
**Data elements and interchange
formats — Information interchange —
Representation of dates and times**

*Éléments de données et formats d'échange — Échange
d'information — Représentation de la date et de l'heure*

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 8601 was prepared by Technical Committee ISO/TC 154, *Processes, data elements and documents in commerce, industry and administration*.

This third edition cancels and replaces the second edition (ISO 8601:2000), of which it constitutes a minor revision.

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Introduction

Although ISO Recommendations and Standards in this field have been available since 1971, different forms of numeric representation of dates and times have been in common use in different countries. Where such representations are interchanged across national boundaries misinterpretation of the significance of the numerals can occur, resulting in confusion and other consequential errors or losses. The purpose of this International Standard is to eliminate the risk of misinterpretation and to avoid the confusion and its consequences.

This International Standard includes specifications for a numeric representation of information regarding date and time of day. In addition this International Standard includes specifications for representation of the formats of these numeric representations.

In order to achieve similar formats for the representations of calendar dates, ordinal dates, dates identified by week number, time intervals, recurring time intervals, combined date and time of day, and differences between local time and UTC of day, and to avoid ambiguities between these representations, it has been necessary to use, apart from numeric characters, either single alphabetic characters or other graphic characters or a combination of alphabetic and other characters in some of the representations.

The above action has had the benefit of enhancing the versatility and general applicability of previous International Standards in this field, and provides for the unique representation of any date or time expression or combination of these. Each representation can be easily recognized, which is beneficial when human interpretation is required.

This International Standard retains the most commonly used expressions for date and time of day and their representations from the earlier International Standards and provides unique representations for some new expressions used in practice. Its application in information interchange, especially between data processing systems and associated equipment will eliminate errors arising from misinterpretation and the costs these generate. The promotion of this International Standard will not only facilitate interchange across international boundaries, but will also improve the portability of software, and will ease problems of communication within an organization, as well as between organizations.

Several of the alphabetic and graphic characters used in the text of this International Standard are common both to the representations specified and to normal typographical presentation. Note that for units of time in plain text the symbols given in ISO 31-1 should be used.

To avoid confusion between the representations and the actual text, its punctuation marks and associated graphic characters, all the representations are contained in brackets []. The brackets are not part of the representation, and should be omitted when implementing the representations. All matter outside the brackets is normal text, and not part of the representation. In the associated examples, the brackets and typographical markings are omitted.

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Data elements and interchange formats — Information interchange — Representation of dates and times

1 Scope

This International Standard is applicable whenever representation of dates in the Gregorian calendar, times in the 24-hour timekeeping system, time intervals and recurring time intervals or of the formats of these representations are included in information interchange. It includes

- calendar dates expressed in terms of calendar year, calendar month and calendar day of the month;
- ordinal dates expressed in terms of calendar year and calendar day of the year;
- week dates expressed in terms of calendar year, calendar week number and calendar day of the week;
- local time based upon the 24-hour timekeeping system;
- Coordinated Universal Time of day;
- local time and the difference from Coordinated Universal Time;
- combination of date and time of day;
- time intervals;
- recurring time intervals.

This International Standard does not cover dates and times where words are used in the representation and dates and times where characters are not used in the representation.

This International Standard does not assign any particular meaning or interpretation to any data element that uses representations in accordance with this International Standard. Such meaning will be determined by the context of the application.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1 Basic concepts

2.1.1

time axis

mathematical representation of the succession in time of instantaneous events along a unique axis

[IEC 60050-111]

2.1.2

instant

point on the time axis

[IEC 60050-111]

NOTE An instantaneous event occurs at a specific instant.

2.1.3

time interval

part of the time axis limited by two instants

[IEC 60050-111]

NOTE A time interval comprises all instants between the two limiting instants and, unless otherwise stated, the limiting instants themselves.

2.1.4

time scale

system of ordered marks which can be attributed to instants on the time axis, one instant being chosen as the origin

[IEC 60050-111]

NOTE 1 A time scale may amongst others be chosen as:

- continuous, e.g. international atomic time (TAI) (see IEC 60050-713, item 713-05-18);
- continuous with discontinuities, e.g. Coordinated Universal Time (UTC) due to leap seconds, standard time due to summer time and winter time;
- successive steps, e.g. usual calendars, where the time axis is split up into a succession of consecutive time intervals and the same mark is attributed to all instants of each time interval;
- discrete, e.g. in digital techniques.

NOTE 2 For physical and technical applications, a time scale with quantitative marks is preferred, based on a chosen initial instant together with a unit of measurement.

NOTE 3 Customary time scales use various units of measurement in combination, such as second, minute, hour, or various time intervals of the calendar such as calendar day, calendar month and calendar year.

NOTE 4 A time scale has a reference point which attributes one of the marks of the time scale to one of the instants, thus determining the attribution of marks to instants for the time scale.

2.1.5

time point

date

time

mark attributed to an instant by means of a specified time scale

[IEC 60050-111]

NOTE 1 On a time scale consisting of successive steps, two distinct instants may be expressed by the same time point (see Note 1 of the term “time scale”).

NOTE 2 For many time scales with quantitative marks, the numerical value of the time point of an instant may also be considered to be equal to the duration between the origin of the time scale and the considered instant.

NOTE 3 In IEC 60050-111 this definition corresponds with the term “date”.

NOTE 4 The term “time” is often used in common language. However, it should only be used if the meaning is clearly visible from the context, since the term “time” is also used with other meanings.

2.1.6

duration

non-negative quantity attributed to a time interval, the value of which is equal to the difference between the time points of the final instant and the initial instant of the time interval, when the time points are quantitative marks

[IEC 60050-111]

NOTE 1 In the case of discontinuities in the time scale, such as a leap second or the change from winter time to summer time and back, the computation of the duration requires the subtraction or addition of the change of duration of the discontinuity.

NOTE 2 Duration is one of the base quantities in the International System of Quantities (ISQ) on which the International System of Units (SI) is based. The term “time” instead of “duration” is often used in this context.

NOTE 3 For the term “duration”, expressions such as “time” or “time interval” are often used. The term “time” is not recommended in this sense and the term “time interval” is deprecated in this sense to avoid confusion with the concept “time interval”.

NOTE 4 The SI unit of duration is the second.

2.1.7

nominal duration

duration expressed amongst others in years, months, weeks or days

NOTE The duration of a calendar year, a calendar month, a calendar week or a calendar day depends on its position in the calendar. Therefore, the exact duration of a nominal duration can only be evaluated if the duration of the calendar years, calendar months, calendar weeks or calendar days used are known.

2.1.8

date

time point representing a calendar day on a time scale consisting of an origin and a succession of calendar days

NOTE In IEC 60050-111 this definition corresponds with the term “calendar date”

2.1.9

calendar date

date representing a particular calendar day by its calendar year, its calendar month and its ordinal number within its calendar month

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2.1.10

ordinal date

date representing a particular calendar day by its calendar year and its ordinal number within its calendar year

2.1.11

week date

date representing a particular calendar day by the calendar year to which its calendar week belongs, the ordinal number of its calendar week within that calendar year and its ordinal number within its calendar week

2.1.12

Coordinated Universal Time

UTC

time scale which forms the basis of a coordinated radio dissemination of standard frequencies and time signals; it corresponds exactly in rate with international atomic time, but differs from it by an integral number of seconds

[IEC 60050-713]

NOTE 1 UTC is established by the International Bureau of Weights and Measures (BIPM, i.e. Bureau International des Poids et Mesures) and the International Earth Rotation Service (IERS). UTC provides the basis of standard time, the use of which is legal in most countries. The 15th Conférence Générale des Poids et Mesures (CGPM) (1975) judged in its Resolution 5 that this usage can be strongly recommended.

NOTE 2 UTC is adjusted to UT1 by the insertion or deletion of seconds, known as “leap seconds”.

NOTE 3 Greenwich Mean Time (GMT) is internationally replaced by UTC. UTC is often (incorrectly) referred to as GMT. UTC is generally used by aviation and maritime navigation that also uses local apparent time and local mean time for celestial navigation (see ISO 19018).

NOTE 4 Additional information can be found as follows:

- the URL for the ITU <http://www.itu.int/itudoc/itu-r/rec/ff/index.html>
- the URL for the International Bureau of Weights and Measures <http://www.bipm.fr>
- the URL for the International Earth Rotation Service <http://hpiers.obspm.fr>.

2.1.13

UTC of day

quantitative expression marking an instant within a calendar day in accordance with UTC

2.1.14

standard time

time scale derived from coordinated universal time, UTC, by a time shift established in a given location by the competent authority

[IEC 60050-111]

NOTE This time shift may be varied in the course of a year.

2.1.15

standard time of day

quantitative expression marking an instant within a calendar day by the duration elapsed after midnight in the local standard time

[IEC 60050-111]

NOTE Standard time of day is called “clock time” in IEC 60050-111.

2.1.16

local time

locally applicable time of day such as standard time of day, or a non-UTC based time of day

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2.1.17

recurring time interval

series of consecutive time intervals of the same duration or nominal duration

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NOTE If the duration of the time intervals is measured in calendar entities, the duration of each time interval depends on the calendar dates of its start and its end.

2.2 Time units, nominal durations and time intervals

2.2.1

second

base unit of measurement of time in the International System of Units (SI) as defined by the International Committee of Weights and Measures (CIPM, i.e. Comité International des Poids et Mesures)

NOTE 1 See also ISO 31-1.

NOTE 2 It is the base unit for expressing duration.

2.2.2

leap second

intentional time step of one second to adjust UTC to ensure appropriate agreement with UT1, a time scale based on the rotation of the Earth

[Rec. ITU-R TF.460-5]

NOTE An inserted second is called positive leap second and an omitted second is called negative leap second. A positive leap second is inserted between [23:59:59Z] and [24:00:00Z] and can be represented as [23:59:60Z]. Negative leap seconds are achieved by the omission of [23:59:59Z]. Insertion or omission takes place as determined by IERS, normally on 30 June or 31 December, but if necessary on 31 March or 30 September.

2.2.3**minute**

unit of time, equal to 60 seconds

[ISO 31-1]

2.2.4**hour**

unit of time, equal to 60 minutes

[ISO 31-1]

2.2.5**day**

⟨unit of time⟩ unit of time, equal to 24 hours

[ISO 31-1]

2.2.6**calendar day**

time interval starting at midnight and ending at the next midnight, the latter being also the starting instant of the next calendar day

NOTE 1 A calendar day is often also referred to as day.

NOTE 2 The duration of a calendar day is 24 hours, except if modified by:

- the insertion or deletion of leap seconds, by decision of the International Earth Rotation Service (IERS), or
- the insertion or deletion of other time intervals, as may be prescribed by local authorities to alter the time scale of local time.

2.2.7**day**

⟨duration⟩ duration of a calendar day <https://standards.iteh.ai/catalog/standards/sist/5acfl57a-5944-41b9-abd7-31b276723d04/iso-8601-2004>

NOTE The term “day” applies also to the duration of any time interval which starts at a certain time of day at a certain calendar day and ends at the same time of day at the next calendar day.

2.2.8**calendar week**

time interval of seven calendar days starting with a Monday

NOTE 1 A calendar week is often also referred to as week.

NOTE 2 See 3.2.2 for the names of the calendar days and their day numbers.

NOTE 3 A calendar week may be identified by its ordinal number within its calendar year.

2.2.9**week**

duration of a calendar week

NOTE The term “week” applies also to the duration of any time interval which starts at a certain time of day at a certain calendar day and ends at the same time of day at the same calendar day of the next calendar week.

2.2.10**calendar week number**

ordinal number which identifies a calendar week within its calendar year according to the rule that the first calendar week of a year is that one which includes the first Thursday of that year and that the last calendar week of a calendar year is the week immediately preceding the first calendar week of the next calendar year

2.2.11

calendar month

time interval resulting from the division of a calendar year in 12 time intervals, each with a specific name and containing a specific number of calendar days

NOTE 1 A calendar month is often referred to as month.

NOTE 2 See 3.2.1 for the names of the months of the calendar year in the Gregorian calendar, listed in their order of occurrence, for their number of days, and for the ordinal dates of the days in common and leap years.

2.2.12

month

duration of 28, 29, 30 or 31 calendar days depending on the start and/or the end of the corresponding time interval within the specific calendar month

NOTE 1 The term “month” applies also to the duration of any time interval which starts at a certain time of day at a certain calendar day of the calendar month and ends at the same time of day at the same calendar day of the next calendar month, if it exists. In other cases the ending calendar day has to be agreed on.

NOTE 2 In certain applications a month is considered as a duration of 30 calendar days.

2.2.13

calendar year

cyclic time interval in a calendar which is required for one revolution of the Earth around the Sun and approximated to an integral number of calendar days

NOTE 1 A calendar year is often also referred to as year.

NOTE 2 Unless otherwise specified the term designates in this International Standard a calendar year in the Gregorian calendar.

2.2.14

year

duration of 365 or 366 calendar days depending on the start and/or the end of the corresponding time interval within the specific calendar year

NOTE The term “year” applies also to the duration of any time interval which starts at a certain time of day at a certain calendar date of the calendar year and ends at the same time of day at the same calendar date of the next calendar year, if it exists. In other cases the ending calendar date has to be agreed on.

2.2.15

Gregorian calendar

calendar in general use, introduced in 1582 to define a calendar year that more closely approximated the tropical year than the Julian calendar

NOTE In this International Standard the term Gregorian calendar is used to refer to the time scale described in 3.2.1.

2.2.16

common year

calendar year in the Gregorian calendar that has 365 calendar days

2.2.17

leap year

calendar year in the Gregorian calendar that has 366 calendar days

2.2.18

centennial year

calendar year in the Gregorian calendar whose year number is divisible without remainder by hundred

2.3 Representations and formats

2.3.1

date and time representation

expression indicating a time point, time interval or recurring time interval

2.3.2

date and time format representation

expression describing the format of a group of date and time representations

2.3.3

basic format

format of a date and time representation or date and time format representation comprising the minimum number of time elements necessary for the accuracy required

NOTE The basic format should be avoided in plain text.

2.3.4

extended format

extension of the basic format that includes additional separators

2.3.5

complete representation

representation that includes all the date and time components associated with the expression; limited, if applicable, for time elements of representations expressing a calendar year to four digits

2.3.6

decimal representation

expansion of a representation by addition of a decimal fraction to the lowest order component of the expression

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2.3.7

representation with reduced accuracy

abbreviation of a representation by omission of lower order components

2.3.8

expanded representation

expansion of a representation to allow identification of dates in calendar years outside the range [0000] till [9999]

3 Fundamental principles

3.1 Basic rules

This International Standard gives a set of rules for the representation of

- time points,
- time intervals,
- recurring time intervals.

Both accurate and approximate representations can be identified by means of unique and unambiguous expressions specifying the relevant dates, times of day and durations. The degree of accuracy required and obtainable can be varied by including or deleting the appropriate time elements (such as seconds).