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Date and time — Representations for information interchange —

Part 1: Basic rules

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

Partie 1: Règles de base

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Foreword

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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).

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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.

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

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

- conversion of the content as Part 1 with the Part title “Basic rules” due to the addition of another Part 2 “Extensions” of ISO 8601;
- replacement of the term “midnight” with “beginning of day”, disallowing the value “24” for hour;
- update of terms and definitions:
  - “time point” is now “time”;
  - “local time” is now “local time of day”;
  - added definition for “time of day” and “local time scale”;
  - updated definitions for “standard time of day”, “local time of day” and “UTC of day” to rely on “time of day”;
  - combined two “day” terms in different domains for consistency;
  - change of the representation of “leap seconds”;
- clarification of “calendar day” expressions intended to mean “calendar day of week” (etc.);
- amendment of the recurring time interval (3.1.1.11) to provide a link to ISO 8601-2:2019 which contains in Clause 5 the “repeat rules for recurring time intervals”.

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.

Introduction

The purpose of this document is to provide a standard set of date and time format representations for information interchange, in order to minimize the risk of misinterpretation, confusion and their consequences.

This document specifies a set of date and time format representations utilizing numbers, alphabets and symbols defined in ISO/IEC 646. These representations are meant to be both human recognizable and machine readable.

This document retains the most commonly used expressions for date and time of day and their representations from earlier International Standards in the field, including earlier editions of ISO 8601 and its predecessors.

Date and time — Representations for information interchange —

Part 1: Basic rules

1 Scope

This document specifies representations of dates of the Gregorian calendar and times based on the 24-hour clock, as well as composite elements of them, as character strings for use in information interchange. It is also applicable for representing times and time shifts based on Coordinated Universal Time (UTC).

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

There are no normative references in this document.

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions 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/

3.1.1 Basic concepts

3.1.1.1
date
time (3.1.1.2) on the *calendar* (3.1.1.18) *time scale* (3.1.1.5)

Note 1 to entry: Common forms of date include *calendar date* (3.1.2.7), *ordinal date* (3.1.2.8) or *week date* (3.1.2.9).

3.1.1.2
time
mark attributed to an *instant* (3.1.1.3) or a *time interval* (3.1.1.6) on a specified *time scale* (3.1.1.5)

Note 1 to entry: The term "time" is often used in common language. However, it should only be used if the meaning is clearly visible from the context.

Note 2 to entry: On a time scale consisting of successive time intervals, such as a *clock* (3.1.1.9) or *calendar* (3.1.1.18), distinct instants may be expressed by the same time.

Note 3 to entry: This definition corresponds with the definition of the term "date" in IEC 60050-113:2011, 113-01-12.

3.1.1.3
instant
point on the *time axis* (3.1.1.4)

Note 1 to entry: An instantaneous event occurs at a specific instant.

[SOURCE: IEC 60050-113:2011, 113-01-08]

3.1.1.4
time axis
mathematical representation of the succession in time according to the space-time model of instantaneous events along a unique axis

Note 1 to entry: According to the theory of special relativity, the time axis depends on the choice of a spatial reference frame.

Note 2 to entry: In IEC 60050-113:2011, 113-01-03, time according to the space-time model is defined to be the one-dimensional subspace of space-time, locally orthogonal to space.

[SOURCE: IEC 60050-113:2011, 113-01-07, modified — The words "according to the space-time" have been added; the phrase "special theory of relativity" has been changed to "theory of special relativity" for clarity; Note 2 to entry has been added.]

3.1.1.5
time scale
system of ordered marks which can be attributed to *instants* (3.1.1.3) on the *time axis* (3.1.1.4), one instant being chosen as the origin

Note 1 to entry: A time scale may amongst others be chosen as:

— continuous, e.g. international atomic time (TAI) (see IEC 60050-713:1998, 713-05-18);

— continuous with discontinuities, e.g. *UTC* (3.1.1.12) due to *leap seconds* (3.1.1.24), *standard time* (3.1.1.14) due to summer time and winter time;

— successive steps, e.g. *calendars* (3.1.1.18), where the *time axis* (3.1.1.4) is split up into a succession of consecutive *time intervals* (3.1.1.6) and the same mark is attributed to all instants of each time interval;

— discrete, e.g. in digital techniques.

[SOURCE: IEC 60050-113:2011, 113-01-11, modified — The words "amongst others" in Note 1 to entry have been added; NOTEs 2 and 3 have been deleted.]

3.1.1.6
time interval
part of the *time axis* (3.1.1.4) limited by two *instants* (3.1.1.3) and, unless otherwise stated, the limiting instants themselves

[SOURCE: IEC 60050-113:2011, 113-01-10, modified — The words "and, unless otherwise stated, the limiting instants themselves" have been added; the NOTEs have been deleted.]

3.1.1.7
time scale unit
unit of measurement of a *duration* (3.1.1.8)

EXAMPLE 1 Calendar year, calendar month and calendar day are time scale units of the Gregorian calendar.

EXAMPLE 2 Clock hour, clock minutes and clock seconds are time scale units of the 24-hour clock.

3.1.1.8
duration
non-negative quantity of time equal to the difference between the final and initial *instants* (3.1.1.3) of a *time interval* (3.1.1.6)

Note 1 to entry: The duration is one of the base quantities in the International System of Quantities (ISQ) on which the International System of Units (SI) is based. The term "time" instead of "duration" is often used in this context and also for an infinitesimal duration.

Note 2 to entry: For the term "duration", expressions such as "time" or "time interval" are often used, but the term "time" is not recommended in this sense and the term "time interval" is deprecated in this sense to avoid confusion with the concept of "time interval".

Note 3 to entry: The exact duration of a *time scale unit* (3.1.1.7) depends on the *time scale* (3.1.1.5) used. For example, the durations of a year, month, week, day, hour or minute, may depend on when they occur [in a *Gregorian calendar* (3.1.1.19), a *calendar month* (3.1.2.19) can have a duration of 28, 29, 30, or 31 days; in a *24-hour clock* (3.1.1.10), a *clock minute* (3.1.2.4) can have a duration of 59, 60, or 61 seconds, etc.]. Therefore, the exact duration can only be evaluated if the exact duration of each is known.

Note 4 to entry: This definition is closely related to NOTE 1 of the terminological entry "duration" in IEC 60050-113:2011, 113-01-13.

3.1.1.9
clock
time scale (3.1.1.5) suited for intra-day time measurements

EXAMPLE The *24-hour clock* (3.1.1.10) is a type of clock.

Note 1 to entry: *clock second* (3.1.2.2), *clock minute* (3.1.2.4) and *clock hour* (3.1.2.6) are often *time scale units* (3.1.1.7) included in a clock.

3.1.1.10
24-hour clock

clock (3.1.1.9) that subdivides a *calendar day* (3.1.2.11) into 24 *clock hours* (3.1.2.6)

Note 1 to entry: *UTC* (3.1.1.12) forms the basis of today's 24-hour clocks and is used in this document as a type of 24-hour clock, as described in 4.2.3.

3.1.1.11
recurring time interval
series of consecutive *time intervals* (3.1.1.6) of identical *duration* (3.1.1.8)

Note 1 to entry: If the duration of the time intervals is measured in *calendar* (3.1.1.18) entities, the duration of each time interval depends on the *calendar dates* (3.1.2.7) of its start and end.

Note 2 to entry: If the starting *instants* (3.1.1.3) of time intervals are repeated according to a set of rules, the "repeat rules for recurring time intervals" in ISO 8601-2:2019, Clause 5 apply.

3.1.1.12
UTC
Coordinated Universal Time
time scale (3.1.1.5) with the same rate as International Atomic Time (TAI), but differing from TAI only by an integral number of *seconds* (3.1.2.1)

Note 1 to entry: UTC is the time standard commonly used across the world from which local time is derived.

Note 2 to entry: UTC is produced by the Bureau International des Poids et Mesures (BIPM), i.e. the International Bureau of Weights and Measures.

Note 3 to entry: TAI is a continuous time scale produced by the BIPM based on the best realizations of the SI second. TAI is a realization of Terrestrial Time (TT) with the same rate as that of TT, as defined by the International Astronomical Union Resolution B1.9 (2000).

[SOURCE: BIPM Recommendation CCTF 3 (2017), modified — The definition of TAI has been included as Note 3 to entry.]

3.1.1.13
UTC of day
time of day (3.1.1.16) in *UTC* (3.1.1.12)

3.1.1.14
standard time
time scale (3.1.1.5) derived from *UTC* (3.1.1.12), by a *time shift* (3.1.1.25) established in a given location by the competent authority

EXAMPLE 1 Some standard times do not vary within a year, such as US Eastern Standard Time (EST), US Eastern Daylight Time (EDT), Australia Western Standard Time (AWST), China Standard Time (CST), Hong Kong Standard Time (HKT), Korea Standard Time (KST) and Japanese Standard Time (JST).

EXAMPLE 2 Some standard times vary within a year, such as US Eastern Time (ET) and Australian Central Standard Time (ACST).

Note 1 to entry: The time shift of a standard time may vary in the course of a year, such as due to daylight savings.

[SOURCE: IEC 60050-113:2011, 113-01-17, modified — The original NOTE has been deleted; EXAMPLE 1 and 2 and Note 1 to entry has been added.]

3.1.1.15
local time scale
locally-applicable *time scale* (3.1.1.5) such as *standard time* (3.1.1.14) or a non-*UTC* (3.1.1.12) based time scale

3.1.1.16
time of day
time (3.1.1.2) occurring within a *calendar day* (3.1.2.11)

Note 1 to entry: Generally, time of day relates to the *duration* (3.1.1.8) elapsed after the beginning of the day. However, this correlation breaks when changes occur in the *time scale* (3.1.1.5) that applies to the time of day, such as *time shifts* (3.1.1.25) and *leap seconds* (3.1.1.24).

Note 2 to entry: This definition corresponds closely with the definition of "clock time" given in IEC 60050-113:2011, 113-01-18, except that the concepts of duration and time scale are not used in this definition.

3.1.1.17
local time of day
time of day (3.1.1.16) in a *local time scale* (3.1.1.15)

3.1.1.18
calendar
time scale (3.1.1.5) that uses the *time scale unit* (3.1.1.7) of *calendar day* (3.1.2.11) as its basic unit

EXAMPLE The *Gregorian calendar* (3.1.1.19) is a type of calendar.

Note 1 to entry: *calendar month* (3.1.2.19) and *calendar year* (3.1.2.21) are time scale units often included in a calendar.

3.1.1.19
Gregorian calendar
calendar (3.1.1.18) in general use that defines a *calendar year* (3.1.2.21) that closely approximates the tropical year

Note 1 to entry: In this document the term "Gregorian calendar" is used to refer to the *time scale* (3.1.1.5) described in 4.2.1.

3.1.1.20
common year
calendar year (3.1.2.21) in the *Gregorian calendar* (3.1.1.19) that has 365 *calendar days* (3.1.2.11)

3.1.1.21
leap year
calendar year (3.1.2.21) in the *Gregorian calendar* (3.1.1.19) that has 366 *calendar days* (3.1.2.11)

Note 1 to entry: A leap year is a calendar year whose year number is divisible by four and is not a *centennial year* (3.1.1.22), or a centennial year whose year number is divisible by four hundred.

3.1.1.22
centennial year
calendar year (3.1.2.21) in the *Gregorian calendar* (3.1.1.19) whose year number is divisible without remainder by one hundred

3.1.1.23
week calendar
calendar (3.1.1.18) based on an unbounded series of contiguous *calendar weeks* (3.1.2.16) that uses the *time scale unit* (3.1.1.7) of calendar week as its basic unit to represent a *calendar year* (3.1.2.21), according to the rule that the first calendar week of a calendar year is the week including the first Thursday of that year, and that the last one is the week immediately preceding the first calendar week of the next calendar year

Note 1 to entry: This rule is based on the principle that a week belongs to the calendar year to which the majority of its *calendar days* (3.1.2.11) belong.

Note 2 to entry: In the week calendar, calendar days of the first and last calendar week of a calendar year may belong to the previous and the next calendar year respectively in the *Gregorian calendar* (3.1.1.19).

Note 3 to entry: The week calendar is described in 4.2.2.

3.1.1.24
leap second
intentional time step of one *second* (3.1.2.1) to adjust *UTC* (3.1.1.12) to ensure appropriate agreement with UT1, a *time scale* (3.1.1.5) based on the rotation of the Earth

Note 1 to entry: See also ITU-R TF.460-6.

Note 2 to entry: An inserted second is called a positive leap second and an omitted second is called a negative leap second. A positive leap second is inserted after [23:59:59Z] and can be represented as [23:59:60Z]. A negative leap second is achieved by the omission of [23:59:59Z]. Insertion or omission takes place as determined by the International Earth Rotation and Reference Systems Service (IERS), normally on 30 June or 31 December, but if necessary on 31 March or 30 September.

3.1.1.25
time shift
constant *duration* (3.1.1.8) difference between *times* (3.1.1.2) of two *time scales* (3.1.1.5)

3.1.2 Time and date units

3.1.2.1
second
base unit of *duration* (3.1.1.8) measurement in the International System of Units (SI)

Note 1 to entry: Second is as defined by the CGPM (Conférence générale des poids et mesures, General Conference on Weights and Measures) on the proposal of the CIPM (Comité international des poids et mesures, International Committee of Weights and Measures).

Note 2 to entry: See also ISO 80000-3.