INTERNATIONAL STANDARD

ISO
8601
First edition
1988-06-15

ISO

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

iTeh STANDARD PREVIEW

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

(standards.iteh.ai)

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

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

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

It cancels and replaces International Standards ISO 2014 : 1976, ISO 2015 : 1976, ISO 2711 : 1973, ISO 3307 : 1975 and ISO 4031 : 1978, of which it constitutes a technical revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Contents

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

0 Introduction

0.1 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.

0.2 This International Standard includes specifications for the numeric representation of information regarding date and time of the day.

0.3 In order to achieve similar formats for the representations of calendar dates, ordinal dates, dates identified by week number, periods of time, combined date and time of the 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.

0.4 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.

0.5 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.

0.6 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.

0.7 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.

1 Scope and field of application

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 month;

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

c) dates identified by means of year, week numbers and day numbers;

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) periods of time, with or without either a start or end date or both.

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.

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 References

ISO 31-0 : 1981, *General principles concerning quantities, units and symbols.*

ISO 31-1 : 1978, *Quantities and units of space and time.*

ISO 646 : 1983, *Information processing — ISO 7-bit coded character set for information interchange.*

3 Terms and definitions

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

3.1 complete representation: The representation that includes all the date and time elements associated with the expression.

3.2 Coordinated Universal Time (UTC): The time scale maintained by the Bureau International de l'Heure (International Time Bureau) that forms the basis of a coordinated dissemination of standard frequencies and time signals.

NOTES

1 The source of this definition is Recommendation 460-2 of the Consultative Committee on International Radio (CCIR). CCIR has also defined the acronym for Coordinated Universal Time as UTC (see also 5.3.3).

2 UTC is often (incorrectly) referred to as Greenwich Mean Time and appropriate time signals are regularly broadcast.

3.3 date, calendar: A particular day of a calendar year, identified by its ordinal number within a calendar month within that year.

3.4 date, ordinal: A particular day of a calendar year identified by its ordinal number within the year.

3.5 day: A period of time of 24 hours starting at 0000 and ending at 2400 (which is equal to the beginning of 0000 the next day).

3.6 format, basic: The format of a representation comprising the minimum number of components necessary for the precision required.

3.7 format, extended: An extension of the basic format that includes additional separators.

3.8 Gregorian calendar: A calendar in general use introduced in 1582 to correct an error in the Julian calendar. In the Gregorian calendar common years have 365 days and leap years 366 days divided into 12 sequential months.

3.9 hour: A period of time of 60 minutes.

3.10 local time: The clock time in public use locally.

3.11 minute: A period of time of 60 seconds.

3.12 month, calendar: A period of time resulting from the division of a calendar year in twelve sequential periods of time, each with a specific name and containing a specified number of days. 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 — In certain applications a month is regarded as a period of 30 days.

3.13 period: A duration of time, specified

a) as a defined length of time (e.g. hours, days, months, years);

b) by its beginning and end points.

3.14 second: A basic unit of measurement of time in the International System of Units (SI) as defined in ISO 31-1.

3.15 truncated representation: The abbreviation of a complete representation by omission of higher order components starting from the extreme left-hand side of the expression.

3.16 week: A period of time of seven days.

3.17 week, calendar: A seven day period within a calendar year, starting on a Monday and identified by its ordinal number within the year; the first calendar week of the year is the one that includes the first Thursday of that year. In the Gregorian calendar, this is equivalent to the week which includes 4 January.

3.18 year: A period of time of twelve consecutive months, considered to equal a calendar year.

3.19 year, calendar: A cyclic period of time in a calendar which is required for one revolution of the earth around the sun. In the Gregorian calendar, a calendar year is either a common year or a leap year.

3.20 year, common: In the Gregorian calendar, a year which has 365 days.

3.21 year, leap: In the Gregorian calendar, a year which has 366 days. A leap year is a year whose number is divisible by four an integral number of times, except that if it is a centennial year it shall be divisible by four hundred an integral number of times.

4 Fundamental principles

4.1 Concept

A precise point in calendar time can be identified by means of a unique expression giving a specific day and a specific time within that day. The degree of precision required for the application can be obtained by including the appropriate components.

4.2 Common features, uniqueness and combinations

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

— precise points in time;

— dates only;

— times only;

— periods of time;

— any abbreviations of the above.

4.3 Characters used in the representations

The representations specified in this International Standard use digits, alphabetic characters and special characters specified in ISO 646. The particular use of these characters is explained in 4.4 and clause 5.

NOTE — Where the upper case characters are not available lower case characters may be used.

The space character shall not be used in the representations.

4.4 Use of separators

When required, the following characters shall be used as separators:

[-] (hyphen) — to separate the time elements "year" and "month", "year" and "week", "year" and "day", "month" and "day", and "week" and "day";

NOTE — The hyphen is also used to indicate omitted components.

[:] (colon) — to separate the time elements "hour" and "minute", and "minute" and "second".

[/] (solidus) — to separate the two components in the representation of periods of time.

4.5 Truncation

It is permitted to omit higher order components (truncation) in applications where their presence is implied. To assure uniqueness of each representation provided for in this International Standard, truncation of a particular representation should be done in accordance with the rules given in the appropriate subclause of clause 5 referring to the representation

in question. The addition of a single hyphen in place of each omitted component will usually be necessary, to avoid risk of misinterpretation.

NOTE — By mutual agreement of the partners in information interchange, leading hyphens may be omitted in the applications where there is no risk of confusing these representations with others defined in this International Standard.

4.6 Leading zero(s)

Each date and time component in a defined representation has a defined length, and (a) leading zero(s) shall be used as required.

5 Representations

5.1 Explanations

5.1.1 Characters used in place of digits

[C] represents a digit used in the thousands and hundreds components (the "century" component) of the time element "year";

[Y] represents a digit used in the tens and units components of the time element "year";

[M] represents a digit used in the time element "month";

[D] represents a digit used in the time element "day";

[w] represents a digit used in the time element "week";

[h] represents a digit used in the time element "hour";

[m] represents a digit used in the time element "minute";

[s] represents a digit used in the time element "second";

[n] represents digit(s), constituting a positive integer.

5.1.2 Characters used as designators

[P] is used as period designator, preceding a data element which represents a given duration of a period of time;

[T] is used as time designator to indicate the start of the representation of the time of the day in combined date and time of day expressions;

[W] is used as week designator, preceding a data element which represents the ordinal number of a calendar week within the year;

[Z] is used as time-zone designator, immediately (without space) following a data element expressing the time of the day in Coordinated Universal Time (UTC).

In representations of duration of time (5.5.3.2), the following characters are also used as parts of the representation when required:

[Y] [M] [W] [D] [H] [M] [S]

NOTE — In these representations, [M] may be used to indicate "month" or "minute", or both.

3

5.2 Dates

For ease of comparison, in all the following examples of representations of dates, the date of 12 April 1985 is used as an illustration, as applicable.

5.2.1 Calendar date

In expressions of calendar dates

— **day of the month** (calendar day) is represented by two digits. The first day of any month is represented by [01] and subsequent days of the same month are numbered in ascending sequence;

— **month** is represented by two digits. January is represented by [01], and subsequent months are numbered in ascending sequence;

— **year** is generally represented by four digits; years are numbered in ascending order according to the Gregorian Calendar.

5.2.1.1 Complete representation

When the application clearly identifies the need for an expression only of a calendar date, then the complete representation shall be a single numeric data element comprising eight digits, where [CCYY] represents a calendar year, [MM] the ordinal number of a calendar month within the calendar year, and [DD] the ordinal number of a day within the calendar month.

Basic format: CCYYMMDD

  Example: 19850412

Extended format: CCYY-MM-DD

  Example: 1985-04-12

5.2.1.2 Representations with reduced precision

If in a given application it is sufficient to express a calendar date with less precision than a complete representation as specified in 5.2.1.1, either two, four or six digits may be omitted, the omission starting from the extreme right-hand side. The resulting representation will then indicate a month, a year or a century, as set out below. When only [DD] are omitted, a separator shall be inserted between [CCYY] and [MM], but separators shall not be used in the other representations with reduced precision.

a) A specific month

  Basic format: CCYY-MM

    Example: 1985-04

  Extended format: not applicable

b) A specific year

  Basic format: CCYY

    Example: 1985

  Extended format: not applicable

c) A specific century

  Basic format: CC

    Example: 19

  Extended format: not applicable

5.2.1.3 Truncated representations

If truncated representations are required the basic formats shall be as specified below. In each case hyphens (to indicate omitted components) shall be used only as indicated.

a) A specific date in the current century

  Basic format: YYMMDD

    Example: 850412

  Extended format: YY-MM-DD

    Example: 85-04-12

b) A specific year and month in the current century

  Basic format: -YYMM

    Example: -8504

  Extended format: -YY-MM

    Example: -85-04

c) A specific year in the current century

  Basic format: -YY

    Example: -85

  Extended format: not applicable

d) A specific day of a month

  Basic format: --MMDD

    Example: --0412

  Extended format: --MM-DD

    Example: --04-12

e) A specific month

  Basic format: --MM

    Example: --04

  Extended format: not applicable

f) A specific day

  Basic format: ---DD

    Example: ---12

  Extended format: not applicable

5.2.2 Ordinal date

The ordinal day of the year is represented by three decimal digits. The first day of any year is represented by [001] and subsequent days are numbered in ascending sequence.

5.2.2.1 Complete representation

When the application clearly identifies the need for a complete representation of an ordinal date, it shall be one of the numeric

expressions as follows, where [CCYY] represents a calendar year and [DDD] the ordinal number of a day within the year.

Basic format: CCYYDDD

Example: 1985102

Extended format: CCYY-DDD

Example: 1985-102

5.2.2.2 Truncated representations

If truncated representations are required, the basic formats shall be as specified below. In each case hyphens (to indicate omitted components) shall be used only as indicated.

a) A specific year and day in the current century

Basic format: YYDDD

Example: 85102

Extended format: YY-DDD

Example: 85-102

b) Day only

Basic format: -DDD

Example: -102

Extended format: not applicable

NOTE — Logically, the representation should be [--DDD], but the first hyphen is superfluous and, therefore, it has been omitted.

5.2.3 Date identified by calendar week and day numbers

Calendar week is represented by two numeric digits. The first calendar week of a year shall be identified as [01] and subsequent weeks shall be numbered in ascending sequence.

Day of the week is represented by one decimal digit. Monday shall be identified as day [1] of any calendar week, and subsequent days of the same week shall be numbered in ascending sequence to Sunday (day [7]).

5.2.3.1 Complete representation

When the application clearly identifies the need for a complete representation of a date identified by calendar week and day numbers, it shall be one of the alphanumeric expressions as follows, where [CCYY] represents a calendar year, [W] is the week designator, [ww] represents the ordinal number of a calendar week within the year, and [D] represents the ordinal number of a day within the calendar week.

Basic format: CCYYWwwD

Example: 1985W155

Extended format: CCYY-Www-D

Example: 1985-W15-5

5.2.3.2 Representation with reduced precision

If the degree of precision required permits, one digit may be omitted from the representation in 5.2.3.1.

Basic format: CCYYWww

Example: 1985W15

Extended format: CCYY-Www

Example: 1985-W15

5.2.3.3 Truncated representations

If truncated representations are required the basic formats shall be as specified below. In each case hyphens (to indicate omitted components) shall be used only as indicated.

a) Year, week and day in the current century

Basic format: YYWwwD

Example: 85W155

Extended format: YY-Www-D

Example: 85-W15-5

b) Year and week only in the current century

Basic format: YYWww

Example: 85W15

Extended format: YY-Www

Example: 85-W15

c) Year of the current decade, week and day only

Basic format: -YWwwD

Example: -5W155

Extended format: -Y-Www-D

Example: -5-W15-5

d) Week and day only of the current year

Basic format: -WwwD

Example: -W155

Extended format: -Www-D

Example: -W15-5

e) Week only of the current year

Basic format: -Www

Example: -W15

Extended format: not applicable

f) Day only of the current week

Basic format: -W-D

Example: -W-5

Extended format: not applicable

NOTE — Although the representation [-W-D] could be abbreviated to [-D] without risk of misinterpretation, the full, logical, derivation

has been retained because the [W] serves to identify the representation as a date based on week and day numbers. Its frequency of use is expected to be low and, therefore, the two potentially superfluous characters are not likely to create transmission problems.

g) Day only of any week

Basic format: ---D

Example: ---5

Extended format: not applicable

5.3 Time of the day

As this International Standard is based on the 24-hour timekeeping system which is now in common use, hours are represented by two digits from [01] to [24], whereas minutes and seconds are represented by two digits from [01] to [60]. For most purposes times will be represented by four digits [hhmm].

5.3.1 Local time of the day

5.3.1.1 Complete representation

When the application clearly identifies the need for an expression only of a time of the day then the complete representation shall be a single numeric data element comprising six digits in the basic format, where [hh] represents hours, [mm] minutes and [ss] seconds.

Basic format: hhmmss

Example: 232050

Extended format: hh:mm:ss

Example: 23:20:50

5.3.1.2 Representations with reduced precision

If the degree of precision required permits, either two or four digits may be omitted from the representation in 5.3.1.1.

Basic format: hhmm
hh

Example: 2320
23

Extended format: hh:mm
not applicable

Example: 23:20

5.3.1.3 Representation of decimal fractions

If necessary for a particular application a decimal fraction of hour, minute or second may be included. If a decimal fraction is included, lower order components (if any) shall be omitted, and the decimal fraction shall be divided from the integer part by the decimal sign specified in ISO 31-0: i.e. the comma [,] or full stop [.]. Of these, the comma is the preferred sign. If the magnitude of the number is less than unity, the decimal sign shall be preceded by a zero (see ISO 31-0).

The number of digits in the decimal fraction shall be determined by the interchange parties, dependent upon the application. The format shall be [hhmmss,s], [hhmm,m] or [hh,h] as appropriate (hour minute second, hour minute and hour, respectively), with as many digits as necessary following the decimal sign. If the extended format is required, separators may be included in the decimal representation when the complete representation is used, or when it is reduced by omission of [ss,s].

Basic format: hhmmss,s
hhmm,m
hh,h

Example: 232050,5
2320,9
23,3

Extended format: hh:mm:ss,s
hh:mm,m
not applicable

Example: 23:20:50,5
23:20,9

5.3.1.4 Truncated representations

If truncated representations are required the basic formats shall be as specified below. In each case hyphens (to indicate omitted components) shall be used only as indicated.

a) A specific minute and second of the hour

Basic format: -mmss

Example: -2050

Extended format: -mm:ss

Example: -20:50

b) A specific minute of the hour

Basic format: -mm

Example: -20

Extended format: not applicable

c) A specific second of the minute

Basic format: --ss

Example: --50

Extended format: not applicable

d) A specific hour of the day and decimal fraction of the hour

Basic format: hh,h

Example: 11,3

Extended format: not applicable

e) A specific minute of the hour and a decimal fraction of the minute

Basic format: -mm,m

Example: -20,9

Extended format: not applicable

f) A specific minute and second of the hour and a decimal fraction of the second

Basic format: -mmss,s

Example: -2050,5

Extended format: -mm:ss,s

Example: -20:50,5

g) A specific second of the minute and a decimal fraction of the second

Basic format: --ss,s

Example: --50,5

Extended format: not applicable

NOTE — The basic formats above show only one digit following the decimal sign, but as many digits as required may be used.

5.3.2 Midnight

The complete and extended representations for midnight, in accordance with 5.3.1, shall be expressed in either of the two following ways:

Basic format	Extended format
a) 000000	00:00:00 (the beginning of a day);
b) 240000	24:00:00 (the end of a day).

The representations may be reduced in accordance with 5.3.1.4.

NOTES

1 Midnight will normally be represented as [0000] or [2400]

2 The choice of representation a) or b) will depend upon any association with a date, or a time period.

3 The end of one day (2400) coincides with (0000) at the start of the next day, e.g. 2400 on 12 April 1985 is the same as 0000 on 13 April 1985. If there is no association with a date or a time period both a) and b) represent the same clock time in the 24-hour timekeeping system.

5.3.3 Coordinated Universal Time (UTC)

To express the time of the day in Coordinated Universal Time, the representations specified in 5.3.1 shall be used, followed immediately, without spaces, by the time-zone designator [Z]. The examples below are complete and reduced precision representations of the UTC time 20 minutes and 30 seconds past 23 hours:

Basic format: hhmmssZ
hhmmZ
hhZ

Example: 232030Z
2320Z
23Z

Extended format: hh:mm:ssZ
hh:mmZ
not applicable

Example: 23:20:30Z
23:20Z

5.3.3.1 Differences between local time and Coordinated Universal Time

When it is required to indicate the difference between local time and Coordinated Universal Time, its representation shall be appended to the representation of the local time following immediately, without space, the lowest order (extreme right-hand) component of the local time expression, which, in this case, shall always include hours.

The difference between local time and Coordinated Universal Time shall be expressed in hours and minutes, or hours only independently of the precision of the local time expression associated with it. It shall be expressed as positive (i.e. with the leading plus sign [+]) if the local time is ahead of and as negative (i.e. with the leading minus sign [−]) if it is behind Coordinated Universal Time as shown below. The complete representation of the time of 27 minutes 46 seconds past 15 hours locally in Geneva (normally one hour ahead of UTC), and in New York (five hours behind UTC), together with the indication of the difference between the local time and Coordinated Universal Time, are used as examples.

Basic format: + hhmm
+ hh
− hhmm
− hh

Example: 152746 + 0100
152746 + 01
152746 − 0500
152746 − 05

Extended format: + hh:mm
not applicable
− hh:mm
not applicable

Example: 15:27:46 + 01:00
15:27:46 + 01
15:27:46 − 05:00
15:27:46 − 05

NOTE — The representations of the negative difference between local time and Coordinated Universal Time should not be used alone as they may be confused with the truncated representations of dates provided for in 5.2.1.3, and with truncated representations of time of the day provided for in 5.3.1.4.

5.4 Combinations of date and time of the day representations

When the application does not clearly identify the need for only a date expression (see 5.2) or only a time of the day expression (see 5.3), then a moment of time can be identified through a combination of date and time of the day representations provided for in this International Standard.

5.4.1 Complete representation

The components of an instant of time shall be written in the following sequence:

a) For calendar dates:

year - month - day - time designator - hour - minute - second