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Information processing – Text and office systems – Office Document Architecture (ODA) and interchange format –

Part 10:
Formal specifications

AMENDMENT 4: Formal specification of the geometric graphics content architectures

Traitement de l'information – Bureautique – Architecture des documents de bureau (ODA) et format d'échange –

Partie 10: Spécifications formelles

AMENDEMENT 4: Spécifications formelles des architectures de contenus graphiques géométriques

Reference number
ISO/IEC 8613-10:1991/Amd. 4:1992 (E)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Amendment 4 to International Standard ISO/IEC 8613-10:1991 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

ISO/IEC 8613 consists of the following parts, under the general title *Information processing – Text and office systems – Office Document Architecture (ODA) and interchange format :*

- *Part 1: Introduction and general principles*
- *Part 2: Document structures*
- *Part 4: Document profile*
- *Part 5: Office Document Interchange Format (ODIF)*
- *Part 6: Character content architectures*
- *Part 7: Raster graphics content architectures*
- *Part 8: Geometric graphics content architectures*
- *Part 10: Formal specifications*

Annex E forms an integral part of ISO/IEC 8613-10.

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Information processing – Text and office systems – Office Document Architecture (ODA) and interchange format –

Part 10:
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AMENDMENT 4: Formal specification of the geometric graphics content architectures

Insert a new annex E as follows:

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Annex E

(normative)

Formal specification of the geometric graphics content architectures

E.1 Introduction

This annex gives a formal specification of the geometric graphics content architectures as described in ISO 8613-8. This annex is composed of 5 clauses:

Clause E.1 provides a general introduction, including a list of all definitions which are given in E.2, E.3 and E.4.

Clause E.2 provides the interface to the document profile and its formal specification.

Clauses E.3 and E.4 provide the interface to the document architecture by giving a formal specification of geometric graphics presentation attributes and content portion attributes that apply to geometric graphics content portions.

Clause E.5 is an index to the terms (definitions, operators, attribute names) used in E.2, E.3 and E.4.

At any time a clause number is specified in the semi-formal descriptions this refers to a clause number in ISO 8613-8.

What follows is the outline of the formula which specifies the geometric graphics content architectures. The dots indicate formal text fragments which have been left out for the sake of readability. The full formula can be obtained by replacing each line (apart from the *and*) with the definition which is referenced by the superscript of the predicate symbol or operator symbol, respectively. The variables used in the definition of the predicate have to be replaced by those appearing in the outline (if they are different). NOTE: A definition is a formula, hence it may never yield an undefined result, whatever value has been inserted for the variable.

... IsProfileDefaultableGeometricGraphicsContentArchitectureAttribute$^{8.1}(att)$ ...
and ... IsProfileGeometricGraphicsCodingSpecification$^{8.2}(v)$ ...
and ... IsProfileGeometricGraphicsPresentationFeature$^{8.3}(v)$ ...
and ... SatisfiesGeometricGraphicsContentArchitectureConstraints$^{8.4}(prof, doby)$ ...
and ... IsGeometricGraphicsContentPortionDescription$^{8.5}(cont)$ ...
and ... IsGeometricGraphicsContentPresentationAttribute$^{8.6}(att)$ ...
and ... IsGeometricGraphicsContentCodingAttribute$^{8.7}(att)$ ...
and ... IsGeometricGraphicsContentPortionAttributeSet$^{8.8}(as)$ ...
and ... IsGeometricGraphicsEncodingAnnouncerValue$^{8.9}(v)$ ...
and ... IsDirectColourValuePair$^{8.10}(v)$ ...
and ... IsLineRenditionValue$^{8.11}(v)$ ...
and ... IsSetOfLineBundleSpecifications$^{8.12}(v)$ ...
and ... IsLineBundleSpecification$^{8.13}(v)$ ...
and ... IsGeometricGraphicsColourValue$^{8.14}(v)$ ...
and ... IsWidthValue$^{8.15}(v)$ ...
and ... IsSpecificationModeValue$^{8.16}(v)$ ...
and ... IsLineTypeValue$^{8.17}(v)$ ...
and ... IsMarkerRenditionValue$^{8.18}(v)$ ...
and ... IsSetOfMarkerBundleSpecifications$^{8.19}(v)$ ...
and ... IsMarkerBundleSpecification$^{8.20}(v)$ ...
and ... IsMarkerTypeValue$^{8.21}(v)$ ...
and ... IsTextRenditionValue$^{8.22}(v)$ ...
and ... IsCharacterSetList$^{8.23}(v)$ ...
and ... IsCharacterSetSpecification$^{8.24}(v)$ ...
and ... IsSetOfTextBundleSpecifications$^{8.25}(v)$ ...
and ... IsRegisteredDesignationSequenceTail$^{8.26}(v)$ ...

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and ... IsTextBundleSpecification$^{8.27}(v)$ ...
and ... IsOrientationVectorPair$^{8.28}(v)$ ...
and ... IsFontListSet$^{8.29}(v)$ ...
and ... IsTextAlignmentSpecification$^{8.30}(v)$ ...
and ... IsFilledAreaRenditionValue$^{8.31}(v)$ ...
and ... IsSetOfFillBundleSpecifications$^{8.32}(v)$ ...
and ... IsFillBundleSpecification$^{8.33}(v)$ ...
and ... IsSetOfPatternTableSpecifications$^{8.34}(v)$ ...
and ... IsPatternTableSpecification$^{8.35}(v)$ ...
and ... IsSeqOfDirectColourValue$^{8.36}(v)$ ...
and ... IsHatchIndexValue$^{8.37}(v)$ ...
and ... IsPatternSizeValue$^{8.38}(v)$ ...
and ... IsEdgeRenditionValue$^{8.39}(v)$ ...
and ... IsSetOfEdgeBundleSpecifications$^{8.40}(v)$ ...
and ... IsEdgeBundleSpecification$^{8.41}(v)$ ...
and ... IsEdgeTypeValue$^{8.42}(v)$ ...
and ... IsColourRepresentationsValue$^{8.43}(v)$ ...
and ... IsSetOfColourTableSpecifications$^{8.44}(v)$ ...
and ... IsColourTableSpecification$^{8.45}(v)$ ...
and ... IsTransparencySpecificationValue$^{8.46}(v)$ ...
and ... IsTransformationSpecificationValue$^{8.47}(v)$ ...
and ... IsRegionOfInterestSpecificationValue$^{8.48}(v)$ ...
and ... IsPictureOrientationValue$^{8.49}(v)$ ...
and ... IsPictureDimensionsValue$^{8.50}(v)$ ...
and ... IsGeometricGraphicsContentArchitectureClassValue$^{8.51}(v)$ ...
and ... IsGeometricGraphicsContentTypeOfCodingValue$^{8.52}(v)$ ...
and ... IsGeometricGraphicsContentInformationValue$^{8.53}(v)$ ...
and ... IsDirectColourValue$^{8.54}(v)$ ...
and ... IsVDCPair$^{8.55}(v)$ ...
and ... IsVDCValue$^{8.56}(v)$ ...
and ... IsNnVDCValue$^{8.57}(v)$ ...
and ... IsRegisteredLineType$^{8.58}(v)$ ...
and ... IsRegisteredMarkerType$^{8.59}(v)$ ...
and ... IsRegisteredHatchIndex$^{8.60}(v)$ ...
and ... IsRegisteredEdgeType$^{8.61}(v)$ ...

NOTE: Other predicates or operators which are used here, but are defined in clause 6, are not listed here.

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E.2 Interface to the Document Profile

Semiformal Description 8.1

Predicate "is a profile defaultable geometric graphics content architecture attribute"

A profile defaultable geometric graphics content architecture attribute is a geometric graphics content presentation attribute.

NOTE: This predicate is used in annex B.

Definition 8.1

1 $\forall att$
2 ($_0$IsProfileDefaultableGeometricGraphicsContentArchitectureAttribute(att) *iff*
3 IsGeometricGraphicsContentPresentationAttribute$^{8.6}$(att) $_0$)

Semiformal Description 8.2

Predicate "is a profile geometric graphics coding specification"

A profile geometric graphics coding specification is a nomination where each element is a geometric graphics content coding attribute.

NOTE: This predicate is used in annex B.

Definition 8.2

1 $\forall v$
2 ($_0$IsProfileGeometricGraphicsCodingSpecification(v) *iff*
3 IsNom(v) *and*
4 $\forall b \in \hat{}v$ • (IsGeometricGraphicsContentCodingAttribute$^{8.7}$(C b)) $_0$)

Semiformal Description 8.3

Predicate "is a profile geometric graphics presentation feature"

A profile geometric graphics presentation feature is a nomination where each element is a geometric graphics content presentation attribute.

NOTE: This predicate is used in annex B.

Definition 8.3

1 $\forall v$
2 ($_0$IsProfileGeometricGraphicsPresentationFeature(v) *iff*
3 IsNom(v) *and*
4 $\forall b \in \hat{}v$ • (IsGeometricGraphicsContentPresentationAttribute$^{8.6}$(C b)) $_0$)

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E.3 Interface to the Document Architecture

Semiformal Description 8.4

Predicate "satisfies geometric graphics content architecture constraints"

A document profile *prof* and a document body *doby* satisfy the constraints imposed by the geometric graphics content architecture if the following holds: For all constituents *cst* and content portions *cont* in the document body for which the content portion is described by the constituent and for which the attribute 'content architecture class' of the constituent has the value '2 8 2 8 0', the content portion is a geometric graphics content portion description and the value '2 8 2 8 0' appears in the document profile attribute 'content architecture classes'.

NOTE: This predicate is used in clause 7 of this part of ISO 8613.

Definition 8.4

1 $\forall prof, doby$
2 $({}_{0}\,\text{SatisfiesGeometricGraphicsContentArchitectureConstraints}(prof, doby)\ \underline{iff}$
3 $\forall cst, cont \in doby$
4 $({}_{1}\,({}_{2}\,(cont)\text{DescribesContPortOf}^{2.153}(cst)\ \underline{and}$
5 $\text{C}\ \hat{}\ cst \bullet \text{'content architecture class'} = \text{'2 8 2 8 0'}_{2})\ \underline{impl}$
6 $({}_{3}\,\text{IsGeometricGraphicsContentPortionDescription}^{8.5}(cont)\ \underline{and}$
7 $\text{'2 8 2 8 0'} \in \text{C}\ \hat{}\ prof \bullet \text{'content architecture classes'}_{3})_{1})_{0})$

Semiformal Description 8.5

Predicate "is a geometric graphics content portion description"

A geometric graphics content portion description is a set of geometric graphics content portion attributes.

NOTE: This predicate is used in clause 7 of this part of ISO 8613.

Definition 8.5

1 $\forall cont$
2 $({}_{0}\,\text{IsGeometricGraphicsContentPortionDescription}(cont)\ \underline{iff}$
3 $\text{IsGeometricGraphicsContentPortionAttributeSet}^{8.8}(cont)_{0})$

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Semiformal Description 8.6

Predicate "is a geometric graphics content presentation attribute"

A geometric graphics content presentation attribute is one of the attributes 'colour representations', 'edge rendition', 'filled area rendition', 'geometric graphics encoding announcer', 'line rendition', 'marker rendition', 'picture dimensions', 'picture orientation', 'region of interest specification', 'text rendition', 'transparency specification' and 'transformation specification' with an appropriate value.

NOTE: This predicate is used in clause 7 of this part of ISO 8613.

Definition 8.6

$$
\begin{aligned}
&\forall att \\
&({}_{0}\,\mathrm{IsGeometricGraphicsContentPresentationAttribute}(att)\ \underline{\mathit{iff}} \\
&\quad \exists n, c \\
&\quad ({}_{1}\,att = [n : c]\ \underline{\mathit{and}} \\
&\qquad n \in [\text{'colour representations'}; \quad \text{'edge rendition'}; \\
&\qquad\quad \text{'filled area rendition'}; \quad \text{'geometric graphics encoding announcer'}; \\
&\qquad\quad \text{'line rendition'}; \quad \text{'marker rendition'}; \\
&\qquad\quad \text{'picture dimensions'}; \quad \text{'picture orientation'}; \\
&\qquad\quad \text{'region of interest specification'}; \text{'text rendition'}; \\
&\qquad\quad \text{'transformation specification'}; \quad \text{'transparency specification'}]\ \underline{\mathit{and}} \\
&\qquad ({}_{2}\,n = \text{'colour representations'}\ \underline{\mathit{impl}} \\
&\qquad\quad ({}_{3}\,\mathrm{IsColourRepresentationsValue}^{8.43}(c)\ \underline{\mathit{or}}\ \mathrm{IsPlaceholder}^{1.19}(c)_{3})\ {}_{2})\ \underline{\mathit{and}} \\
&\qquad ({}_{4}\,n = \text{'edge rendition'}\ \underline{\mathit{impl}} \\
&\qquad\quad ({}_{5}\,\mathrm{IsEdgeRenditionValue}^{8.39}(c)\ \underline{\mathit{or}}\ \mathrm{IsPlaceholder}^{1.19}(c)_{5})\ {}_{4})\ \underline{\mathit{and}} \\
&\qquad ({}_{6}\,n = \text{'filled area rendition'}\ \underline{\mathit{impl}} \\
&\qquad\quad ({}_{7}\,\mathrm{IsFilledAreaRenditionValue}^{8.31}(c)\ \underline{\mathit{or}}\ \mathrm{IsPlaceholder}^{1.19}(c)_{7})\ {}_{6})\ \underline{\mathit{and}} \\
&\qquad ({}_{8}\,n = \text{'geometric graphics encoding announcer'}\ \underline{\mathit{impl}} \\
&\qquad\quad ({}_{9}\,\mathrm{IsGeometricGraphicsEncodingAnnouncerValue}^{8.9}(c)\ \underline{\mathit{or}}\ \mathrm{IsPlaceholder}^{1.19}(c)_{9})\ {}_{8})\ \underline{\mathit{and}} \\
&\qquad ({}_{10}\,n = \text{'line rendition'}\ \underline{\mathit{impl}} \\
&\qquad\quad ({}_{11}\,\mathrm{IsLineRenditionValue}^{8.11}(c)\ \underline{\mathit{or}}\ \mathrm{IsPlaceholder}^{1.19}(c)_{11})\ {}_{10})\ \underline{\mathit{and}} \\
&\qquad ({}_{12}\,n = \text{'marker rendition'}\ \underline{\mathit{impl}} \\
&\qquad\quad ({}_{13}\,\mathrm{IsMarkerRenditionValue}^{8.18}(c)\ \underline{\mathit{or}}\ \mathrm{IsPlaceholder}^{1.19}(c)_{13})\ {}_{12})\ \underline{\mathit{and}} \\
&\qquad ({}_{14}\,n = \text{'picture dimensions'}\ \underline{\mathit{impl}} \\
&\qquad\quad ({}_{15}\,\mathrm{IsPictureDimensionsValue}^{8.50}(c)\ \underline{\mathit{or}}\ \mathrm{IsPlaceholder}^{1.19}(c)_{15})\ {}_{14})\ \underline{\mathit{and}} \\
&\qquad ({}_{16}\,n = \text{'picture orientation'}\ \underline{\mathit{impl}} \\
&\qquad\quad ({}_{17}\,\mathrm{IsPictureOrientationValue}^{8.49}(c)\ \underline{\mathit{or}}\ \mathrm{IsPlaceholder}^{1.19}(c)_{17})\ {}_{16})\ \underline{\mathit{and}} \\
&\qquad ({}_{18}\,n = \text{'region of interest specification'}\ \underline{\mathit{impl}} \\
&\qquad\quad ({}_{19}\,\mathrm{IsRegionOfInterestSpecificationValue}^{8.48}(c)\ \underline{\mathit{or}}\ \mathrm{IsPlaceholder}^{1.19}(c)_{19})\ {}_{18})\ \underline{\mathit{and}} \\
&\qquad ({}_{20}\,n = \text{'text rendition'}\ \underline{\mathit{impl}} \\
&\qquad\quad ({}_{21}\,\mathrm{IsTextRenditionValue}^{8.22}(c)\ \underline{\mathit{or}}\ \mathrm{IsPlaceholder}^{1.19}(c)_{21})\ {}_{20})\ \underline{\mathit{and}} \\
&\qquad ({}_{22}\,n = \text{'transformation specification'}\ \underline{\mathit{impl}} \\
&\qquad\quad ({}_{23}\,\mathrm{IsTransformationSpecificationValue}^{8.47}(c)\ \underline{\mathit{or}}\ \mathrm{IsPlaceholder}^{1.19}(c)_{23})\ {}_{22})\ \underline{\mathit{and}} \\
&\qquad ({}_{24}\,n = \text{'transparency specification'}\ \underline{\mathit{impl}} \\
&\qquad\quad ({}_{25}\,\mathrm{IsTransparencySpecificationValue}^{8.46}(c)\ \underline{\mathit{or}}\ \mathrm{IsPlaceholder}^{1.19}(c)_{25})\ {}_{24})\ {}_{1})\ {}_{0})
\end{aligned}
$$

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Semiformal Description 8.7

Predicate "is a geometric graphics content coding attribute"

A geometric graphics content coding attribute is the attribute 'type of coding' with an appropriate value.

NOTE: This predicate is used in clause 7 of this part of ISO 8613.

Definition 8.7

1 $\forall\, att$
2 $(_0$ IsGeometricGraphicsContentCodingAttribute(att) *iff*
3 $\exists\, n, c$
4 $(_1\, att = [n : c]$ *and*
5 $n =$ 'type of coding' *and* IsGeometricGraphicsContentTypeOfCodingValue$^{8.52}(c)\ _1)_0)$

E.4 Attributes of the Geometric Graphics Content Architecture

Semiformal Description 8.8

Predicate "is a geometric graphics content portion attribute set"

For a geometric graphics content portion attribute set the value of the attribute 'content information' is a geometric graphics content information value.

Definition 8.8

1 $\forall\, as$
2 $(_0$ IsGeometricGraphicsContentPortionAttributeSet(as) *iff*
3 IsNeNom$^{1.2}(as)$ *and*
4 $\forall\, a \hat{\in} \hat{}as \bullet$
5 $(_1$ N $a =$ 'content information' *impl* IsGeometricGraphicsContentInformationValue$^{8.53}$(C $a)\ _1)_0)$

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Semiformal Description 8.9

Predicate "is a geometric graphics encoding announcer value" (clause 6.1.1.1)

The value of the attribute 'geometric graphics encoding announcer' is a nomination with the names 'Colour Index Precision', 'Colour Precision', 'Colour Selection Mode', 'Colour Value Extent', 'Index Precision', 'Integer Precision', 'Maximum Colour Index', 'Real Precision', 'VDC Integer Precision', 'VDC Real Precision' and 'VDC Type' (3-3). For the names 'Colour Index Precision', 'Colour Precision', 'Index Precision' and 'Integer Precision' the value is either 8, 16, 24 or 32 (11, 12). For the name 'Colour Selection Mode' the value is either 'indexed' or 'direct' (13, 14). For the name 'Colour Value Extent' the value is a direct colour value pair (15, 16). For the name 'Maximum Colour Index' the value is a non-negative integer (17, 18). For the names 'Real Precision' and 'VDC Real Precision' the value is either 'floating point format, 9, 23', 'floating point format, 12, 52', 'fixed point format, 16, 16' or 'fixed point format, 32, 32' (19-22). For the name 'VDC Integer Precision' the value is either 16, 24 or 32 (23, 24). For the name 'VDC Type' the value is either 'integer' or 'real' (25, 26). All parameters are defaultable.

Definition 8.9

```
1   ∀ v
2   (0 IsGeometricGraphicsEncodingAnnouncerValue(v) iff
3     IsNom(v) and
4     NAMS1.18(v) = ['Colour Index Precision';  'Colour Precision';
5                    'Colour Selection Mode';  'Colour Value Extent';
6                    'Index Precision';        'Integer Precision';
7                    'Maximum Colour Index';   'Real Precision';
8                    'VDC Integer Precision';  'VDC Real Precision';
9                    'VDC Type'] and
10  ∀ a ∈̂ v •
11  (1 (2 N a ∈ ['Colour Index Precision';'Colour Precision';'Index Precision';'Integer Precision'] impl
12       (3 IsPlaceholder1.19(C a) or C a ∈ [8;16;24;32] 3)2) and
13     (4 N a = 'Colour Selection Mode' impl
14       (5 IsPlaceholder1.19(C a) or C a ∈ ['indexed';'direct'] 5)4) and
15     (6 N a = 'Colour Value Extent' impl
16       (7 IsPlaceholder1.19(C a) or IsDirectColourValuePair8.10(C a)7)6) and
17     (8 N a = 'Maximum Colour Index' impl
18       (9 IsPlaceholder1.19(C a) or IsNnInt1.7(C a)9)8) and
19     (10 N a ∈ ['Real Precision';'VDC Real Precision'] impl
20       (11 IsPlaceholder1.19(C a) or
21          C a ∈ ['floating point format, 9, 23';'floating point format, 12, 52';
22                 'fixed point format, 16, 16';'fixed point format, 32, 32'] 11)10) and
23    (12 N a = 'VDC Integer Precision' impl
24       (13 IsPlaceholder1.19(C a) or C a ∈ [16;24;32] 13)12) and
25    (14 N a = 'VDC Type' impl
26       (15 IsPlaceholder1.19(C a) or C a ∈ ['integer';'real'] 15)14)1)0)
```


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Semiformal Description 8.10

Predicate "is a direct colour value pair" (clause 6.1.1.1)

A direct colour value pair is a sequence of two direct colour values.

Definition 8.10

```
1   ∀ v
2   (0 IsDirectColourValuePair(v) iff
3     v = [ → l → r → ] and
4     IsDirectColourValue^8.54(l) and IsDirectColourValue^8.54(r)0)
```

Semiformal Description 8.11

Predicate "is a line rendition value" (clause 6.1.1.2)

The value of the attribute 'line rendition' is a nomination with the names 'line aspect source flags', 'line bundle specifications', 'Line Bundle Index', 'Line Colour', 'Line Type', 'Line Width' and 'Line Width Specification Mode'. For the name 'line aspect source flags' the value is again a nomination with the names 'line colour asf', 'line type asf' and 'line width asf' whose values are either 'bundled' or 'individual' (9-14). For the name 'line bundle specifications' the value is a set of line bundle specifications (15, 16). For the name 'Line Bundle Index' the value is a positive integer (17, 18). For the name 'Line Colour' the value is a geometric graphics colour value (19, 20). For the name 'Line Type' the value is a line type value (21, 22). For the name 'Line Width' the value is a width value (23, 24). For the name 'Line Width Specification Mode' the value is a specification mode value (25, 26). All parameters are defaultable.

Definition 8.11

```
1   ∀ v
2   (0 IsLineRenditionValue(v) iff
3     IsNom(v) and
4     NAMS^1.18(v) = ['line aspect source flags'; 'line bundle specifications';
5                     'Line Bundle Index';      'Line Colour';
6                     'Line Type';              'Line Width';
7                     'Line Width Specification Mode'] and
8     ∀ a ∈̂ ~v •
9     (1 (2 N a = 'line aspect source flags' impl
10        (3 IsPlaceholder^1.19(C a) or
11          (4 IsNom(C a) and
12            NAMS^1.18(C a) = ['line colour asf'; 'line type asf'; 'line width asf'] and
13            ∀ b ∈̂ ^(C a) •
14            (5 IsPlaceholder^1.19(C b) or C b ∈ ['bundled'; 'individual'])5)4)3)2) and
15      (6 N a = 'line bundle specifications' impl
16        (7 IsPlaceholder^1.19(C a) or IsSetOfLineBundleSpecifications^8.12(C a)7)6) and
17      (8 N a = 'Line Bundle Index' impl
18        (9 IsPlaceholder^1.19(C a) or IsNat(C a)9)8) and
19      (10 N a = 'Line Colour' impl
20        (11 IsPlaceholder^1.19(C a) or IsGeometricGraphicsColourValue^8.14(C a)11)10) and
21      (12 N a = 'Line Type' impl
22        (13 IsPlaceholder^1.19(C a) or IsLineTypeValue^8.17(C a)13)12) and
23      (14 N a = 'Line Width' impl
24        (15 IsPlaceholder^1.19(C a) or IsWidthValue^8.15(C a)15)14) and
25      (16 N a = 'Line Width Specification Mode' impl
26        (17 IsPlaceholder^1.19(C a) or IsSpecificationModeValue^8.16(C a)17)16)1)0)
```


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Semiformal Description 8.12

Predicate "is a set of line bundle specifications" (clause 6.1.1.2)

A set of line bundle specifications is a collection of elements which are line bundle specifications.

Definition 8.12

1 $\forall v$
2 $(_0$ IsSetOfLineBundleSpecifications(v) *iff*
3 IsCol(v) *and*
4 $\forall a \in v$ (IsLineBundleSpecification$^{8.13}(a))_0)$

Semiformal Description 8.13

Predicate "is a line bundle specification" (clause 6.1.1.2)

A line bundle specification is a nomination with the names 'line bundle representation' and 'Line Bundle Index'. For the name 'Line Bundle Index' the value is a positive integer (6). For the name 'line bundle representation' the value is again a nomination with the names 'Line Colour', 'Line Type' and 'Line Width' (7-9). For the name 'Line Colour' the value is a geometric graphics colour value (11). For the name 'Line Type' the value is a line type value (12). For the name 'Line Width' the value is a width value (13).

Definition 8.13

1 $\forall v$
2 $(_0$ IsLineBundleSpecification(v) *iff*
3 IsNom(v) *and*
4 NAMS$^{1.18}(v)$ = ['line bundle representation'; 'Line Bundle Index'] *and*
5 $\forall a \hat{\in} \hat{}v \bullet$
6 $(_1 (_2$ N a = 'Line Bundle Index' *impl* IsNat(C $a)_2)$ *and*
7 $(_3$ N a = 'line bundle representation' *impl*
8 $(_4$ IsNom(C $a)$ *and*
9 NAMS$^{1.18}$(C a) = ['Line Colour'; 'Line Type'; 'Line Width'] *and*
10 $\forall b \hat{\in} \hat{}$(C $a) \bullet$
11 $(_5 (_6$ N b = 'Line Colour' *impl* IsGeometricGraphicsColourValue$^{8.14}$(C $b)_6)$ *and*
12 $(_7$ N b = 'Line Type' *impl* IsLineTypeValue$^{8.17}$(C $b)_7)$ *and*
13 $(_8$ N b = 'Line Width' *impl* IsWidthValue$^{8.15}$(C $b)_8)_5)_4)_3)_1)_0)$

Semiformal Description 8.14

Predicate "is a geometric graphics colour value" (clauses 6.1.1.2, 6.1.1.3, 6.1.1.4, 6.1.1.5, 6.1.1.6)

A geometric graphics colour value is either a non-negative integer or a direct colour value.

NOTE: Since the attribute 'colour' is used within the document structures (ISO 8613-2) and an associated predicate "IsColourValue" is defined in clause 7 of this part of ISO 8613, the qualifier "GeometricGraphics" has been added to the predicate name.

Definition 8.14

1 $\forall v$
2 $(_0$ IsGeometricGraphicsColourValue(v) *iff*
3 IsNnInt$^{1.7}(v)$ *or* IsDirectColourValue$^{8.54}(v)_0)$

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