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AMENDMENT 1
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Information technology — Document description and processing languages — Office Open XML File Formats —

Part 1:
Fundamentals and Markup Language Reference

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Technologies de l'information — Description des documents et langages de traitement — Formats de fichier "Office Open XML" — Partie 1: Principes essentiels et référence de langage de balisage

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Reference number
ISO/IEC 29500-1:2011/Amd.1:2012(E)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75% of the national bodies casting a vote.

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

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Amendment 1 to ISO/IEC 29500-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 34, *Document description and processing languages*.

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Introduction

ISO/IEC 29500-1 incorporates several features designed to allow the use of ISO 8601 lexical date formats for spreadsheet cell values. Typically, standards will profile ISO 8601 to explain the subset of formats and entities covered (see, for example, SQL or XML) but this was not done in ISO/IEC 29500-1. Subsequently, several issues exist with those features, primarily:

1. No guidance is provided on representations covered. ISO 8601 covers many aspects in addition to straightforward date/time representations, and ISO/IEC 29500-1 gives no guidance as to which of those is permitted in spreadsheet cells.
2. No guidance is given on date/time precision or restrictions on range.
3. ISO/IEC 29500-1 states that all dates and times are in UTC, but does not describe how to treat non-UTC or local dates. This makes time zone treatment implementation-defined, and does not reflect the expectation of users.
4. The leap-year bug is not removed from the Strict variant of ISO/IEC 29500-1. This Strict variant retains a date base that erroneously treats 1900 as a leap year.

This amendment addresses the issues identified above by making the following changes:

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1. Representations from ISO 8601 are limited in ISO/IEC 29500 to include only date, time, and dateTime, with specific lexical formats defined. [Issues #1, 2]
2. The dateCompatibility attribute (used to determine whether 1900 is treated erroneously as a leap year) has been removed.) [Issue #4]

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3. Dates and times in SpreadsheetML cell values and formulas are specified in local time, with no UTC or UTC-offset designation permitted. [Issue #3]
4. The range of possible dates in SpreadsheetML cell values and formulas is changed from years [-9999, 9999] to years [0001, 9999]. [Issue #2]
5. The term *date system* is now used consistently to describe epochs, and the term *serial date-times* is now used to describe numeric values in SpreadsheetML cell values and formulas that are used to specify dates and/or times. [editorial change for consistency]
6. The 1904 date base was renamed *1904 backward-compatibility* when compared to ECMA-376, edition 1; this has been reverted to *1904*, as there is no known reason as to why the 1904 date base should be seen as a legacy construct. [clean-up change]

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Notational conventions

The title of each change is the complete reference to the clause or subclause being modified. In all cases, the title begins with the clause or subclause number, the clause or subclause name, and the page number. In those cases containing changes to a particular row of a table, the value in that row's first column is appended to the title. As the lines in each XML schema subclause are numbered starting at 1 and going to the end of a schema, modifications to schemas also contain the numbers of the lines being modified.

A change can contain any one or more of the following kinds of edits:

1. Addition of text: New text is displayed in blue and is underlined, as demonstrated here.
2. Deletion of text: ~~Deleted text is displayed in red and is struck-through, as demonstrated here.~~
3. Change of format of text: Text whose format (but not its content) has changed is displayed in green and is double-underlined, as demonstrated here.

Some changes involve edits to large paragraphs, tables, and/or XML fragments. In such cases, the changes contain only as much unchanged content as is necessary to establish the correct context of each change. Unchanged content that is not necessary to establish the correct context of a change is represented by an ellipsis (…).

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Within a change, intent that cannot be represented visually as an edit is written as an instruction in italic and delimited by curly brackets; for example: *{In paragraph 2, item 4, and in paragraph 4, make the numbers in the text "17–23" hyperlinked forward references to Clauses 17 and 23.}*

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Except for whole clauses or annexes that are identified as being informative, informative text that is contained within normative text is indicated in the following ways:

1. [*Example:* code fragment, possibly with some narrative … *end example*]
2. [*Note:* narrative … *end note*]
3. [*Rationale:* narrative … *end rationale*]
4. [*Guidance*: narrative … *end guidance*]

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Part 1:
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1. §18.2.27, "workbook (Workbook)", p. 1740

…

[*Example*:

…

```
  <workbookPr dateCompatibility="false" vbName="ThisWorkbook"
defaultThemeVersion="123820"/>
```

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…

end example]

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2. §18.2.28, "workbookPr (Workbook Properties)", p. 1742

…

[*Example*:

```
  <workbookPr dateCompatibility="false" showObjects="none"
  saveExternalLinkValues="0"
    defaultThemeVersion="123820"/>
```

end example]

3. §18.2.28, "workbookPr (Workbook Properties)", p. 1744, attribute various

…

date1904 (Date 1904)	Value that indicates whether to use a 1900 or 1904 date ~~base~~ system when converting ~~serial value~~serial date-times in the workbook to dates. ~~[*Note*: If the dateCompatibility attribute is 0 or false, this attribute is ignored. *end note*]~~ A value of 1 or `true` indicates the workbook uses the 1904 ~~backward compatibility~~ date system.

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	A value of `0` or `false` indicates the workbook uses ~~a date system based in~~the 1900 date system~~, as specified by the value of the dateCompatibility attribute~~. (See §18.17.4.1 for the definition of the date ~~bases~~systems.) The default value for this attribute is false. The possible values for this attribute are defined by the W3C XML Schema boolean datatype.
~~dateCompatibility (Date Compatibility)~~	~~Specifies whether the date base should be treated as a compatibility date base or should support the full ISO 8601 date range.~~ ~~A value of 1 or true indicates that the date system in use is either the 1900 backward compatibility date base or the 1904 backward compatibility date base, as specified by the value of the date1904 attribute.~~ ~~A value of 0 or false indicates that the date system is the 1900 date base, based on the ISO 8601 date range.~~ ~~(See §18.17.4.1 for the definition of the date bases.)~~ ~~The default value for this attribute is true.~~ ~~The possible values for this attribute are defined by the W3C XML Schema boolean datatype.~~

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4. §18.3.1.96, “v (Cell Value)”, pp. 1889–1890

…

[*Example*: In this example, cell B4 contains the number "360"~~ and~~, cell C4 contains the ~~UTC~~ local date and time 22 November 1976, 08:30, and cell C5 contains the 1900 date system serial date-time for the date-time in cell C4.

```
<c, “r="B4">
  <v>360</v>
</c>
<c r="C4" t="d">
  <v>1976-11-22T08:30~~Z~~</v>
</c>

<c r="C5">
  <f>C4</f>
   <v>28086.3541666667</v>
</c>
```

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end example]

5. §18.8.31, "numFmts (Number Formats)", p. 1986

…

See §18.17.4.1 for details on possible date ~~bases~~systems.

6. §18.17.4, "Dates and Times", p. 2300

~~Each unique instant~~Dates and times in cells in SpreadsheetML ~~time is~~ are stored as ~~an ISO 8601-formatted~~ strings, ~~which is made up of a date component, a time component, and a timezone component~~using the ISO 8601 lexical formats defined below.

The earliest date permitted is 0001-01-01, 00:00. The latest date permitted is 9999-12-31, 23:59:59.999. The time midnight shall be expressed always with hour component 0 and not with hour component 24. Leap seconds are not permitted – the maximum number of seconds expressed in a minute shall be 60.

Values with only a date component shall be expressed using the Complete, Extended Format Calendar Date representation, as defined in ISO 8601, §B.1.1 and §B2.1.

[*Example*: The date 5 October 1975 is expressed in SpreadsheetML as

1975-10-05

end example]

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Values with only a time-of-day component shall be expressed using the Complete, Extended Format Time Of Day representation, as defined in ISO 8601, §B.1.2 and §B2.2. The decimal separator shall be a full stop (period), and fractional seconds shall be expressed with no more than three decimal places.

[*Example*: The time-of-day 08:30 can be expressed in the following ways within SpreadsheetML:

08:30
08:30:00
08:30:00.000
end example]

Values with both date and time-of-day components shall be expressed using the Complete, Extended Format Calendar Date and Time Of Day representation, as defined in ISO 8601, §B.1.3 and §B2.3. For the time component, only seconds may use a decimal separator, the decimal separator shall be a full stop (period) and fractional seconds shall be expressed with no more than three decimal places.

[*Example*: The date 22 November 1976 at local time 08:30 can be expressed in the following ways within SpreadsheetML:

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1976-11-22T08:30
1976-11-22T08:30:00
1976-11-22T08:30:00.000

The date 15 October 1582—the day the Gregorian calendar went into effect for some countries—can be expressed in the following ways:

1582-10-15
1582-10-15T00:00
1582-10-15T00:00:00
1582-10-15T00:00:00.000

end example]

[*Note:* SpreadsheetML relates all dates to the proleptic Gregorian calendar of ISO 8601, treating time periods extending into the past and into the distant future as if the Gregorian calendar is in effect for all of those days. January 1 is always the first day of each year, ignoring historical changes to the period of the calendar year. The gaps and shifts introduced as part of calendar reforms and for introduction of leap seconds are ignored under the proleptic Gregorian calendar system. *end note*]

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~~Numerous functions take dates and/or times as arguments. Functions that care only about the date shall ignore any time information that is provided. Functions that care only about the time shall ignore any date information that is provided.~~

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~~[*Example*: The date 22 November 1976 at exactly 08:30 Pacific Standard Time (+08:00 UTC) could be represented in the following (non-exhaustive list of) ways within SpreadsheetML:~~

~~1976-11-22T08:30:00,000+08:00~~
~~1976-11-22T16:30Z~~
~~*end example*]~~

Wherever a calculation in a formula is specified to apply to number values and a date or time is provided, the effect shall be the same as if the date and/or time value is converted to the corresponding serial date-time. Wherever a calculation in a formula is specified to apply to or to deliver a date and/or time value, and a number value is supplied, the number value is interpreted as a serial date-time for the date and/or time. The relationships between serial date-times and dates and times are specified in §18.17.4.1, §18.17.4.2, and §18.17.4.3.

~~For compatibility with existing spreadsheet applications, a consuming application should allow certain numeric serial values to be interpreted as dates and times for display or for use in calculations. These values should behave as defined in §18.17.4.1, §18.17.4.2, and §18.17.4.3.~~

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7. §18.17.4.1, "Date Conversion for ~~Serial Values~~Serial Date-Times", pp. 2300–2302

~~All date values stored in cells within a SpreadsheetML file are stored in the ISO 8601 format.~~

~~For compatibility, a SpreadsheetML application can interpret serial number values in cells or in formulas as dates. This subclause describes how serial number values can be converted to date values depending on the compatibility mode.~~

~~A date that can be interpreted as a numeric value is a *serial value*~~A serial date-time is a number that represents a date and time. This ~~is made up of a~~ signed value is in units of days relative to the base date for the selected date system. ~~integer date component and an unsigned fractional time component. Going forward in time, the date component of a serial value~~Serial date-times increase~~s~~ by 1 ~~each day~~into each successive day and decrease by 1 into each preceding day. Fractional portions of serial date-times represent fractions of a single day. [*Example*: When using the 1900 date system, which has a base date of 30th December 1899, a serial date-time of 1.5 represents midday on the 31st December 1899 (serial date-time day 1), or 1899-12-31T12:00. A serial date-time of -4.25 represents 6 pm on the 25th December 1899, or 1899-12-25T18:00. *end example*] The base dates and the related serial date-times represent local date and time. ~~A serial value represents a UTC date and time, and, as such, has no timezone information.~~

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~~Three~~Two different bases are~~*can be*~~ used for converting dates ~~into~~to and from ~~serial values~~serial date-times:

- In the *1900 date ~~base~~ system*, the lower limit is January 1st, ~~9999~~0001 00:00:00, which has a ~~serial value~~serial date-time of -693593~~4346018~~. The upper limit is December 31st, 9999, 23:59:59.999, which has a ~~serial value~~serial date-time of 2,958,465.9999884. The base date for this ~~date base~~ system is 00:00:00 on December 30th, 1899, which has a ~~serial value~~serial date-time of 0.
- ~~In the *1900 backward compatibility date-base system*, the lower limit is January 1, 1900, 00:00:00, which has serial value 1. The upper limit is December 31, 9999, 23:59:59, which has serial value 2,958,465.9999884. The base date for this date base system is December 31, 1899, which has a serial value of 0.~~
- In the *1904 ~~backward compatibility~~ date~~-base~~ system*, the lower limit is January 1st, ~~1904~~0001, 00:00:00, which has a ~~serial value~~serial date-time of ~~0~~ -695055. The upper limit is December 31st, 9999, 23:59:59.999, which has a ~~serial value~~serial date-time of 2,957,003.9999884. The base date for this ~~date base~~ system is 00:00:00 on January 1st, 1904, which has a ~~serial value~~serial date-time of 0.

A ~~serial value~~serial date-time outside ~~of~~ the temporal range for ~~its date base~~ the selected date system is invalid~~ill-formed~~.

~~[*Note*: The 1900 date-base system is the preferred system to be used by applications when converting serial values to dates. The use of the 1900 backward compatibility or 1904 backward compatibility date-base system should be avoided. *end note*]~~

The date~~-base~~ system is specified ~~recorded in the Workbook part's XML~~ by the ~~presence or absence of the dateCompatibility and~~ value of the date1904 attribute~~s~~ of the workbookPr element. [*Example*:

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