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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).

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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 seventh edition cancels and replaces the sixth edition (ISO/IEC 9075-4:2016), which has been technically revised. It also incorporates the Technical Corrigenda ISO/IEC 9075-4:2016/Cor.1:2019 and ISO/IEC 9075-4:2016/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.

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This seventh edition of ISO/IEC 9075-4 is designed to be used in conjunction with the following editions of other parts of the ISO/IEC 9075 series, all published 2023:

— ISO/IEC 9075-1, sixth edition;

— ISO/IEC 9075-2, sixth edition;

— ISO/IEC 9075-3, sixth edition;

— ISO/IEC 9075-9, fifth edition;

— ISO/IEC 9075-10, fifth edition;

— ISO/IEC 9075-11, fifth edition;

— ISO/IEC 9075-13, 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 persistent stored modules.

5) Clause 5, "Lexical elements", defines a number of lexical elements used in the definition of persistent stored modules.

6) Clause 6, "Scalar expressions", defines a number of scalar expressions used in the definition of persistent stored modules.

7) Clause 7, "Query expressions", defines the elements of the language that produce rows and tables of data as used in persistent stored modules.

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 common elements used in the definition of persistent stored modules.

10) Clause 10, "Schema definition and manipulation", defines the schema definition and manipulation statements associated with the definition of persistent stored modules.

11) Clause 11, "Access control", defines facilities for controlling access to SQL-data.

12) Clause 12, "SQL-client modules", defines the facilities for using persistent stored modules.

13) Clause 13, "Data manipulation", defines data manipulation operations associated with persistent stored modules.

14) Clause 14, "Additional data manipulation rules", defines additional rules for data manipulation.

15) Clause 15, "Control statements", defines the control statements used with persistent stored modules.

16) Clause 16, "Dynamic SQL", defines the facilities for executing SQL-statements dynamically in the context of persistent stored modules.

17) Clause 17, "Embedded SQL", defines the host language embeddings.

18) Clause 18, "Direct invocation of SQL", defines direct invocation of SQL language.

19) Clause 19, "Diagnostics management", defines enhancements to the facilities used with persistent stored modules.

20) Clause 20, "Information Schema", defines the Information and Definition Schema objects associated with persistent stored modules.

21) Clause 21, "Definition Schema", defines base tables on which the viewed tables containing schema information depend.

22) Clause 22, "Status codes", defines SQLSTATE values related to persistent stored modules.

23) Clause 23, "Conformance", defines the criteria for conformance to this document.

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24) Annex A, "SQL conformance summary", is an informative Annex. It summarizes the conformance requirements of the SQL language.

25) 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.

26) 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.

27) 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.

28) 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.

29) Annex F, "Incompatibilities with ISO/IEC 9075:2016", is an informative Annex. It lists incompatibilities with the previous edition of this document.

30) 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, in Clause 5, "Lexical elements", through Clause 23, "Conformance", Subclauses begin new pages. Any resulting blank space is not significant.

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Information technology — Database language SQL —

Part 4:
Persistent Stored Modules (SQL/PSM)

1 Scope

This document specifies the syntax and semantics of a database language for declaring and maintaining persistent database language routines in SQL-server modules.

The database language for <externally-invoked procedure>s and <SQL-invoked routine>s includes the following capabilities.

— The specification of statements to direct the flow of control.

— The assignment of the result of expressions to variables and parameters.

— The specification of condition handlers that allow SQL-invoked routines to deal with various conditions that arise during their execution.

— The specification of statements to signal and resignal conditions.

— The declaration of standing SQL-server cursors.

— The declaration of local variables.

It also includes the definition of the Information Schema tables that contain schema information pertaining to SQL-server modules and SQL-invoked routines.

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

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