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**Date and time — Representations for  
information interchange —**

**Part 2:  
Extensions**

*Date et heure — Représentations pour l'échange d'information —*

*Partie 2: Extensions*  
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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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

This first edition of ISO 8601-2, together with ISO 8601-1, cancels and replaces ISO 8601:2004, which has been technically revised.

The main changes compared to ISO 8601:2004 are as follows:

- addition of standard representations for concepts not previously supported, such as negative values, qualification, sets, seasons, extended time intervals, selections, grouped units, repeating rules and profiles.

A list of all parts in the ISO 8601 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

The purpose of this document is to provide a set of date and time format representations for information interchange beyond those supported by ISO 8601-1.

There are various concepts and representations that many applications find useful not supported by ISO 8601-1, including:

- negative values for time scale components;
- qualification of expressions and time scale components;
- set representation of date and time expressions;
- seasons;
- time intervals with open or unknown starts or ends;
- expression of movable days through date and time selection;
- date and time expressions without digit length limits; and
- profiles for specifying feature support amongst ISO 8601 (all parts) features.

Such concepts are often represented according to various ad-hoc conventions; this document aims to provide a standard syntax for their representation.

The extended representations allow unambiguous interpretation, enforce the confidence of interoperability and minimize the risk of misinterpretations and their consequences.

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# Date and time — Representations for information interchange —

## Part 2: Extensions

### 1 Scope

This document specifies additional representations of dates of the Gregorian calendar and times based on the 24-hour clock that extend the basic rules and composite elements of those defined in ISO 8601-1. These representations are specified as character strings for use in information interchange. It is also applicable for representing times and time shifts based on Coordinated Universal Time (UTC).

These extensions include:

- uncertain or approximate dates, or dates with portions unspecified;
- extended time intervals;
- divisions of a year;
- sets and choices of calendar dates;
- grouped time scale units;
- repeat rules for recurring time intervals; and
- date and time arithmetic.

This document excludes the representation of date elements from non-Gregorian calendars, or times not from the 24-hour clock. This document does not address character encoding of representations specified in this document.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8601-1:2019, *Date and time — Representation for information interchange — Part 1: Basic rules*

### 3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the terms and definitions given in ISO 8601-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

### 3.1 Terms and definitions

#### 3.1.1 Basic concepts

##### 3.1.1.1

##### **approximate date**

calendar date which is an estimate whose value is asserted to be possibly correct

Note 1 to entry: The degree of confidence in approximation depends on the application.

##### 3.1.1.2

##### **uncertain date**

calendar date whose source is considered *dubious* (3.1.1.4)

##### 3.1.1.3

##### **date with unspecified part**

calendar date of which a part is unstated

Note 1 to entry: The unstated part can be year, year and month, month, month and day, or year and day. It is unstated because it has not (yet) been assigned (it can be assigned in the future), or because it is classified or unknown, or for any other reason.

##### 3.1.1.4

##### **dubious**

not to be relied upon

##### 3.1.1.5

##### **qualification symbol**

symbol that indicates certain qualification to a value it applies to

EXAMPLE The symbol [?] indicates that the value it applies to is uncertain.

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##### 3.1.1.6

##### **movable day**

repeatedly occurring day in a calendar that is represented by criteria set by one or more *selection rules* (3.1.2.6), but does not always resolve to a fixed calendar day in every repeating cycle

EXAMPLE 1 Thanksgiving Day in the U.S. and Canada are considered movable days, set to the fourth Thursday in November and the second Monday in October, respectively.

EXAMPLE 2 First Day of Summer (*sumardagurinn fyrsti*) in Iceland is considered a movable day, set to the first Thursday after April 18th.

EXAMPLE 3 Father's Day is celebrated on the third Sunday in June in North America and is considered a movable day.

Note 1 to entry: The selection of this term pays homage to the phrase "movable feast" used in some calendars to indicate the rule-based determination of annual events.

##### 3.1.1.7

##### **negative duration**

duration in the reverse direction to the proceeding time scale

#### 3.1.2 Feature description

##### 3.1.2.1

##### **feature**

single function or group of functions

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### 3.1.2.2 conformity level

value assigned to a subset of *features* (3.1.2.1) within a *profile* (3.1.2.3)

Note 1 to entry: A profile may refer to these conformity levels to facilitate the specification of conformance to the profile.

### 3.1.2.3 profile

subset of *features* (3.1.2.1) described in a standard or a set of standards

Note 1 to entry: A community may develop a profile to describe how to carry out functions or apply features specified in a standard or family of standards in a manner relevant to that community.

Note 2 to entry: A profile often describes what features are to be supported and how to apply those features. In cases where multiple methods are allowed for a required feature, a profile may select a single method. In cases where a particular function allows different interpretations, a profile may select a single interpretation or provide clarification. A profile may list out features that need not be supported. It may specify several *conformity levels* (3.1.2.2).

Note 3 to entry: The term “profile” is used in this document with the specific definition (including the notes) given here, despite its various meanings in other contexts.

### 3.1.2.4 ISO 8601 profile

*profile* (3.1.2.3) whose base standard is the ISO 8601 series

### 3.1.2.5 repeat rule

set of *eligible time intervals* (3.1.2.8) and *selection rules* (3.1.2.6) that allows computation of a set of *matching instants* (3.1.2.9)

### 3.1.2.6 selection rule

rule specifying restrictions on the value of a time scale component

### 3.1.2.7 repeat cycle

set of repeating instants, calculated by a specified start instant and specified duration gap between the repeating instants

### 3.1.2.8 eligible time interval

time interval eligible for matching using *selection rules* (3.1.2.6)

### 3.1.2.9 matching instants

set of instants, computed by a *repeat rule* (3.1.2.5), that belongs within *eligible time intervals* (3.1.2.8) and fulfils criteria set by specified *selection rules* (3.1.2.6)

### 3.1.2.10 date time formula

expression that specifies modification of a date and time expression with a duration

### 3.1.2.11 durational unit

time scale component that composes the duration date and time representation

### 3.1.2.12 grouped time scale unit

time scale unit composed of a duration expressed by one or more *durational units* (3.1.2.11)

### 3.1.2.13

#### equation of time

difference between mean solar time and apparent solar time, which varies with time within a calendar year

Note 1 to entry: A clock is a type of device that measures mean solar time; a sundial is a type of device that measures apparent solar time.

### 3.1.3 Seasons

#### 3.1.3.1

##### season

time interval resulting from the common division of a calendar year into four time intervals, *spring* (3.1.3.2), *summer* (3.1.3.3), *autumn* (3.1.3.4) or *winter* (3.1.3.5)

Note 1 to entry: A single calendar date may represent different seasons depending on local customs or location, such as the difference between the northern or southern hemispheres.

#### 3.1.3.2

##### spring

season (3.1.3.1) following *winter* (3.1.3.5) and preceding *summer* (3.1.3.3)

#### 3.1.3.3

##### summer

season (3.1.3.1) following *spring* (3.1.3.2) and preceding *autumn* (3.1.3.4)

#### 3.1.3.4

##### autumn

season (3.1.3.1) following *summer* (3.1.3.3) and preceding *winter* (3.1.3.5)

#### 3.1.3.5

##### winter

season (3.1.3.1) following *autumn* (3.1.3.4) and preceding *spring* (3.1.3.2)

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## 3.2 Symbols and abbreviated terms

### 3.2.1 General

Representations and expressions specified in this document make use of the symbols given in ISO 8601-1 and the following.

### 3.2.2 Time scale component symbols

c(feat)	the left side of a representation statement where "c" is a time scale component (e.g. "year") and "feat" is a feature, for example "q" or "m" (see below)
yearE	time scale component calendar year in explicit form, specified in ISO 8601-1:2019, 4.3.2 b)
monthE	time scale component calendar month in explicit form, specified in ISO 8601-1:2019, 4.3.3 b)
weekE	time scale component calendar week of year in explicit form, specified in ISO 8601-1:2019, 4.3.4 b)
dayE	time scale component calendar day of month in explicit form, specified in ISO 8601-1:2019, 4.3.5 b)
daykE	time scale component calendar day of week in explicit form, specified in 4.3.3

dayoE	time scale component calendar day of year in explicit form, specified in <a href="#">4.3.4</a>
hourE	time scale component hour in explicit form, specified in ISO 8601-1:2019, 4.3.8 b)
minE	time scale component minute in explicit form, specified in ISO 8601-1:2019, 4.3.9 b)
secE	time scale component second in explicit form, specified in ISO 8601-1:2019, 4.3.10 b)
decE	time scale component decade (defined in ISO 8601-1:2019, 3.1.2.22) in explicit form, specified in <a href="#">4.3.5</a>
centE	time scale component century (defined in ISO 8601-1:2019, 3.1.2.23) in explicit form, specified in <a href="#">4.3.6</a>
season	the values 21 to 24 as specified in <a href="#">4.8.1</a>
ydivision	the values 25 to 41 as specified in <a href="#">4.8.1</a>
seasonE	the values 21 to 41 as specified in <a href="#">4.8.1</a>
expr <i>i</i>	any date and time expression, where <i>i</i> is empty or a positive integer
intexpr	a date and time expression accepted by the time interval representation as start or end as determined in ISO 8601-1:2019, 5.4.3.

### 3.2.3 Composite component symbols

dateI	date representation in implicit form, specified in ISO 8601-1:2019, 3.2.3 as date and dateX
timeI	time of day representation in implicit form, specified in ISO 8601-1:2019, 3.2.3 as time and timeX
timeE	time of day representation in explicit form
dtE	date and time representation in explicit form
dsE	date with shift representation in explicit form
dtsE	date and time with shift representation in explicit form
tiseE	time interval representation with a start and end in explicit form
tisdE	time interval representation with a start in explicit form and duration
tiedE	time interval representation with a duration and end in explicit form
positiveDuration	representation of [duration] specified in ISO 8601-1:2019, 5.4.2 that contains only time scale components that have positive values
timeUnits	time scale components for time of day representation
groupUnit	grouped time scale unit representation
group	grouped time scale unit representation with value
groupDateTime	date time representation that incorporates grouped time scale units
timeIntervalE	collective representation of tiseE, tisdE, and tiedE

### 3.2.4 Symbols used to represent time scale component features

q	qualified form for time scale components, as specified in <a href="#">4.5</a>
p	prefixed year, only used in accordance with requirements specified in <a href="#">4.7.2</a>
e	exponential form for time scale components, as specified in <a href="#">4.7.3</a>
s	significant digits form for time scale components, as specified in <a href="#">4.4.3</a>
m	minus form to allow time scale components to accept negative integer values, as specified in <a href="#">4.4.1</a>

### 3.2.5 Symbols used in date and time representations

!	symbol indicating that the token following this symbol is optional (may be omitted)
Q	placeholder for a qualification modifier which applies to the time scale component value
AA	the grouping digit pair, representing a two-digit integer that is 21 or greater
I	a positive integer
negi	a positive or negative integer; equivalent to [!]["-"][i]

### 3.2.6 Designator symbols used in date and time expressions

"-"	a minus sign represented by the character "-" to indicate a negative value
"K"	the calendar day of week designator, represented by the character "K", preceding a data element which represents the ordinal number of a calendar day within a calendar week
"J"	the decade designator, represented by the character "J", preceding a data element which represents the decade number
"C"	the century designator, represented by the character "C", preceding a data element which represents the century number
"O"	the calendar day of year designator, represented by the character "O", preceding a data element which represents the ordinal number of a calendar day within a calendar year
"B"	the suffix designator to represent years before year one (1), represented by the character "B", placed after the time scale components of calendar year, decade and century
"E"	the exponent designator, represented by the character "E", preceding the component which represents the exponential part of a time scale component value
"S"	the significant digit designator, represented by the character "S", preceding the component which represents the number of significant digits of the time scale component value
"G"	the grouped time scale unit prefix designator, represented by the character "G", indicating that a grouping calculation applies to the subsequent time scale components until encountering the corresponding suffix designator
"U"	the grouped time scale unit suffix designator, represented by the character "U", indicating that a grouping calculation applies to the preceding time scale components from the corresponding prefix designator

"I"	the instance designator, represented by the character "I", indicating that a specific instance is to be selected within the time scale component
"F"	the frequency designator, represented by the character "F", preceding the component which represents the frequency part of a repeat rule
"L"	the selection prefix designator, represented by the character "L", preceding the component which represents the selection part of a repeat rule until encountering the corresponding suffix designator
"N"	the selection suffix designator, represented by the character "N", following the component which represents the selection part of a repeat rule from the corresponding prefix designator
"X"	the unspecified digit, used within a date with unspecified part, represented by the character "X", indicating that the time scale component value of the specific digit it replaces is unspecified
"*"	the unspecified digit modifier, represented by the character "*", indicating, when used with the unspecified digit as "X*", that the entire time scale component value it applies to is unspecified
"?"	qualification modifier, represented by the character "?", indicating that the time scale component value it applies to is uncertain
"~"	qualification modifier, represented by the character "~", indicating that the time scale component value it applies to is approximate
"%"	qualification modifier, represented by the character "%", indicating that the time scale component value it applies to is both uncertain and approximate
"..x	indicating "on or before" value x if applied as a prefix to a time scale component
x".."	indicating "on or after" value x if applied as a suffix to a time scale component
x".."y	indicating "between x and y" (inclusive) when applied between two time scale components

NOTE 1 The designator symbol "J" is assigned from its ordinal position being the tenth letter of the English alphabet.

NOTE 2 The designator symbols "G" and "U" are used to demarcate the "grouped time scale unit" time scale components as they are the initial letters of the words "group" and "unit".

### 3.2.7 Component symbols, representations and expressions

Throughout this document are statements of the form:

$$\langle \text{component symbol} \rangle = \langle \text{representation} \rangle$$

This means that the <component symbol> is assigned a representation <representation>, where the <representation> describes accepted symbols.

EXAMPLE The statement 'year(q) = [!][Q][YYYY]' means that the component symbol "year(q)" is represented as "[!][Q][YYYY]", year(q) is the symbol for "qualified form for year", and "[!][Q][YYYY]" means the string "YYYY" optionally preceded by a qualification character. Thus, for year 1985 and qualification character '?', the representation [!][Q][YYYY], would result in the expression '1985' or '?1985'.