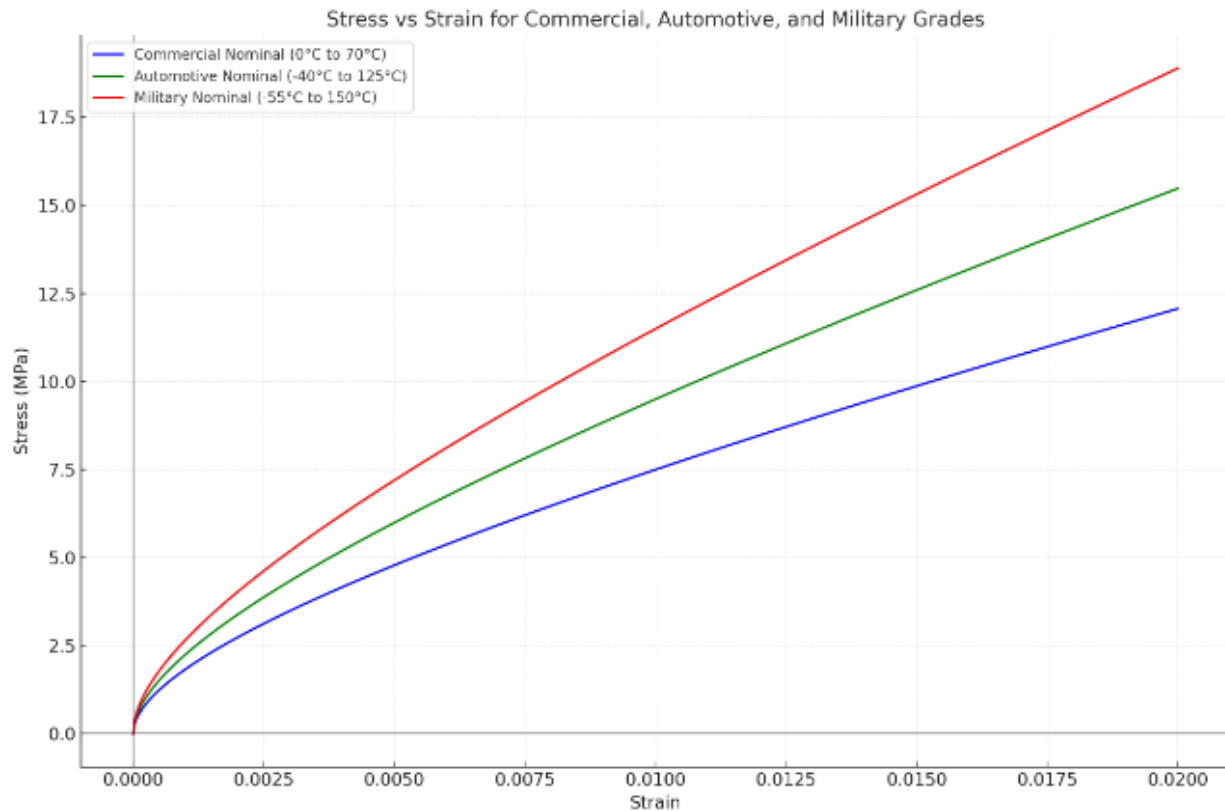
path	PartModel/DesignKitSection/MaterialDesignKit-Array/MaterialDesignKit/.../...-Array/...Graph/Data-Array/Formatting.
diagram	
type	GraphDataFormattingType, GraphDataFormattingPointType. GraphDataFormattingLineType, GraphDataFormattingColorType, GraphDataFormattingPointStyleType, GraphDataFormattingLineStyleType.

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.

#### 5.4.3.6.9.11 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

```
<StressGraph>
  <GraphTitle>Stress vs Strain for Commerical, Automotive, and Military Grades</GraphTitle>
  <TestConditionDefinition>
    <AxisTitle>Strain</AxisTitle>
    <Name>Strain</Name>
    <LaTeX-Symbol> $\epsilon$ </LaTeX-Symbol>
    <Definition> Strain is the relative change in length:  $\epsilon = \Delta L/L_0$ .</Definition>
    <Units>
      <StrainUOM>m/m</StrainUOM>
    </Units>
    <Formatting>
      <Range>
        <Minimum>0.0000</Minimum>
        <Maximum>0.0200</Maximum>
      </Range>
    </Formatting>
  </TestConditionDefinition>
</StressGraph>
```

**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>
    <LaTeX-Symbol> $\sigma$ </LaTeX-Symbol>
    <Definition>Stress is defined as force per unit area:  $\sigma = F/A$ .</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°C to 70°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>
        </ParameterValue>

```

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

```

</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°C to 125°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 >
      <Description>Military Nominal (-55°C to 155°C).</Description>
    </Legend>
  </PlotConditionDefinition>

```

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

```

<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	<p>The diagram illustrates the structure of the <code>PackageTestDesignKit-Array</code> type. It is an array type containing one or more <code>PackageTestDesignKit</code> elements. Each <code>PackageTestDesignKit</code> element is of type <code>PackageTestDesignKitType</code>. The <code>PackageTestDesignKitType</code> has several attributes: <code>ID</code> (type <code>xs:string</code>), <code>Footnote-Array</code> (type <code>JEP30-D10:Footnote-ArrayType</code>), <code>DocumentID</code> (type <code>xs:string</code>), and <code>ds:Signature</code> (type <code>ds:SignatureType</code>). A <code>constraints</code> section is also present at the bottom of the <code>PackageTestDesignKitType</code> definition.</p>
type	<code>PackageTestDesignKit-ArrayType</code> , <code>PackageTestDesignKitType</code> , <code>JEP30-D10:Footnote-ArrayType</code> , <code>ds:SignatureType</code>

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	<b>PartModel/DesignKitSection/FootprintRuleDesignKit-Array</b>
diagram	<p>The diagram illustrates the structure of the <b>FootprintRuleDesignKit-Array</b>. It is a container type that holds one or more <b>FootprintRuleDesignKit</b> objects. Each <b>FootprintRuleDesignKit</b> object is of type <b>FootprintRuleDesignKitType</b> and contains the following elements:</p> <ul style="list-style-type: none"> <li><b>attributes</b> (group):       <ul style="list-style-type: none"> <li><b>ID</b>: type <code>xs:string</code>, cardinality 1, key <code>ID</code>.</li> <li><b>AssemblyTechnologyID</b>: type <code>xs:string</code>, cardinality 1..∞.</li> </ul> </li> <li><b>FootprintRules-Array</b>: type <code>FootprintRules-ArrayType</code>, cardinality 1.</li> <li><b>Footnote-Array</b>: type <code>JEP30-D10:Footnote-ArrayType</code>, cardinality 1.       <ul style="list-style-type: none"> <li><b>DocumentID</b>: type <code>xs:string</code>, cardinality 1.</li> <li><b>ds:Signature</b>: type <code>ds:SignatureType</code>, cardinality 1.</li> </ul> </li> </ul> <p>A <b>constraints</b> group is also present at the bottom of the diagram.</p>
type	<b>FootprintRuleDesignKit-ArrayType</b> , <b>FootprintRuleDesignKitType</b> , <b>Terminal-to-PadRule-ArrayType</b> , <b>FootprintRules-ArrayType</b> , <b>JEP30-D10:Footnote-ArrayType</b> , <b>ds:SignatureType</b>



### 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	<a href="#">PartModel/DesignKitSection/FootprintRuleDesignKit-Array/FootprintRuleDesignKit/Terminal-to-PadRule-Array/Terminal-to-PadRule/TableRowLabel</a>
diagram	
type	<a href="#">TableRowLabelType</a>

### 5.6.1.3 Table Data

path	<a href="#">PartModel/DesignKitSection/FootprintRuleDesignKit-Array/FootprintRuleDesignKit/Terminal-to-PadRule-Array/Terminal-to-PadRule/TableData</a>
diagram	
type	<a href="#">TableDataType</a> , <a href="#">JEP30-D10:ValueType</a> , <a href="#">FootprintUnitsType</a> , <a href="#">JEP30-D10:LengthUOMType</a> , <a href="#">JEP30-D10:EmptyType</a> .

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.

## 5.6.1.3 Table Data (cont'd)

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			

```

<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>

```

**5.6.1.3 Table Data (cont'd)**

```

        <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>
        <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>

```

### 5.6.1.3 Table Data (cont'd)

```

</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>
  <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>
  <Value>
    <Nominal>-15</Nominal>
  </Value>
  <Units>
    <Percent/>
  </Units>
</TableData>
<TableData>
  <ID>Table Data 10</ID>
  <TableHeaderID>Table Header 3</TableHeaderID>
  <TableRowLabelID>Table Row Label 2</TableRowLabelID>
  <Value>
    <Nominal>5</Nominal>
  </Value>
  <Units>
    <Percent/>
  </Units>
</TableData>
<TableData>

```

**5.6.1.3 Table Data (cont'd)**

```

        <ID>Table Data 11</ID>
        <TableHeaderID>Table Header 3</TableHeaderID>
        <TableRowLabelID>Table Row Label 3</TableRowLabelID>
        <Value>
            <Nominal>0.01</Nominal>
        </Value>
    </TableData>
    <TableData>
        <ID>Table Data 12</ID>
        <TableHeaderID>Table Header 3</TableHeaderID>
        <TableRowLabelID>Table Row Label 4</TableRowLabelID>
        <Value>
            <Nominal>0.50</Nominal>
        </Value>
        <Units>
            <Dimension>mm</Dimension>
        </Units>
    </TableData>
    <FootnoteID>Footnote 4</FootnoteID>
</Terminal-to-PadRule>
</Terminal-to-PadRule-Array>

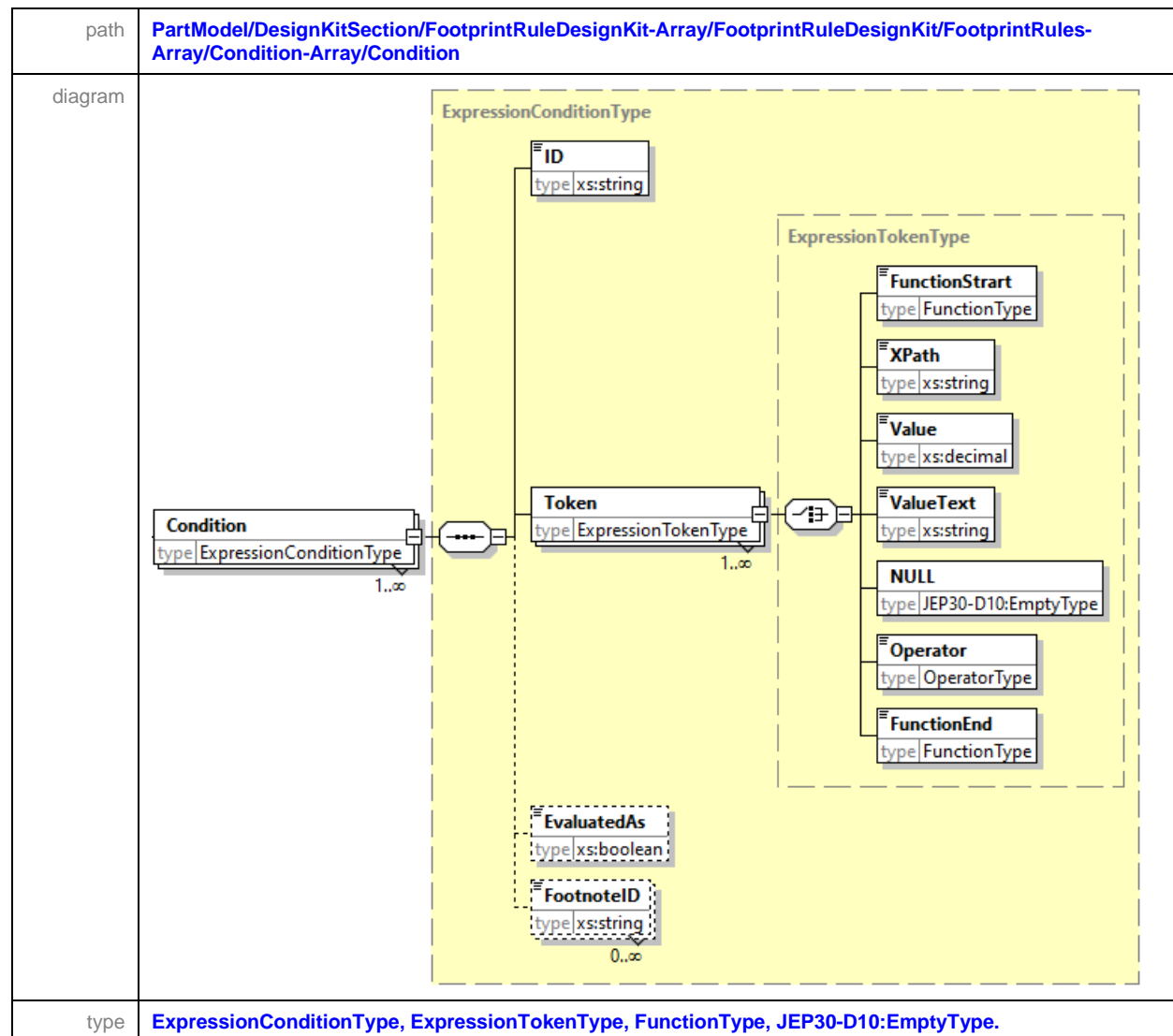
:
<Footnote-Array>
    <Footnote>
        <ID>Footnote 1</ID>
        <Footnote>Ball Grid Array BGA Construction and land pattern development
are described in 14.1.1 & 14.1.2</Footnote>
    </Footnote>
    <Footnote>
        <ID>Footnote 2</ID>
        <Footnote>reduction below nominal ball diameter</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



The enumerated values of the *FunctionType* are

*power,*  
*mod,*  
*cos,*  
*arctan,*  
*truncate,*  
*or,*  
*nor.*

*sqrt,*  
*abs,*  
*tan,*  
*round,*  
*min,*  
*xor,*

*log,*  
*factorial,*  
*arcsin,*  
*floor,*  
*max,*  
*not,*

*In*  
*sin*  
*arccos,*  
*ceil,*  
*and,*  
*nand,*



### 5.6.2.2 Condition Set

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

The enumerated values of the *OperatorType* are

*add,*  
*and,*  
*lessThan,*

*subtract,*  
*or,*  
*equals.*

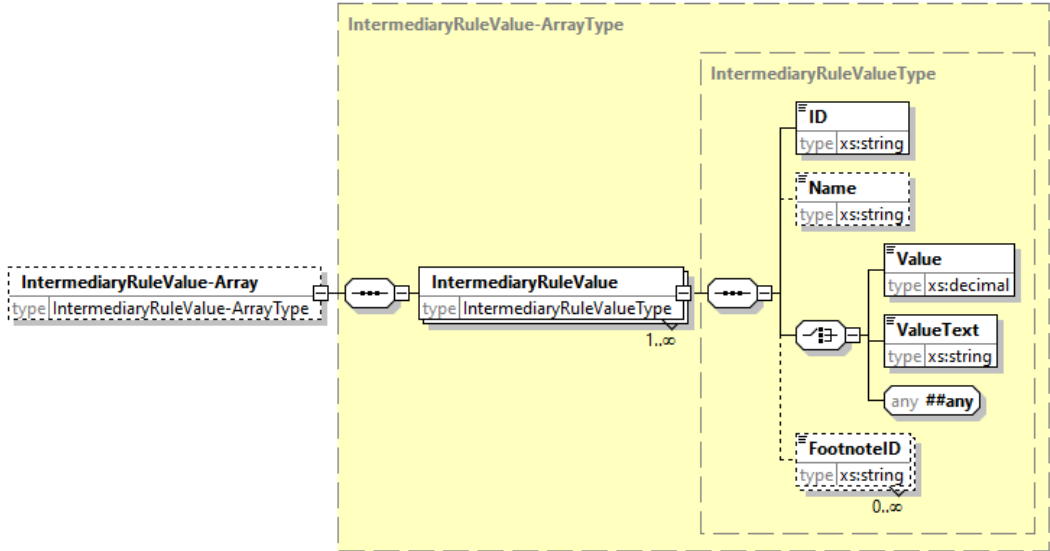
*multiply,*  
*not,*

*divide,*  
*greaterThan,*

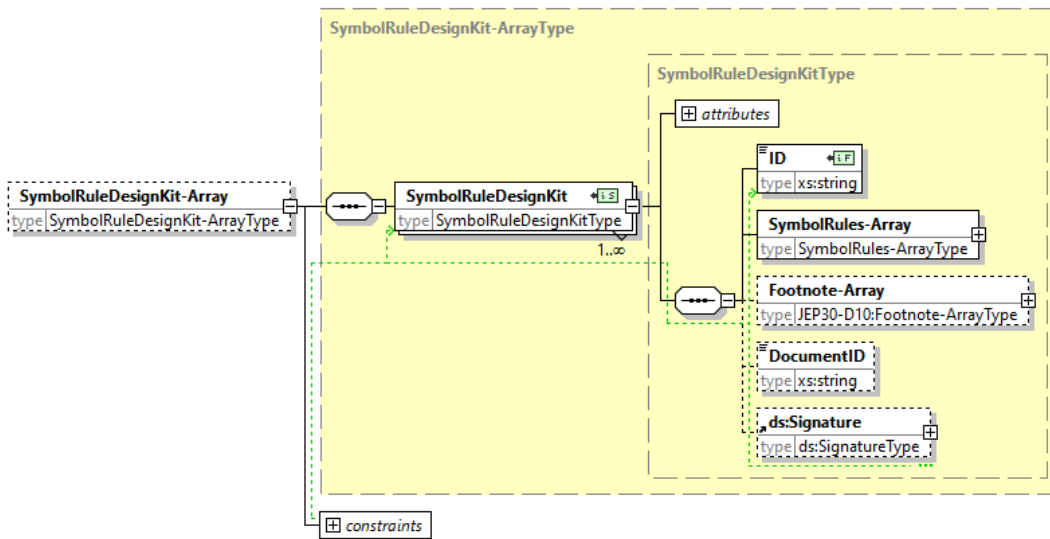
5.6.2.3 Output - Array

path	PartModel/DesignKitSection/FootprintRuleDesignKit-Array/FootprintRuleDesignKit/FootprintRules-Array/FootprintRule/Output-Array
diagram	<p>The diagram illustrates the structure of the <b>RuleOutput-ArrayType</b> and its components. It is divided into three main sections: <b>RuleOutput-ArrayType</b>, <b>RuleOutputType</b>, and <b>ExpressionTokenType</b>.</p> <ul style="list-style-type: none"><li><b>RuleOutput-ArrayType</b> (yellow background) contains:<ul style="list-style-type: none"><li><b>Output-Array</b> (type: RuleOutput-ArrayType)</li><li><b>Output</b> (type: RuleOutputType, multiplicity 1..∞)</li><li><b>Token</b> (type: ExpressionTokenType, multiplicity 1..∞)</li><li><b>FootnoteID</b> (type: xs:string, multiplicity 0..∞)</li></ul></li><li><b>RuleOutputType</b> (dashed box) contains:<ul style="list-style-type: none"><li><b>ConditionID</b> (type: xs:string)</li><li><b>ConditionSetID</b> (type: xs:string)</li><li><b>OutputXPath</b> (type: xs:string)</li></ul></li><li><b>ExpressionTokenType</b> (dashed box) contains:<ul style="list-style-type: none"><li><b>FunctionStart</b> (type: FunctionType)</li><li><b>XPath</b> (type: xs:string)</li><li><b>Value</b> (type: xs:decimal)</li><li><b>ValueText</b> (type: xs:string)</li><li><b>NULL</b> (type: JEP30-D10:EmptyType)</li><li><b>Operator</b> (type: OperatorType)</li><li><b>FunctionEnd</b> (type: FunctionType)</li></ul></li></ul>
type	RuleOutput-ArrayType, RuleOutputType, ExpressionTokenType, FunctionType, JEP30-D10:EmptyType, OperatorType.

### 5.6.2.4 Intermediary Rule Value - Array

path	<a href="#">PartModel/DesignKitSection/FootprintRuleDesignKit-Array/FootprintRuleDesignKit/FootprintRules-Array/IntermediaryRuleValue-Array</a>
diagram	 <p>The diagram illustrates the structure of the <b>IntermediaryRuleValue-Array</b> type. It is composed of an array of <b>IntermediaryRuleValue</b> elements (indicated by a dashed box and a multiplicity of 1..∞). Each <b>IntermediaryRuleValue</b> element is of type <b>IntermediaryRuleValueType</b>. This type contains several fields: <b>ID</b> (type xs:string), <b>Name</b> (type xs:string), <b>Value</b> (type xs:decimal), <b>ValueText</b> (type xs:string), and <b>FootnoteID</b> (type xs:string, multiplicity 0..∞). There is also an <b>any ##any</b> field. The entire structure is enclosed in a dashed box labeled <b>IntermediaryRuleValue-ArrayType</b>.</p>
type	<a href="#">IntermediaryRuleValue-ArrayType</a> , <a href="#">IntermediaryRuleValueType</a> .

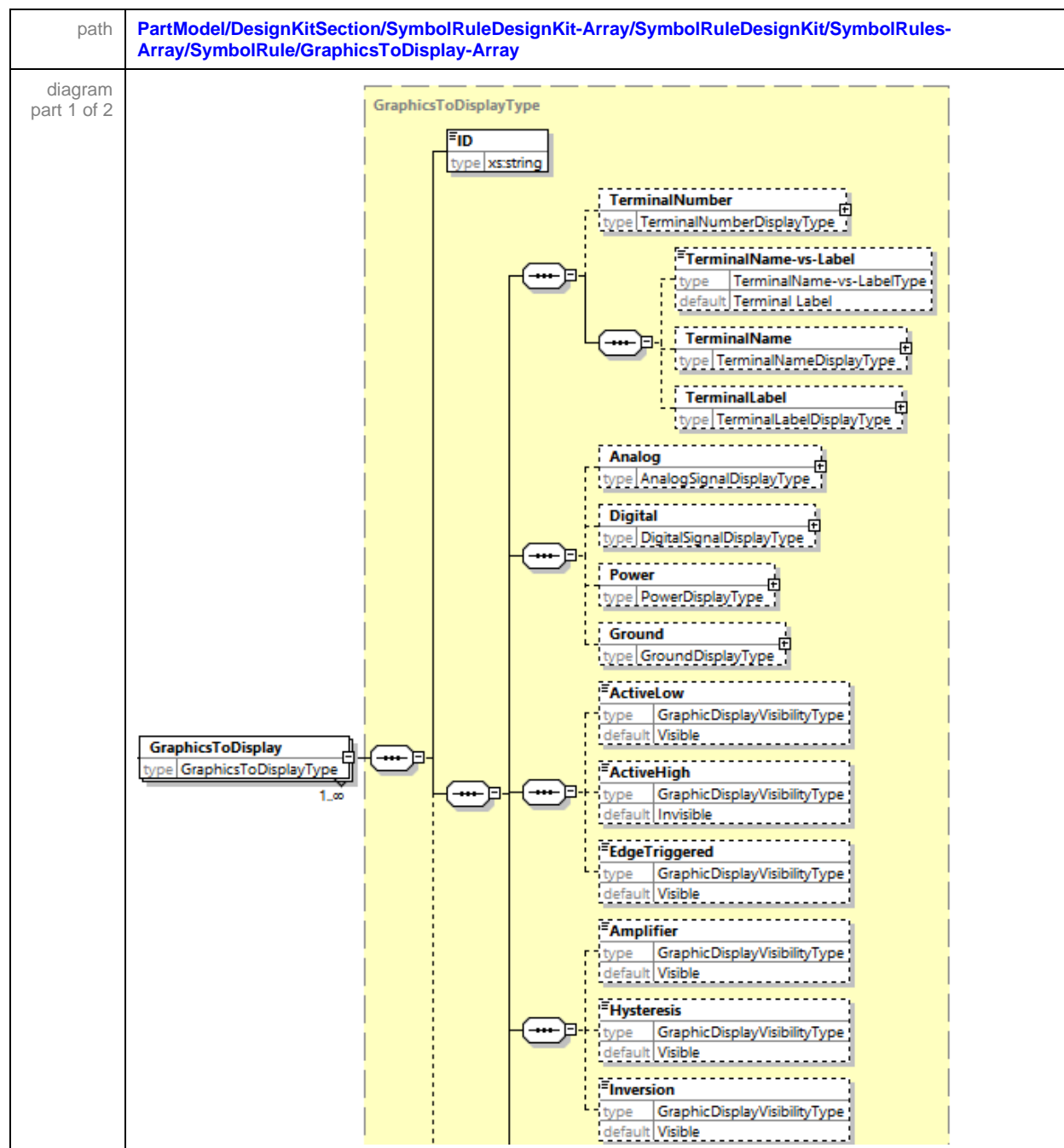
### 5.7 Symbol Rule Design Kit - Array

path	<a href="#">PartModel/DesignKitSection/SymbolRuleDesignKit-Array</a>
diagram	 <p>The diagram illustrates the structure of the <b>SymbolRuleDesignKit-Array</b> type. It is composed of an array of <b>SymbolRuleDesignKit</b> elements (indicated by a dashed box and a multiplicity of 1..∞). Each <b>SymbolRuleDesignKit</b> element is of type <b>SymbolRuleDesignKitType</b>. This type contains several fields: <b>attributes</b> (a box with a plus sign), <b>ID</b> (type xs:string, with a key icon), <b>SymbolRules-Array</b> (type <a href="#">SymbolRules-ArrayType</a>), <b>Footnote-Array</b> (type <a href="#">JEP30-D10:Footnote-ArrayType</a>), <b>DocumentID</b> (type xs:string), and <b>ds:Signature</b> (type <a href="#">ds:SignatureType</a>). There is also a <b>constraints</b> field (a box with a plus sign). The entire structure is enclosed in a dashed box labeled <b>SymbolRuleDesignKit-ArrayType</b>.</p>
type	<a href="#">SymbolRuleDesignKit-ArrayType</a> , <a href="#">SymbolRuleDesignKitType</a> , <a href="#">JEP30-D10:Footnote-ArrayType</a> , <a href="#">ds:SignatureType</a>

5.7.1 Symbol Rule - Array

path	PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array
diagram	<p>The diagram illustrates the structure of the <b>SymbolRules-Array</b> type. It is composed of several nested components:</p> <ul style="list-style-type: none"><li><b>SymbolRules-Array</b> (type <code>SymbolRules-ArrayType</code>): The outermost container, containing a <b>SymbolRule</b> element with a multiplicity of <code>1..∞</code>.</li><li><b>SymbolRule</b> (type <code>SymbolRuleType</code>): Contains an <b>ID</b> attribute (type <code>xs:string</code>) and a <b>GraphicsToDisplay-Array</b> element (type <code>GraphicsToDisplay-ArrayType</code>) with a multiplicity of <code>1..∞</code>.</li><li><b>GraphicsToDisplay-Array</b> (type <code>GraphicsToDisplay-ArrayType</code>): Contains a <b>GraphicsToDisplay</b> element (type <code>GraphicsToDisplayType</code>) with a multiplicity of <code>1..∞</code>.</li><li><b>GraphicsToDisplay</b> (type <code>GraphicsToDisplayType</code>): Contains two optional attributes: <b>TextFormat</b> (type <code>JEP30-D10:DefaultTextFormatType</code>) and <b>GraphicalFormat</b> (type <code>JEP30-D10:DefaultGraphicalFormatType</code>).</li></ul>
type	SymbolRules-ArrayType, SymbolRuleType, GraphicsToDisplay-ArrayType, GraphicsToDisplayType, JEP30-D10:DefaultTextFormatType, JEP30-D10:DefaultGraphicalFormatType.

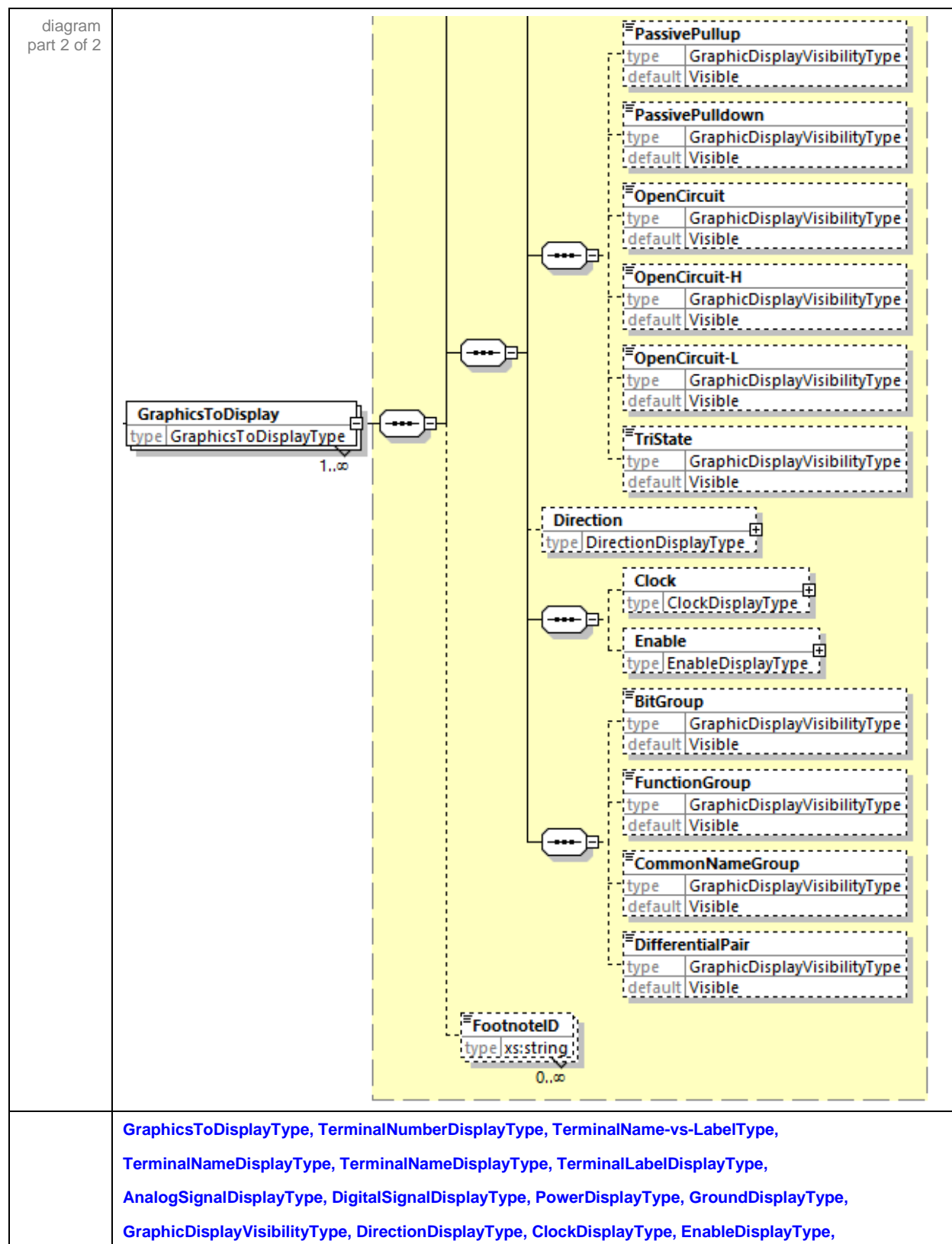
## 5.7.1.1 Graphics To Display - Array



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)



### 5.7.1.1.1 Terminal Number

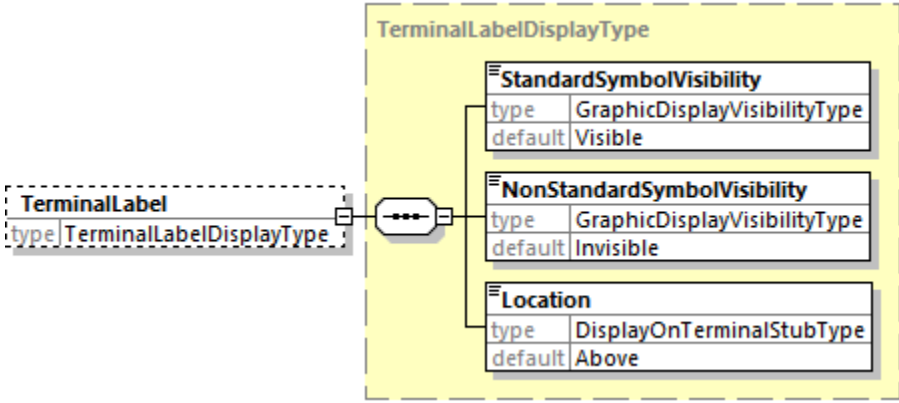
path	PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/TerminalNumber												
diagram	<p>The diagram illustrates the structure of the <b>TerminalNumber</b> entity. It is connected to a central node, which then branches into three properties: <b>PolarizedSymbolVisibility</b>, <b>NonPolarizedSymbolVisibility</b>, and <b>Location</b>. Each property has a <b>type</b> and a <b>default</b> value.</p> <table><tr><th>Property</th><th>type</th><th>default</th></tr><tr><td>PolarizedSymbolVisibility</td><td>GraphicDisplayVisibilityType</td><td>Visible</td></tr><tr><td>NonPolarizedSymbolVisibility</td><td>GraphicDisplayVisibilityType</td><td>Invisible</td></tr><tr><td>Location</td><td>DisplayOnTerminalStubType</td><td>Above</td></tr></table>	Property	type	default	PolarizedSymbolVisibility	GraphicDisplayVisibilityType	Visible	NonPolarizedSymbolVisibility	GraphicDisplayVisibilityType	Invisible	Location	DisplayOnTerminalStubType	Above
Property	type	default											
PolarizedSymbolVisibility	GraphicDisplayVisibilityType	Visible											
NonPolarizedSymbolVisibility	GraphicDisplayVisibilityType	Invisible											
Location	DisplayOnTerminalStubType	Above											
type	TerminalNumberDisplayType, GraphicDisplayVisibilityType, DisplayOnTerminalStubType.												

The enumerated values of the [DisplayOnTerminalStubType](#) are *Above* and *Below*.

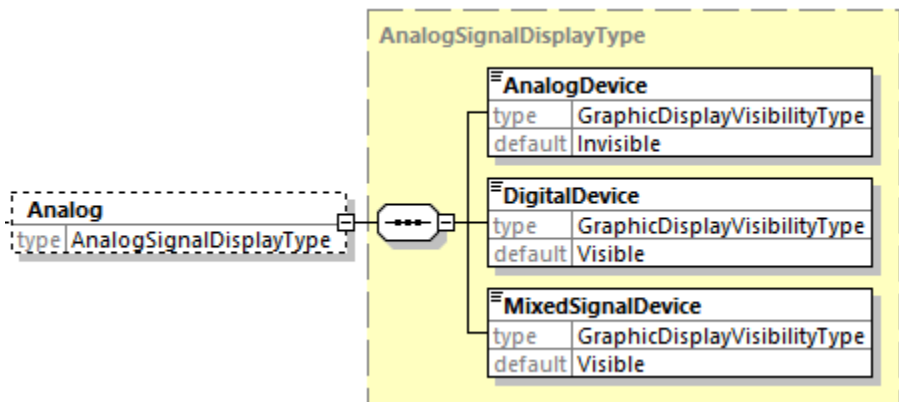
### 5.7.1.1.2 Terminal Name

path	PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/TerminalName												
diagram	<p>The diagram illustrates the structure of the <b>TerminalName</b> entity. It is connected to a central node, which then branches into three properties: <b>PolarizedSymbolVisibility</b>, <b>NonPolarizedSymbolVisibility</b>, and <b>Location</b>. Each property has a <b>type</b> and a <b>default</b> value.</p> <table><thead><tr><th>Property</th><th>type</th><th>default</th></tr></thead><tbody><tr><td><b>PolarizedSymbolVisibility</b></td><td>GraphicDisplayVisibilityType</td><td>Visible</td></tr><tr><td><b>NonPolarizedSymbolVisibility</b></td><td>GraphicDisplayVisibilityType</td><td>Invisible</td></tr><tr><td><b>Location</b></td><td>DisplayOnTerminalStubType</td><td>Above</td></tr></tbody></table>	Property	type	default	<b>PolarizedSymbolVisibility</b>	GraphicDisplayVisibilityType	Visible	<b>NonPolarizedSymbolVisibility</b>	GraphicDisplayVisibilityType	Invisible	<b>Location</b>	DisplayOnTerminalStubType	Above
Property	type	default											
<b>PolarizedSymbolVisibility</b>	GraphicDisplayVisibilityType	Visible											
<b>NonPolarizedSymbolVisibility</b>	GraphicDisplayVisibilityType	Invisible											
<b>Location</b>	DisplayOnTerminalStubType	Above											
type	TerminalNameDisplayType, GraphicDisplayVisibilityType, DisplayOnTerminalStubType.												

### 5.7.1.1.3 Terminal Label

path	<a href="#">PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/TerminalLabel</a>
diagram	 <p>The diagram shows a dashed box labeled <b>TerminalLabel</b> with a sub-property <code>type</code> of <code>TerminalLabelDisplayType</code>. This is connected via a multi-ported block to a larger dashed box labeled <b>TerminalLabelDisplayType</b>. Inside this box are three sub-properties:</p> <ul style="list-style-type: none"> <li><b>StandardSymbolVisibility</b>: <code>type</code> is <code>GraphicDisplayVisibilityType</code>, <code>default</code> is <code>Visible</code>.</li> <li><b>NonStandardSymbolVisibility</b>: <code>type</code> is <code>GraphicDisplayVisibilityType</code>, <code>default</code> is <code>Invisible</code>.</li> <li><b>Location</b>: <code>type</code> is <code>DisplayOnTerminalStubType</code>, <code>default</code> is <code>Above</code>.</li> </ul>
type	<a href="#">TerminalLabelDisplayType</a> , <a href="#">GraphicDisplayVisibilityType</a> , <a href="#">DisplayOnTerminalStubType</a> .

### 5.7.1.1.4 Analog

path	<a href="#">PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/Analog</a>
diagram	 <p>The diagram shows a dashed box labeled <b>Analog</b> with a sub-property <code>type</code> of <code>AnalogSignalDisplayType</code>. This is connected via a multi-ported block to a larger dashed box labeled <b>AnalogSignalDisplayType</b>. Inside this box are three sub-properties:</p> <ul style="list-style-type: none"> <li><b>AnalogDevice</b>: <code>type</code> is <code>GraphicDisplayVisibilityType</code>, <code>default</code> is <code>Invisible</code>.</li> <li><b>DigitalDevice</b>: <code>type</code> is <code>GraphicDisplayVisibilityType</code>, <code>default</code> is <code>Visible</code>.</li> <li><b>MixedSignalDevice</b>: <code>type</code> is <code>GraphicDisplayVisibilityType</code>, <code>default</code> is <code>Visible</code>.</li> </ul>
type	<a href="#">AnalogSignalDisplayType</a> , <a href="#">GraphicDisplayVisibilityType</a> .



### 5.7.1.1.5 Digital

path	<a href="#">PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/Digital</a>
diagram	
type	<a href="#">DigitalSignalDisplayType</a> , <a href="#">GraphicDisplayVisibilityType</a> .

### 5.7.1.1.6 Power

path	<a href="#">PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/Power</a>
diagram	
type	<a href="#">PowerDisplayType</a> , <a href="#">TerminalStubLocationRelative-to-SymbolBodyType</a> , <a href="#">GraphicDisplayVisibilityType</a> .

The enumerated values of the [TerminalStubLocationRelative-to-SymbolBodyType](#) are

<i>Left-top,</i>	<i>Left-center,</i>	<i>Left-bottom,</i>	<i>Left,</i>
<i>Right-top,</i>	<i>Right-center,</i>	<i>Right-bottom,</i>	<i>Right,</i>
<i>Top-left,</i>	<i>Top-center,</i>	<i>Top-right,</i>	<i>Top,</i>
<i>Bottom-left,</i>	<i>Bottom-center,</i>	<i>Bottom-right,</i>	<i>Bottom.</i>

5.7.1.1.7 Ground

path	PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/Ground
diagram	<p>The diagram illustrates the 'Ground' symbol and its associated properties. On the left, a dashed box labeled 'Ground' contains the text 'type GroundDisplayType'. This box is connected by a line to a central symbol, which is a circle with three dots inside. To the right of this symbol is a large yellow box labeled 'GroundDisplayType'. Inside this yellow box, there are two property tables. The first table is titled 'LocationRelative-to-SymbolBody' and has two rows: 'type' with the value 'TerminalStubLocationRelative-to-SymbolBodyType' and 'default' with the value 'Top-center'. The second table is titled 'Visibility' and has two rows: 'type' with the value 'GraphicDisplayVisibilityType' and 'default' with the value 'Visible'.</p>
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*.

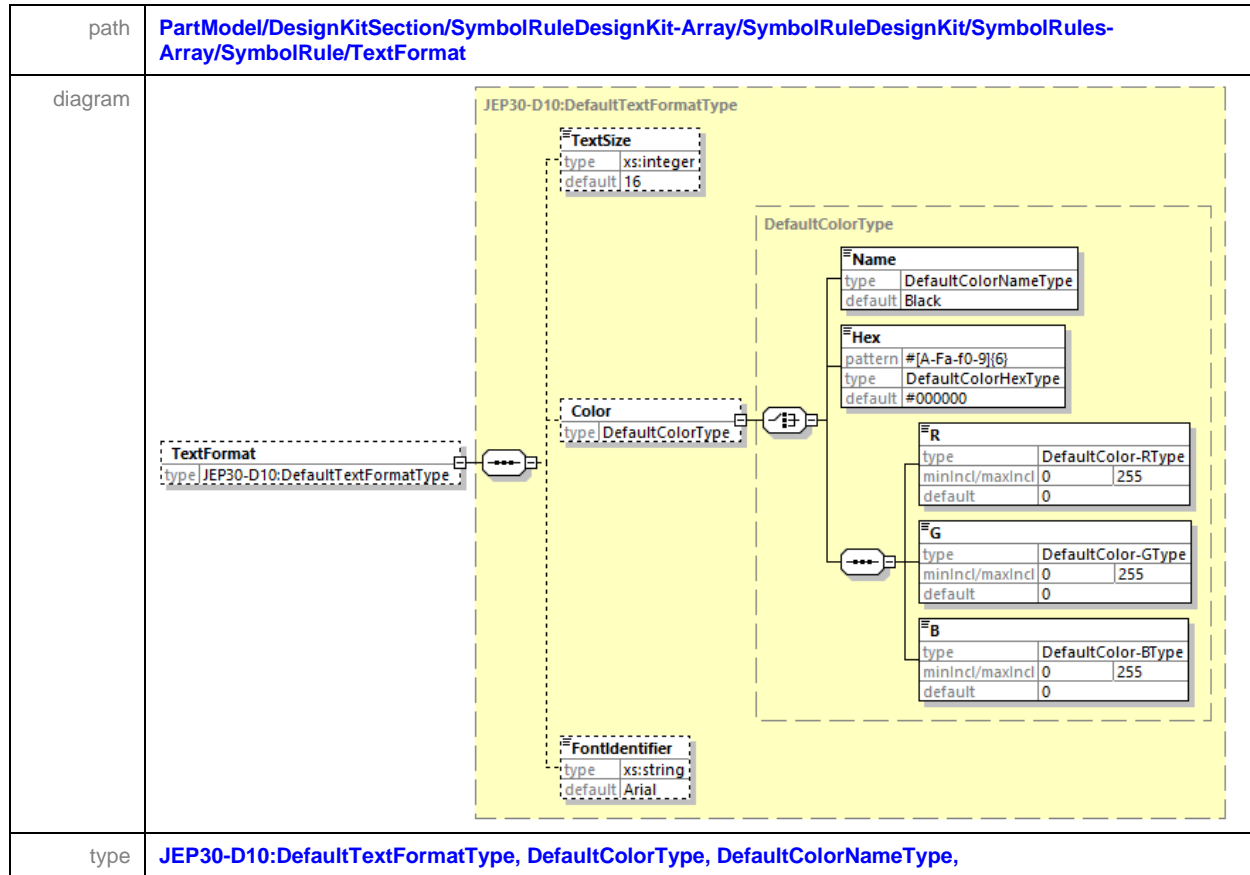
**5.7.1.1.9 Clock**

path	<a href="#">PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/Direction</a>
diagram	
type	<a href="#">ClockDisplayType</a> , <a href="#">TerminalStubLocationRelative-to-SymbolBodyType</a> , <a href="#">GraphicDisplayVisibilityType</a> .

**5.7.1.1.10 Enable**

path	<a href="#">PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicsToDisplay-Array/GraphicsToDisplay/Direction</a>
diagram	
type	<a href="#">EnableDisplayType</a> , <a href="#">TerminalStubLocationRelative-to-SymbolBodyType</a> , <a href="#">GraphicDisplayVisibilityType</a> .

### 5.7.1.2 Text Format



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,

- [TextSize](#) is defaulted to value "16"
- [Color](#) is default to black or its equivalent in Hex or RGB color settings.
- [FontIdentifier](#) is defaulted to value "Arial"

5.7.1.3 Graphical Format

path	PartModel/DesignKitSection/SymbolRuleDesignKit-Array/SymbolRuleDesignKit/SymbolRules-Array/SymbolRule/GraphicalFormat
diagram	<p>The diagram illustrates the structure of the <b>DefaultGraphicalFormatType</b>. On the left, a dashed box labeled <b>DefaultGraphicalFormat</b> contains the text <code>type DefaultGraphicalFormatType</code>. This box is connected to a large yellow-shaded area representing the <b>DefaultGraphicalFormatType</b> class. Inside this area, several properties are listed in table-like structures:</p> <ul style="list-style-type: none"><li><b>StrokeWidth</b>:<ul style="list-style-type: none"><li>type: DefaultStrokeWidthType</li><li>minIncl/maxIncl: 1</li><li>default: 1</li></ul></li><li><b>StrokeOpacity</b>:<ul style="list-style-type: none"><li>type: DefaultStrokeOpacityType</li><li>minIncl/maxIncl: 0, 100</li><li>default: 100</li></ul></li><li><b>StrokeLineCap</b>:<ul style="list-style-type: none"><li>type: DefaultStrokeLineCapType</li><li>default: Butt</li></ul></li><li><b>StrokeColor</b>:<ul style="list-style-type: none"><li>type: DefaultColorType</li></ul></li><li><b>FillColor</b>:<ul style="list-style-type: none"><li>type: DefaultColorType</li></ul></li><li><b>FillOpacity</b>:<ul style="list-style-type: none"><li>type: DefaultFillOpacityType</li><li>minIncl/maxIncl: 0, 100</li><li>default: 100</li></ul></li></ul>
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
-----------------------

Issue: A	Date: September 2025	Item Number: 11.2-1083
Description of Change		
Changed signature element names to ds:Signature in all sections		
Section 4.1 PartModel - SupplyChain Section: Updated images to match changes in the JEP30 parent schema		
Section 4.2 Manufacturer Part Number-Array: Updated images to match changes in the JEP30 parent schema		
Section 4.3 Standards Identifier Array: Added new section to connect Standards Identifiers to the Design Kit content.		
Section 4.4 Process Technology Identifier Array: Added new section to connect Process Technology Identifiers to the Design Kit content.		
Section 5.2 Package Assembly Design Kit Array: Added General Summary text field.		
Section 5.2.2.2 Feature Type Selection: Added Terminal to the Feature selection.		
Section 5.2.3.1 and Section 5.3.1.1 Rule – Array: Update image with new dimension type name for IEC compliance.		
Section 5.4.3.1.3 Electric Conductivity – Array: Changed Bulk Conductivity to Electric Conductivity and moved “Electric Conductivity UOM Type” to dictionary.		
Section 5.4.3.1.4 Electric Resistivity – Array: Changed Bulk Resistivity to Electric Resistivity and Moved “Resistivity UOM Type” to dictionary.		
Section 5.4.3.1.5 Electric Field Strength Array: Changed Field Strength to Electric Field Strength.		
Section 5.4.3.1.5.1 Field Strength Graph: Added Electric Field Strength UOM to Parameter Definition		
Section 5.4.3.2 Thermal: Replaced CTE with two units called Linear Expansion Coefficient and Cubic Expansion Coefficient. Changed “Specific Heat” to “Specific Heat Capacity”.		
Section 5.4.3.2.6 Specific Heat Capacity Array: Changed “Specific Heat” to “Specific Heat Capacity”, and moved “Specific Heat Capacity UOM Type” to dictionary.		
Section 5.4.3.3 Structural: Changed Youngs Modulus to Elastic Modulus. Merged Stress UOM with Yield Strength and Failure Strength UOM’s to Stress UOM and applied further restrictions based on Force UOM in sub sections.		
Section 5.4.3.4 Optical: Added more units to Wavelength UOM and moved to dictionary		
Section 5.4.3.5.1 Test Condition: Update Rule Group to LaTeX-and-MathML-Rule Group for consistency with the rest of the JEP30 schemas.		
Section 5.4.3.5.2 Values: Updated Units to comply with IEC definitions. Updated Complex UOM type based on changes made in the Electrical section.		

**Annex B (cont'd)**

Section 5.4.3.6.1 Parameter Identity Group: Updated image to include Standards Authority Body ID” and Property ID. Also update Symbol to a choice of LaTeX-Symbol or MathML-Symbol.
Section 5.6.1.3 Table Data: Update image with new dimension type name for IEC compliance.





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**Standard Improvement Form****JEDEC Standard No. JEP30-K100A**

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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).

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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 \_\_\_\_\_

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2. Recommendations for correction:


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3. Other suggestions for document improvement:


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Submitted by

Name: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

City/State/Zip: \_\_\_\_\_

Phone: \_\_\_\_\_

E-mail: \_\_\_\_\_

Date \_\_\_\_\_

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