INTERNATIONAL STANDARD

ISO 8601-1

First edition
2019-02

AMENDMENT 1
2022-10

Date and time — Representations for information interchange —

Part 1: Basic rules

AMENDMENT 1: Technical corrections

Date et heure — Représentations pour l'échange d'information —

Partie 1: Règles de base

AMENDEMENT 1: Corrections techniques

Reference number
ISO 8601-1:2019/Amd.1:2022(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 ISO documents 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 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 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.

This document was prepared by Technical Committee ISO/TC 154, *Processes, data elements and documents in commerce, industry and administration*.

A list of all parts in the ISO 8601 series can be found on the ISO website.

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.

Date and time — Representations for information interchange —

Part 1: Basic rules

AMENDMENT 1: Technical corrections

3.1.1.24

Replace "Note 2 to entry" with the following:

Note 2 to entry: An inserted second is called a positive leap second and an omitted second is called a negative leap second. A positive leap second is inserted after [23:59:59Z] as the last second of that minute, which is represented as [23:59:60Z]. A negative leap second is achieved by the omission of [23:59:59Z], where the last second of that minute is represented as [23:59:58Z]. Insertion or omission takes place as determined by the International Earth Rotation and Reference Systems Service (IERS), normally on 30 June or 31 December, but if necessary on 31 March or 30 September.

3.1.2.15

Replace "Note 1 to entry" with the following:

Note 1 to entry: The term "week" applies also to the duration of any *time interval* (3.1.1.6) which starts at a certain *time of day* (3.1.1.16) at a certain *calendar day of week* (3.1.2.12) and ends at the same time of day at the same calendar day of week in the next calendar week.

4.2.2

Replace "NOTE" with the following:

NOTE The calendar year used in the week calendar and the Gregorian calendar are independent units and do not necessarily align. An identical day as referenced in the week calendar and the Gregorian calendar can belong to different calendar years in their respective calendars. For instance, the first day of 2019 Week 1 (a Monday) in the week calendar is actually 2018-12-31 in the Gregorian calendar.

4.2.2

Move the NOTE to before Table 2.

4.2.3, first paragraph

Replace the paragraph with the following:

This document uses the 24-hour clock for identification of times within a calendar day, where the duration of a calendar day is defined as 24 clock hours, the duration of a clock hour as 60 clock minutes, and the duration of a clock minute generally as 60 clock seconds (except when insertion of a positive leap second or omission of a negative leap second occurs).

4.3.2

Add the following paragraph after the first paragraph:

The year number may be preceded by a minus sign to indicate a year preceding year zero.

4.3.2, third paragraph

Replace the paragraph with the following:

The number of digits may exceed 4 in the case of expanded representation.

4.3.11

Add the following paragraph as the first paragraph:

Each Gregorian calendar decade is identified by a 3-digit ordinal number beginning with '000', for decade zero, through '999'.

4.3.12

Add the following paragraph as the first paragraph:

Each Gregorian calendar century is identified by a 2-digit ordinal number beginning with '00', for century zero, through '99'.

5.3.1.4, first paragraph

Replace the paragraph with the following:

A decimal fraction of hour, minute or second may be included in a representation. If included, lower order time scale components (if any) shall be omitted and the decimal fraction shall be divided from the integer part by the decimal sign. If the magnitude of the number is less than one, the decimal sign shall be preceded by two zeros in accordance with 4.5.

5.3.2

Replace the subclause title of "Beginning of day" with "Beginning of the day, ending of the day".

5.3.2

Replace the text with the following:

The beginning of the day is defined as the first instant of the day, and the ending of the day is defined as the last instant of the day, where the last instant of the day is identical to the first instant of the next day.

NOTE 1 An instant does not have any duration.

For disambiguation and semantic needs, despite that the last instant of the day is technically also the first instant of the next day, separate expressions are used to differentiate these two cases.

As time of day relates to the duration elapsed since the first instant of the day:

— the “beginning of the day” expressions represent that no time has elapsed since the first instant of the day;

— the “ending of the day” expressions represent that 24 hours have elapsed since the first instant of the day.

NOTE 2 This document does not explicitly distinguish the representation of instants from time intervals.

Expressions of the beginning of the day and the ending of the day conform with representations of time of day.

The expressions, as complete representations in basic and extended format for the beginning of the day and the ending of the day, in accordance with 5.3.1, are as follows:

a) Beginning of the day

Basic format: T000000 (in the format of 5.3.1.2 a))

Extended format: 00:00:00 (or T00:00:00) (in the format of 5.3.1.2 b))

b) Ending of the day

Basic format: T240000 (in the format of 5.3.1.2 a))

Extended format: 24:00:00 (or T24:00:00) (in the format of 5.3.1.2 b))

NOTE 3 ‘T’ is always present in basic format. For extended format, ‘T’ can be omitted for a time-only expression but is included for a date-and-time expression.

Expressions for the beginning of the day, which represent the first instant of day (which has no duration), are identical to expressions that represent the first second of day (which has a duration of 1s).

Expressions for the ending of the day are solely to be used as references to the last instant of the day (which has no duration), which exists within the last second of the day. The ending of the day expressions explicitly represent only instants, not time intervals, therefore they do not represent the last second of the day nor the first second of the next day. Only in the context of the ending of the day, an instant is expressed with 24 in the hour time scale component.

Time intervals starting at the end of day are expressed using the beginning of the next calendar day. The beginning of the day instant can be expressed using a valid representation from this document comprising of only zeros.

NOTE 4 At the beginning of the day, no time has elapsed since the first instant of the day, therefore the expression comprises of zeros regardless of the level of precision.

NOTE 5 Date and time expressions according to this document typically refer to the first instant of the referenced time scale unit. However, the final instant of the day technically does not belong to the beginning of any time scale unit considered in this document. Thus the value '24:00:00' is chosen to represent the final instant of the day in order to distinguish the expression of this instant from an expression of a time scale unit.

The expressions may have reduced precision in accordance with 5.3.1.3 or may omit the time designator in accordance with 5.3.5.

EXAMPLE 1 The following are valid reduced precision expressions of the beginning of the day:

— 'T00' (time of day expression with omission of minutes and seconds);

— '00' (time of day expression with omission of minutes, seconds and time designator);

— 'T00:00' (time of day expression with omission of seconds);

— '00:00' (time of day expression with omission of seconds and time designator).

EXAMPLE 2 The following are valid reduced precision expressions of the ending of the day:

— 'T24' (time of day expression with omission of minutes and seconds);

— '24' (time of day expression with omission of minutes, seconds and time designator);

— 'T24:00' (time of day expression with omission of seconds);

— '24:00' (time of day expression with omission of seconds and time designator).

The expressions may utilize representations expanded with a decimal fraction in accordance with 5.3.1.4:

— to represent the beginning of the day; representations may be expanded with a decimal fraction containing only zeros;

  EXAMPLE 3 T000000.000

— to represent the ending of the day; representations may be expanded with a decimal fraction containing only zeros.

  EXAMPLE 4 T240000.000

For legal purposes, that is, when a legal document refers to the instant "end of the day", it is to be understood as the last instant of this day as stated in this clause.

In the usage of the beginning of the day expression (e.g. '00:00:00') or the ending of the day expression (e.g. '24:00:00'), a system shall disambiguate whether the usage of the expression refers to a time in a clock system, or to the beginning of the day or ending of the day instant, respectively.

An ending of the day expression (e.g. '24:00:00') is not intended to represent time scale units. For the benefit of clarity, it is explicitly stated that the '24' in the ending of the day expression does not represent the hour in time of day representations (5.3); the valid values for hours are described in 4.3.8.

The ending of the day expressions, which represent the last instant of the day, exists within and marks the instantaneous end boundary of the last second of the day, its final instant.

NOTE 6 The last instant of the day exists within the last second of the day, which can be one of the following:

with no leap second	23:59:59
with a negative leap second	23:59:58
with a positive leap second	23:59:60

EXAMPLE 5 ‘T235960’ represents the final second of a calendar day with a positive leap second in UTC.

EXAMPLE 6 ‘T2359’ represents the final minute of a calendar day in UTC, regardless of whether there is a positive, negative or no leap second.

EXAMPLE 7 ‘T23’ represents the final hour of a calendar day in UTC, regardless of whether there is a positive, negative or no leap second.

Ending of the day expressions may be used in reasoning with instants and time scale units.

EXAMPLE 8 An ending of the day expression can be used to represent a deadline.

When an ending of the day expression is used as an excluded maximum value, all instants before the final instant of the day are included, but the final instant of the day is excluded;

EXAMPLE 9 When the ending of the day expression is used as an excluded maximum value:

— ‘23:59:58’, ‘23:59:59’, ‘23:59:60’ are times before the ending of the day;

— ‘24:00:00’ and ‘00:00:00’ of the next day are excluded instants.

When an ending of the day expression is used as an included maximum value, all instants before the final instant of the day, and the final instant of the day itself, are included. As the final instant of the day is also the first instant of the next day, the first instant of the next day is also considered to be included.

EXAMPLE 10 When the ending of the day expression is used as an included maximum value:

— ‘23:59:58’, ‘23:59:59’, ‘23:59:60’, ‘24:00:00’ are times before or at the ending of the day;

— beginning of the day expressions of the next day, such as ‘00:00:00’ and ‘00:00:00.00’, are considered included instants, but the corresponding time scale unit representations are excluded;

— while ‘00:00:00.01’ belongs to the first second of the day represented as ‘00:00:00’, it is not a beginning of the day expression and therefore represents a time of day after the first instant of the day, and is therefore excluded.

If an ending of the day expression is received for processing, for example, to calculate duration, denote time intervals, or perform date and time arithmetic (as defined in ISO 8601-2:2019), it should be interpreted as the beginning instant of the next calendar day.

EXAMPLE 11 When a system receives a time interval expression of ‘2022-04-19T00:00:00/2022-04-19T24:00:00’, this time interval is interpreted as ‘2022-04-19T00:00:00/2022-04-20T00:00:00’.

EXAMPLE 12 In the specification of a representation of a whole day in accordance with this document, the following time interval expressions are logically equivalent:

— ‘2022-04-19T00:00:00/P1D’;

— ‘2022-04-19T00:00:00/2022-04-19T24:00:00’;

— ‘2022-04-19T00:00:00/2022-04-20T00:00:00’;

— ‘2022-04-18T24:00:00/2022-04-19T24:00:00’;

— ‘2022-04-18T24:00:00/2022-04-20T00:00:00’.

5.5.1, fourth paragraph

Replace the paragraph with the following:

Representations of the time shift between the local time scale and UTC included with the component preceding the separator shall be assumed to apply to the component following the separator, unless a corresponding alternative is included.