INTERNATIONAL STANDARD

ISO 8601

Second edition
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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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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

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

This second edition cancels and replaces the first edition (ISO 8601:1988), of which it constitues a minor revision. It incorporates Technical Corrigendum 1:1991.

Annexes A and B of this International Standard are for information only.

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 the day.

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 Coordinated Universal Time, and to avoid ambiguities between these representations, it has been necessary to use, apart from numeric characters, either single alphabetic characters or one or more 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 the 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 the 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.

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.

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

1 Scope

This International Standard specifies the representation of dates in the Gregorian calendar and times and representations of periods of time. It includes

a) calendar dates expressed in terms of year, month and day of the month;

b) ordinal dates expressed in terms of year and day of the year;

c) week dates expressed in terms of year, week number and day of the week;

d) time of the day based upon the 24-hour timekeeping system;

e) differences between local time and Coordinated Universal Time (UTC);

f) combination of date and time;

g) time-intervals;

h) recurring time-intervals.

This International Standard is applicable whenever dates and times are included in information interchange.

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 considers the leap seconds that are occasionally inserted at the end of a calendar month to maintain astronomic precision of the calendar day.

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 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 31-0:1992, *Quantities and units — Part 0: General principles*.

ISO 31-1:1992, *Quantities and units — Part 1: Space and time*.

ISO/IEC 646:1991, *Information technology — ISO 7-bit coded character set for information interchange*.

ITU-R RecommendationTF.460-5, *Standard-frequency and time-signal emissions*.

ITU-R RecommendationTF.686, *Glossary*.

3 Terms and definitions

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

3.1
Coordinated Universal Time (UTC)
time scale maintained by the Bureau international des poids et mesures (International Bureau of Weights and Measures) and the International Earth Rotation Service (IERS) which forms the basis of a coordinated dissemination of standard frequencies and time signals

NOTE 1 The source of this definition is ITU-R Recommendation TF.686 of the International Telecommunication Union – Radio. ITU-R has also defined the acronym for Coordinated Universal Time as UTC (see also 5.3.3).

NOTE 2 UTC is often (incorrectly) referred to as Greenwich Mean Time.

NOTE 3 Additional information can be found as follows:
the URL for the ITU http://www.itu.int/itudoc/itu-r/rec/tf/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

3.2
date
identification of a particular calendar day, expressed by some combination of the data elements calendar year, calendar month, calendar week, calendar day or day of the year

3.3
date, calendar
identification of a particular calendar day by its calendar year, its calendar month and its ordinal number within its calendar month

3.4
date, ordinal
identification of a particular calendar day by its calendar year and its ordinal number within its calendar year

3.5
date, week
identification of a particular calendar day by the calendar year to which its calendar week belongs, the ordinal number of its calendar week within that year and its ordinal number within its calendar week

3.6
day
unit of time of 24 hours

3.7
day, calendar
time-interval starting at [0000] and ending at [2400] (which is equal to the beginning of the next calendar day); typically a calendar day has a duration of 24 h

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 IERS, or
— the insertion or deletion of other time intervals, as may be prescribed by local authorities to alter local time.

3.8
duration
quantity (“length”) of time

3.9
format, basic
format of a representation comprising the minimum number of components necessary for the precision required

3.10
format, extended
extension of the basic format that includes additional separators

3.11
Gregorian calendar
calendar in general use; introduced in 1582 to define a year that more closely approximated the tropical year than the Julian calendar

NOTE 1 The introduction of the Gregorian calendar included the cancellation of the accumulated inaccuracies of the Julian year. In the Gregorian calendar, a calendar year is either a common year or a leap year; each year is divided into 12 sequential months.

NOTE 2 In this International Standard the term Gregorian Calendar is used to refer to the reference system described in 4.3.2.1.

3.12
hour
unit of time of 60 minutes, as defined in ISO 31-1

3.13
local time
clock time in public use locally

NOTE The difference between local time and “UTC-time” is established by the (national, regional or local) authority responsible for these matters. The difference depends upon the time zone and may also be varied in the course of a year.

3.14
minute
unit of time of 60 seconds, as defined in ISO 31-1

3.15
month
unit of time of 28, 29, 30 or 31 days

NOTE In certain applications a month is regarded as a unit of time of 30 days.

3.16
month, calendar
time-interval resulting from the division of a calendar year in 12 sequential time-intervals, each with a specific name and containing a specified number of calendar days

NOTE 1 In the Gregorian calendar, the months of the calendar year, listed in their order of occurrence, are named and contain the number of days as follows: January (31), February (28 in common years; 29 in leap years), March (31), April (30), May (31), June (30), July (31), August (31), September (30), October (31), November (30), December (31).

NOTE 2 A calendar month is often also referred to as month.

3.17
period of time (time-interval)
portion of time between two time points

NOTE A period of time is often also referred to as period.

3.18
recurring time-interval
series of consecutive time-intervals of the same duration

3.19
representation, complete
representation that includes all the date and time elements associated with the expression; limited, if applicable, by representations expressing the calendar year by four digits

3.20
representation, decimal
expansion of a representation by addition of a decimal fraction to the lowest order component of the expression

3.21
representation, expanded
expansion of a representation to allow identification of dates in calendar years outside the range [0000] till [9999]

3.22
representation, truncated
abbreviation of a representation by omission of higher order components starting from the left-hand side of the expression

NOTE 1 See also 4.6.

NOTE 2 An expression for duration, in the format with time-unit designators, is referred to as truncated if components with value zero are omitted (see 5.5.3.1).

3.23
representation with reduced precision
abbreviation of a representation by omission of lower order components starting from the right-hand side of the expression

3.24
second
basic unit of measurement of time in the International System of Units, (SI) as defined in ISO 31-1

3.25
second, leap
intentional time step of one second used to adjust UTC to ensure approximate agreement with UT1 (a time scale based on the rotation of the Earth); an inserted second is called positive leap second and an omitted second is called negative leap second (see ITU-R Rec.TF.460-5)

NOTE 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 June 30th or December 31st, but if necessary on March 31st or September 30th.

3.26
time-point
instant in the laps of time regarded as dimensionless

3.27
week
unit of time of seven days

3.28
week, calendar
time-interval of seven days, starting on a Monday and identified by its ordinal number within a calendar year

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

3.29
year
unit of time of which the duration equals the duration of a calendar year

3.30
year, calendar
cyclic time-interval in a calendar which is required for one revolution of the earth around the sun (approximated to an integral number of calendar days)

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

3.31
year, centennial
⟨Gregorian calendar⟩ calendar year whose year number is divisible by hundred an integral number of times

3.32
year, common
⟨Gregorian calendar⟩ calendar year that has 365 days

3.33
year, leap
⟨Gregorian calendar⟩ calendar year that has 366 days

NOTE The rules used for assigning the extra day are given in 4.3.2.1.

4 Fundamental principles

4.1 Basic concepts

For the purpose of this International Standard, four concepts are fundamental:

— **Time-point**: an instant in the laps of time regarded as dimensionless. Time-points are determined by specifying their position (i.e. their 'distance' in time from the zero-point) in a time oriented reference system.

— **Time-interval**: a portion of time between two time-points. These time-points are respectively labelled “start” and “end”. Time intervals may be specified by these two time-points, by one of these time-points and the temporal distance between the points or by the temporal distance between these points only.

— **Recurring time-interval**: a series of consecutive time-intervals of the same duration. Recurring time-intervals may be specified by specification of one time-interval and the number of recurrences.

— **Duration**: a quantity (“length”) of time. Duration is a physical unit expressed in the units of time of the International System of Units (SI), as defined in ISO 31-1.

Both precise and approximate time-points and time-intervals can be identified by means of unique and unambiguous expressions specifying the relevant dates and times of the day. This International Standard specifies a set of rules for the representation of dates, times-of-the day, time-intervals and recurring time-intervals. The degree of precision required and obtainable can be varied by including or deleting the appropriate time elements (such as seconds).

4.2 Common features, uniqueness and combinations

The decreasing order of components, left-to-right, is common to the expressions for

— points in time;

— dates only;

— times only;

— time-intervals;

— recurring time-intervals;

— any abbreviation of the above.

4.3 Time-units and reference systems

4.3.1 Time-units

Duration referred to in this International Standard shall be expressed in one or more of the following units:

— **second**: a basic unit of measurement of time in the International system of units (SI), defined in ISO 31-1:1992

— **minute**: a time-unit of 60 seconds

— **hour**: a time-unit of 60 minutes

— **day**: a time-unit of 24 hours

— **week**: a time-unit of seven days.

— **month**: a time-unit of 28, 29, 30 or 31 days.

NOTE In certain applications a month is regarded as a unit of time of 30 days.

— **year**: a time-unit of 12 months, considered to approximate the duration required for one revolution of the earth around the sun. See also 4.3.2.1.

4.3.2 Date and time reference systems

4.3.2.1 The Gregorian calendar

This International Standard uses the Gregorian calendar for the identification of calendar days.

The Gregorian calendar provides a reference system consisting of a, potentially infinite, series of contiguous calendar years. Consecutive calendar years are identified by sequentially assigned year numbers. A reference point is used which assigns the year number 1875 to the calendar year in which the “Convention du mètre” was signed at Paris.

The Gregorian calendar distinguishes common years with a duration of 365 calendar days and leap years with a duration of 366 calendar days. A leap year is a year whose year number is divisible by four an integral number of times. However, centennial years are not leap years unless they are divisible by four hundred an integral number of times.

This International Standard allows the identification of calendar years by their year number for years both before and after the introduction of the Gregorian calendar. For the determination of calendar years and year numbers only the rules mentioned above are used. For the purposes of this International Standard these rules are referred to as the Gregorian calendar. The use of this calendar for dates preceding the introduction of the Gregorian calendar (i.e. before 1582) should only be done by agreement of the partners in information interchange.

NOTE 1 In the prolaptic Gregorian calendar the calendar year [0000] is a leap year.

NOTE 2 No dates shall be inserted or deleted when determining dates in the prolaptic Gregorian calendar (this may be necessary for the calculation of dates in the Julian calendar before 1582). Also note that the year numbers of years before the