

DIN EN ISO 19107:2020-09 (E)

Geographic information - Spatial Schema (ISO 19107:2019); English version EN ISO 19107:2019

Contents		Page
	Foreword	viii
	Introduction	ix
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Symbols, notation and abbreviated terms	17
4.1	Presentation and notation.....	17
4.1.1	Unified Modeling Language (UML).....	17
4.1.2	Naming conventions.....	17
4.2	Organization.....	18
4.3	Abbreviated terms and symbols.....	18
5	Conformance	19
5.1	Requirements class conformance targets.....	19
5.1.1	Conformance targets.....	19
5.1.2	Geometry metrics (geodesy).....	22
5.1.3	Topological dimensionality.....	22
5.1.4	Interpolation schemes.....	22
5.1.5	Structural complexity.....	23
5.1.6	Functional complexity.....	24
5.2	Conformance classes.....	24
5.3	Requirements classes.....	25
6	Coordinates and core geometry	26
6.1	Semantics.....	26
6.2	Requirements Class Coordinate.....	27
6.2.1	Codelists to specify capabilities.....	27
6.2.2	Coordinate systems for Geometry — Semantics.....	27
6.2.3	GeometricReferenceSurface.....	31
6.2.4	Interface ReferenceSystem.....	35
6.2.5	Codelist ReferenceSystemTypes.....	36
6.2.6	Interface CompoundReferenceSystem.....	36
6.2.7	Interface HomogeneousCoordinateSystem.....	37
6.2.8	Interface GeometricCoordinateSystem.....	37
6.2.9	Datatype DirectPosition.....	42
6.2.10	Union Datatype RSID.....	44
6.2.11	Codelist Axis.....	45
6.2.12	Role metadata: AxisDescription.....	45
6.2.13	Datatype Axis Description.....	45
6.2.14	Codelist SpatialAxis.....	45
6.2.15	Codelist SphericalAxis.....	45
6.2.16	Codelist TemporalAxis.....	45
6.2.17	Codelist ParametricAxis.....	46
6.2.18	Codelist Datum.....	46
6.2.19	Datatype Parameter.....	47
6.2.20	Datatype Permutation, Projection.....	47
6.2.21	Interface ReferenceDirection.....	48
6.2.22	Datatype Bearing.....	48

6.2.23	Codelist Rotation	50
6.2.24	Codelist RelativeDirection	50
6.2.25	Codelist FixedDirection	50
6.2.26	Codelist CurveRelativeDirection	50
6.2.27	Datatype Vector	51
6.2.28	Interface Envelope	52
6.2.29	Engineering coordinate systems, Tangent spaces and local interpolations	53
6.3	Requirements Class Coordinate Data	53
6.4	Requirements Class Geometry	54
6.4.1	Semantics	54
6.4.2	Interface TransfiniteSetOfDirectPositions	55
6.4.3	CodeList: BoundaryType	55
6.4.4	Interface Geometry	56
6.4.5	Datatype GeometryData	70
6.4.6	CodeList: GeometryType	70
6.4.7	Interface Encoding	70
6.4.8	Interface Query2D	71
6.4.9	Interface Query3D	74
6.4.10	Interface Empty	75
6.4.11	Interface Primitive	76
6.4.12	Datatype PrimitiveData	77
6.4.13	Interface Point	78
6.4.14	Datatype PointData	80
6.4.15	Interface Orientable	80
6.4.16	Datatype OrientableData	81
6.4.17	Datatype Knot	82
6.4.18	Interface Curve	83
6.4.19	Data Type CurveData	93
6.4.20	Interface OffsetCurve	93
6.4.21	Datatype OffsetCurveData	94
6.4.22	Interface ProductCurve	94
6.4.23	ProductCurveData	96
6.4.24	CodeList: CurveInterpolation	96
6.4.25	Interface Surface	97
6.4.26	Datatype SurfaceData	101
6.4.27	CodeList: SurfaceInterpolation	101
6.4.28	Interface Solid	101
6.4.29	Datatype SolidData	104
6.4.30	CodeList: SolidInterpolation	104
6.4.31	Interface Collection	105
6.4.32	Role element: Geometry	106
6.4.33	Data Type CollectionData	107
6.4.34	Interface Complex	107
6.4.35	Role Complex: generator: Primitive	110
6.4.36	Role Complex: superComplex and subComplex	110
6.5	Requirements Class Geometry Data	111
7	Interpolations for Curves	111
7.1	Requirements Class Line Curve	111
7.1.1	Semantics	111
7.1.2	Interface Line	111
7.1.3	Data Type LineData	113
7.2	Requirements Class Line Data	114
7.3	Requirements Class Geodesic Curve	114
7.3.1	Semantics	114
7.3.2	Interface Geodesic	115
7.3.3	Data Type GeodesicData	115
7.4	Requirements Class Geodesic Curve Data	115
7.5	Requirements Class Rhumb	116
7.5.1	Interface Rhumb	116
7.5.2	Data Type RhumbData	116

7.6	Requirements Class Rhumb Curve Data.....	117
7.7	Requirements Class Polynomial Curves.....	117
7.7.1	Semantics.....	117
7.7.2	Interface RealFunction.....	118
7.7.3	Interface FunctionArc.....	118
7.7.4	Association Role function.....	118
7.7.5	Interface FunctionCurve.....	119
7.7.6	Interface RealPolynomial.....	119
7.7.7	Interface PolynomialArc.....	120
7.7.8	Datatype PolynomialArcData.....	121
7.7.9	Interface PolynomialCurve.....	121
7.7.10	Data Type PolynomialCurveData.....	121
7.8	Requirements Class Polynomial Curve Data.....	121
7.9	Requirements Class Conic Curves.....	122
7.9.1	Semantics.....	122
7.9.2	Interface Arc.....	123
7.9.3	Datatype ArcData.....	124
7.9.4	Interface Circle.....	125
7.9.5	Interface Conic.....	125
7.9.6	Interface EllipticArc, Datatype EllipticArcData.....	128
7.10	Requirements Class Conic Curve Data.....	128
7.11	Requirements Class Spiral Curve.....	128
7.11.1	Semantics, Mathematical background: curves and curvature.....	128
7.11.2	Interface Spiral Curves.....	134
7.11.3	Interface Clothoid Curve.....	136
7.11.4	Datatype SpiralData.....	136
7.12	Requirements Class Spiral Curve Data.....	136
7.13	Requirements Class Spline Curve.....	136
7.13.1	Semantics.....	136
7.13.2	CodeList: KnotType.....	137
7.13.3	CodeList: SplineCurveForm.....	138
7.13.4	Interface SplineCurve.....	138
7.13.5	Interface PolynomialSpline.....	141
7.13.6	Interface CubicSpline.....	142
7.13.7	Interface Bezier.....	143
7.13.8	Interface BSplineCurve (and NURBS).....	144
7.13.9	Data Type BsplineData.....	145
7.14	Requirements Class Spline Curve Data.....	145
8	Interpolations for Surfaces.....	145
8.1	Requirements Class Polygon Surface.....	145
8.1.1	Semantics.....	145
8.1.2	Interface Polygon.....	145
8.1.3	Datatype PolygonData.....	147
8.1.4	Interface PolyhedralSurface.....	147
8.1.5	Datatype PolyhedralSurfaceData.....	147
8.1.6	Interface Triangle.....	147
8.1.7	Datatype TriangleData.....	148
8.1.8	Interface TriangulatedSurface.....	148
8.1.9	Datatype TriangulatedSurfaceData.....	148
8.2	Requirements Class Polygon Surface Data.....	148
8.3	Requirements Class Parametric Curve Surface.....	148
8.3.1	Semantics.....	148
8.3.2	Interface ParametricCurveSurface.....	149
8.3.3	Datatype ParametricCurveSurfaceData.....	152
8.3.4	Interface BilinearGrid.....	152
8.3.5	Extensions of ParametricCurveSurface.....	153
8.4	Requirements Class Parametric Curve Surface Data.....	153

8.5	Requirements Class Conic Surface.....	154
8.5.1	Semantics.....	154
8.5.2	Interface Sphere.....	154
8.5.3	Interface Cone.....	155
8.5.4	Interface Cylinder.....	155
8.6	Requirements Class Conic Surface Data.....	155
8.7	Requirements Class Spline Surface.....	156
8.7.1	Semantics.....	156
8.7.2	Interface BSplineSurface (and NURBS).....	156
8.7.3	Codelist BSplineSurfaceForm.....	158
8.8	Requirements Class Spline Surface Data.....	158
9	Interpolations for Solids.....	158
9.1	Requirements Class Boundary Representation Solid.....	158
9.2	Requirements Class Boundary Representation Solid Data.....	159
9.3	Requirements Class Parametric Curve Solid.....	159
9.3.1	Interface ParametricCurveSolid.....	159
9.3.2	Interface BSolidSpline.....	160
9.3.3	Other interpolations.....	161
9.4	Requirements Class Parametric Curve Solid Data.....	161
10	Topology.....	161
10.1	Requirements Class Topology root.....	161
10.1.1	Semantics.....	161
10.1.2	Interface Topology.....	162
10.1.3	Interface Primitive.....	166
10.1.4	Interface DirectedTopo.....	168
10.1.5	Datatype TopologyData.....	170
10.1.6	DataType PrimitiveData.....	171
10.1.7	DataType ComplexData.....	171
10.1.8	Datatype Expression.....	171
10.1.9	Datatype ExpressionTerm.....	174
10.2	Requirements Class Topology Root Data.....	174
10.3	Requirements Class Node.....	174
10.3.1	Semantics.....	174
10.3.2	Interface Node.....	174
10.3.3	Interface DirectedNode.....	175
10.4	Requirements Class Edge.....	175
10.4.1	Interface Edge.....	175
10.4.2	Interface DirectedEdge.....	176
10.5	Requirements Class Face.....	177
10.5.1	Semantics.....	177
10.5.2	Interface Face.....	177
10.5.3	Interface DirectedFace.....	178
10.6	Requirements Class Topology Solid.....	178
10.6.1	Interface Solid.....	178
10.6.2	Interface DirectedSolid.....	179
10.7	Requirements Class Topological Complex.....	179
10.7.1	Semantics.....	179
10.7.2	Interface Complex.....	179
10.8	Requirements Class Derived Topological Relations.....	182
10.8.1	Introduction.....	182
10.8.2	Canonical form for Geometry.....	183
10.8.3	Boundary operators for aggregate objects.....	183
10.8.4	Boolean or set operators.....	185
10.8.5	Egenhofer operators.....	186
10.8.6	Full topological operators.....	187
10.8.7	Combinations.....	190

11	Special Requirements Classes	190
11.1	Requirements Class Simplicial geometry	190
11.1.1	Semantics	190
11.1.2	Datatype Simplex	191
11.1.3	DataType SimplicialTerm	193
11.1.4	DataType::SimplicialPolynomial	193
11.1.5	DataType::SimplicialComplex	193
11.2	Requirements Class Point Clouds	193
11.2.1	Semantics	193
11.2.2	Interface PointCloud	194
Annex A	(normative) Abstract test suite	196
Annex B	(informative) Examples for application schemas	211
Annex C	(informative) MiniTopo	215
Annex D	(informative) Crosswalk 19107:2003 to current version	220
Bibliography	223