
**Information technology — Database
languages SQL —**

**Part 13:
SQL Routines and types using the Java
TM programming language (SQL/
JRT)**

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

*Partie 13: Routines et types de SQL utilisant le langage de
programmation Java TM (SQL/JRT)*

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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.

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 or www.iec.ch/members_experts/refdocs).

ISO and IEC draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO and IEC take no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO and IEC have not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents and <https://patents.iec.ch>. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

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

For an explanation of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 32, *Data management and interchange*.

This fifth edition cancels and replaces the fourth edition (ISO/IEC 9075-13:2016), which has been technically revised. It also incorporates the Technical Corrigenda ISO/IEC 9075-13:2016/Cor.1:2019 and ISO/IEC 9075-13:2016/Cor.2:2022.

The main changes are as follows:

- improve the presentation and accuracy of the summaries of implementation-defined and implementation-dependent aspects of this document;
- introduction of several digital artifacts;
- alignment with updated ISO house style and other guidelines for creating standards.

This fifth edition of ISO/IEC 9075-13 is designed to be used in conjunction with the following editions of other parts of the ISO/IEC 9075 series, all published in 2023:

- ISO/IEC 9075-1, sixth edition;
- ISO/IEC 9075-2, sixth edition;

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- ISO/IEC 9075-3, sixth edition;
- ISO/IEC 9075-4, seventh edition;
- ISO/IEC 9075-9, fifth edition;
- ISO/IEC 9075-10, fifth edition;
- ISO/IEC 9075-11, fifth edition;
- ISO/IEC 9075-14, sixth edition;
- ISO/IEC 9075-15, second edition;
- ISO/IEC 9075-16, first edition.

A list of all parts in the ISO/IEC 9075 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

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Introduction

The organization of this document is as follows:

- 1) **Clause 1, “Scope”**, specifies the scope of this document.
- 2) **Clause 2, “Normative references”**, identifies additional standards that, through reference in this document, constitute provisions of this document.
- 3) **Clause 3, “Terms and definitions”**, defines the terms and definitions used in this document.
- 4) **Clause 4, “Concepts”**, presents concepts used in the definition of Java routines and types.
- 5) **Clause 5, “Lexical elements”**, defines a number of lexical elements used in the definition of Java routines and types.
- 6) **Clause 6, “Scalar expressions”**, defines the elements of the language that produce scalar values.
- 7) **Clause 7, “Predicates”**, defines the predicates of the language.
- 8) **Clause 8, “Additional common rules”**, specifies the rules for assignments that retrieve data from or store data into SQL-data, and formation rules for set operations.
- 9) **Clause 9, “Additional common elements”**, defines additional language elements that are used in various parts of the language.
- 10) **Clause 10, “Schema definition and manipulation”**, defines the schema definition and manipulation statements associated with the definition of Java routines and types.
- 11) **Clause 11, “Access control”**, defines facilities for controlling access to SQL-data.
- 12) **Clause 12, “Built-in procedures”**, defines new built-in procedures used in the definition of Java routines and types.
- 13) **Clause 13, “Java topics”**, defines the facilities supported by implementations of this document and the conventions used in deployment descriptor files.
- 14) **Clause 14, “Information Schema”**, defines viewed tables that contain schema information.
- 15) **Clause 15, “Definition Schema”**, defines base tables on which the viewed tables containing schema information depend.
- 16) **Clause 16, “Status codes”**, defines SQLSTATE values related to Java routines and types.
- 17) **Clause 17, “Conformance”**, defines the criteria for conformance to this document.
- 18) **Annex A, “SQL conformance summary”**, is an informative Annex. It summarizes the conformance requirements of the SQL language.
- 19) **Annex B, “Implementation-defined elements”**, is an informative Annex. It lists those features for which the body of this document states that the syntax, the meaning, the returned results, the effect on SQL-data and/or schemas, or other aspect is partly or wholly implementation-defined.
- 20) **Annex C, “Implementation-dependent elements”**, is an informative Annex. It lists those features for which the body of this document states that the syntax, the meaning, the returned results, the effect on SQL-data and/or schemas, or other aspect is partly or wholly implementation-dependent.
- 21) **Annex D, “SQL optional feature taxonomy”**, is an informative Annex. It identifies the optional features of the SQL language specified in this document by an identifier and a short descriptive name. This taxonomy is used to specify conformance.

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- 22) **Annex E, “Deprecated features”**, is an informative Annex. It lists features that the responsible Technical Committee intends not to include in a future edition of this document.
- 23) **Annex F, “Incompatibilities with ISO/IEC 9075:2016”**, is an informative Annex. It lists incompatibilities with the previous edition of this document.
- 24) **Annex G, “Defect Reports not addressed in this edition of this document”**, is an informative Annex. It describes the Defect Reports that were known at the time of publication of this document. Each of these problems is a problem carried forward from the previous edition of the ISO/IEC 9075 series. No new problems have been created in the drafting of this edition of this document.

In the text of this document, Clauses begin a new odd-numbered page, and in **Clause 5, “Lexical elements”**, through **Clause 17, “Conformance”**, Subclauses begin a new page. Any resulting blank space is not significant.

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Information technology — Database language SQL —

Part 13:

SQL Routines and Types Using the Java™ Programming Language (SQL/JRT)**1 Scope**

This document specifies the ability to invoke static methods written in the Java¹ programming language as SQL-invoked routines and to use classes defined in the Java programming language as SQL structured user-defined types.

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¹ Java™ is a registered trademark of Oracle Corporation and/or its affiliates.

2 Normative references

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.

ISO/IEC 9075-1, *Information technology — Database languages — SQL — Part 1: Framework (SQL/Framework)*

ISO/IEC 9075-2, *Information technology — Database languages — SQL — Part 2: Foundation (SQL/Foundation)*

ISO/IEC 9075-10, *Information technology — Database languages — SQL — Part 10: Object Language Bindings (SQL/OLB)*

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

Java Community Process. *The Java™ Language Specification* [online]. Java SE 13 Edition. Redwood Shores, California, USA: Oracle, Available at <https://docs.oracle.com/javase/specs/jls/se13/jls13.pdf>

Java Community Process. *The Java™ Virtual Machine Specification* [online]. Java SE 13 Edition. Redwood Shores, California, USA: Oracle, Available at <https://docs.oracle.com/javase/specs/jvms/se13/jvms13.pdf>

Java Community Process. *Java™ Object Serialization Specification* [online]. Redwood Shores, California, USA: Oracle, Available at <https://docs.oracle.com/en/java/javase/13/docs/specs/serialization/serial-arch.html>

Java Community Process. *JDBC™ 4.3 Specification* [online]. Edition 4.3. Redwood Shores, California, USA: Oracle, Available at https://download.oracle.com/otn-pub/jcp/jdbc-4_3-mrel3-eval-spec/jdbc4.3-fr-spec.pdf

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 9075-1, ISO/IEC 9075-2, Java, JVMs, and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

block

related statements within braces, which would be treated as a single statement

3.2

class declaration

specifies a possibly empty set consisting of zero or more *fields* (3.6), zero or more methods, zero or more *nested classes* (3.11), zero or more *interfaces* (3.9), zero or more *instance initializers* (3.7), zero or more *static initializers* (3.13), and zero or more constructors

3.3

class file

file containing Java byte code

3.4

class instance

consists of an instance of each *instance variable* (3.8) declared in the class and each *instance variable* (3.8) declared in the superclasses of the class

3.5

class variable

static variable declared in a class

3.6

field

class variables (3.5) and *instance variables* (3.8) of a class

3.7

instance initializer

block that is used to initialize the instance data member; that runs each time when object of the class is created

3.8

instance variable

variable that is declared inside a class but outside the scope of any method

3.9

interface

Java construct consisting of a set of method signatures

3.10

local variable

variables declared inside the body of a method

3.11

nested class

class within another class

3.12

package

zero or more classes, zero or more *interfaces* (3.9), and zero or more *subpackages* (3.14)

3.13

static initializer

executes code before the object initialization

3.14

subpackage

package (3.12) within a *package* (3.12)

3.15

JVM

Java Virtual Machine

virtual machine that enables a computer to run Java programs

3.16

default connection

JDBC connection to the current SQL-implementation, SQL-session, and SQL-transaction established with the data source URL 'jdbc:default:connection'

Note 1 to entry: See RFC 2368 and RFC 3986 for more details about URLs.

3.17

deployment descriptor

one or more SQL-statements that specify <install actions> and <remove actions> to be taken, respectively, by the `SQLJ.INSTALL_JAR` and `SQLJ.REMOVE_JAR` procedures and that are contained in a *deployment descriptor file* (3.18)

3.18

deployment descriptor file

text file containing *deployment descriptors* (3.17) that is contained in a *JAR* (3.22), for which the JAR's manifest entry, as described by the `java.util.jar` section of *JVMS*, specifies `SQLJDeploymentDescriptor:TRUE`

3.19

external Java data type

SQL user-defined type defined with a <user-defined type definition> that specifies an <external Java type clause>

3.20

external Java routine

external routine defined with an <SQL-invoked routine> that specifies `LANGUAGE JAVA` and either `PROCEDURE` or `FUNCTION`, or defined with a <user-defined type definition> that specifies an <external Java type clause>

3.21

installed JAR

JAR (3.22) whose existence has been registered with the SQL-environment and whose contents have been copied into that SQL-environment due to execution of one of the procedures `SQLJ.INSTALL_JAR` and `SQLJ.REPLACE_JAR`

3.22

JAR

Java Archive

zip-formatted file, as described by the `java.util.zip` section of *JVMS*, containing zero or more Java `class` and `ser` files, and zero or more deployment descriptor files

Note 1 to entry: JARs are a normal vehicle for distributing Java programs and the mechanism specified by this document to provide the implementation of external Java routines and external Java data types to an SQL-environment.

3.23

ser file

file containing representations of Java objects in the form defined in *Java Serialization*

3.24

subject Java class

Java class uniquely identified by the combination of the class's *subject Java class name* (3.25) and its containing *JAR* (3.22)

3.25

subject Java class name

fully-qualified package name and class name of a Java class

3.26

system class

Java class provided by a conforming implementation of this document that can be referenced by an external Java routine or an external Java data type without that class having been included in an installed *JAR* (3.22)

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