
**Information technology — Database
languages — SQL —**

**Part 14:
XML-Related Specifications (SQL/XML)**

*Technologies de l'information — Langages de base de données —
SQL —*

Partie 14: Spécifications relatives au XML (SQL/XML)

This document is a preview generated by ERS



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2016, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword.....	xi
Introduction.....	xii
1 Scope.....	1
2 Normative references.....	3
2.1 ISO and IEC standards.....	3
2.2 Other international standards.....	3
3 Definitions, notations and conventions.....	5
3.1 Definitions.....	5
3.1.1 Definitions taken from XML.....	5
3.1.2 Definitions taken from XML Schema.....	5
3.1.3 Definitions provided in Part 14.....	5
3.2 Notation.....	10
4 Concepts.....	13
4.1 Data types.....	13
4.1.1 Naming of predefined types.....	13
4.1.2 Data type terminology.....	13
4.2 XML.....	13
4.2.1 Introduction.....	13
4.2.2 XML types.....	14
4.2.3 Characteristics of XML values.....	15
4.2.4 XML comparison and assignment.....	16
4.2.5 Operations involving XML values.....	17
4.2.6 Registered XML Schemas.....	18
4.3 Data conversions.....	20
4.4 Data analysis operations (involving tables).....	21
4.4.1 Aggregate functions.....	21
4.5 SQL-invoked routines.....	21
4.5.1 Routine descriptors.....	21
4.6 SQL-statements.....	21
4.6.1 SQL-statements classified by function.....	21
4.6.1.1 SQL-session statements.....	22
4.7 Basic security model.....	22
4.7.1 Privileges.....	22
4.8 SQL-sessions.....	22
4.8.1 SQL-session properties.....	22

4.9	XML namespaces.	23
4.10	Overview of mappings.	23
4.10.1	Mapping SQL character sets to Unicode.	24
4.10.2	Mapping Unicode to SQL character sets.	24
4.10.3	Mapping SQL <identifier>s to XML.	24
4.10.4	Mapping XML Names to SQL.	25
4.10.5	Mapping SQL data types to XML.	25
4.10.6	Mapping values of SQL data types to XML.	27
4.10.7	Mapping XQuery atomic values to SQL values.	27
4.10.8	Visibility of columns, tables, and schemas in mappings from SQL to XML.	28
4.10.9	Mapping an SQL table to XML.	29
4.10.10	Mapping an SQL schema to XML.	30
4.10.11	Mapping an SQL catalog to XML.	30
5	Lexical elements.	33
5.1	<token> and <separator>.	33
5.2	Names and identifiers.	35
6	Scalar expressions.	37
6.1	<data type>.	37
6.2	<field definition>.	40
6.3	<value expression primary>.	41
6.4	<case expression>.	42
6.5	<cast specification>.	43
6.6	<XML cast specification>.	46
6.7	<value expression>.	54
6.8	<string value function>.	56
6.9	<XML value expression>.	61
6.10	<XML value function>.	62
6.11	<XML comment>.	63
6.12	<XML concatenation>.	65
6.13	<XML document>.	67
6.14	<XML element>.	69
6.15	<XML forest>.	74
6.16	<XML parse>.	77
6.17	<XML PI>.	79
6.18	<XML query>.	82
6.19	<XML text>.	88
6.20	<XML validate>.	90
7	Query expressions.	95
7.1	<table reference>.	95
7.2	<query expression>.	100
8	Predicates.	103
8.1	<predicate>.	103
8.2	<XML content predicate>.	105

8.3	<XML document predicate>.....	107
8.4	<XML exists predicate>.....	109
8.5	<XML valid predicate>.....	110
9	Mappings.....	115
9.1	Mapping SQL <identifier>s to XML Names.....	115
9.2	Mapping a multi-part SQL name to an XML Name.....	118
9.3	Mapping XML Names to SQL <identifier>s.....	120
9.4	Mapping an SQL data type to an XML Name.....	122
9.5	Mapping SQL data types to XML Schema data types.....	127
9.6	Mapping an SQL data type to a named XML Schema data type.....	147
9.7	Mapping a collection of SQL data types to XML Schema data types.....	150
9.8	Mapping values of SQL data types to values of XML Schema data types.....	152
9.9	Mapping an SQL table to XML Schema data types.....	158
9.10	Mapping an SQL table to an XML element or a sequence of XML elements.....	162
9.11	Mapping an SQL table to XML and an XML Schema document.....	166
9.12	Mapping an SQL schema to XML Schema data types.....	172
9.13	Mapping an SQL schema to an XML element.....	175
9.14	Mapping an SQL schema to an XML document and an XML Schema document.....	178
9.15	Mapping an SQL catalog to XML Schema data types.....	183
9.16	Mapping an SQL catalog to an XML element.....	185
9.17	Mapping an SQL catalog to an XML document and an XML Schema document.....	188
10	Additional common rules.....	193
10.1	Retrieval assignment.....	193
10.2	Store assignment.....	195
10.3	Result of data type combinations.....	197
10.4	Type precedence list determination.....	200
10.5	Type name determination.....	201
10.6	Determination of identical values.....	202
10.7	Determination of equivalent XML values.....	203
10.8	Equality operations.....	206
10.9	Grouping operations.....	207
10.10	Multiset element grouping operations.....	208
10.11	Ordering operations.....	209
10.12	Determination of namespace URI.....	210
10.13	Construction of an XML element.....	212
10.14	Concatenation of two XML values.....	215
10.15	Serialization of an XML value.....	216
10.16	Parsing a string as an XML value.....	220
10.17	Removing XQuery document nodes from an XQuery sequence.....	224
10.18	Constructing a copy of an XML value.....	226
10.19	Constructing an unvalidated XQuery document node.....	227
10.20	Creation of an XQuery expression context.....	228
10.21	Determination of an XQuery formal type notation.....	230

10.22	Validating an XQuery document or element node.	233
11	Additional common elements.	235
11.1	<routine invocation>.	235
11.2	<aggregate function>.	238
11.3	<XML lexically scoped options>.	241
11.4	<XML returning clause>.	243
11.5	<XML passing mechanism>.	244
11.6	<XML valid according to clause>.	245
12	Schema definition and manipulation.	249
12.1	<column definition>.	249
12.2	<check constraint definition>.	251
12.3	<alter column data type clause>.	252
12.4	<view definition>.	254
12.5	<assertion definition>.	256
12.6	<user-defined type definition>.	257
12.7	<attribute definition>.	258
12.8	<SQL-invoked routine>.	259
12.9	<user-defined cast definition>.	263
13	SQL-client modules.	265
13.1	<externally-invoked procedure>.	265
13.2	<SQL procedure statement>.	267
13.3	Data type correspondences.	268
14	Data manipulation.	271
14.1	<fetch statement>.	271
14.2	<select statement: single row>.	273
14.3	<delete statement: searched>.	275
14.4	<insert statement>.	276
14.5	<merge statement>.	277
14.6	<update statement: positioned>.	278
14.7	<update statement: searched>.	279
15	Control statements.	281
15.1	<compound statement>.	281
15.2	<assignment statement>.	283
16	Session management.	285
16.1	<set XML option statement>.	285
17	Dynamic SQL.	287
17.1	Description of SQL descriptor areas.	287
17.2	<input using clause>.	288
17.3	<output using clause>.	289
17.4	<prepare statement>.	291
18	Embedded SQL.	293

18.1	<embedded SQL host program>.....	293
18.2	<embedded SQL Ada program>.....	298
18.3	<embedded SQL C program>.....	301
18.4	<embedded SQL COBOL program>.....	306
18.5	<embedded SQL Fortran program>.....	309
18.6	<embedded SQL Pascal program>.....	312
18.7	<embedded SQL PL/I program>.....	315
19	Call-Level Interface specifications.....	319
19.1	SQL/CLI data type correspondences.....	319
20	Diagnostics management.....	323
20.1	<get diagnostics statement>.....	323
21	Information Schema.....	325
21.1	NCNAME domain.....	325
21.2	URI domain.....	326
21.3	ATTRIBUTES view.....	327
21.4	COLUMNS view.....	328
21.5	DOMAINS view.....	329
21.6	ELEMENT_TYPES view.....	330
21.7	FIELDS view.....	331
21.8	METHOD_SPECIFICATION_PARAMETERS view.....	332
21.9	METHOD_SPECIFICATIONS view.....	333
21.10	PARAMETERS view.....	334
21.11	ROUTINES view.....	335
21.12	XML_SCHEMA_ELEMENTS view.....	337
21.13	XML_SCHEMA_NAMESPACES view.....	338
21.14	XML_SCHEMAS view.....	339
21.15	Short name views.....	340
22	Definition Schema.....	345
22.1	DATA_TYPE_DESCRIPTOR base table.....	345
22.2	PARAMETERS base table.....	348
22.3	ROUTINES base table.....	350
22.4	SQL_CONFORMANCE base table.....	351
22.5	USAGE_PRIVILEGES base table.....	352
22.6	XML_SCHEMA_ELEMENTS base table.....	353
22.7	XML_SCHEMA_NAMESPACES base table.....	354
22.8	XML_SCHEMAS base table.....	355
23	The SQL/XML XML Schema.....	357
23.1	The SQL/XML XML Schema.....	357
24	Status codes.....	361
24.1	SQLSTATE.....	361
25	Conformance.....	363
25.1	Claims of conformance to SQL/XML.....	363

25.2	Additional conformance requirements for SQL/XML.....	364
25.3	Implied feature relationships of SQL/XML.....	365
Annex A	(informative) SQL Conformance Summary.....	375
Annex B	(informative) Implementation-defined elements.....	409
Annex C	(informative) Implementation-dependent elements.....	419
Annex D	(informative) Deprecated features.....	421
Annex E	(informative) Incompatibilities with ISO/IEC 9075:2011.....	423
Annex F	(informative) SQL feature taxonomy.....	425
Annex G	(informative) Defect reports not addressed in this edition of this part of ISO/IEC 9075... 	433
Index		435

Tables

Table	Page
1	Permanently registered XML Schemas. 19
2	XML namespace prefixes and their URIs. 23
3	Constraining facets of XML Schema integer types. 133
4	XQuery node properties. 204
5	Data type correspondences for Ada. 268
6	Data type correspondences for C. 268
7	Data type correspondences for COBOL. 268
8	Data type correspondences for Fortran. 269
9	Data type correspondences for M. 269
10	Data type correspondences for Pascal. 269
11	Data type correspondences for PL/I. 269
12	Codes used for SQL data types in Dynamic SQL. 287
13	SQL/CLI data type correspondences for Ada. 319
14	SQL/CLI data type correspondences for C. 319
15	SQL/CLI data type correspondences for COBOL. 320
16	SQL/CLI data type correspondences for Fortran. 320
17	SQL/CLI data type correspondences for M. 320
18	SQL/CLI data type correspondences for Pascal. 320
19	SQL/CLI data type correspondences for PL/I. 321
20	SQL-statement codes. 323
21	SQLSTATE class and subclass codes. 361
22	Implied feature relationships of SQL/XML. 365
23	Feature taxonomy for optional features. 425

(Blank page)

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, SC 32, *Data management and interchange*.

This fifth edition of ISO/IEC 9075-14 cancels and replaces the fourth edition (ISO/IEC 9075-14:2011), which has been technically revised. It also incorporates Technical Corrigenda ISO/IEC 9075-14:2011/Cor.1:2013 and ISO/IEC 9075-14:2011/Cor.2:2015.

A list of all parts in the ISO/IEC 9075 series, published under the general title *Information technology — Database languages — SQL*, can be found on the ISO website.

NOTE The individual parts of multi-part standards are not necessarily published together. New editions of one or more parts can be published without publication of new editions of other parts.

Introduction

The organization of ISO/IEC 9075-14 is as follows:

- 1) **Clause 1, “Scope”**, specifies the scope of this part of ISO/IEC 9075.
- 2) **Clause 2, “Normative references”**, identifies additional standards that, through reference in this part of ISO/IEC 9075, constitute provisions of this part of ISO/IEC 9075.
- 3) **Clause 3, “Definitions, notations and conventions”**, defines the notations and conventions used in this part of ISO/IEC 9075.
- 4) **Clause 4, “Concepts”**, presents concepts related to this part of ISO/IEC 9075.
- 5) **Clause 5, “Lexical elements”**, defines the lexical elements of the language.
- 6) **Clause 6, “Scalar expressions”**, defines the elements of the language that produce scalar values.
- 7) **Clause 7, “Query expressions”**, defines the elements of the language that produce rows and tables of data.
- 8) **Clause 8, “Predicates”**, defines the predicates of the language.
- 9) **Clause 9, “Mappings”**, defines the ways in which certain SQL information can be mapped into XML and certain XML information can be mapped into SQL.
- 10) **Clause 10, “Additional common rules”**, specifies the rules for assignments that retrieve data from or store data into SQL-data, and formation rules for set operations.
- 11) **Clause 11, “Additional common elements”**, defines additional language elements that are used in various parts of the language.
- 12) **Clause 12, “Schema definition and manipulation”**, defines facilities for creating and managing a schema.
- 13) **Clause 13, “SQL-client modules”**, defines SQL-client modules and externally-invoked procedures.
- 14) **Clause 14, “Data manipulation”**, defines the data manipulation statements.
- 15) **Clause 15, “Control statements”**, defines the SQL-control statements.
- 16) **Clause 16, “Session management”**, defines the SQL-session management statements.
- 17) **Clause 17, “Dynamic SQL”**, defines the SQL dynamic statements.
- 18) **Clause 18, “Embedded SQL”**, defines the host language embeddings.
- 19) **Clause 20, “Diagnostics management”**, defines the diagnostics management facilities.
- 20) **Clause 21, “Information Schema”**, defines viewed tables that contain schema information.
- 21) **Clause 22, “Definition Schema”**, defines base tables on which the viewed tables containing schema information depend.
- 22) **Clause 23, “The SQL/XML XML Schema”**, defines the content of an XML namespace that is used when SQL and XML are utilized together.
- 23) **Clause 24, “Status codes”**, defines values that identify the status of the execution of SQL-statements and the mechanisms by which those values are returned.

- 24) [Clause 25, “Conformance”](#), specifies the way in which conformance to this part of ISO/IEC 9075 may be claimed.
- 25) [Annex A, “SQL Conformance Summary”](#), is an informative Annex. It summarizes the conformance requirements of the SQL language.
- 26) [Annex B, “Implementation-defined elements”](#), is an informative Annex. It lists those features for which the body of this part of ISO/IEC 9075 states that the syntax, the meaning, the returned results, the effect on SQL-data and/or schemas, or any other behavior is partly or wholly implementation-defined.
- 27) [Annex C, “Implementation-dependent elements”](#), is an informative Annex. It lists those features for which the body of this part of ISO/IEC 9075 states that the syntax, the meaning, the returned results, the effect on SQL-data and/or schemas, or any other behavior is partly or wholly implementation-dependent.
- 28) [Annex D, “Deprecated features”](#), is an informative Annex. It lists features that the responsible Technical Committee intend will not appear in a future revised version of this part of ISO/IEC 9075.
- 29) [Annex E, “Incompatibilities with ISO/IEC 9075:2011”](#), is an informative Annex. It lists incompatibilities with the previous version of this part of ISO/IEC 9075.
- 30) [Annex F, “SQL feature taxonomy”](#), is an informative Annex. It identifies features of the SQL language specified in this part of ISO/IEC 9075 by an identifier and a short descriptive name. This taxonomy is used to specify conformance.
- 31) [Annex G, “Defect reports not addressed in this edition of this part of ISO/IEC 9075”](#), is an informative Annex. It describes the Defect Reports that were known at the time of publication of this part of this International Standard. Each of these problems is a problem carried forward from the previous edition of ISO/IEC 9075. No new problems have been created in the drafting of this edition of this International Standard.

In the text of this part of ISO/IEC 9075, Clauses and Annexes begin new odd-numbered pages, and in [Clause 5, “Lexical elements”](#), through [Clause 25, “Conformance”](#), Subclauses begin new pages. Any resulting blank space is not significant.

(Blank page)

Information technology — Database languages — SQL —

Part 14: XML-Related Specifications (SQL/XML)

1 Scope

This part of ISO/IEC 9075 defines ways in which Database Language SQL can be used in conjunction with XML.

(Blank page)

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

2.1 ISO and IEC standards

[ISO9075-1] ISO/IEC 9075-1:2016, *Information technology — Database languages — SQL — Part 1: Framework (SQL/Framework)*.

[ISO9075-2] ISO/IEC 9075-2:2016, *Information technology — Database languages — SQL — Part 2: Foundation (SQL/Foundation)*.

[ISO9075-3] ISO/IEC 9075-3:2016, *Information technology — Database languages — SQL — Part 3: Call-Level Interface (SQL/CLI)*.

[ISO9075-4] ISO/IEC 9075-4:2016, *Information technology — Database languages — SQL — Part 4: Persistent Stored Modules (SQL/PSM)*.

[ISO9075-11] ISO/IEC 9075-11:2016, *Information technology — Database languages — SQL — Part 11: Information and Definition Schemas (SQL/Schemata)*.

[ISO10646] ISO/IEC 10646, *Information technology — Universal Multi-Octet Coded Character Set (UCS)*.

2.2 Other international standards

[CanonicalXML] (Recommendation) *Canonical XML Version 1.0*.
<http://www.w3.org/TR/xml-c14n>

[Infoset] (Recommendation) *XML Information Set*.
<http://www.w3.org/TR/xml-infoset>

[Namespaces] is used to reference either [Namespaces 1.0] or [Namespaces 1.1] when there is no significant difference between the two for the purposes of a given citation.

[Namespaces 1.0] (Recommendation) *Namespaces in XML 1.0*.
<http://www.w3.org/TR/xml-names>

[Namespaces 1.1] (Recommendation) *Namespaces in XML 1.1*.
<http://www.w3.org/TR/xml-names11>

[RFC3986] RFC 3986, *Uniform Resource Identifier (URI): Generic Syntax*, T. Berners-Lee, R. Fielding, L. Masinter.
<http://www.ietf.org/rfc/rfc3986.txt>

[Schema1] (Recommendation) *XML Schema Part 1: Structures*.
<http://www.w3.org/TR/xmlschema-1/>

[Schema2] (Recommendation) *XML Schema Part 2: Datatypes*.
<http://www.w3.org/TR/xmlschema-2/>

[Serialization] (Recommendation) *XSLT 2.0 and XQuery 1.0 Serialization*.
<http://www.w3.org/TR/xslt-xquery-serialization/>

[Unicode] The Unicode Consortium, *The Unicode Standard*. (Information about the latest version of the Unicode standard can be found by using the "Latest Version" link on the "Enumerated Versions of The Unicode Standard" page.)

<http://www.unicode.org/versions/enumeratedversions.html>

[Unicode15] Davis, Mark and Dürst, Martin, *Unicode Standard Annex #15: Unicode Normalization Forms*. The Unicode Consortium.

<http://www.unicode.org/reports/tr15/>

[UniXML] (Note) *Unicode in XML and Other Markup Languages*.

<http://www.w3.org/TR/unicode-xml/>

[XML] is used to reference either [XML 1.0] or [XML 1.1] when there is no significant difference between the two for the purposes of a given citation. [UniXML] provides rules for character usage in XML.

[XML 1.0] (Recommendation) *Extensible Markup Language (XML) Version 1.0*.

<http://www.w3.org/TR/xml>

[XML 1.1] (Recommendation) *Extensible Markup Language (XML) Version 1.1*.

<http://www.w3.org/TR/xml11>

[XPath] (Recommendation) *XML Path Language (XPath) Version 2.0*.

<http://www.w3.org/TR/xpath20>

[XQuery] (Recommendation) *XQuery 1.0: an XML Query Language*.

<http://www.w3.org/TR/xquery/>

[XQueryDM] (Recommendation) *XQuery 1.0 and XPath 2.0 Data Model*.

<http://www.w3.org/TR/xpath-datamodel/>

[XQueryFO] (Recommendation) *XQuery 1.0 and XPath 2.0 Functions and Operators*.

<http://www.w3.org/TR/xpath-functions/>

[XQueryFS] (Recommendation) *XQuery 1.0 and XPath 2.0 Formal Semantics*.

<http://www.w3.org/TR/xquery-semantics/>

[XQuery Update] (Candidate Recommendation) *XQuery Update Facility 1.0*, W3C Working Draft.

<http://www.w3.org/TR/xquery-update-10/>