INTERNATIONAL STANDARD

ISO
8601

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION
ME*AYHAPOAHAR 0PrAHkI3AL4HR n0 CTAHAAPTH3AL4KM

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

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 and ISO 8601: 1988, of which it constitutes a technical revision. It incorporates ISO 8601: 1988, Technical Corrigendum 1 and ISO 8601: 1988 Amendment 1.

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.

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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, recurring time-intervals, 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 of the weeknumbers;

   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.

   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.

This International Standard does not considers the leap seconds which are occasionally inserted between calendar months years to maintain astronomic precision.

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

ISO 31-0 : 1992,   *Quantities and units - Part 0: General principles.*
ISO 31-0 : 1981, *General principles concerning quantities, units and symbols.*

ISO 31-1 : 1992,   *Quantities and units - Part 1: Space and time.*
ISO 31-1 : 1978, *Quantities and units of space and time.*

ISO 646 : 1991,   *Information processing - ISO 7-bit coded character set for information interchange.*
ISO 646 : 1983, *Information processing – ISO 7-bit coded character set for information interchange.*

Rec.ITU-R TF.460-4   *Standard-frequency and time-signal emissions.*

Rec.ITU-R TF.686   *Glossary*

3 Terms and definitions

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

3.2   Coordinated Universal Time (UTC): The time scale maintained by the Bureau International des Poids et Mesuresde l'Heure (International Time Bureau of Weights and Measures) and the International Earth Rotation Service (IERS) whichthat forms the basis of a coordinated dissemination of standard frequencies and time signals.

NOTES

1 The source of this definition is Recommendation ITU TF.686460-2 of the International Telecommunication Union - Radio (ITU-R) Consultative Committee on International Radio (CCIR). ITU-RCCIR 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**: A particular calendar day of a calendar year, expressed by some combination of the data elements century, calendar year, calendar month, calendar week, calendar day or day of the year.

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

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

3.6 **day**: A unit of time of 24 hours.

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

NOTE – A calendar day is often also referred to as day

3.8 **duration**: a quantity ("length") of time.

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

3.10 **format, extended**: An extension of the basic format that includes additional separators for date and time components.

3.11 **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.

3.12 **hour**: A unitperiod of time of 60 minutes, as defined in ISO 31-1.

3.13 **local time**: The 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**: A unitperiod of time of 60 seconds, as defined in ISO 31-1.

3.15 **month**: A 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**: 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 calendar days. In the Gregorian calendar, the months of the calender 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 – A calendar month is often also referred to as month

NOTE – In certain applications a month is regarded as a period of time 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.

3.17 **period of time (time-interval)**: a portion of time of which the duration in a given context is considered to be significant and relevant.

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

3.xx **recurring time-interval**: a series of consecutive-time intervals of the same duration.

3.xy **representation, complete**: The representation that includes all the date and time elements associated with the expression.

3.18   **representation, decimal**: The expansion of a representation by addition of a decimal fraction to the lowest order component of the expression.

3.19   **representation, truncated**: The abbreviation of a ~~complete~~ representation by omission of higher order components starting from the ~~extreme~~ left-hand side of the expression. See also 4.6.

NOTE – An expression for duration where each component has a designator is referred to as truncated if components with value zero are omitted (see 5.5.3.1).

3.20   **representation with reduced precision**: The abbreviation of a representation by omission of lower order components starting from the right-hand side of the expression.

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

3.22   **second, leap**: An 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 rec. ITU-R TF.460-4). Positive leap seconds are 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 when needed, typically on June 30th or December 31st.

3.23   **time-point**: a portion of time of which the duration in a given context is considered to be insignificant, irrelevant or unknown.

3.24   **week**: A unit~~period~~ of time of seven days.

3.25   **week, calender**: A period ~~of time~~ of seven days ~~within a calendar year~~, starting on a Monday and identified by its ordinal number within ~~the~~ a calendar 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.

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

3.26   **year**: A unit~~period~~ of time ~~of twelve consecutive months, considered to equal~~ of which the duration equals the duration of a calendar year.

3.27   **year, calendar**: A cyclic period of time in a calendar which is required for one revolution of the earth around the sun (approximated to an integral number of days). In the Gregorian calendar, a calendar year is either a common year or a leap year.

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

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

3.29   **year, leap**: In the Gregorian calendar, a calendar 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.~~

4.1   General concepts

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

Time-point: a portion of time of which the duration in a given context is considered to be insignificant, irrelevant or unknown.

Period of time (time-interval): a portion of time of which the duration in a given context is considered to be significant and relevant.

Duration: a quantity ("length") of time

Both precise and approximate time-points and periods of time can be identfied by means of unique and unambiguous expressions specifying the relevant dates and times of the day. This standard gives a set of rules for the representation of dates, times-of-day, periods of time 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

- precise points in time;

- dates only;

- times only;

- periods of time;

- recurring time-intervals

- any abbreviations of the above.

4.3 Units and zero points

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 in the International system of units (SI), defined in ISO 31-1

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 7 days. See also 4.3.2.2.

month: a time-unit of 28, 29, 30 or 31 days. See also 4.3.2.1.

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 Dates in the Gregorian calendar

The Gregorian calendar uses a reference point which assigns the year number 1875 to the calendar year in which the Convention du Mètre was signed at Paris. All calendar years numbered according to this convention have, by definition, one specific year number.

The Gregorian calendar distinguishes common years with a duration of 365 days and leap years with a duration of 366 days (chapter 3 gives the rules used for assigning the extra day.)
In the Gregorian calendar each year is divided as follows in 12 sequential calendar months:

Calendar month number	Calendar month name	Number of days in the month	Ordinal dates of the days in common years	Ordinal dates of the days in leap years
01	January	31	01-31	01-31
02	February	28 (leap year 29)	32-59	32-60
03	March	31	60-90	61-91
04	April	30	91-120	92-121
05	May	31	121-151	122-152
06	June	30	152-181	153-182
07	July	31	182-212	183-213
08	August	31	213-243	214-244
09	September	30	244-273	245-274
10	October	31	274-304	275-305
11	November	30	305-324	306-325
12	December	31	325-365	326-366

Each calendar day within a calendar year can be identified by
a) its ordinal number within its calendar month,
b) its ordinal number within its calendar year.

If a day is identified by means of a) the result is called a calendar date, if identfied by means of b) the result is called its ordinal date. Since method a) is more common, the somewhat loose term "date" as a rule refers to the combination of three time elements
A = (Gregorian) year number
B = calendar month number (or name)
C = ordinal number of the calendar day within its month

4.3.2.2   Calendar weeks

The time-unit "week" has already been considered in par. 4.3.1. For many applications it is useful to be able to refer to a specific set of seven consecutive calendar days. To that end the following definitions are needed:

calendar week: a period of time of seven consecutive calendar days,
-   identified by its year and its ordinal number within that year,
-   with Monday as its first day and the other six days numbered and named accordingly.

NOTE – To be precise, it should be mentioned that the naming and numbering of the days of the week correspond with assigning to the date of 2000-01-01 the name Wednesday.

Calendar week number: the ordinal number of the week, applying the rule that the first calendar week of a year is the one that includes the first Thursday of that year.

NOTE: In the Gregorian calendar, the first calendar week is the week which includes 4 January.

4.4   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 4.5 and clause 5.

NOTES

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

2. Encoding of characters for the interchange of dates and times is not in the scope of this standard.

The space character shall not be used in the representations.

4.5   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.

NOTE - Representations defined by this standard make also use of the decimal separator.

4.6   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.

NOTES

1. 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.

2.The representations specified in this International Standard make use of "minus" and "hyphen". The repertoire of ISO 646 contains the character "hyphen-minus" which is used to represent both "hyphen" and "minus". The representations in this standard have been defined so that there is no risk of confusion when the repertoire of ISO 646 is used for interchange. When the interchanging partners have agreed on the use of a repertoire which supports "hyphen" and "minus" as different characters, it is recommended to use both characters as specified in this International Standard.

Truncation should only be used in situations where the application ensures that the value of the omitted components can be inferred unevoqually by all receiving partners.

4.7 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 or zero.

5.1.2 Characters used as designators

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

[R] is used as recurring time-interval designator, preceding a data element which represents a given duration of one time-interval of a recurring time-interval;

[T] is used as time designator to indicate:

       - the start of the representation of local time if it is necessary or desirable to designate time of the day expressions as such,

       - the start of the representation of the time of the day in combined date and time of day expressions,

       - the start of the representation of the time-units for hour, minute or second in expressions of duration;

[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 (5.5.3.1), the following characters are also used as part 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.

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 by values in the range [0001] till [9999].

NOTES

1. By mutual agreement of the partners in information interchange the number of digits representing the calendar year may exceed 4 in applications where it is necessary to identify calendar years in the Gregorian calendar beyond the calendar year [9999] and where there is no risk of confusing the representations with others defined in this International Standard.

2. By mutual agreement of the partners in information interchange a 'minus sign' may immediately precede the calendar year component in applications where it is necessary to identify calendar years in the Gregorian calendar before the calendar year [0001] and where there is no risk of confusing the representations with others defined in this International Standard. In the Gregorian calendar consecutive calendar years are identified by consecutive numbers, except for the calendar year [-0001] which is followed by the calendar year [0001].

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 calender 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] isare 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 implied ~~current~~ century

Basic format: YYMMDD

        Example: 850412

Extended format: YY-MM-DD

        Example: 85-04-12

b)   A specific year and month in the implied ~~current~~ century

Basic format: -YYMM

        Example: -8504

Extended format: -YY-MM

        Example: -85-04

c)   A specific year in the implied ~~current~~ century

Basic format: -YY

        Example: -85

Extended format: not applicable

d)   A specific day of a month in the implied year

Basic format: --MMDD

        Example: --0412

Extended format: --MM-DD

        Example: --04-12

e)   A specific month in the implied year

Basic format: --MM

        Example: --04

Extended format: not applicable

f)   A specific day in the implied month

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 implied ~~current~~ century

Basic format: YYDDD

Example: 85102

Extended format: YY-DDD

Example: 85-102

b)   Day only in the implied year

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 decimal~~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~~6~~

NOTE – The first calendar week of a calendar year can include days of the preceeding year and the last calendar week of a calendar year can include days of the succeeding year:
    Sunday 1 January 1995 is represented as 1994-W52-7,
    Tuesday 31 December 1996 is represented as 1997-W01-2.

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: l985-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 implied ~~current~~ century

      Basic format: YYWwwD

            Example: 85W155

      Extended format: YY-Www-D

            Example: 85-W15-5

    b)   Year and week only in the implied ~~current~~ century

      Basic format: YYWww

            Example: 85W15

      Extended format: YY-Www

            Example: 85-W15

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

      Basic format: -YWwwD

            Example: -5W155

      Extended format: -Y-Www-D

            Example: -5-W15-5

    d)   Year of the implied decade and week only

      Basic format: -YWww

            Example: -5W15

Extended format: -Y-Www

Example: -5-W15

e)   Week and day only of the implied ~~current~~ year

Basic format: -WwwD

Example: -W155

Extended format: -Www-D

Example: -W15-5

f)   Week only of the implied ~~current~~ year

Basic format: -Www

Example: -W15

Extended format: not applicable

g)   Day only of the implied ~~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~~

NOTE – 5.2.3.3 includes the definition of representations which are both truncated and have reduced precision.

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 [00][01] to [24], whereas minutes and seconds are represented by two digits from [00] to [59],[01] to [60] and seconds are represented by two digits from [00] till [60]. For most purposes times will be represented by four digits [hhmm].

The representation of the hour by [24] is only allowed to indicate midnight, see 5.3.2.

The representation of the second by [60] is only allowed to indicate the positive leap second or a time-point within that second.

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 two zeros in accordance with 4.6a 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 extended with a decimal fractionused, or when it is reduced by omission of the seconds component[ss,s].

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

Example: 232050,5
2320,8~~9~~
23,3

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

Example: 23:20:50,5
23:20,8~~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 implied hour

Basic format: -mmss

Example: -2050

Extended format: -mm:ss

Example: -20:50

b)   A specific minute of the implied hour

Basic format: -mm

Example: -20

Extended format: not applicable

c)   A specific second of the implied 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~~

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

Basic format: -mmss,s

Example: -2050,5

Extended format: -mm:ss,s

Example: -20:50,5

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

Basic format: -mm,m

Example:	-20,8~~9~~
Extended format:	not applicable

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

Basic format:	--ss,s
Example:	--50,5
Extended format:	not applicable

NOTES

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

2   5.3.1.3 includes the definition of representations which have been truncated and have reduced precision and/or a decimal fraction.

3   The representations of local time of the day should not be used in situations where they may be confused with the reduced or truncated representations of dates provided for in 5.2.1.2 and 5.2.1.3. In situations where the usage of either calendar date or local time of the day is not clear from the context or from the representations the provisions of clause 5.3.1.5 for the representation of local time shall be used.

5.3.1.5   Representation with time designator

In expressions of local time applications may put the time designator [T] immediately in front of the representations defined in 5.3.1.1 through 5.3.1.3.

If the time of the day is represented in basic format in a context which does not clearly identify a time only expression, the time designator [T] shall be used immediately in front of the presentations defined in 5.3.1.1 through 5.3.1.3.

5.3.2 Midnight

The complete ~~and extended~~ representations in basic and extended format 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~~5.3.1.2, truncated in accordance with 5.3.1.4 or designated to be a time expression in accordance with 5.3.1.5. To represent midnight the representations may be expanded with a decimal fraction containing only zero's in accordance with 5.3.1.3.

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. Representation were [hh] has the value [24] are only preferred to represent the end of a period of time in accordance with 5.5.4 or 5.5.5.

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 period of time 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~~ 5.3.1.1 through 5.3.1.3 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~~5.3.4~~   ~~Differences between~~ Local time and Coordinated Universal Time

5.3.4.1 Difference between local time and Coordinated Universal Time

When it is required to indicate the difference between local time and Coordinated Universal Time, the representation of the difference can be expressed in hours and minutes, or hours only. 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 minutes component of the difference may only be omitted if the time difference is exactly an integral number of hours.

     Basic format: ±hhmm
                                  ±hh

          Example: +0100
                                 +01
                                 -0500
                                 -05

     Extended format: ±hh:mm

          Example: +01:00
                                 -05:00

NOTES

1 The representations of the negative difference between local time and Coordinated Universal Time should not be used in situations where~~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.

2   In the format expressions the plus-minus sign [±] is used to indicate the position where either the plus sign [+] or the minus sign [-] must be placed.

5.3.4.2 Local time and the difference with Coordinated Universal Time

When it is required to indicate local time and the difference between local time and Coordinated Universal Time, the~~its~~ representation of the difference shall be appended to the representation of the local time following immediately, without space, the lowest order (extreme righthand) 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.

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: hhmmss±hhmm
                              hhmmss±hh

          Example: 152746+0100
                              152746+01
                              152746-0500

152746-05

Extended format: hh:mm:ss±hh:mm
                                  hh:mm:ss±hh~~not applicable~~

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

In these expressions the local time component may be represented with reduced precision as defined in 5.3.1.2 or with decimal fraction as defined in 5.3.1.3.

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 time-point~~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-point shall be written in the following sequence

a) For calendar dates:

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

b) For ordinal dates:

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

c) For dates identified by week and day numbers:

year - week designator - week - day - time designator - hour - minute - second - zone designator

The zone designator is empty if use is made of local time of the day in accordance with 5.3.1.1 through 5.3.1.3, it is the time-zone designator [Z] if the expression makes use of Coordinated Universal Time in accordance with 5.3.3 and it is the difference component if the expression makes use of local time and the difference with UTC in accordance with 5.3.4.2.

The character [T] shall be used as time designator to indicate the start of the representation of time of the day in date and time expressions. The hyphen [-] and the colon [:] shall be used, in accordance with 4.5, as separators within the date and time of the day expressions respectively, when required. ~~When any of the date or time components are omitted, the time designator shall always precede the remaining time of day components.~~

NOTE – By mutual agreement of the partners in information interchange, the character [T] may be omitted in applications where there is no risk of confusing a combined date and time of the day representation with others defined in this International Standard.

The following are examples of the complete ~~and reduced~~ representation (in basic and extended format) of combinations of calendar date and time of the day representations:

Basic format: CCYYMMDDThhmmss
       CCYYMMDDThhmmssZ
       CCYYMMDDThhmmss±hhmm
       CCYYMMDDThhmmss±hh

  Examples: 19850412T101530
      19850412T101530Z
      19850412T101530+0400
      19850412T101530+04

Extended format: CCYY-MM-DDThh:mm:ss
       CCYY-MM-DDThh:mm:ssZ
       CCYY-MM-DDThh:MM:ss±hhmm
       CCYY-MM-DDThh:MM:ss±hh

  Examples: 1985-04-12T10:15:30
      1985-04-12T10:15:30Z
      1985-04-12T10:15:30+04:00
      1985-04-12T10:15:30+04

Where complete representations using calendar dates have been shown in 5.4.1, ordinal dates (5.2.2.1) or dates identified by week number (5.2.3.1) may be substituted in a similar fashion.

~~a) Calendar date and local time of the day~~

~~*Basic format:* CCYYMMDDThhmmss~~
~~CCYYMMDDThhmm~~

~~CCYYMMDDThh~~

~~*Examples:* 19850412T101530~~
~~19850412T1015~~
~~19850412T10~~

~~*Extended format:* CCYY-MM-DDThh:mm:ss~~
~~CCYY-MM-DDThh:mm~~
~~CCYY-MM-DDThh~~

~~*Examples:* 1985-04-12T10:~~15~~:30~~
~~1985-04-12T10:15~~
~~1985-04-12T10~~

~~b) Ordinal date and local time of the day~~

~~*Basic format:* CCYYDDDThhmmss~~
~~CCYYDDDThhmm~~
~~CCYYDDDThh~~

~~*Examples:* 1985102T235030~~
~~1985102T2350~~
~~1985102T23~~

~~*Extended format:* CCYY-DDDThh:mm:ss~~
~~CCYY-DDDThh:mm~~
~~CCYY-DDDThh~~

~~*Examples:* 1985-102T23:50:30~~
~~1985-102T23:50~~
~~1985-102T23~~

~~c) Date identified by calendar week and day numbers and local time of the day~~

~~*Basic format:* CCYYWwwDThhmmss~~
~~CCYYWwwDThhmm~~
~~CCYYWwwDThh~~

~~*Examples:* 1985W155T235030~~
~~1985W155T2350~~
~~1985W155T23~~

~~*Extended format:* CCYY-Www-DThh:mm:ss~~
~~CCYY-Www-DThh:mm~~
~~CCYY-Www-DThh~~

~~*Examples:* 1985-W15-5T23:~~50~~:30~~
~~1985-W15-5T23:50~~
~~1985-W15-5T23~~

5.4.2 Representations other than complete

For reduced precision, decimal or truncated representations of a combined date and time of the day expression any of the representations in 5.2.1 (for calendar dates), 5.2.2 (for ordinal dates) or 5.2.3 (for dates identified by week numbers) followed immediately by the time designator [T], may be combined with any of the representations in ~~5.3~~ 5.3.1.1 through 5.3.1.3 (local time of the day), 5.3.3 (U.T.C.) or 5.3.4.2 (local time and the difference with UTC) provided that:

    a) the rules specified in those sections are applied;

    b) the resulting expression does not qualify as a complete representation in accordance with 5.4.1;

    c) the date component shall not be represented with reduced precision and the time component shall not be truncated ~~in a combined date and time expression~~. Note that this excludes the date representations in 5.2.1.3 and 5.2.3.3 which are truncated and reduced;

d)   when truncation occurs in the date component of a combined date and time expression, it is not necessary to replace the omitted higher order components with the hyphen [-];

e)   the expression shall either be completely in basic format, in which case the minimum number of separators necessary for the required expression is used, or completely in extended format, in which case additional separators shall be used in accordance with 5.2 and 5.3.

~~c)   when the context does not clearly identify a time only component, and if the extended format including colon [:] separator is not used, then it is necessary to commence the time expression with the designator [T].~~

The following are examples of reduced, decimal and truncated representation of combinations of calendar date and time of the day representations:

a)   Calendar date and local time of the day

Basic format: CCYYMMDDThhmm
YYMMDDThhmm
MMDDThh

Examples: 19850412T1015
850412T1015
0412T10

Extended format: CCYY-MM-DDThh:mm
YY-MM-DDThh:mm
MM-DDThh

Examples: 1985-04-12T10:15
85-04-12T10:15
04-12T10

b)   Ordinal date and coordinated universal time

Basic format: CCYYDDDThhmmZ
YYDDDThhmmZ
DDDThhZ

Examples: 1985102T1015Z
85102T1015Z
102T10Z

Extended format: CCYY-DDDThh:mmZ
YY-DDDThh:mmZ

Examples: 1985-102T10:15Z
85-102T10:15Z

c)   Date identified by calendar week and day numbers and local time and the difference with UTC

Basic format: CCYYWwwDThhmm±hhmm
YYWwwDThhmm,m±hhmm
YWwwDThhmm,m±hhmm
WwwDThh±hhmm
W-DThh,h±hhmm
WDThh,h±hhmm

Examples: 1985W155T1015+0400
85W155T1015,5+0400
5W155T1015,5+0400
W155T10+0400
W-5T10,25+0400
W5T10,25+0400

Extended format: CCYY-Www-DThh:mm±hh:mm
                     YY-Www-DThh:mm,m±hh:mm
                     Y-Www-DThh:mm,m±hh:mm
                     Www-DThh±hh:mm

Examples: 1985-W15-5T10:15+04:00
            85-W15-5T10:15,5+04:00
            5-W15-5T10:15,5+04:00
            W15-5T10+04:00

5.5   Periods of time

5.5.1 Means of specifying periods of time

A period of time shall be expressed in one of the following ways:

    a)   As a ~~duration~~quantity of time delimited by a specific start and a specific end;

    b)   As a ~~quantity of time~~duration expressed in one or more specific components but not associated with any specific start or end;

    c)   As a ~~quantity of time~~duration associated with a specific start;

    d)   As a ~~quantity of time~~duration associated with a specific end.

5.5.2 Separators and designators

A solidus [/] shall be used to separate the two components in each of 5.5.1 a), c) and d).

For 5.5.1 b), c) and d) the designator [P] shall precede, without spaces, the representation of the duration.

Other designators (and the hyphen when used to indicate omitted components) shall be used as shown in 5.5.4 and 5.5.5 below.

NOTE – In certain application areas a double hyphen is used as a separator instead of a solidus.

5.5.3 Duration ~~of time~~

5.5.3.1 Format with time-unit designators

~~A given duration of a period of time, whether or not associated with a start or end, shall be represented~~ In expressions of period of time or recurring time-interval duration can be represented by a data element of variable length~~, preceded by the designator [P]~~. The number of years shall be followed by the designator [Y], the number of months by [M], the number of weeks by [W], and the number of days by [D]. The part including time components shall be preceded by the designator [T]; the number of hours shall be followed by [H], the number of minutes by [M] and the number of seconds by [S]. In the examples ~~set out below~~ [n] represents one or more digits, constituting a positive integer or zero.

In complete representations the format shall be nYnMnDTnHnMnS or nW.

For reduced precision, decimal or truncated representations of this format of duration the following rules apply:

a) If necessary for a particular application the lowest order components may be omitted to represent duration with reduced precision;

b) If necessary for a particular application the lowest order component may have a decimal fraction. 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);

c) If the number of years, months, days, hours, minutes or seconds in any of these expressions equals zero, the number and the corresponding designator may be absent; however, at least one number and its designator shall be present. Note that the removal of leading non-zero components is not allowed;

d) The designator T shall be absent if all of the time components are absent.

5.5.3.2 Alternative format

If required for particular reasons, duration~~s of time~~ may also be expressed in conformity with the format used for points-in-time, as specified in ~~clause 5~~5.2.1, 5.3.1.5 and 5.4, where the formats of 5.4 are restricted for the date component to the formats in 5.2.1 and for the time-of-the-day component to the formats in 5.3.1.1 through 5.3.1.3. Accordingly, the values expressed must not exceed the "carry-over points" of 12 months, 30 days, 24 hours, 60 minutes and 60 seconds. Since weeks have no defined

carry-over point (52 or 53), weeks should not be used in these applications. In these expressions the year component may have the value [0000] and the month and day-of-the-month components may have the value [00]. Truncated representations may only be used if the omitted components are zero.

5.5.4 Complete representations

5.5.4.1   Representation of period of time identified by its start and end

When the application identifies the need for a complete representation of a period of time, identified by its start and its end, it shall be one of the alphanumeric expressions as set out below. For the specific start or end of a period, [CCYY] represents a calendar year, [MM] the ordinal number of a calendar month within the calendar year, [DD] the ordinal number of a day within the calendar month, [hh] hours, [mm] minutes and [ss] seconds. use an expression combining any two complete date and time of the day representations as defined in 5.4.1, provided that the resulting expression is either consistently in basic format or consistently in extended format.

Basic format:

CCYYMMDDThhmmss/CCYYMMDDThhmmss

> *Example:* l9850412T232050/19850625T103000

Extended format:

CCYY-MM-DDThh:mm:ss/CCYY-MM-DDThh:mm:ss

> *Example:* l985-04-12T23:20:50/1985-06-25T10:30:00

> A period of time beginning at 20 minutes and 50 seconds past 23 hours on 12 April 1985 and ending at 30 minutes past 10 hours on 25 June 1985.

5.5.4.2 Representation of period of time by duration only

5.5.4.2.1 Format with time-unit designators

When an application identifies the need for a complete representation of a period of time through its duration only, with duration in the format with time-unit designators, it shall use one of the expressions as set out below.

Basic format: PnYnMnDTnHnMnS
                           PnW

> *Example:*   P2Y10M15DT10H30M20SOS

> A period of time with a duration of two years, 10 months, 15 days, 10 hours, 30 minutes and 20 seconds.

>   P6W

> A period of time with a duration of six weeks.

5.5.4.2.2 Alternative format

When an application identifies the need for a complete representation of a period of time through its duration only, with duration in the alternative format, it shall use one of the expressions as set out below.

Basic format: PCCYYMMDDThhmmss

> *Examples:*   P00021015T103020

Extended format: PCCYY-MM-DDThh:mm:ss

> *Examples:*   P0002-10-15T10:30:20

A period of time with a duration of two years, 10 months, 15 days, 10 hours, 30 minutes and 20 seconds.

5.5.4.3. Representation of period of time identified by its start and its duration

When the application identifies the need for a complete representation of a period of time, identified by its start and its duration it shall use an expression combining any complete representation combining date and time as defined in 5.4.1, with any complete representation of duration as defined in 5.5.3, provided that the resulting expression is either consistently in basic format or consistently in extended format.

Basic format: CCYYMMDDThhmmss/PnYnMnDTnHnMnS
                 CCYYMMDDThhmmss/PCCYYMMDDThhmmss

    Example: 19850412T232050/P1Y2M15DT12H30M0S
                 19850412T232050/P00010215T123000

Extended format: CCYY-MM-DDThh:mm:ss/PnYnMnDTnHnMnS
                 CCYY-MM-DDThh:mm:ss/PCCYY-MM-DDThh:mm:ss

    Example: 1985-04-12T23:20:50/P1Y2M15DT12H30M0S
                 1985-04-12T23:20:50/P0001-02-15T12:30:00

A period of time of one year, 2 months, 15 days, 12 ~~and a half~~ hours and 30 minutes, beginning on 12 April 1985 at 20 minutes and 50 seconds past 23 hours.

5.5.4.4   Representation of period of time identified by its duration and its end

When the application identifies the need for a complete representation of a period of time, identified by its duration and its end it shall use an expression combining any complete representation of the duration as defined in 5.5.3 with any complete representation of date and time as defined in 5.4.1, provided that the resulting expression is either consistently in basic format or consistently in extended format.

Basic format: PnYnMnDTnHnMnS/CCYYMMDDThhmmss
                 PCCYYMMDDThhmmss/CCYYMMDDThhmmss

    Example: P1Y2M15DT12H30M0S/19850412T232050
                 P00010215T123000/19850412T232050

Extended format: PnYnMnDTnHnMnS/CCYY-MM-DDThh:mm:ss
                 PCCYY-MM-DDThh:mm:ss/CCYY-MM-DDThh:mm:ss

    Example: P1Y2M15DT12H30M0S/1985-04-12T23:20:50
                 P63W/1985-04-12T23:20:50
                 P0001-02-15T12:30:00/1985-04-12T23:20:50

A period of time of one year, 2 months, 15 days and 12~~and a half~~ hours and 30 minutes, ending on 12 April 1985 at 20 minutes and 50 seconds past 23 hours.

~~NOTES~~

Where complete representations using calendar dates in a time-point component have been shown in 5.5.4, ordinal dates (5.2.2) or dates identified by week number (5.2.3) may be substituted in a similar fashion.

Where complete representations using local-time-of-the-day in a time-point component have been shown in 5.5.4, coordinated universal time (5.3.3) or local time and the difference with Coordinated Universal Time (5.3.4.2) may be substituted in a similar fashion.

Where complete representations using the expression PnYnMnDTnHnMnS in a duration component have been shown in 5.5.4, the expression PnW (5.5.4.2.1) may be substituted in a similar fashion.

If extended formats are required for the representations shown in 5.5.4, they shall conform to the requirements of 5.2.1.1, 5.2.2.1, 5.2.3.1, 5.3.1.1, 5.3.3 and 5.3.4.2.

NOTE – In 5.5.4.2, 5.5.4.3 and 5.5.4.4 the components for duration would frequently be in reduced precision form. See 5.5.5.

5.5.5 Representations other than complete

A reduced precision, or truncated, or decimal representations of a period of time shall be an expression in accordance with 5.5.1 and 5.5.2, where time-points are represented in accordance with 5.4 and where duration of time is represented in accordance with 5.5.3.1 or 5.5.3.2, provided that:

   a)   the rules specified in those sections are applied;

   b)   the result is not a complete representation in accordance with 5.5.4 and

   c)   for which the resulting expression is either consistently in basic format or consistently in extended format.~~or extended formats, are used in place of any components in the complete representations, they shall each be in accordance with the corresponding rules in 5.2 and 5.3.~~

In representation for the periods of time conform~~in~~ 5.5.1 a),

   – if higher order components are omitted from the expression following the solidus (i.e. the representation for "end of period"), it shall be assumed that the corresponding components from the "start of period" expression apply (e.g. if [CCYYMM] are omitted by using a derived representation, the end of the period is in the same year and month as the start of the period);

   – representations for time-zones and Coordinated Universal Time included with the component preceding the solidus shall be assumed to apply to the component following the solidus, unless a corresponding alternative is included.

5.6 Recurring time-intervals

5.6.1 Means of specifying recurring time-intervals

A recurring time-interval shall be expressed in one of the following ways:

a)   As a duration expressed in one or more specific components but not associated with any specific time-point;

b)   As a duration associated with a specific time-point;

5.6.2 Separators and designators

A solidus [/] shall be used to separate the two components in 5.6.1 b).

For 5.6.1 a) and b) the designator [R] shall precede, without spaces, the representation of the duration.

Other designators (and the hyphen when used to indicate omitted components) shall be used as shown in 5.6.3 and 5.6.4 below.

5.6.3 Complete representations

5.6.3.1 Representation of recurring time-intervals by duration only

5.6.3.1.1 Format with time-unit designators

When an application identifies the need for a complete representation of a recurring time inteval through its duration only, with duration in the format with time-unit designators, it shall use one of the expressions as set out below.

Basic format: RnYnMnDTnHnMnS
                        RnW

        Example: R2Y10M15DT10H30M20S

        A recurring time-interval with a duration of each time-interval of two years, 10 months, 15 days, 10 hours, 30 minutes and 20 seconds of each time interval.

                    R6W

        A recurring time-interval with a duration of each time-interval of six weeks.

5.6.3.1.2 Alternative format

When an application identifies the need for a complete representation of a period of time through its duration only, with duration in the alternative format, it shall use one of the expressions as set out below.

Basic format: RCCYYMMDDThhmmss

        Examples: R00021015T103020

Extended format: RCCYY-MM-DDThh:mm:ss

        Examples: R0002-10-15T10:30:20

5.6.3.2   Representation of recurring time-interval identified by duration and time-point

When the application identifies the need for a complete representation of a recurring time interval, identified by the duration of each time-interval and a time-point it shall use an expression combining any complete representation of duration as defined in 5.5.3 with any complete representation of date and time as defined in 5.4.1, provided that the resulting expression is either consistently in basic format or consistently in extended format.

| *Basic format:* | RnYnMnDTnHnMnS/CCYYMMDDThhmmss |
| | RCCYYMMDDThhmmss/CCYYMMDDThhmmss |

| *Example:* | R1Y2M15DT12H30M0S/19850412T232050 |
| | R00010215T123000/19850412T232050 |

| *Extended format:* | RnYnMnDTnHnMnS/CCYY-MM-DDThh:mm:ss |
| | RCCYY-MM-DDThh:mm:ss/CCYY-MM-DDThh:mm:ss |

| *Example:* | R1Y2M15DT12H30M0S/1985-04-12T23:20:50 |
| | R0001-02-15T12:30:00/1985-04-12T23:20:50 |

A recurring time-interval with a duration of each time-interval of one year, 2 months, 15 days and 12 hours and 30 minutes, and associated with the time-poiunt 12 April 1985 at 20 minutes and 50 seconds. past 23 hours.

Where complete representations using calendar dates in a time-point component have been shown in 5.6.3, ordinal dates (5.2.2) or dates identified by week number (5.2.3) may be substituted in a similar fashion.

Where complete representations using local-time-of-the-day in a time-point component have been shown in 5.6.3, coordinated universal time (5.3.3) or local time and the difference with Coordinated Universal Time (5.3.4.2) may be substituted in a similar fashion.

Where complete representations using the expression RnYnMnDTnHnMnS in a duration component have been shown in 5.6.3, the expression PnW (5.5.4.2.1) may be substituted in a similar fashion.

If extended formats are required for the representations shown in 5.6.3, they shall conform to the require-ments of 5.2.1.1, 5.2.2.1, 5.2.3.1, 5.3.1.1, 5.3.3 and 5.3.4.2.

NOTE – In 5.6.3.1 and 5.6.3.2 the components for duration would frequently be in reduced precision form. See 5.6.4.

5.6.4 Representations other than complete

A reduced precision, or truncated, or decimal representations of a recurring time interval shall be an expression in accordance with 5.6.1 and 5.6.2, where time-points are represented in accordance with 5.4 and where duration of time is represented in accordance with 5.5.3.1 or 5.5.3.2, provided that:

a)   that the rules specified in those sections are applied;

b)   that the result is not a complete representation in accordance with 5.6.3 and

c)   for which the resulting expression is either consistently in basic format or consistently in extended format.

Annex A

Relationship to ISO 2014, 2015, 2711, 3307 and 4031

(This annex does not form part of the standard.)

A.1 In preparing the first edition of ISO 2014 an examination was carried out of the potential uses of all-numeric dates. The advantages of the descending order year-month-day were found to outweigh those for the ascending order day-month-year, already established at that time in many parts of the world.

The advantages of the descending order were found to include the following, in particular:

    a)   the avoidance of confusion in comparison with existing national conventions using different systems of ascending order;

    b)   the ease with which the whole date may be treated as a single numeral for the purposes of filing and classification;

    c)   arithmetic calculation, particularly in computer uses;

    d)   the possibility of continuing the order by adding digits for hour-minute-second.

A.2   For times, use of the 24-hour timekeeping system is how so common In particular in view of the wide availability and use of digital watches) that separators to aid human interpretation are no longer necessary but are included as options.

The natural addition of the lower order time digits to the higher order date digits (see above) established the basic concept used, in the preparation of this International Standard: that a point in time could be uniquely represented in all-numeric form by a string of digits commencing with year and ending with hour, minute or second, depending on the precision desired.

From that concept representations of all other date and time values were logically derived and, thus, ISO 2014, ISO 3307 and ISO 4031 have been superseded.

A.3 Numbering of days and weeks in the year based on the Gregorian calendar is important in many commercial applications. Methods of numbering the weeks of the year vary from country to country, and, therefore, for international trade and for industrial planning within international companies it is essential to use uniform numbering of weeks. ISO 2015 and ISO 2711 were prepared to meet these requirements.

The uniform numbering of weeks necessitates a unique designation of the day on which a week begins. For commercial purposes, i.e. accounting, planning and similar purposes for which a week number might be used, Monday has been found the most appropriate as the first day of the week.

Identification of a particular date by means of ordinal dates (ISO 2711) and by means of the week numbering system (ISO 2015) were alternative methods that the basic concept of this International Standard could also encompass and, thus, ISO 2015 and ISO 2711 have now been superseded.

Annex B

Examples of representation of dates, time of the day, combinations of date and time, and periods of time

(This annex does not form part of the standard.)

B.1   Dates

Basic format	Extended format	Explanations

Calendar date – 12 April 1985

19850412	1985-04-12	Complete
850412	85-04-12	Year of the implied century, with month and ~~date~~ day only
--0412	-12-04	Month and ~~date~~ day of the implied year
---12	not applicable	Day only of the implied month

Ordinal date – 12 April 1985

1985102	1985102	Complete
85102	85-102	Year of the implied century, with ordinal day
~~5-102~~	~~not applicable Year of any decennium, with ordinal day~~	
-102	not applicable	Ordinal day of the implied year

Calendar week and day – Friday 12 April 1985

1985W155	1985-W15-5	Complete
85W155	85-W15-5	Year of the implied century, with week and day
-5W155	-5-W15-5	Year of the implied decennium, with week and day
-W155	-W15-5	Week and day of the implied year
-W-5	not applicable	Day of the implied week

Calendar week – 15th week of 1985

1985W15	1985-W15	Complete
85W15	85-W15	Year of the implied century and week of that year
-5W15	-5-W15	Year of the implied decennium and week of that year
-W15	not applicable	Specific week of the implied year

~~**Day of the week – Friday**~~

~~---5   not applicable Any Friday~~

Calendar month – April 1985

1985-04	not applicable	Complete
-8504	-85-04	Year of the implied century and month of that year
--04	not applicable	Specific month of the implied year

Calendar year – 1985

1985	not applicable	Complete
-85	not applicable	Specific year of the implied century

B.2 Time of the day

Basic format	**Extended format**	**Explanations**

Local time of the day

27 minutes 46 seconds past 15 hours locally
152746	15:27:46	Complete
-2746	-27:46	Specific minute and second of the implied hour
--46	not applicable	Specific second of the implied minute

Reduced to hours and minutes
| 1528~~7~~ | 15:28~~7~~ | Complete |
| -28~~7~~ | not applicable | Specific minute of the implied hour |

Reduced to hours
| 15 | not applicable | Specific hour of the implied day |

Local time with decimal fractions

27 minutes 35 and a half seconds past 15 hours locally
152735,5	15:27:35,5	Complete
-2735,5	-27:35,5	Minute of the implied hour, second with decimal fraction
--35,5	not applicable	Second with decimal fraction of the implied minute
15,46	not applicable	Hour with decimal fraction of that hour
-27,59	not applicable	Minute of the implied hour with decimal fraction of that minute
-00,59	not applicable	Minute of the implied hour, second with decimal fraction
--00,5	not applicable	Second with decimal fraction of the implied minute

Midnight – The beginning of a day
| 000000 | 00:00:00 | Complete |
| 0000 | 00:00 | Hour and minute only |

Midnight – The end of the day
| 240000 | 24:00:00 | Complete |
| 2400 | 24:00 | Hour and minute only |

Coordinated Universal Time (UTC)

20 minutes and 30 seconds past 23 hours UTC
232030Z	23:20:30Z	Complete
2320Z	23:20Z	Hour and minute in UTC
23Z	not applicable	Hour in UTC

Differences between local time and Coordinated Universal Time

The time of 27 minutes 46 seconds past 15 hours locally in Geneva (one hour ahead of UTC)
| 152746+0100 | 15:27:46+01:00 | Complete |
| 152746+01 | 15:27:46+01 | Time difference expressed in hours only |

The same time locally in New York (five hours behind UTC)
| 152746-0500 | 15:27:46-05:00 | Complete |
| 152746-05 | 15:27:46-05 | Time difference expressed in hours only |

B.3 Combinations of date and time

Basic format	**Extended format**	**Explanations**
Combinations of calender date and local time of the day		
19850412T101530	1985-04-12T10:15:30	Complete
850412T101530	85-04-12T10:15:30	Within specific year of the implied century
850412T1015	85-04-12T10:15	Ditto, with hour and minute only
0412T1015	04-12T10:15	Within specific month of the implied year, with hour and minute
0412T10	04-12T10	Ditto, with hour only
12T10	not applicable	Within specific day of any month, with hour only
~~12T10~~	~~12T10~~	~~Within specific day of any month, with hour only~~
850412T10	85-04-12T10	Within specific date of the implied century, with hour only
12T101530	12T10:15:30	Within specific day of the implied month

etc.

Combinations of ordinal date and local time of the day		
1985102T235030	1985-102T23:50:30	Complete
85102T235030	85-102T23:50:30	Within specific year of the implied century
85102T2350	85-102T23:50	Ditto, with hour and minute only
102T2350	102T23:50	Ditto, within specific ordinal date in the implied year
102T23	not applicable	Ditto, with hour only
~~102T23~~	~~102T23~~	~~Ditto, with hour only~~
85102T23	85-102T23	Within specific year of the implied century, with hour only
102T235030	102T23:50:30	Within specific ordinal date in the implied year

etc.

Combinations of calendar week, day number and local time of the day		
1985W155T235030	1985-W15-5T23:50:30	Complete
85W155T235030	85-W15-5T23:50:30	Within specific year of the implied century
85W155T2350	85-W15-5T23:50	Ditto, with hour and minute only
W155T2350	W15-5T23:50	Ditto, in the implied year
W155T23	W15-5T23	Ditto, with hour only
85W155T23	85-W15-5T23	Within specific year of the implied century, with hour only
W155T235030	W15-5T23:50:30	Within specific week and day of that week, in the implied year

etc.

Combinations of day number and local time of the day		
5T235030	5T23:50:30	A Friday in the implied week
5T2350	5T23:50	With hour and minute only
5T23	not applicable	With hour only

B.4 Periods of time

Basic format	Extended format

Period with specific start and specific end

A period beginning at 20 minutes and 50 seconds past 23 hours on 12 April 1985 and ending at 30 minutes past 10 hours on 25 June 1985

19850412T232050/19850625T103000	1985-04-12T23:20:50/1985-06-25T10:30:00

A period beginning on 12 April 1985 and ending on 25 June 1985

19850412/--0625	1985-04-12/--06-25

Duration of a period as a quantity of time

Two years, ten months, 15 days, 10 hours, 20 minutes and 30 seconds

P2Y10M15DT10H20M30S	not applicable
P00021015T102030	P0002-10-15T10:20:30

One year and six months

P1Y6M	not applicable
P0001-06	not applicable
P010600	P01-06-01

Seventy-two hours

PT72H	not applicable

Period with specific start and specific duration

A period of one year, 2 months, 15 days and 12 hours, beginning on 12 April 1985 at 20 minutes and 50 seconds past 23 hours

19850412T232050/P1Y2M15DT12H	1985-04-12T23:20:50/P1Y2M15DT12H

Period of specific duration and with specific end

A period of one year, 2 months, 15 days and 12 hours, ending on 12 April 1985 at 20 minutes and 50 seconds past 23 hours

P1Y2M15DT12H/19850412T232050	P1Y2M15DT12H/1985-04-12T23:20:50

B.5 Recurring time-intervals

Basic format	Extended format

Recurring time-interval as a duration

Two years, ten months, 15 days, 10 hours, 20 minutes and 30 seconds

R2Y10M15DT10H20M30S	not applicable
R00021015T102030	P0002-10-15T10:20:30

One year and six months

R1Y6M	not applicable
R0001-06	not applicable
R010600	R01-06-01

Seventy-two hours

PT72H	not applicable

Recurring time-interval as a duration and with specific time-point

A recurring time-interval of one year, 2 months, 15 days and 12 hours, with the time-point 12 April 1985 at 20 minutes and 50 seconds past 23 hours

P1Y2M15DT12H/19850412T232050	P1Y2M15DT12H/1985-04-12T23:20:50