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

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

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Foreword

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

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

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

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

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

Introduction

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

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

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

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

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

Several of the alphabetic and graphic characters used in the text of this International Standard are common both to the representations specified and to normal typographical presentation.

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

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

1 Scope

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

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

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

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

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

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

f) combination of date and time;

g) time-intervals;

h) recurring time-intervals.

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

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

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

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

2 Normative references

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

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

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

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

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

ITU-R RecommendationTF.686, *Glossary*.

3 Terms and definitions

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

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

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

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

NOTE 3 Additional information can be found as follows:
the URL for the ITU http://www.itu.int/itudoc/itu-r/rec/tf/index.html
the URL for the International Bureau of Weights and Measures http://www.bipm.fr
the URL for the International Earth Rotation Service http://hpiers.obspm.fr

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

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

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

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

3.6
day
unit of time of 24 hours

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

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

NOTE 2 The duration of a calendar day is 24 hours; except if modified by:
— the insertion or deletion of leap seconds, by decision of the IERS, or
— the insertion or deletion of other time intervals, as may be prescribed by local authorities to alter local time.

3.8
duration
quantity (“length”) of time

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

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

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

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

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

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

3.13
local time
clock time in public use locally

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

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

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

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

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

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

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

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

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

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

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

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

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

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

NOTE 1 See also 4.6.

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

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

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

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

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

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

3.27
week
unit of time of seven days

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

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

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

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

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

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

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

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

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

4 Fundamental principles

4.1 Basic concepts

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

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

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

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

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

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

4.2 Common features, uniqueness and combinations

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

— points in time;

— dates only;

— times only;

— time-intervals;

— recurring time-intervals;

— any abbreviation of the above.

4.3 Time-units and reference systems

4.3.1 Time-units

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

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

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

— **hour**: a time-unit of 60 minutes

— **day**: a time-unit of 24 hours

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

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

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

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

4.3.2 Date and time reference systems

4.3.2.1 The Gregorian calendar

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

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

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

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

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

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

calendar year [0001] differ from the year numbers in the “BC/AD calendar system”, where the year “1 BC” is followed by the year “1 AD”.

In the Gregorian calendar each year is divided in 12 sequential calendar months as indicated in Table 1.

Table 1 — 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	305-334	306-335
12	December	31	335-365	336-366

4.3.2.2 The calendar week

In parallel with the reference system described in 4.3.2.1, there is a reference system based on an unbounded series of contiguous calendar weeks. Each calendar week has seven calendar days as indicated in Table 2.

Table 2 — Calendar days

Ordinal day number in the week	Calendar day name
01	Monday
02	Tuesday
03	Wednesday
04	Thursday
05	Friday
06	Saturday
07	Sunday

The reference point of the week calendar assigns Saturday to 2000 January 1.

A calendar week is identified within a calendar year by the calendar week number. This is its ordinal position within the year, applying the rule that the first calendar week of a year is the one that includes the first Thursday of that year

and that the last calendar week of a calendar year is the week immediately preceding the first calendar week of the next calendar year.

NOTE 1 These rules provide for a calendar year to have 52 or 53 calendar weeks;

NOTE 2 The first calendar week of a calendar year may include up to three days from the previous calendar year; the last calendar week of a calendar year may include up to three days from the following calendar year;

NOTE 3 The time-interval formed by the week dates of a calendar year is not the same as the time-interval formed by the calendar dates or ordinal dates for the same year. For instance:

— Sunday 1995 January 1 is the 7^{th} day of the 52^{nd} week of 1994, and
— Tuesday 1996 December 31 is the 2^{nd} day of the 1^{st} week 1997.

NOTE 4 The rule for determining the first calendar week is equivalent with the rule “the first calendar week is the week which includes January 4”.

4.3.2.3 Dates

Each calendar day can be identified by a calendar date, an ordinal date, or a week date.

A calendar date identifies a calendar day by

— its calendar year;

— its calendar month, and

— its ordinal number within its calendar month.

An ordinal date identifies a calendar day by

— its calendar year, and

— its ordinal number within the calendar year.

A week date identifies a calendar day by

— the calendar year to which its calendar week belongs;

— the calendar week number of its calendar week within that year, and

— its ordinal number within its calendar week.

4.4 Characters used in the representations

The representations specified in this International Standard use digits, alphabetic characters and special characters specified in ISO/IEC 646. The particular use of these characters is explained in 4.5 and 5.1.

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

NOTE 2 Encoding of characters for the interchange of dates and times is not in the scope of this International 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 may also be 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 time-intervals or recurring time-intervals.

[#] (number sign): to separate in the representation of a recurring time-interval the time-interval and the recurrence factor.

NOTE Representations defined by this International Standard make also use of the decimal separator.

4.6 Truncation

By mutual agreement of the partners in information interchange it is permitted to omit higher order components (truncation) in applications where their presence is implied. The addition of a single hyphen in place of each omitted component may be necessary, to avoid risk of misinterpretation. These leading hyphens may be omitted in the applications where there is no risk of confusing these representations with others.

Truncation should only be used in situations where the application ensures that the value of the omitted components can be inferred unequivocally by all communicating parties.

NOTE Insufficient attention to this requirement may give rise to problems like the “millennium bug”.

When truncated representations are used provisions should be made to prevent confusion of the truncated representations, with other date and time representations used by the application.

4.7 Expansion

By mutual agreement of the partners in information interchange it is permitted to expand the component identifying the calendar year, which is otherwise limited to at most four digits. This enables reference to dates and times in calendar years outside the range supported by complete representations, i.e. before the start of the year [0000] or after the end of the year [9999].

When expanded representations are used, provisions should be made to prevent confusion of the expanded representations, with other date and time representations used by the application.

4.8 Leading zeros

Each date and time component in a defined representation has a defined length, and leading zeros shall be used as required.

4.9 Mutual agreement

Some of the representations identified in this International Standard are only allowed by mutual agreement of the partners in information interchange. Such agreement should ensure that fields in which the representation may occur is not allowed to hold other representations that cannot be unambiguously distinguished from the agreed representation.

5 Representations

5.1 Explanations

5.1.1 Characters used in place of digits or signs

[Y] represents a digit used in 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;

[±] represents a plus sign [+] if in combination with the following element a positive value or zero needs to be represented, or
a minus sign [–] if in combination with the following element a negative value needs to be represented.

In addition the following convention applies:

When any of the characters representing a digit is underlined, it represents zero or more digits in the corresponding time element. The number of digits is to be determined by the interchanging partners.

5.1.2 Characters used as designators

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

[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 or the total expression if there is no duration data element;

[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 UTC 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 [0000] to [9999]. Values in the range [0000] through [1582] shall only be used by mutual agreement of the partners in information interchange.

5.2.1.1 Complete representation

When the application 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 [YYYY] 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: YYYYMMDD EXAMPLE 19850412

Extended format: YYYY-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] is omitted, a separator shall be inserted between [YYYY] and [MM], but separators shall not be used in the other representations with reduced precision.

a) A specific month
Basic format: YYYY-MM EXAMPLE 1985-04
Extended format: not applicable

b) A specific year
Basic format: YYYY EXAMPLE 1985
Extended format: not applicable

c) A specific century
Basic format: YY EXAMPLE 19
Extended format: not applicable

5.2.1.3 Truncated representations

If, by agreement, truncated representations are used the basic formats shall be as specified below. In each case hyphens that indicate omitted components shall be used only as indicated or shall be omitted.

a) A specific date in the implied century
Basic format: YYMMDD EXAMPLE 850412
Extended format: YY-MM-DD EXAMPLE 85-04-12

b) A specific year and month in the implied century
Basic format: -YYMM EXAMPLE -8504
Extended format: -YY-MM EXAMPLE -85-04

c) A specific year in the implied 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

NOTE 5.2.1.3 includes the definition of representations that are truncated and have reduced precision.

5.2.1.4 Expanded representations

If, by agreement, expanded representations are used, the basic formats shall be as specified below. In the examples below it has been agreed to expand the time element year with two digits.

a) A specific day
Basic format: ±YYYYYMMDD EXAMPLE +0019850412
Extended format: ±YYYYY-MM-DD EXAMPLE +001985-04-12

b) A specific month
Basic format: ±YYYYY-MM EXAMPLE +001985-04
Extended format: not applicable

c) A specific year
Basic format: ±YYYYY EXAMPLE +001985
Extended format: not applicable

d) A specific century
Basic format: ±YYY EXAMPLE +0019
Extended format: not applicable

NOTE 5.2.1.4 includes the definition of representations that both expanded and have reduced precision.

5.2.2 Ordinal date

In expressions of ordinal dates

— **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;

— **year** is represented as in 5.2.1.

5.2.2.1 Complete representation

When the application identifies the need for a complete representation of an ordinal date, it shall be one of the numeric expressions as follows, where [YYYY] represents a calendar year and [DDD] the ordinal number of a day within the year.

Basic format:	YYYYDDD	EXAMPLE	1985102
Extended format:	YYYY-DDD	EXAMPLE	1985-102

5.2.2.2 Truncated representations

If, by agreement, truncated representations are used, the basic formats shall be as specified below. In each case hyphens that indicate omitted components shall be used only as indicated or shall be omitted.

a) A specific year and day in the implied 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.

5.2.2.3 Expanded representations

If, by agreement, expanded representations are used the basic formats shall be as specified below. In the examples below it has been agreed to expand the time element year with two digits.

a) A specific day

Basic format:	±YYYYYDDD	EXAMPLE	+001985102
Extended format:	±YYYYY-DDD	EXAMPLE	+001985-102

5.2.3 Week date

In expressions of week dates

— **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]).

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

— **year** is represented as in 5.2.1.

5.2.3.1 Complete representation

When the application 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 [YYYY] 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:	YYYYWwwD	EXAMPLE	1985W155
Extended format:	YYYY-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.

a) A specific week

Basic format:	YYYYWww	EXAMPLE	1985W15
Extended format:	YYYY-Www	EXAMPLE	l985-W15

5.2.3.3 Truncated representations

If, by agreement, truncated representations are used the basic formats shall be as specified below. In each case hyphens that indicate omitted components, shall be used only as indicated or shall be omitted

a) Year, week and day in the implied century

Basic format:	YYWwwD	EXAMPLE	85W155
Extended format:	YY-Www-D	EXAMPLE	85-W15-5

b) Year and week only in the implied century

Basic format:	YYWww	EXAMPLE	85W15
Extended format:	YY-Www	EXAMPLE	85-W15

c) Year of the implied 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 year

Basic format:	-WwwD	EXAMPLE	-W155
Extended format:	-Www-D	EXAMPLE	-W15-5

f) Week only of the implied year

Basic format:	-Www	EXAMPLE	-W15
Extended format:	not applicable		

g) Day only of the implied week

Basic format:	-W-D	EXAMPLE	-W-5
Extended format:	not applicable		

NOTE 1 5.2.3.3 includes the definition of representations which are both truncated and have reduced precision.

NOTE 2 Logically the representations should be [--W-D], but the first hyphen is superfluous and, therefore, it has been omitted.

5.2.3.4 Expanded representations

If, by agreement, expanded representations are used the basic formats shall be as specified below. In the examples below it has been agreed to expand the time element year with two digits.

a) A specific day
Basic format: ±YYYYYWwwD EXAMPLE +001985W155
Extended format: ±YYYYY-Www-D EXAMPLE +001985-W15-5

b) A specific week
Basic format: ±YYYYYWww EXAMPLE +001985W15
Extended format: ±YYYYY-Www EXAMPLE +001985-W15

NOTE 5.2.3.4 includes the definition of representations that both expanded and have reduced precision.

5.3 Time of the day

As this International Standard is based on the 24-hour timekeeping system that is now in common use, hours are represented by two digits from [00] to [24], minutes are represented by two digits from [00] to [59], and seconds are represented by two digits from [00] to [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 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.

a) A specific hour and minute
Basic format: hhmm EXAMPLE 2320
Extended format: hh:mm EXAMPLE 23:20

b) A specific hour
Basic format: hh EXAMPLE 23
Extended format: not applicable

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 4.8.

The number of digits in the decimal fraction shall be determined by the interchange parties, dependent upon the application. The format shall be [hhmmss,ss], [hhmm,mm] or [hh,hh] as appropriate (hour minute second, hour minute and hour, respectively), with as many digits as necessary following the decimal sign. A decimal fraction shall have at least one digit. In the examples below it has been agreed to expand the smallest time element with one digit.

a) A specific hour, minute and second and a decimal fraction of the second
   Basic format: hhmmss,ss EXAMPLE 232050,5
   Extended format: hh:mm:ss,ss EXAMPLE 23:20:50,5

b) A specific hour and minute and a decimal fraction of the minute
   Basic format: hhmm,mm EXAMPLE 2320,8
   Extended format: hh:mm,mm EXAMPLE 23:20,8

c) A specific hour and a decimal fraction of the hour
   Basic format: hh,hh EXAMPLE 23,3
   Extended format: not applicable

NOTE 5.3.1.3 includes the definition of representations that have both reduced precision and a decimal fraction.

5.3.1.4 Truncated representations

If, by agreement, truncated representations are used the basic formats shall be as specified below. In each case hyphens that indicate omitted components, shall be used only as indicated or shall be omitted.

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 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
   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

NOTE 1 In the examples it has been agreed to expand the smallest time element with one digit.

NOTE 2 5.3.1.4 includes the definition of representations that have been truncated and have reduced precision and/or a decimal fraction.

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 that 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 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 5.3.1.2, 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 zeros in accordance with 5.3.1.3.

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

NOTE 2 The choice of representation a) or b) will depend upon any association with a date, or a time-interval. Representations where [hh] has the value [24] are only preferred to represent the end of a time-interval in accordance with 5.5.1.

NOTE 3 The end of one day [2400] coincides with [0000] at the start of the next day, e.g. 2400 on 1985 April 12 is the same as 0000 on 1985 April 13. If there is no association with a date or a time-interval 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 5.3.1.1 through 5.3.1.3 shall be used, followed immediately, without spaces, by the UTC 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	EXAMPLE	232030Z
	hhmmZ		2320Z
	hhZ		23Z
	Extended format:	hh:mm:ssZ	EXAMPLE 23:20:30Z
		hh:mmZ	23:20Z
		not applicable	

5.3.4 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 UTC, 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 or equal to UTC and as negative (i.e. with the leading minus sign [–]) if it is behind UTC. The minutes component of the difference may only be omitted if the time difference is exactly an integral number of hours.

Basic format:	±hhmm	EXAMPLE	+0100
	±hh		+01
Extended format:	±hh:mm	EXAMPLE	+01:00

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 UTC, the representation of the difference 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 UTC 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 UTC, are used as examples.

Basic format:	hhmmss±hhmm	EXAMPLE	152746+0100
			152746–0500
	hhmmss±hh		152746+01
			152746–05
Extended format:	hh:mm:ss±hh:mm	EXAMPLE	15:27:46+01:00
			15:27:46–05:00
	hh:mm:ss±hh		15:27:46+01
			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

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 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 a 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 week dates:

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 UTC designator [Z] if use is made of UTC in accordance with 5.3.3 and it is the difference-component if use is made 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.

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 representation (in basic and extended format) of combinations of calendar date and time of the day representations:

Basic format:	YYYYMMDDThhmmss	EXAMPLE	19850412T101530
	YYYYMMDDThhmmssZ		19850412T101530Z
	YYYYMMDDThhmmss±hhmm		19850412T101530+0400
	YYYYMMDDThhmmss±hh		19850412T101530+04
Extended format:	YYYY-MM-DDThh:mm:ss	EXAMPLE	1985-04-12T10:15:30
	YYYY-MM-DDThh:mm:ssZ		1985-04-12T10:15:30Z
	YYYY-MM-DDThh:mm:ss±hh:mm		1985-04-12T10:15:30+04:00
	YYYY-MM-DDThh:mm:ss±hh		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 week dates (5.2.3.1) may be substituted in a similar fashion.

5.4.2 Representations other than complete

For reduced precision, decimal, truncated or expanded 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 week dates) followed immediately by the time designator [T], may be combined with any of the representations in 5.3.1.1 through 5.3.1.3 (local time of the day), 5.3.3 (UTC) 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. Note that this excludes the date representations in 5.2.1.3 and 5.2.3.3 that are truncated and reduced and the date representations in 5.2.1.4 and 5.2.3.4 that are expanded and reduced;

d) 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.

The following are examples of reduced representations of combinations of calendar date and time of the day representations:

a) Calendar date and local time of the day

Basic format:	YYYYMMDDThhmm	EXAMPLE	19850412T1015
Extended format:	YYYY-MM-DDThh:mm	EXAMPLE	1985-04-12T10:15

b) Ordinal date and coordinated universal time

Basic format:	YYYYDDDThhmmZ	EXAMPLE	1985102T1015Z
Extended format:	YYYY-DDDThh:mmZ	EXAMPLE	1985-102T10:15Z

c) Week date and local time and the difference with UTC

Basic format:	YYYYWwwDThhmm±hhmm	EXAMPLE	1985W155T1015+0400
Extended format:	YYYY-Www-DThh:mm±hh	EXAMPLE	1985-W15-5T10:15+04

5.5 Time-intervals

5.5.1 Means of specifying time-intervals

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

a) by a start and an end;

b) by a duration not associated with any start or end;

c) by a start and a duration;

d) by a duration and an end.

5.5.2 Separators and designators

A time interval is expressed according to the following rules:

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

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

c) 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 Representation of duration

5.5.3.1 Format with time-unit designators

In expressions of time-interval or recurring time-interval duration can be represented by a data element using time unit designators. 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 [n] represents one or more digits, constituting a positive integer or zero.

In basic and extended format the complete representation for duration shall be nYnMnDTnHnMnS or nW.

For reduced precision, decimal or truncated representations of this format 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. The decimal fraction shall at least have one digit. 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

By mutual agreement of the partners in information interchange, duration may be expressed in conformity with the format used for time-points, as specified in 5.2.1, 5.2.2, 5.2.3, 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. 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

Where complete representations using calendar dates in a time-point component are shown in 5.5.4, a complete representation of ordinal dates (5.2.2) or of dates identified by week number (5.2.3) may be substituted for the calendar date.

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

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

5.5.4.1 Representation of time-intervals identified by start and end

When the application identifies the need for a complete representation of a time-interval, identified by its start and its end, it shall use an expression in accordance with 5.5.2 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: YYYYMMDDThhmmss/YYYYMMDDThhmmss
EXAMPLE 19850412T232050/19850625T103000

Extended format: YYYY-MM-DDThh:mm:ss/YYYY-MM-DDThh:mm:ss
EXAMPLE 1985-04-12T23:20:50/1985-06-25T10:30:00

A time-interval beginning at 20 minutes and 50 seconds past 23 hours on 12 April 1985 local time and ending at 30 minutes past 10 hours on 25 June 1985 local time.

5.5.4.2 Representation of time-interval 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 time-interval through its duration only, with duration in the format with time-unit designators, it shall use an expression in accordance with 5.5.2 using a complete duration representation as defined in 5.5.3.1.

Basic and extended format: PnYnMnDTnHnMnS
PnW

EXAMPLE P2Y10M15DT10H30M20S

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

P6W

A time-interval with a duration of six weeks.

5.5.4.2.2 Alternative format

If, by agreement, a complete representation of a time-interval through its duration only, with duration in the alternative format, is used, the expression shall be in accordance with 5.5.2 and use a complete duration representation as defined in 5.5.3.2.

Basic format:	PYYYYMMDDThhmmss	EXAMPLE	P00021015T103020
Extended format:	PYYYY-MM-DDThh:mm:ss	EXAMPLE	P0002-10-15T10:30:20

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

5.5.4.3 Representation of time-interval identified by its start and its duration

When the application identifies the need for a complete representation of a time-interval identified by its start and its duration, it shall use an expression in accordance with 5.5.2, combining any complete date and time of the day representation 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:	YYYYMMDDThhmmss/PnYnMnDTnHnMnS
	YYYYMMDDThhmmss/PYYYYMMDDThhmmss
EXAMPLE	19850412T232050/P1Y2M15DT12H30M0S
	19850412T232050/P00010215T123000
Extended format:	YYYY-MM-DDThh:mm:ss/PnYnMnDTnHnMnS
	YYYY-MM-DDThh:mm:ss/PYYYY-MM-DDThh:mm:ss
EXAMPLE	1985-04-12T23:20:50/P1Y2M15DT12H30M0S
	1985-04-12T23:20:50/P0001-02-15T12:30:00

A time-interval of one year, two months, 15 days, 12 hours and 30 minutes, beginning on 12 April 1985 at 20 minutes and 50 seconds past 23 hours local time.

5.5.4.4 Representation of time-interval identified by its duration and its end

When the application identifies the need for a complete representation of a time-interval identified by its duration and its end, it shall use an expression in accordance with 5.5.2, combining any complete representation of the duration as defined in 5.5.3 with any complete representation of date and time of the day 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/YYYYMMDDThhmmss
	PYYYYMMDDThhmmss/YYYYMMDDThhmmss
EXAMPLE	P1Y2M15DT12H30M0S/19850412T232050
	P00010215T123000/19850412T232050
Extended format:	PnYnMnDTnHnMnS/YYYY-MM-DDThh:mm:ss
	PYYYY-MM-DDThh:mm:ss/YYYY-MM-DDThh:mm:ss
EXAMPLE	P1Y2M15DT12H30M0S/1985-04-12T23:20:50
	P0001-02-15T12:30:00/1985-04-12T23:20:50

A time-interval of time of one year, two months, 15 days and 12 hours and 30 minutes, ending on 12 April 1985 at 20 minutes and 50 seconds past 23 hours local time .

5.5.5 Representations other than complete

A representation other than complete of a time-interval shall be an expression in accordance with 5.5.1 and 5.5.2, where time-points are represented in accordance with 5.2, 5.3 or 5.4 and where duration 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;

d) the use of a representation needs to be agreed by the partners in information interchange, if the use of any of its constituent parts needs to be agreed by the partners in information interchange.

In the representation of time-intervals in accordance with 5.5.1 a),

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

— 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) By a number of recurrences (optional), a start and an end. This represents a recurring time-interval of which the first time-interval is identified by the first two components of the expression and the number of recurrences by the last component. If the last component is absent the number of occurrences is unbounded.

b) By a number of recurrences (optional) and a duration. This represents a recurring time interval with the indicated duration for each time-interval and with the indicated number of recurrences. If the number of recurrences is absent the number of occurrences is unbounded.

c) By a number of recurrences (optional) a start and a duration. This represents a recurring time-interval of which the first time-interval is identified by the first two components of the expression and the number of recurrences by the last component. If the last component is absent the number of occurrences is unbounded.

d) By a number of recurrences (optional), a duration and an end. This represents a recurring time-interval of which the last time-interval is identified by the first two components of the expression and the number of recurrences by the last component. If the last component is absent the number of occurrences is unbounded.

5.6.2 Separators and designators

A recursive time interval is expressed according to the following rule:

All representations start with the designator [R], followed, without spaces, by the number of recurrences, if present, followed, without spaces, by a solidus [/], followed, without spaces, by the expression of a time interval in accordance with 5.5.1. For the representation 5.6.1 a), 5.6.1 b), 5.6.1 c) and 5.6.1 d) the time interval in accordance with 5.5.1 a), 5.5.1 b), 5.5.1 c) and 5.5.1 d) shall be used respectively.

5.6.3 Complete representations

When the application identifies the need for a complete representation of a recurring time-interval, it shall use an expression in accordance with 5.6.2 combining any complete time-interval representations as defined in 5.5.4 (with amended designator) with the number of recurrences.

Basic format:	Rn/YYYYMMDDThhmmss/YYYYMMDDThhmmss Rn/PnYnMnDTnHnMnS Rn/YYYYMMDDThhmmss/PnYnMnDTnHnMnS Rn/PnYnMnDTnHnMnS/YYYYMMDDThhmmss
EXAMPLE	R12/19850412T232050/19850625T103000 R12/P2Y10M15DT10H30M20S R12/19850412T232050/P1Y2M15DT12H30M0S R12/P1Y2M15DT12H30M0S/19850412T232050
Extended format:	Rn/YYYY-MM-DDThh:mm:ss/YYYY-MM-DDThh:mm:ss Rn/YYYY-MM-DDThh:mm:ss/PnYnMnDTnHnMnS Rn/PnYnMnDTnHnMnS/YYYY-MM-DDThh:mm:ss
EXAMPLE	R12/l985-04-12T23:20:50/1985-06-25T10:30:00 R12/1985-04-12T23:20:50/P1Y2M15DT12H30M0S R12/P1Y2M15DT12H30M0S/1985-04-12T23:20:50

5.6.4 Representations other than complete

A reduced precision, truncated, or decimal representation of a recurring time-interval shall be an expression in accordance with 5.6.1 and 5.6.2, where the time interval is represented in accordance with 5.5.5.

Annex A
(informative)

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

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.

For times, use of the 24-hour timekeeping system is how so common (particularly 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.

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
(informative)

Examples

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 day only
Ordinal date - 12 April 1985		
1985102	1985102	Complete
85102	85-102	Year of the implied century, with ordinal day
Week date - Friday 12 April 1985		
1985W155	1985-W15-5	Complete
85W155	85-W15-5	Year of the implied century, with week and day
Calendar week - 15th week of 1985		
1985W15	1985-W15	Reduced
85W15	85-W15	Year of the implied century and week of that year
Calendar month - April 1985		
1985-04	not applicable	Reduced
-8504	-85-04	Year of the implied century and month of that year
Calendar year - 1985		
1985	not applicable	Reduced
-85	not applicable	Specific year of the implied century
Calendar date - 12 April 11985		
+	0119850412	+ 011985-04-12 Expanded; 6 digits to represent the year
-00020412	-0002-04-12	Expanded; 4 digits to represent the year
The 12th April in the 2nd year before the year [0000]		

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
Reduced to hours and minutes		
1528	15:28	Reduced
-28	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 second 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
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 of the day

Basic format	Extended format	Explanations
Combinations of calendar 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
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
Combinations of week date 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

B.4 Time-intervals

Basic format	Extended format
A time interval starting 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 time-interval starting at 12 April 1985 and ending on 25 June 1985	
19850412/0625	1985-04-12/06-25
A time-interval of 2 years, 10 months, 15 days, 10 hours, 20 minutes and 30 seconds	
P2Y10M15DT10H20M30S	not applicable
P00021015T102030	P0002-10-15T10:20:30
A time-interval of 1 year and 6 months	
P1Y6M	not applicable
P0001-06	not applicable
P010600	P01-06-01
A time interval of seventy-two hours	
PT72H	not applicable
A time-interval of one year, two months, 15 days and 12 hours, beginning on 12 April 1985 at 20 minutes past 23 hours	
19850412T232000/P1Y2M15DT12H	1985-04-12T23:20:00/P1Y2M15DT12H
A time-interval of one year, two months, 15 days and 12 hours, ending on 12 April 1985 at 20 minutes past 23 hours	
P1Y2M15DT12H/19850412T232000	P1Y2M15DT12H/1985-04-12T23:20:00

B.5 Recurring time-intervals

Basic format	Extended format

Fifteen recurrences of a time-interval of two years, 10 months, 15 days, 10 hours, 20 minutes and 30 seconds

R15/P2Y10M15DT10H20M30S#15	not applicable

An unbounded number of recurrences of a time-interval of two years, 10 months, 15 days, 10 hours, 20 minutes and 30 seconds

R/P00021015T102030	R/P0002-10-15T10:20:30

Two recurrences of a time-interval of one year and six months

R2/P1Y6M	not applicable
R2/P0001-06	not applicable

Eight recurrences of a time-interval of seventy-two hours

R8/PT72H	not applicable

An unbounded number of occurrences of a time-interval of one year, two months, 15 days and 12 hours of which the last occurrence ends at 12 April 1985 at 20 minutes and 50 seconds past 23 hours

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

ICS 01.140.30

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