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Edition 1.0 2017-11

TECHNICAL SPECIFICATION

Solar thermal electric plants – Part 1-3: General – Data format for meteorological data sets

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SOLAR THERMAL ELECTRIC PLANTS –

Part 1-3: General – Data format for meteorological data sets

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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62862-1-3, which is a Technical Specification, has been prepared by IEC technical committee 117: Solar thermal electric plants.

The text of this Technical Specification is based on the following documents:

Draft TS	Report on voting
117/68/DTS	117/78/RVDTS

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62862 series, published under the general title *Solar thermal electric plants*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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SOLAR THERMAL ELECTRIC PLANTS –

Part 1-3: General – Data format for meteorological data sets

1 Scope

The goal of this document on data format is to reduce efforts for data exchange and to avoid errors caused by misunderstandings due to the application of various different and at times unclear formats. To achieve this goal, the proposed format has the following properties:

- suitability for common operation systems;
- suitability for satellite/model-derived data;
- suitability for measured data;
- suitability for combined data sets;
- suitability for typical meteorological years and forecasted data.

2 Normative references

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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.

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ISO 8601, *Data elements and interchange formats – Information interchange – Representation of dates and times*

ANSI INCITS 4-1986 (R2007), *American National Standard for Information Systems – Coded Character Sets – 7-Bit American National Standard Code for Information Interchange (7-Bit ASCII)*

3 Terms and definitions

No terms and definitions are listed in this document.

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

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

4 Format description

The data format has been inspired by the thesaurus on solar irradiance proposed at EnvironInfo 2007.

After a header with information about the data, a data section follows with the meteorological data. The data section starts after the "#begindata" header field (see Table 1), where the first line contains the name or acronym of the parameters. The order of the columns is the same as the order defined on the "channel" description (Table 7). After the data section, the last line of the file contains "#enddata".

The thesaurus is usually implemented in an XML-file format. Many applications in solar energy tend to use a simpler ASCII data format with values separated by spaces or semicolons ';', each line standing for one point in time. The proposed data format tries to combine both, as the data is stored in a simple ASCII format line by line. But it includes a header which contains all information of the thesaurus. The data can be very easily converted into an appropriate XML-file to be exchanged via standard web protocols.

Other sources which were used are the depri format which is used in some wind energy environments (http://depri.org) and the climate and forecasting metadata conventions. For the available options for delimiters, see Table 1, "#delimiter".

The fieldnames from Tables 1 to 8 are separated from the value of the parameter by a space.

5 General conventions

5.1 Character set

The format shall be based on the standard ASCII character set as defined in ANSI INCITS 4-1986 (R2007). Using only the first 127 characters will ease exchange of data between different operating systems. The field "#characterset" is mandatory as a second line of the file to ease interpretation of the remaining text fields.

5.2 New line

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New lines are set by ASCII character 10 (line feed as in UNIX[1]). Also acceptable is the combination "Carriage return + line feed" with ASCII characters 13 and 10 (DOS/Windows[2] new line). When transferring data between DOS/Windows and UNIX type systems, care should be taken of the different conventions for new lines on each of the systems.

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For the available options, see Table 1, "#endofline".

5.3 Time-stamps, integration and averaging

Time stamps follow ISO 8601 YYYY-MM-DDTHH:MM:SS.ssss with leading zeros. Time stamps for temporally averaged data shall refer to the end of the integration period, as it is the convention in meteorology. Instantaneous values can also be described by the data format (see parameter "#time.averaging" in Table 3).

Integration and averaging always refer to the complete time interval. This is especially important at sunrise and sunset, and it should also include the time frame when the sun is still or already below the horizon. Limiting such intervals only to the time when the sun is above the horizon is not allowed.

The only exception is the sun elevation or sun zenith angle. During the sun rise or sunset, these values should be calculated in a way that allows calculating the DNI from direct horizontal irradiance using the averaged angles.

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1 UNIX is the trade name of a product supplied by The Open Group. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

2 DOS and Windows are the trade names of products supplied by Microsoft Corporation. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the products named. Equivalent products may be used if they can be shown to lead to the same results.

6 Meteorology file format

Table 1 – General header fields

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Field name	Data type	Unit	Complexity level	mandatory/ optional	Example(s)	Description
#MET_IEC.v1.0 headerlines: *number_of_headerlines*	String		1	m	#MET_IEC.v1.0 headerlines:57	Indicates that this is a meteorological data file of the IEC document. It gives the version number. The last field is the number of header lines in the field until the data begins (line number of the line "#begindata"). Header name and number of header lines have to be written in one line.
#characterset	String		1	m	#characterset 850	This is a mandatory second line of the file.
					#characterset ISO/IEC-8859-1	Defines which extended character set has been used for ASCII characters above 127. It can be an MS-DOS or Windows code-page indicated by a three- or four-digit number. Or reference is made to ISO/IEC 8859 (all parts). In this case, it should read ISO/IEC-8859-1, for example Latin-1, the western European version.
#delimiter	String		1	m	#delimiter space tab	Delimiter between different columns in the data section. Options are "space", ";", ",", or "tab". A combination of different delimiters is not allowed.
#endofline	String		1	m	#endofline \n	The ASCII character indicates that a new line starts. Options are "\n" or "\n\r".
#title	String		1	o	#title Plataforma Solar	Title of the time series.
#history.*timestamp*	String		1	o	#history.2016-02-09T12:30 initial research	The #history field describes the evolution of the data set, and by whom it has been processed after the original creation. "#history" fields should be numbered to ensure that the order of processing can be evaluated. Each processing step should be documented by additional "#history" fields.
						If a modification is described in several lines, the order of the lines can be kept by marginally increasing the timestamp.
#comment	String		1	o	#comment this is a general comment	General comments

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Field name	Data type	Unit	Complexity level	mandatory/ optional	Example(s)	Description
#datasource	String		1	m	#datasource measured	Indicator of which type of data is in the file: "measured", "modelled", "synthetic", "mixed", "satellite", "NWP". "measured" or "modelled" data refer to a real time series. "synthetic" means an artificial data set with no real time reference. Examples are typical meteorological data sets or data from algorithms that generate data sets. "mixed" indicates that the file contains data from several categories, for example measured and modelled data. "forecast" indicates that the data is forecasted data.
#status_update begindateenddate text	String		1	o	#status_update 2015-01-01T12:45 2015-03-02T09:00 Failure of sensor 1.	Describes status updates within the data set, for example sensor failures, cleaning events, external influences, etc. Timestamps follow ISO 8601.
#begindata time "sign of second column" "sign of third column" ...	String		1	m	#begindata time ghi dni dhi noo	Beginning of the data section. The order of the columns is defined by writing the names of the signs contained in the columns after "#begindata" in the next line in the same order as the columns. All signs are separated by the defined delimiter from each other. The first column from the left of the data section shall be "time". If "begin_time" and/or "end_time" and/or "time_orig" are also given, these columns shall appear on the right of "time" and on the left of all other columns.
#enddata			1	m		End of the data section. Last line of the data file.
#user_defined_fields	String		2	o	#user_defined_fields yes	Options are "yes" and "no". No: Only field names from Tables 2 to 8 are used. Yes: Additional user field names are used (e.g. variables defined by the user that are not included in Table 8).
#user_defined_fields_reference	String		2	o	#user_defined_fields_reference www.example.com/mesor_specific_extensions.pdf	Gives a reference of where a description of the extension can be found. Can be on the internet or local environment.

Table 2 – IPR header fields

Field name	Data type	Unit	Complexity level	mandatory/ optional	Example	Description
#IPR. source.name	String		1	o	#IPR.source.name ExampleName	Name of the source providing the data.
#IPR. source.URL	String		1	o	#IPR. source.URL www.example.com	URL of the source.
#IPR.copyrightText	String		1	o	#IPR.copyrightTextcopyright Creative Commons License	Copyright information.
#IPR.contact	String		1	o	#IPR.contact	Contact for copyright issues.

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Table 3 – Location fields

Field name	Data type	Unit	Complexity level	mandatory/ optional	Example	Description
#location.latitudeDegrN	Float	degreeNorth	1	m	#location. latitudeDegrN 48,3	Latitude in degree: North positive, South negative.
#location.longitudeDegrE	String	decimal degree	1	m	#location. longitudeDegrE 8,3	Longitude in degree: East positive, West Negative.
#location.elevationMAMSL	Float	meter	1	m	#location.elevation 100	Elevation in metres above mean sea level.