

# INTERNATIONAL STANDARD FOR DENOTATION OF CALENDAR TIME

## INTRODUCTION

The lack of a unified way of representing calendar time leads to unnecessary confusion and mistakes in vital communications regarding events in time. There exists an internationally adopted standard which provides a working solution to this problem - the ISO standard 8601.

This text is a *short presentation* of ISO 8601 and a *comparison* with the American standard (ANSI) with *annotations* added by the author.

## ISO 8601 - RECOMMENDATIONS AND STANDARDS

**ISO 8601** is the denotation of the International Standard "*Data elements and interchange formats - Information interchange - Representation of dates and times*".

The International Organization for Standardization (**ISO**) says:

*"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"*.

The International Standard does **not** cover denotation of calendar time where language dependent **words** are used in the representation.

ISO has recommended a standard for denoting a date by figures in the sequence *year, month* and *day* since 1971.

Despite the existence of this standard, different forms of numeric denotation of date have been commonly used in different countries.

The ISO 8601 standard has been applicable since 1988. This standard includes specifications for the numeric denotation of *day* but also numeric denotations of *point of time* and *period of time*.

ISO has issued the following standards regarding denotation of calendar time:

- ISO 8601:2004 (Third edition 2004-12-03)
- ISO 8601:2000 (Second edition)
- ISO 8601:1988 (First edition)
- ISO 2014:1976, 2015:1976, 2711:1973, 3307:1975 och 4031:1978

The European Committee for Standardization (**CEN**) accepted ISO 8601:1988 as the standard (**EN 28601**) for its national members Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom. This means that ISO 8601:1988 was national standard in all these countries.

## CALENDAR TIME - THE GREGORIAN CALENDAR

*Calendar time* means running time according to a given time base, e.g. the Gregorian calendar.

*The Gregorian calendar* may be regarded as a "world standard" for the continuous reckoning of time. Even among nations that apply other systems of time reckoning are arrival- and departure times in communication timetables expressed according to the Gregorian system of reckoning. However, the number of work-free days (holidays) and when they take place, deviate even among different countries that adopt the Gregorian calendar.

This calendar was first introduced in the years 1582/1584 in most of the catholic countries of the world and adopted in Britain in the year 1752 (including its colonies, e.g. in North America).

Apart from the Gregorian calendar there are about 40 other calendars in use throughout the world.

There is no number *zero* in the roman numerical system. The Epoch – the starting point of time (origo) - of the Christian era is the beginning of the year 1 AD (Anno Domini). It is therefore clear that the New Millennium began at *zero o'clock on 1st January 2001*. Celebration of the New Millennium should have taken place at the turn of the year 2000/2001 and not 1999/2000.

The proleptic Gregorian calendar includes the year 0000. This year, a leap year, is in historical-chronological context year 1 BC (before Christ).

The International Standard ISO 8601 is based upon the Gregorian calendar.

## DENOTATION OF A PARTICULAR DAY (24 HOURS) OR DATE

### The guiding rules:

- The calendar date shall be denoted by eight numeric characters; in the sequence year [CCYY], month [MM] and day [DD].
- The allowed values for calendar year are [0000] through [9999].
- When desired, the character **hyphen** [-] can be used to separate "year" and "month", and "month" and "day".

Example: The 2<sup>nd</sup> May 2009 may be written as 2009-05-02.

### Annotation 1:

To specify the year with only two instead of four digits could lead to serious misunderstandings, especially during the years 2001/2031.

Example: A date written as 09-11-01; which date is that?  
Is it the ninth day of November in the year 2001; or  
is it the first day of November in the year 2009; or  
is it the eleventh day of September in the year 2001 (USA)?

The objectionable habit to express the year with only two instead of four digits was the main cause to the "Year 2000 problem (Y2K-bug)".

*To exclude the two digits representing the century is therefore **unwise**.*

For the Gregorian calendar ISO 8601:2004 recommends this way to specify year: [CCYY], i.e. with four digits.

It is once again worth while to mention that ISO 8601 is limited to numerical denotation of day. If one in text writes the month in letters, for instance the 2 **May** 2009 the ISO 8601 is not valid. But if one writes the date solely with figures the ISO 8601 should be followed.

#### Annotation 2:

It is also acceptable in ISO 8601 to identify days, partly via year and ordinal day number within the year without respect to the division of year into months, partly via week numbers and days in the week.

These two ways to specify dates are totally **unnecessary** as all days can be denoted by date in the sequence: year-month-day.

#### Annotation 3 (ANSI):

The American National Standard Institute (**ANSI**) standard is limited to the representation of **calendar date** for interchange among data systems only and it is not designed for (nor does it preclude) usage by humans as input to or output from data systems. The use of American National Standards is completely voluntary.

No separators are allowed between year, month and day, but the sequence year-month-day is the same as in the International Standard.

The standard document is "Representation of Calendar Date and Ordinal Date for Information Interchange" with the denotation ANSI INCITS 30-1997 (Reaffirmed 2003).

Example: The fourth day of July in the year 1776 is denoted as "17760704".

## **DENOTATION OF POINT OF TIME**

*Point of time* means a co-ordinate (point) on a given time scale.

### **The guiding rules:**

- A point of time in the Gregorian calendar can be identified by means of a unique expression giving a specific date and a specific stroke of clock within that date.  
The order year, month, day can be extended by hour, minute, second and decimal fraction of a second, in order to denote points of time numerically.  
*The ISO standard is based on the 24-hour timekeeping system.*  
A point of time shall be denoted in the sequence year [CCYY], month [MM], day [DD], hour [hh], minute [mm] and second [ss,s]. Leading zeroes in each time component are required.
- The letter **T** shall be used as time designator to indicate the combination of date and stroke of the clock. By mutual agreement of the partners in information interchange, the character [T] may be omitted.

- When desired, the character **colon** [:] can be used to separate "hour" and "minute", and "minute" and "second".  
Example: The 2<sup>nd</sup> May 2009, 11:15 pm or 23:15 hours may be written as 2009-05-02T23:15.
- If a point of time is converted into *Coordinated Universal Time (UTC)* the time zone designator [**Z**] shall be added to the notation. UTC is commonly known as the previous denotation GMT (Strictly scientific, however, has UTC and GMT not the same definition).  
Example: 2009-05-02T22:15Z.
- The *differences between local time and UTC* shall be expressed as positive if the local time is ahead of UTC and as negative if it is behind.  
Example: 2009-05-02 T23:15 +01:00 (local time).

#### Annotation 4 (ANSI):

The ANSI standard is limited to the representation of **time** for interchange among data systems only and it is not designed for (nor does it preclude) usage by humans as input to or output from data systems. The use of American National Standards is completely voluntary.

No separators are allowed between date and stroke of clock or between hour and minute, and minute and second, but the denotation by figures is the same as in the International Standard. When a decimal fraction of a second is specified it shall be separated from the second by a decimal point (ISO prefers comma as the decimal sign).

The standard document is "Representation of Time for Information Interchange" with denotation ANSI INCITS 310-1998 (Reaffirmed 2003).

Example: 39 minutes and 25.6 seconds past 7 o'clock in the afternoon of the fourth day of July in the year 1776 is denoted as "17760704193925.6".

## **DENOTATION OF TIME PERIOD**

*Time period* means the time between two points of time on the same time scale.

### **The guiding rules:**

To denote a given day is a way of specifying a period of time of 24 hours. ISO 8601 denotes several other ways to express period of time, for instance:

- by denoting those two points of time that indicate the beginning and the end of the time period concerned.

Examples:

2009-05-02T23:15/2010-02-03T13:00

2009-05-02T08:15/10:30 (within the same day)

- by denoting a period of time from a given day to another given day.

Examples:

2009-05-02/31 (= 2009-05-02T00:00/2009-05-31T24:00)

2009-05/10 (= 2009-05-01T00:00/2009-10-31T24:00)

2009/2010 (= 2009-01-01T00:00/2010-12-31T24:00), i.e. two years

- The character **solidus** [/] shall be used to separate the two points of time, intended to indicate a specific time period.

#### Annotation 5:

If the actual stroke of the clock is not indicated, the period of time is reckoned to begin at 00:00 o'clock on the first day and end at 24:00 o'clock on the last day of the period concerned.

#### Annotation 6 (ANSI):

ANSI does not have a standard for the above.

## **NUMBERING OF "COMMERCIAL" WEEKS**

### **The guiding rules:**

- A week number should always stand for a period of time of *seven* days.
- For the purpose of week numbering, the first day of a week should be *Monday*.
- Week number one is the first week containing *four days* or more of the new year. (Week number 53 takes place with an interval of five to six years).
- The letter **W** shall be used as a week designator preceding the ordinal number of a calendar week within the year.

Examples:

Week number one year 2009 (i.e. 2008-12-29/2009-01-04), may can be written as 2009-W01.

Week number 53 year 2009 (i.e. 2009-12-28/2010-01-03), may can be written as 2009-W53.

#### Annotation 7:

Week numbers are rarely used outside Scandinavia and Germany.

#### Annotation 8:

The first day of the "traditional" week is *Sunday* and has been for several thousand years.

The week day names are in many languages based on fact that the Sunday is the first day of the week. This is the case in for instance the Hebrew, Arabic, German, Portuguese, Greek, Finish and the east European languages (including Russian).

Annotation 9 (ANSI):

ANSI does not have a standard for numbering the weeks of a year.

**CONCLUSION**

Any period of time or any point of time can be effectively and universally specified by using the ISO 8601 standard.

**For further details:**

- ISO – International Organization for Standardization ([www.iso.ch](http://www.iso.ch))
- SIS – Swedish Standards Institute ([www.sis.se](http://www.sis.se))
- CEN – European Committee for Standardization ([www.cenorm.be](http://www.cenorm.be))
- ANSI – American National Standard Institute ([www.ansi.org](http://www.ansi.org))

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