
**Information technology — Guidance
for the use of database language
SQL —**

**Part 2:
Time-related information**

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Reference number
ISO/IEC 19075-2:2021(E)

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Published in Switzerland

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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).

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), or the IEC list of patent declarations received (see patents.iec.ch).

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 Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 32, *Data management and interchange*.

This first edition of ISO/IEC 19075-2 cancels and replaces ISO/IEC TR 19075-2:2015.

This document is intended to be used in conjunction with the following editions of the parts of the ISO/IEC 9075 series:

- ISO/IEC 9075-1, sixth edition or later;
- ISO/IEC 9075-2, sixth edition or later;
- ISO/IEC 9075-3, sixth edition or later;
- ISO/IEC 9075-4, seventh edition or later;
- ISO/IEC 9075-9, fifth edition or later;
- ISO/IEC 9075-10, fifth edition or later;
- ISO/IEC 9075-11, fifth edition or later;
- ISO/IEC 9075-13, fifth edition or later;
- ISO/IEC 9075-14, sixth edition or later;
- ISO/IEC 9075-15, second edition or later;
- ISO/IEC 9075-16, first edition or later.

A list of all parts in the ISO/IEC 19075 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, “Time-related data types, constructs, operators, and predicates”**, explains time-related data types, operators, and predicates in SQL.
- 5) **Clause 5, “Time-related tables”**, explains how time-related tables are used.

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Information technology — Guidance for the use of database language SQL —

Part 2:

Time-related information

1 Scope

This document describes the support in SQL for time-related information.

This document discusses the following features of the SQL language:

- Time-related data types
- Operations on time-related data
- Time-related Predicates
- Application-time period tables
- System-versioned tables
- Bi-temporal tables

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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)*

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3 Terms and definitions

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

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

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

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4 Time-related data types, constructs, operators, and predicates

4.1 Context of time-related specifications

The requirements for the material discussed in this document shall be as specified in ISO/IEC 9075-1 and ISO/IEC 9075-2.

4.2 Datetime types

ISO/IEC 9075-2 defines the time-related data types, constructs, operators, and predicates described in this document. ISO/IEC 9075-2 specifies requirements for the material discussed in this document.

There are three *datetime types*, each of which is made up of different datetime fields.

A value of data type **TIMESTAMP** is made up of the datetime fields YEAR, MONTH, DAY, HOUR, MINUTE, and SECOND. It is always a valid time at a valid Gregorian date.

A value of data type **TIME** comprises values of the datetime fields HOUR, MINUTE and SECOND. It is always a valid time of day.

A value of data type **DATE** is made up of the datetime fields YEAR, MONTH, and DAY. It is always a valid Gregorian date.

TIMESTAMP and **TIME** may be specified with a number of (decimal) digits of fractional seconds precision.

TIMESTAMP and **TIME** may also be specified as being **WITH TIME ZONE**, in which case every value has associated with it a time zone displacement (the offset of the **TIMESTAMP** or **TIME** from Coordinated Universal Time, UTC). In comparing values of a data type **WITH TIME ZONE**, the value of the time zone displacement is disregarded.

Table 1, “Fields in datetime values”, specifies the fields that can make up a datetime value.

Table 1 — Fields in datetime values

Keyword	Meaning
YEAR	Year, between 0001 and 9999
MONTH	Month within year, between 01 and 12
DAY	Day within month, between 1 and 31, but further constrained by the value of MONTH and YEAR fields, according to the rules for well-formed dates in the Gregorian calendar.
HOUR	Hour within day, between 00 and 23
MINUTE	Minute within hour, between 00 and 59

Keyword	Meaning
SECOND	Second and possibly fraction of a second within minute, between 00 and 61.999...
TIMEZONE_HOUR	Hour value of time zone displacement, between -14 and 14. The range for time zone intervals is larger than many readers might expect because it is governed by political decisions in governmental bodies rather than by any natural law.
TIMEZONE_MINUTE	Minute value of time zone displacement, between -59 and 59. When the value of TIMEZONE_HOUR is either -12 or 14, the value of TIMEZONE_MINUTE is restricted to be 00 (zeros).

There is an ordering of the significance of these fields. This is, from most significant to least significant: YEAR, MONTH, DAY, HOUR, MINUTE, and SECOND.

Table 2, “Mapping of datetime fields to datetime data types”, clarifies which of the various datetime fields can appear in each of the datetime data types.

Table 2 — Mapping of datetime fields to datetime data types

Data type	YEAR	MONTH	DAY	HOUR	MINUTE	SECOND	TZ HOUR	TZ MINUTE
TIMESTAMP	Y	Y	Y	Y	Y	Y	N	N
TIMESTAMP WITH TIME ZONE	Y	Y	Y	Y	Y	Y	Y	Y
TIME	N	N	N	Y	Y	Y	N	N
TIME WITH TIME ZONE	N	N	N	Y	Y	Y	Y	Y
DATE	Y	Y	Y	N	N	N	N	N

The surface of the earth is divided into zones, called time zones, in which every correct clock tells the same time, known as *local time*. Local time is equal to UTC (Coordinated Universal Time) plus the *time zone displacement*, which is an interval value that ranges between INTERVAL '-12:00' HOUR TO MINUTE and INTERVAL '+14:00' HOUR TO MINUTE. The time zone displacement is constant throughout a time zone, changing at the beginning and end of Summer Time, where applicable.

NOTE 1 — IANA Time Zone Database is one resource from which SQL-implementations can determine details about time zones.

A datetime value, of data type TIME WITHOUT TIME ZONE or TIMESTAMP WITHOUT TIME ZONE, may represent a local time, whereas a datetime value of data type TIME WITH TIME ZONE or TIMESTAMP WITH TIME ZONE represents UTC.

Table 3, “Examples of the datetime data types”, provides a few examples of datetime data type declarations.