

# ISO/IEC 9075-1:2016-12 (E)

## Information technology - Database languages - SQL - Part 1: Framework (SQL/Framework)

---

Contents	Page
Foreword.....	ix
Introduction.....	x
<b>1 Scope.....</b>	<b>1</b>
<b>2 Normative references.....</b>	<b>3</b>
2.1 ISO and IEC standards.....	3
<b>3 Definitions and use of terms.....</b>	<b>5</b>
3.1 Definitions.....	5
3.1.1 Definitions provided in this standard.....	5
3.2 Use of terms.....	7
3.3 Informative elements.....	7
<b>4 Concepts.....</b>	<b>9</b>
4.1 Caveat.....	9
4.2 SQL-environments and their components.....	9
4.2.1 SQL-environments.....	9
4.2.2 SQL-agents.....	9
4.2.3 SQL-implementations.....	10
4.2.3.1 SQL-clients.....	10
4.2.3.2 SQL-servers.....	10
4.2.4 SQL-client modules.....	10
4.2.5 User identifiers.....	11
4.2.6 Roles.....	11
4.2.7 User mapping concepts.....	11
4.2.8 Routine mapping concepts.....	11
4.2.9 Catalogs and schemas.....	11
4.2.9.1 Catalogs.....	11
4.2.9.2 SQL-schemas.....	12
4.2.9.3 The Information Schema.....	12
4.2.9.4 The Definition Schema.....	12
4.2.10 Foreign servers and descriptors.....	12
4.2.11 Foreign-data wrappers and descriptors.....	13
4.2.12 SQL-data.....	13
4.3 Tables.....	13
4.4 SQL data types.....	14
4.4.1 General data type information.....	14
4.4.2 The null value.....	14

4.4.3	Predefined types. . . . .	15
4.4.3.1	Numeric types. . . . .	15
4.4.3.2	Character string types. . . . .	15
4.4.3.3	Binary string types. . . . .	15
4.4.3.4	Boolean type. . . . .	16
4.4.3.5	Datetime types. . . . .	16
4.4.3.6	Interval types. . . . .	16
4.4.3.7	XML type. . . . .	16
4.4.4	Constructed atomic types. . . . .	16
4.4.4.1	Reference types. . . . .	16
4.4.5	Constructed composite types. . . . .	17
4.4.5.1	Collection types. . . . .	17
4.4.5.2	Row types. . . . .	17
4.5	Sites and operations on sites. . . . .	17
4.5.1	Sites. . . . .	17
4.5.2	Assignment. . . . .	17
4.5.3	Nullability. . . . .	18
4.6	SQL-schema objects. . . . .	18
4.6.1	General SQL-schema object information. . . . .	18
4.6.2	Descriptors relating to character sets. . . . .	19
4.6.2.1	Character sets. . . . .	19
4.6.2.2	Collations. . . . .	19
4.6.2.3	Transliterations. . . . .	19
4.6.3	Domains and their components. . . . .	20
4.6.3.1	Domains. . . . .	20
4.6.3.2	Domain constraints. . . . .	20
4.6.4	User-defined types. . . . .	20
4.6.4.1	Introduction to user-defined types. . . . .	20
4.6.4.2	Distinct types. . . . .	20
4.6.4.3	Structured types. . . . .	20
4.6.5	Base tables and their components. . . . .	21
4.6.5.1	Base tables. . . . .	21
4.6.5.2	Columns. . . . .	21
4.6.5.3	Periods. . . . .	21
4.6.5.4	Table constraints. . . . .	21
4.6.5.5	Triggers. . . . .	22
4.6.6	View definitions. . . . .	22
4.6.7	Assertions. . . . .	22
4.6.8	SQL-server modules (defined in [ISO9075-4]). . . . .	22
4.6.9	Schema routines. . . . .	23
4.6.10	Sequence generators. . . . .	23
4.6.11	Privileges. . . . .	23
4.7	Integrity constraints and constraint checking. . . . .	23
4.7.1	Constraint checking. . . . .	23

4.7.2	Determinism and constraints. . . . .	24
4.8	Communication between an SQL-agent and an SQL-server. . . . .	24
4.8.1	Host languages. . . . .	24
4.8.2	Parameter passing and data type correspondences. . . . .	25
4.8.2.1	General parameter passing and data type correspondence information. . . . .	25
4.8.2.2	Data type correspondences. . . . .	25
4.8.2.3	Locators. . . . .	25
4.8.2.4	Status parameters. . . . .	26
4.8.2.5	Indicator parameters. . . . .	26
4.8.3	Descriptor areas. . . . .	26
4.8.4	Diagnostic information. . . . .	26
4.8.5	SQL-transactions. . . . .	27
4.9	Modules. . . . .	27
4.10	Routines. . . . .	28
4.10.1	General routine information. . . . .	28
4.10.2	Type preserving functions. . . . .	28
4.11	SQL-statements. . . . .	29
4.11.1	Classes of SQL-statements. . . . .	29
4.11.2	SQL-statements classified by function. . . . .	29
<b>5</b>	<b>The parts of ISO/IEC 9075. . . . .</b>	<b>31</b>
5.1	Overview. . . . .	31
5.2	ISO/IEC 9075-1: Framework (SQL/Framework). . . . .	31
5.3	ISO/IEC 9075-2: Foundation (SQL/Foundation). . . . .	32
5.3.1	Data types specified in <a href="#">[ISO9075-2]</a> . . . . .	32
5.3.2	Tables. . . . .	32
5.3.3	Bindings methods. . . . .	32
5.3.3.1	Embedded SQL. . . . .	32
5.3.3.2	Dynamic SQL. . . . .	32
5.3.3.3	Direct invocation of SQL. . . . .	33
5.3.4	SQL-statements specified in <a href="#">[ISO9075-2]</a> . . . . .	33
5.4	ISO/IEC 9075-3: Call Level Interface (SQL/CLI). . . . .	34
5.5	ISO/IEC 9075-4: Persistent Stored Modules (SQL/PSM). . . . .	34
5.5.1	SQL-statements specified in <a href="#">[ISO9075-4]</a> . . . . .	35
5.6	ISO/IEC 9075-9: Management of External Data (SQL/MED). . . . .	35
5.7	ISO/IEC 9075-10: Object Language Bindings (SQL/OLB). . . . .	35
5.8	ISO/IEC 9075-11: Information and Definition Schemas (SQL/Schemata). . . . .	35
5.9	ISO/IEC 9075-13: SQL Routines and Types Using the Java™ Programming Language (SQL/JRT). . . . .	36
5.10	ISO/IEC 9075-14: XML-Related Specifications (SQL/XML). . . . .	36
<b>6</b>	<b>Notation and conventions used in other parts of ISO/IEC 9075. . . . .</b>	<b>37</b>
6.1	Notation taken from <a href="#">[ISO10646]</a> . . . . .	37
6.2	Notation provided in this International Standard. . . . .	37
6.3	Conventions. . . . .	39
6.3.1	Specification of syntactic elements. . . . .	39

6.3.2	Specification of the Information and Definition Schemata. . . . .	39
6.3.3	Use of terms. . . . .	40
6.3.3.1	Syntactic containment. . . . .	40
6.3.3.2	Terms denoting rule requirements. . . . .	41
6.3.3.3	Rule evaluation order. . . . .	41
6.3.3.4	Conditional rules. . . . .	42
6.3.3.5	Syntactic substitution. . . . .	43
6.3.3.6	Other terms. . . . .	43
6.3.3.7	Exceptions. . . . .	44
6.3.3.8	General Rules not terminated on exception conditions. . . . .	44
6.3.4	Descriptors. . . . .	45
6.3.5	Relationships of parts within ISO/IEC 9075. . . . .	46
6.3.5.1	New and modified Clauses, Subclauses, and Annexes. . . . .	46
6.3.5.2	New and modified tables and figures. . . . .	47
6.3.5.3	Functions. . . . .	48
6.3.5.4	New and modified Format items. . . . .	48
6.3.5.5	New and modified paragraphs and rules. . . . .	49
6.3.5.6	Modified annexes. . . . .	50
6.3.6	Subclauses used as subroutines. . . . .	50
6.3.7	Index typography. . . . .	51
6.3.8	Feature ID and Feature Name. . . . .	51
<b>7</b>	<b>Annexes to the parts of ISO/IEC 9075. . . . .</b>	<b>53</b>
7.1	SQL conformance summary. . . . .	53
7.2	Implementation-defined elements. . . . .	53
7.3	Implementation-dependent elements. . . . .	53
7.4	Deprecated features. . . . .	53
7.5	Incompatibilities with previous versions. . . . .	53
7.6	SQL feature taxonomy. . . . .	54
7.7	Defect Reports. . . . .	54
<b>8</b>	<b>Conformance. . . . .</b>	<b>55</b>
8.1	Minimum conformance. . . . .	55
8.2	Conformance to parts. . . . .	55
8.3	Conformance to features. . . . .	55
8.4	Extensions and options. . . . .	56
8.5	SQL flagger. . . . .	57
8.6	Claims of conformance. . . . .	58
8.6.1	Requirements for SQL applications. . . . .	58
8.6.2	Requirements for SQL-implementations. . . . .	59
<b>Annex A</b>	<b>(informative) Maintenance and interpretation of SQL. . . . .</b>	<b>61</b>
<b>Annex B</b>	<b>(informative) Implementation-defined elements. . . . .</b>	<b>63</b>
<b>Annex C</b>	<b>(informative) Implementation-dependent elements. . . . .</b>	<b>65</b>
<b>Annex D</b>	<b>(informative) Deprecated features. . . . .</b>	<b>67</b>

<b>Annex E</b> (informative) <b>Incompatibilities with ISO/IEC 9075:2011</b> .....	<b>69</b>
<b>Annex F</b> (informative) <b>SQL feature taxonomy</b> .....	<b>71</b>
<b>Annex G</b> (informative) <b>Defect reports not addressed in this edition of this part of ISO/IEC 9075</b> ....	<b>73</b>
<b>Index</b> .....	<b>75</b>

## Tables

<b>Table</b>	<b>Page</b>
1 Relationships between externally-invoked and SQL-invoked routines. ....	28
2 Symbols used in BNF. ....	37