

TECHNICAL REPORT



Climatic field data including validation

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CLIMATIC FIELD DATA INCLUDING VALIDATION

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IEC/TR 62130, which is a technical report, has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
104/572/DTR	104/577/RVC

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

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

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CLIMATIC FIELD DATA INCLUDING VALIDATION

1 Scope

IEC/TR 62130, which is a technical report, provides traceable recommendations from validated field data for updating IEC 60721-2-1.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60721-1:1982, *Classification of environmental conditions – Part 1: Environmental parameters and their severities*

IEC 60721-2-1:1982, *Classification of environmental conditions – Part 2-1: Environmental conditions appearing in nature – Temperature and humidity*
Amendment 1:1987

3 Current IEC 60721-2-1 standard dealing with temperature and humidity

IEC 60721-2-1:1982 and its Amendment 1 (1987) give maps of climatic types with the following parameters:

- mean value of the annual extreme daily mean values of temperature, humidity and highest temperature with $RH < 95 \%$;
- mean value of the annual extreme values of temperature, humidity and highest temperature with $RH \geq 95 \%$;
- absolute extreme values of temperature, humidity and highest temperature with $RH \geq 95 \%$.

Values of parameters and maps of statistical open-air climates in the geographical areas of the world are given in Tables 1 to 3, and in Figures 1 and 2, respectively.

Table 1 – Types of climate by extreme daily mean values from the current standard

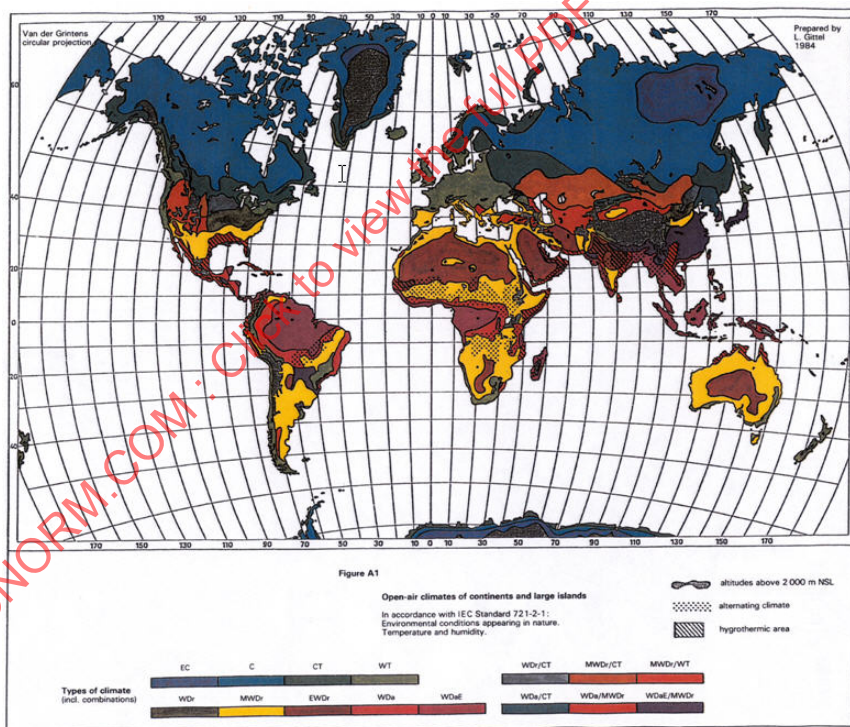
Type of climate	Mean value of the annual extreme daily mean values of temperature and humidity			
	Low temperature	High temperature	Highest temperature with RH ≥ 95 %	Highest absolute humidity
	°C	°C	°C	g × m ⁻³
Extremely cold (except Central Antarctic)	–55	+26	+18	14
Cold	–45	+25	+13	12
Cold temperate	–29	+29	+18	15
Warm temperate	–15	+30	+20	17
Warm dry	–10	+35	+23	20
Mild warm dry	0	+35	+24	22
Extremely warm dry	+8	+43	+26	24
Warm damp	+12	+35	+28	27
Warm damp, equable	+17	+33	+31	30

Table 2 – Types of climate by annual extreme values from the current standard

Type of climate	Mean value of the annual extreme values of temperature and humidity			
	Low temperature	High temperature	Highest temperature with RH ≥ 95 %	Highest absolute humidity
	°C	°C	°C	g × m ⁻³
Extremely cold (except Central Antarctic)	–65	+32	+20	17
Cold	–50	+32	+20	18
Cold temperate	–33	+34	+23	20
Warm temperate	–20	+35	+25	22
Warm dry	–20	+40	+27	24
Mild warm dry	–5	+40	+27	25
Extremely warm dry	+3	+55	+28	27
Warm damp	+5	+40	+31	30
Warm damp, equable	+13	+35	+33	36

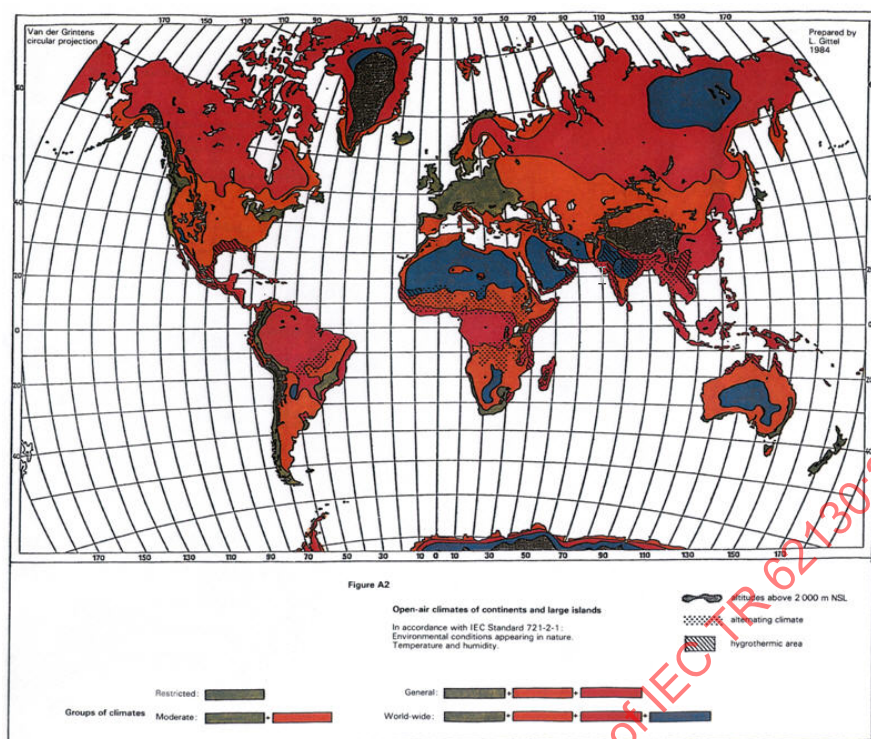
Table 3 – Types of climate by absolute extreme value from the current standard

Type of climate	Absolute extreme values of temperature and humidity			
	Low temperature	High temperature	Highest temperature with RH ≥ 95 %	Highest absolute humidity
	°C	°C	°C	g × m ⁻³
Extremely cold (except Central Antarctic)	−75	+40	+24	20
Cold	−60	+40	+27	22
Cold temperate	−45	+40	+28	25
Warm temperate	−30	+40	+28	25
Warm dry	−30	+45	+30	27
Mild warm dry	−15	+45	+31	30
Extremely warm dry	−10	+60	+31	30
Warm damp	0	+45	+35	36
Warm damp, equable	+4	+40	+37	40



IEC 1696/12

Figure 1 – Current map showing types of climate and their combinations



IEC 1697/12

Figure 2 – Current map showing the groups of climates

4 Task 1

The purpose of task 1 is to collect field data and to collate the validated data into a form suitable for comparison with IEC 60721-2-1.

The field data was collected from two independent main sources. The data was organized, arranged and analysed using a spreadsheet (Figure 3 and attachment). Annex A shows the graphical data based on the data in Annex B. The validation process is described in details in Clauses 5 and 6.

City or Location	Proposal	Type according to the map by M.Kottek et al	Mean value of the annual extreme daily mean values of temperature and humidity			Mean value of the annual extreme values of temperature and humidity			Absolute extreme value of temperature and humidity			Years on record	Expert CD, 1997
			Low temperature (°C)	High temperature (°C)	Highest absolute humidity	Low temperature (°C)	High temperature (°C)	Highest absolute humidity	Low temperature (°C)	High temperature (°C)	Highest absolute humidity		
			Low temperature (°C)	High temperature (°C)	Highest absolute humidity	Low temperature (°C)	High temperature (°C)	Highest absolute humidity	Low temperature (°C)	High temperature (°C)	Highest absolute humidity		
Akureyri, IL	very low	polar	-11	19	13	-17	23	14	-19	27	21	1973-1992	Expert CD, 1997
Jan Mayen, No	very low	polar	-14	11	8	-19	12	8	-26	18	11	1973-1992	Expert CD, 1997
Godthab, GL	very low	polar	-14	14	9	-21	18	10	-28	21	13	1973-1992	Expert CD, 1997
Eureka, CN	very low	polar	-35	1	5	-50	15	7	-53	19	9	1973-1992	Expert CD, 1997
Mould Bay, airport, CN	very low	polar	-34	2	5	-47	13	8	-53	19	11	1973-1992	Expert CD, 1997
Resolute airport, CN	very low	polar	-32	2	7	-45	13	9	-51	16	25	1973-1992	Expert CD, 1997
Sondre Stromfjord	very low	polar	-26	15	8	-40	21	9	-46	22	11	1973-1992	Expert CD, 1997
Forbisher, CN	very low	polar	-26	10	8	-42	23	10	-45	25	32	1973-1992	Expert CD, 1997
Thule, CN	very low	polar	-26	8	6	-39	15	7	-44	20	9	1973-1992	Expert CD, 1997
Fort Reliance, CN	very low	polar	-27	16	10	-45	28	14	-52	33	21	1973-1992	Expert CD, 1997
Harbin, China	Low	snow	-14	24	14	-33	33	23	-37	37	29	1973-1992	Expert CD, 1997
Nome, AK, US	very low	snow	-24	16	9	-37	25	12	-47	28	16	1973-1992	Expert CD, 1997
Chibougamau-Chapais, CN	very low	snow	-21	21	13	-40	31	17	-44	35	20	1973-1992	Expert CD, 1997
Mountain Home, ID, US	Intermediate	Snow	-13	31	13	-20	40	14	-30	43	23	1973-1992	Expert CD, 1997
Renner, KS, US	Intermediate	Snow	-12	33	14	-24	37	18	-32	40	21	1973-1992	Expert CD, 1997
Jinzhou, China	Intermediate	snow	-6	29	15	-19	34	27	-23	37	37	1973-1992	Expert CD, 1997
Yulin, China	Intermediate	snow	-10	27	13	-23	35	19	-29	39	26	1973-1992	Expert CD, 1997
Pyongyang, N.Korea	Intermediate	snow	-5	25	17	-20	33	24	-25	35	29	1973-1992	Expert CD, 1997
Beijing, China	Intermediate	snow	-1	28	16	-14	37	26	-17	39	29	1973-1992	Expert CD, 1997
Griffiss AFB, Rome, NY, US	Low	snow	-13	28	17	-27	34	22	-34	36	24	1973-1992	Expert CD, 1997
Winnipeg Intl Airport, CN	Low	snow	-18	25	13	-35	35	20	-38	38	24	1973-1992	Expert CD, 1997
Huron Regional, SD, US	Low	snow	-16	31	16	-31	39	22	-38	42	25	1973-1992	Expert CD, 1997
Andoya NORWAY	Intermediate	snow	-11	16	10	-16	23	12	-20	26	16	1973-1992	Expert CD, 1997
Oslo NORWAY	Intermediate	snow	-10	22	12	-19	30	15	-26	35	17	1973-1992	Expert CD, 1997
Shenyang, China	Low	snow	-8	26	15	-25	34	24	-28	38	27	1973-1992	Expert CD, 1997
Jyväskylä FINLAND	Low	snow	-18	19	12	-31	28	16	-38	34	23	1973-1992	Expert CD, 1997
Kajaani FINLAND	Low	snow	-21	18	11	-34	27	15	-41	30	19	1973-1992	Expert CD, 1997
	Low	Snow	-25	35	25	-45	45	25	-50	45	30		
Gibraltar	High	WT	9	31	17	5	36	18	-1	39	20	1973-1992	Expert CD, 1997
Palma Mallorca SPAIN	High	WT	2	30	19	-3	36	24	-6	40	29	1973-1992	Expert CD, 1997
Rabat, Morocco	High	WT	13	23		5	38		0	48		1973-1992	Expert CD, 1997
Naples ITALY	High	WT	3	30	19	-2	36	25	-5	40	32	1973-1992	Expert CD, 1997
Posadas airport, AG	High	WT	6	37	25	1	39	27	-2	41	36	1973-1992	Expert CD, 1997
Buenos Aires, AG	High	WT	1	33	21	-3	37	24	-4	40	29	1973-1992	Expert CD, 1997
Shanghai, China	High	WT	3	31	22	-6	37	28	-9	39	30	1973-1992	Expert CD, 1997
Fukuoka, Japan	High	WT	4	29	20	-4	35	25	-7	38	29	1973-1992	Expert CD, 1997
Palermo ITALY	High	WT	10	33	21	5	37	26	2	43	34	1973-1992	Expert CD, 1997
Athens GREECE	High	WT	6	30	17	0	37	21	-3	41	26	1973-1992	Expert CD, 1997
Osaka (Itoami), Japan	High	WT	4	28	19	-4	36	24	-7	38	27	1973-1992	Expert CD, 1997
Tokyo, Japan	High	WT	5	28	19	-3	34	25	-5	37	27	1973-1992	Expert CD, 1997

IEC 1698/12

Figure 3 – Screenshot from data analysis spreadsheet

5 Task 2

5.1 General

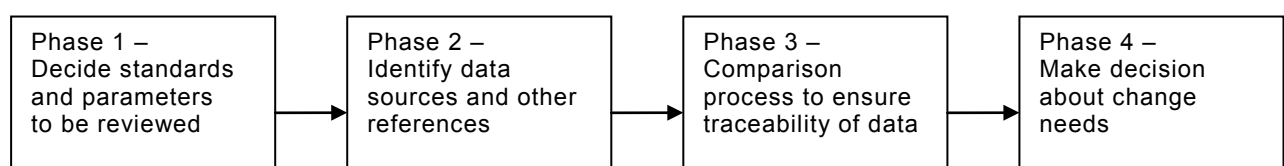
The purpose of task 2 is to ensure traceability of the comparison process.

5.2 Description of the comparison process

The high level process for updating IEC 60721-2 standards [1]¹ is given in Figure 4. The process has four main phases. The traceability between measured field data and values given in the standard can be achieved by following this process. Detailed actions that were carried out in each phase are given in Table 4. To ensure full traceability, it is crucial that all process phases are documented and that the sources used can be found in the future.

In Phase 1, it is decided what standards will be reviewed and possibly updated. In Phase 2, data sources are identified and data is collected with certain attributes. Analysis of data and comparison to current values in the particular standard takes place in Phase 3. The data comparison process is a key phase to ensure traceability of data and it can vary depending on which parameters are in question. This phase is described in detail in Clause 6. The output of the process (Phase 4) helps the maintenance team decide how a standard should be updated and/or modified. The decision can also be a proposal to leave the parameters in the standard as they are.

¹ References in square brackets refer to the Bibliography.



IEC 1699/12

Figure 4 – High level comparison process to ensure traceability of data**Table 4 – Process phases and actions in the each phase**

Process phase	Actions
Phase 1. Decide what standard and what parameters will be reviewed	Decide what standard will be reviewed Decide what parameters will be reviewed Document decisions
Phase 2. Identify data sources	Identify data and other input sources of parameters Identify the name of data source organization (universities, meteorological offices or corresponding organization) Ensure that data sources are independent from each other i.e. no same data Identify date and period of data collection Identify the location of measurement set-up Document the uncertainty of data Document all of the above attributes
Phase 3. Make comparison	Arrange data in a format so that it can be compared to data given in the standard Make comparison, evaluate whether there is a need to make changes Analyze impact of possible change Document the comparison process
Phase 4. Make decision	Make decision about proposal for possible changes Make decision whether changes are needed Document decisions with rationale Deliver decision to relevant maintenance team

5.3 Traceability of temperature and humidity parameters by using the main process

5.3.1 General

This subclause describes each process phase and the actions taken in each phase.

5.3.2 Process phase 1 – Decide what standard and what parameters to review

Temperature and humidity parameters in IEC 60721-2-1 to be reviewed. The decision can be found in the IEC TC 104 and WG14 meeting minutes from June 2006.

5.3.3 Process phase 2 – Identify data sources and other references

Two data sources [2], [3] were identified and used as input sources in the TC104 WG14 working group meeting in Stockholm, June 2006 (see the unconfirmed meeting minutes [4]). References [5] and [6] give maps of climatic classification which were identified after the Stockholm meeting:

a) MIL210 ExPERT database (Version 1.0 July 1997) [2]

Data is provided by ACFFF/SYS AFRL, 88 WS. Daily temperature and humidity data were collected during the years 1973 – 1992. Measurement locations are mainly airports and major cities worldwide. The total amount of sites/stations is 289. The uncertainty of measurement is not documented in the CD. The data source contained no data about the highest temperature with RH > 95 %.

b) The Hutchinson World Weather Guide by E.A. Pearce and C.G. Smith (ISBN 1-85986-342-6, 2000, Helicon Publishing Ltd) [3]

Data in this book was provided by the British Meteorological Office. The length of the measured period differs from location to location. The measurement span in years varies from 2 years up to 105 (Toronto, Ontario in Canada). The years express time when measurements were published. Detailed locations and uncertainty of measurement are not documented in the book. The data source contained no data about highest temperature with RH > 95 %.

c) M. Kottek, J. Grieser, C. Beck, B. Rudolf, and F. Rubel, 2006: World Map of the Köppen-Geiger climate classification updated. *Meteorol. Z.*, **15**, 259-263 [5]

Data sets (1951 – 2000) are from the Climatic Research Unit (CRU) of the University of East Anglia and from the Global Precipitation Climatology Centre (GPCC) at the German Weather Service. Detailed data analysis methods are given in the publication. Reference. 3 contained no data about highest temperature with RH > 95 %. IEC recognizes the work in the reference but has changed the description of "Snow" to "Cold", "Warm temperate" to "Temperate" and Equatorial" to "Tropical".

d) Christoph Beck, Jürgen Grieser, Markus Kottek, Franz Rubel and Bruno Rudolf, Characterizing Global Climate Change By Means Of Köppen Climate Classification, *Klimastatusbericht*, **2005**, 139-149 [6]

Data sets (1951 – 2000) are from the Climatic Research Unit (CRU) of the University of East Anglia and from the Global Precipitation Climatology Centre (GPCC) at the German Weather Service. Detailed data analysis methods are given in the publication including a more detailed climatic map. Reference [6] contained no data about highest temperature with RH > 95 %.

References [2] and [3] were used to compare temperature and humidity values. The data for these references are independent from each other. References [5] and [6] were used for comparison purposes and the map of the climatic classes.

5.3.4 Process phase 3 – Comparison process to ensure traceability of data

The process phase 3 is given in detail in Clause 6 "to describe acceptable data comparison processes"

5.3.5 Process phase 4 – Make decision about change needs

Four different change recommendations were identified regarding climatic types, definitions, values and maps. Recommendations with rationale are given in Clause 7.

6 Task 3

6.1 General

The purpose of task 3 is to describe acceptable data comparison processes.

The purpose of the data comparison process is to ensure the traceability of data. This process is one part of the main comparison process (Phase 3).

At the October 2006 meeting, WG14 discussed how collected data should be compared to the tables and how to update the map of world climatic types given in IEC 60721-2-1 and as shown in Annex A (see also Figures 1 and 2). In order to make comparison of data it was decided to first validate the map (Figure 1).

6.2 Process for analysing the map

The process for analysing the map was as follows:

- a) Making of a spreadsheet containing all temperature and humidity data points (location and/or city) from different sources.
- b) Finding of current IEC 60721-2-1 climate types from the map for each data point. Only main climatic types were used.
- c) Sorting of data points according to the current IEC 60721-2-1 type of climates
- d) Comparing values given in Tables 1 to 3 IEC 60721-2-1:1982 to each data points in the spreadsheet
- e) Finding of data points which don't fall under the particular climatic type
- f) Analysing of the existing map in IEC 60721-1. How many data points fall under each particular climatic type?

As a result of analysis work it was noticed that about 35 % of data points didn't fall under climatic types where they were supposed to be. Based on this finding and further discussion it was concluded that the map was not up-to-date and it could be used only as reference. Adding a disclaimer was discussed.

The current map in IEC 60721-2-1 contains 9 main climatic types and 6 different combinations of the main climatic types. It was discussed by WG14 that the map could be too difficult to use due to number of detailed types of climates. It was decided to have a map with better readability. The proposal includes five new main climatic types. At the October 2006 meeting the working group discussed names of new categories such as: Very low, Low, Intermediate, High and High humid. After the October 2006 meeting, references [5] and [6] were found and a new proposal was made by the convener to use same main categories as in references [5] and [6] for several beneficial reasons. These are given in 7.1.

The process for analysing climatic types, maps and temperature and humidity parameters was as follows:

- 1) Formation of five new climatic types by combining IEC 60721-2-1 types:

IEC 60721-2-1 types	Proposed new climatic types
Warm damp and Warm damp, Equable	Tropical
Mild warm dry, Extremely warm dry	Arid
Warm temperate and Warm dry	Temperate
Cold temperate	Cold
Extremely cold and cold	Polar
- 2) Add new data points and review these using the spreadsheet in order to find possible errors.
- 3) Arrange data points (measurement location) under the proposed climatic types from References [5] and [6] .
- 4) Analysis of temperature and humidity values for new climatic types. Analysis results for each climatic type are given in Annex A. Some values were rounded and adjusted to correspond better with the experimental data points (location /city).
- 5) Propose new climatic types and values for temperature and humidity (Clause 7).

6.3 Impact analysis

Keeping in mind the goals of WG14 and the results of the comparison process, it is evident that some parameters, values and maps in the standard should be updated based on the results found.

Main impacts of the update compared to the current standard are as follows:

- background, analysis process and sources of values would be known;
- easier to use due to reduced amount of main climatic types (one target of WG14 work);
- about 50 % temperature and humidity values are changing due to reduced amount of categories;
- wider ranges are needed;
- removal of one parameter due to traceability reasons (no data found);
- simple and detailed up-to-date maps correspond with temperature and humidity values.

7 Task 4 – To make traceable recommendations for updating IEC 60721-2-1

7.1 General

There are four different recommendations on how to update IEC 60721-2-1. Recommendations and reasons are given below.

7.2 Recommendation 1 – Naming of new climatic types

WG14 proposes to the maintenance team to combine and rename existing climatic types in IEC 60721-2-1 according to Table 5. Names of climatic types are based on references [5] and [6]. Justifications for a change proposal are as follows:

- to enable easier usage of standard due to reduced number of categories of main climatic types;
- to drive convergence “standardization” thinking by using the most widely used and well known published climatic types;
- to give readers, when needed, a possibility to for further details of climatic types by referring to the already published climatic types. This is especially needed when designing or acquiring products to the certain environments;
- to enable easier access to data behind the map by referring to the publications and web references.

Table 5 – Recommended climatic types

Recommendation for new classes	Current IEC 60721-2-1 classes when combined
Tropical	Warm damp and Warm damp, Equable
Arid	Mild warm dry and Extremely warm dry
Temperate	Warm temperate and Warm dry
Cold	Cold temperate
Polar	Extremely cold and Cold

7.3 Recommendation 2 – Definitions for new climatic types

Definitions for new climatic types are given in Table 6. Definitions were taken from reference [6].

Table 6 – Definitions for proposed climatic types (reference [6])

Climate type	Definition
Tropical	Tropical rain climates where the mean temperature of the coldest month exceeds +18,0 °C
Arid	Arid climates, rainfall less than 500 mm
Temperate	Temperate rain climates where the mean temperature of the coldest month is between –3,0 °C and +18,0 °C
Cold	Boreal forest and snow climates. Mean temperature of the warmest month exceeding 10,0 °C and a mean temperature of the coldest month below –3,0 °C
Polar	Cold snow climates. Mean temperature of the warmest month below 10,0 °C

7.4 Recommendation 3 – Values for new climatic types

Proposed new climatic categories and corresponding values are shown in Tables 7 to 9. Values are based on the data given in references [2] and [3]. Due to the traceability requirement of data, and no found data, it is proposed to remove “Highest temperature with RH ≥ 95 %” from this technical report. The reason for proposing this is the traceable requirements for data. All data sources which have been used in preparation of this technical report are now well known and adequate traceability is achieved. Also parameters can be updated more easily when new independent information is received.

Table 7 – Types of climate by extreme daily mean values

Type of climate	Mean value of the annual extreme daily mean values of temperature and humidity		
	Low temperature °C	High temperature °C	Highest absolute humidity g × m ⁻³
Tropical	10	40	30
Arid	0	45	25
Temperate	–15	40	25
Cold	–25	35	25
Polar	–40	25	15

Table 8 – Types of climate by annual extreme values

Type of climate	Mean value of the annual extreme values of temperature and humidity		
	Low temperature °C	High temperature °C	Highest absolute humidity g × m ⁻³
	°C	°C	G × m ⁻³
Tropical	5	45	35
Arid	–10	50	30
Temperate	–20	40	30
Cold	–45	45	25
Polar	–50	30	20

Table 9 – Types of climate by absolute extreme value

Type of climate	Absolute extreme values of temperature and humidity		
	Low temperature °C	High temperature °C	Highest absolute humidity g × m ⁻³
Tropical	0	50	40
Arid	–20	55	35
Temperate	–30	50	35
Cold	–50	45	30
Polar	–60	35	25

7.5 Recommendation 4 – Update of the map of climatic classes

There are three options on how to update climatic maps in IEC 60721-2-1:

- a) **Option 1** – Use the latest existing maps which are available in the scientific articles. IEC TC104/WG14 has permission from the authors to use the map such as that in Figure 5 in reference [5], on the condition that reference to the authors and journal is added to the standard². In this case, the maps and data in Tables 7 to 9 correspond directly to each other.
- b) **Option 2** – Draw a new map with 181 locations from the spreadsheet and using references [2] and [3]. Reason: the map would be easy to update by adding new locations (city, country). In this case, the map and recommended data in Tables 7 to 9 correspond with each other.
- c) **Option 3** – Keep the existing map and add a disclaimer that the map(s) can be used only for reference purposes. Correspondence of data and maps is about 65 %.

WG14 recommends the use of Option 1.

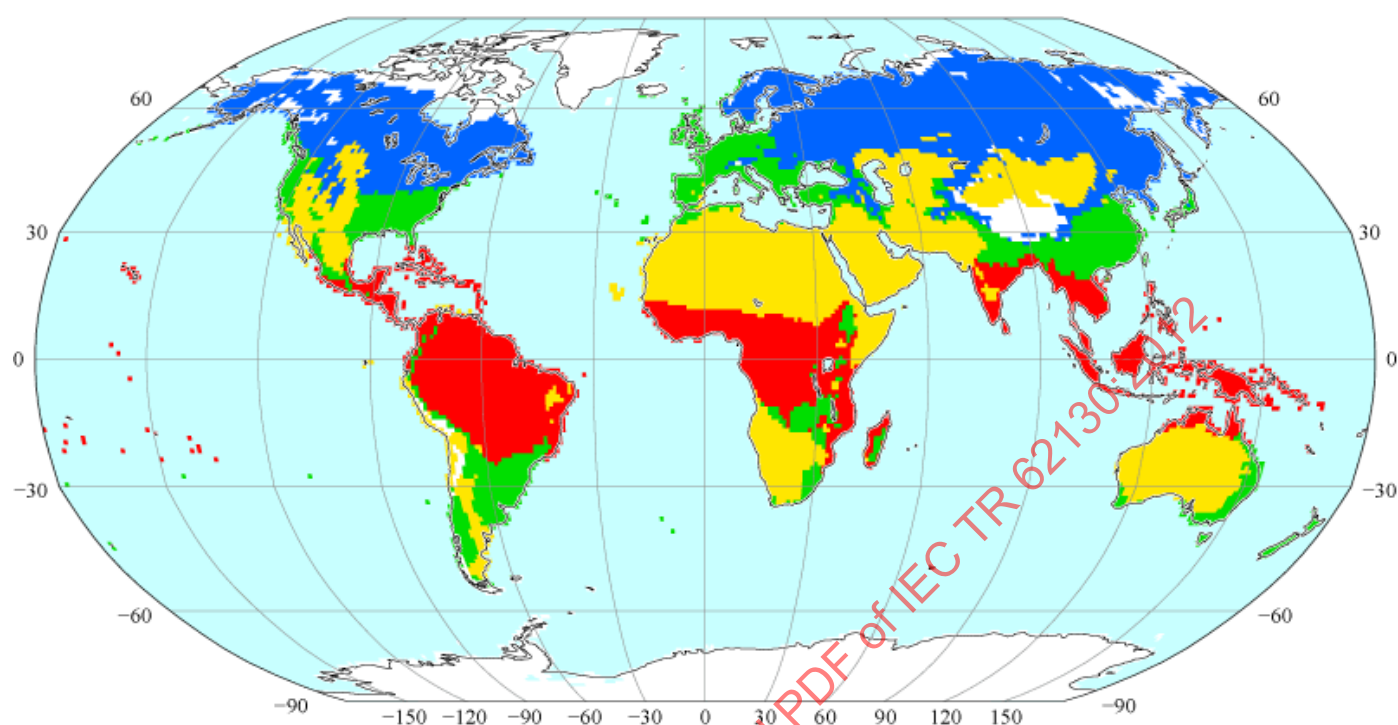
² Discussions with Kyösti Väkeväinen and Markus Kottek, Department of Natural Sciences, University of Veterinary Medicine Vienna Veterinärplatz 1 A-1210, University of Vienna, 11th December 2006 and 5th January 2007.

Ann 5100



Main climate zones []

Source: World map of the Köppen–Geiger climate classification updated with CRU TS 2.1 temperature and VASCLimO v1.1 precipitation data



NOTE WG14 received a new version of the map in February 2007 (see footnote 2).

IEC 1700/12

Figure 5 – Main climatic types from reference [5]

Table 10 – Cross reference table between different climatic types

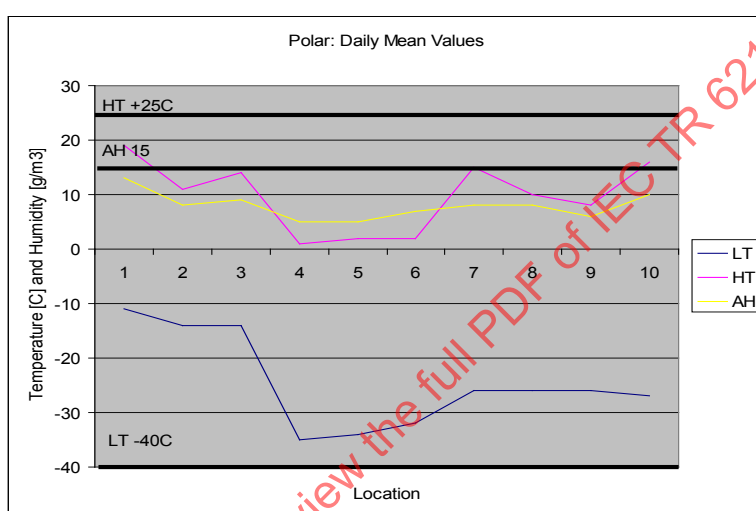
New proposed climatic types	Earlier proposed climatic types	Köppen-Geiger climate types	IEC 60721-2-1 types
Tropical	Equatorial	Equatorial	Warm damp and Warm damp, equable
Arid	Arid	Arid	Mild warm dry, Extremely warm dry
Temperate	Warm temperate	Warm temperate	Warm temperate and Warm dry
Cold	Cold	Snow	Cold Temperate
Polar	Polar	Polar	Extremely cold and cold

Annex A (informative)

Analysis of temperature and absolute humidity

Annex A shows, for each location from Annex B, high and low temperature and high absolute humidity. The figures are divided into each proposed climate type. In each figure, the proposed limits for high temperature (HT), low temperature (LT) and high absolute humidity (AH) are shown. The limits were chosen to find the limit that covers most locations.

Figures A.1, A.2 and A.3 describe temperature and absolute humidity for polar climatic type regions.



IEC 1701/12

Figure A.1 – Polar: Daily mean values



IEC 1702/12

Figure A.2 – Polar: Annual means

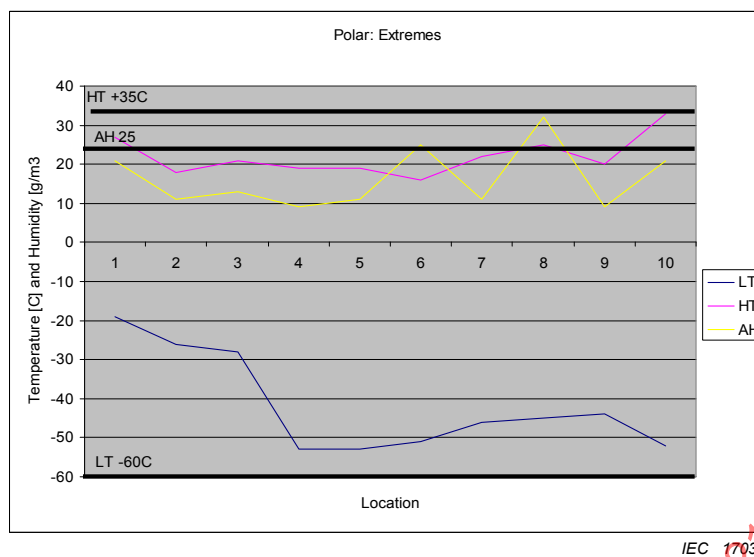


Figure A.3 – Polar – Extremes

Figures A.4, A.5 and A.6 describe temperature and absolute humidity for cold climatic type regions.

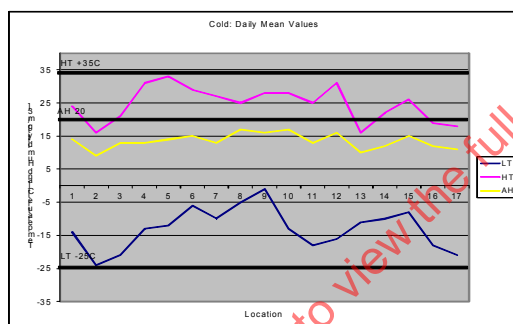


Figure A.4 – Cold: Daily mean values

IEC 1704/12

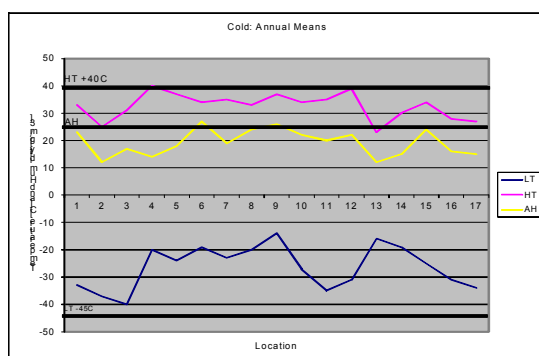


Figure A.5 – Cold: Annual means

IEC 1705/12

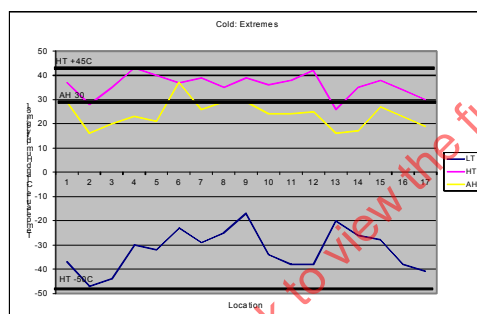
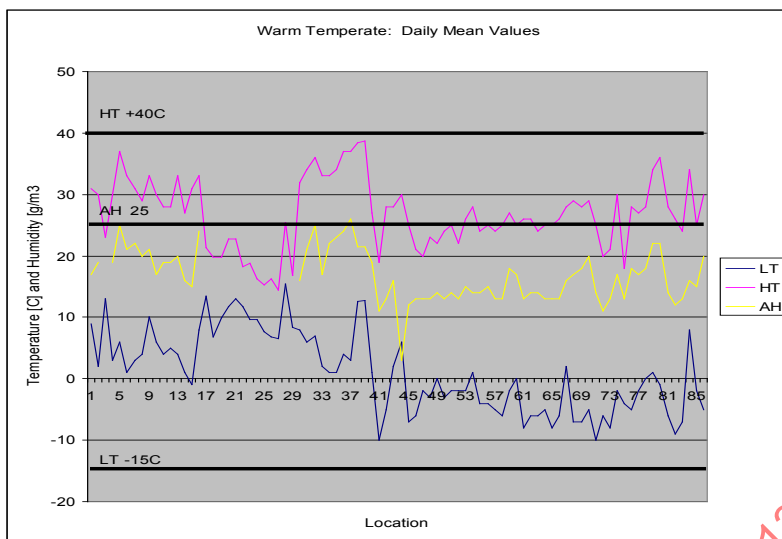


Figure A.6 – Cold: Extremes

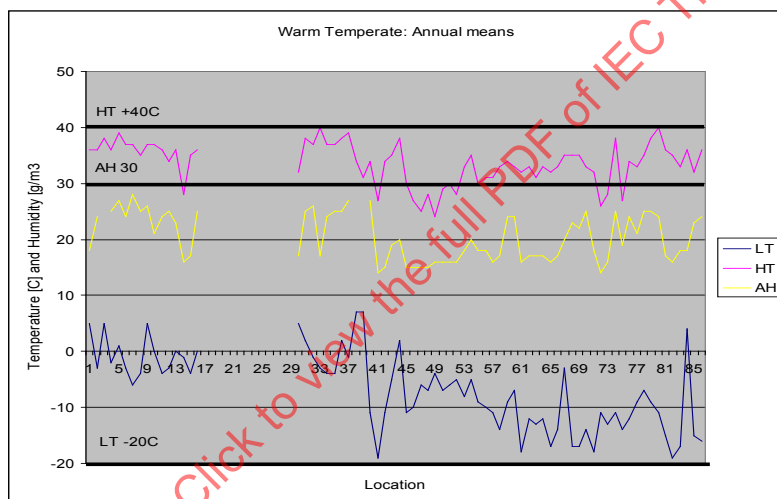
IEC 1706/12

Figures A.7, A.8 and A.9 describe temperature and absolute humidity for temperate climatic type regions



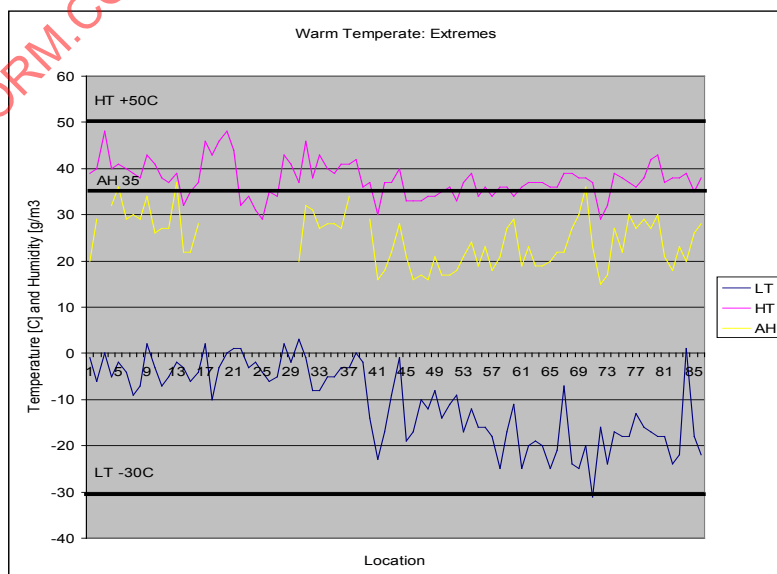
IEC 1707/12

Figure A.7 – Warm temperature: Daily mean values



IEC 1708/12

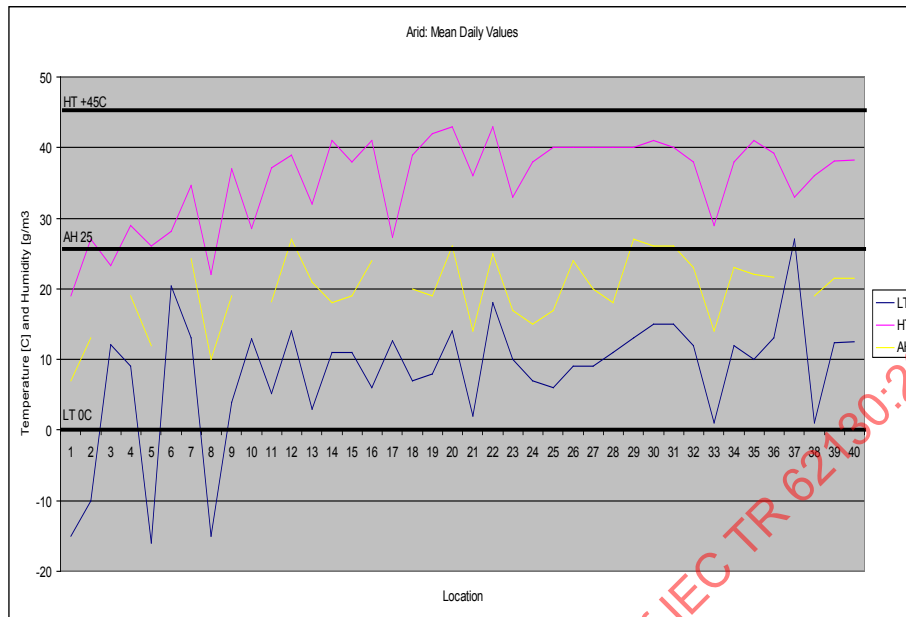
Figure A.8 – Warm temperature: Annual means



IEC 1709/12

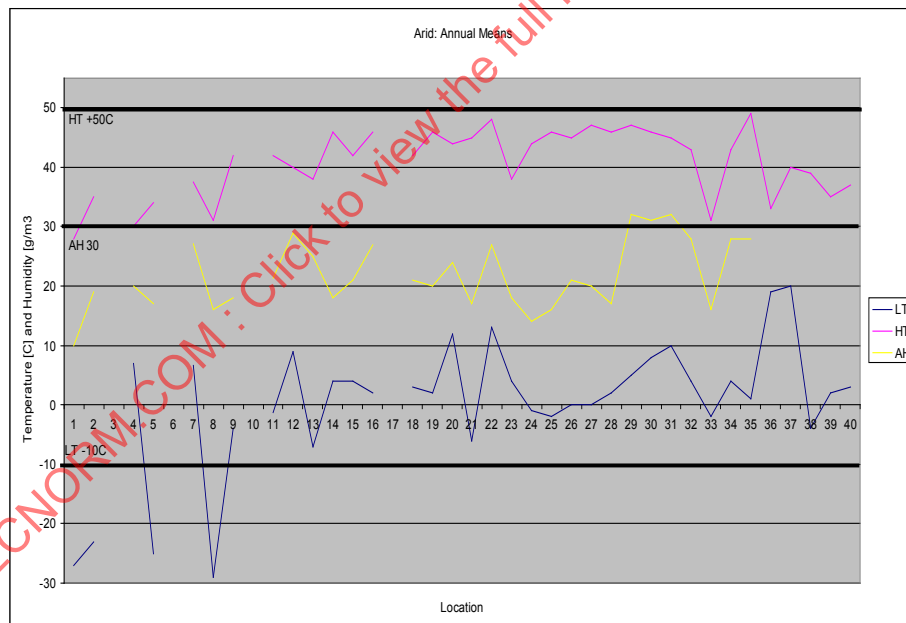
Figure A.9 – Warm temperature: Extremes

Figures A.10, A.11 and A.12 describe temperature and absolute humidity for arid climatic type regions.



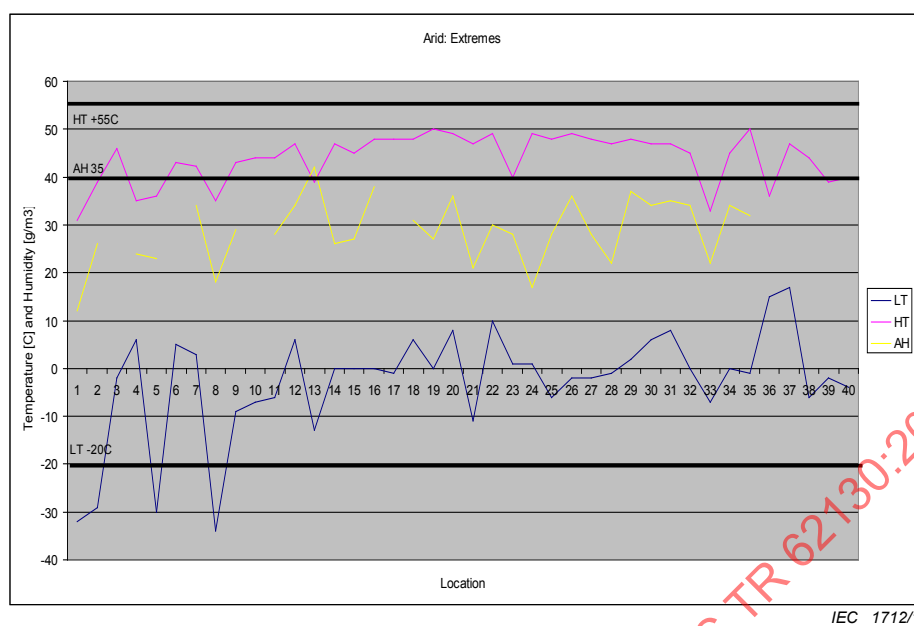
IEC 1710/12

Figure A.10 – Arid: Mean daily values



IEC 1711/12

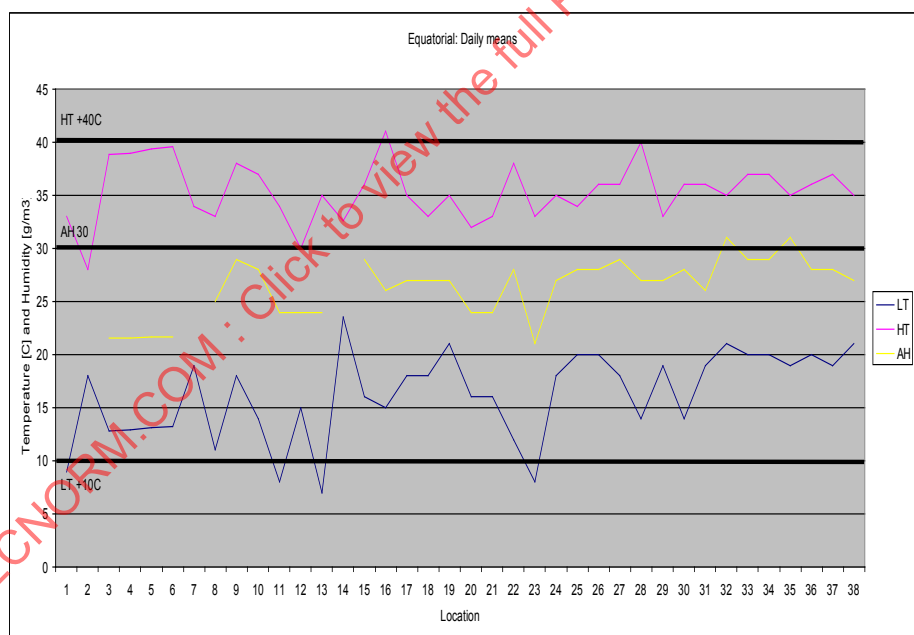
Figure A.11 – Arid: Annual means



IEC 1712/12

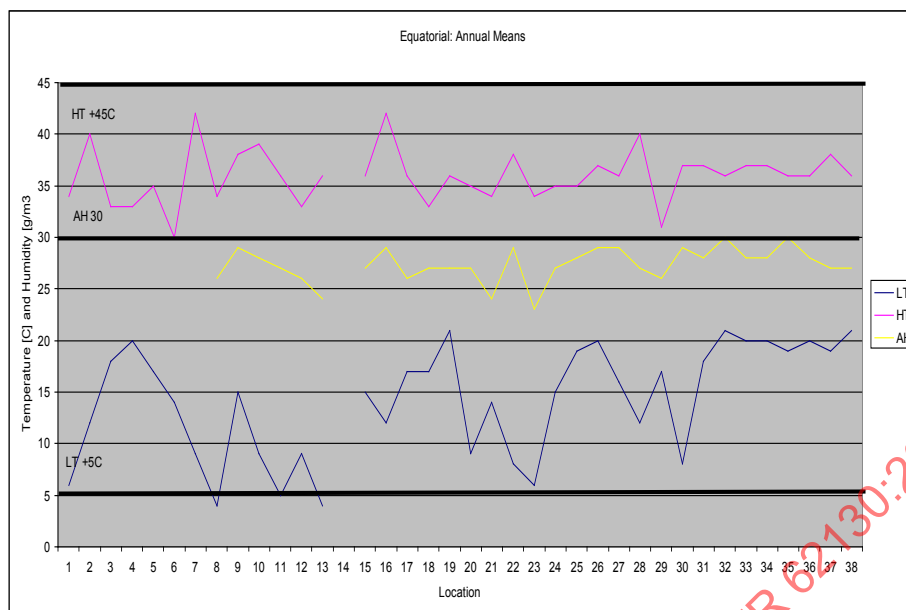
Figure A.12 – Arid: Extremes

Figures A.13, A.14 and A.15 describe temperature and absolute humidity for tropical climatic type regions.



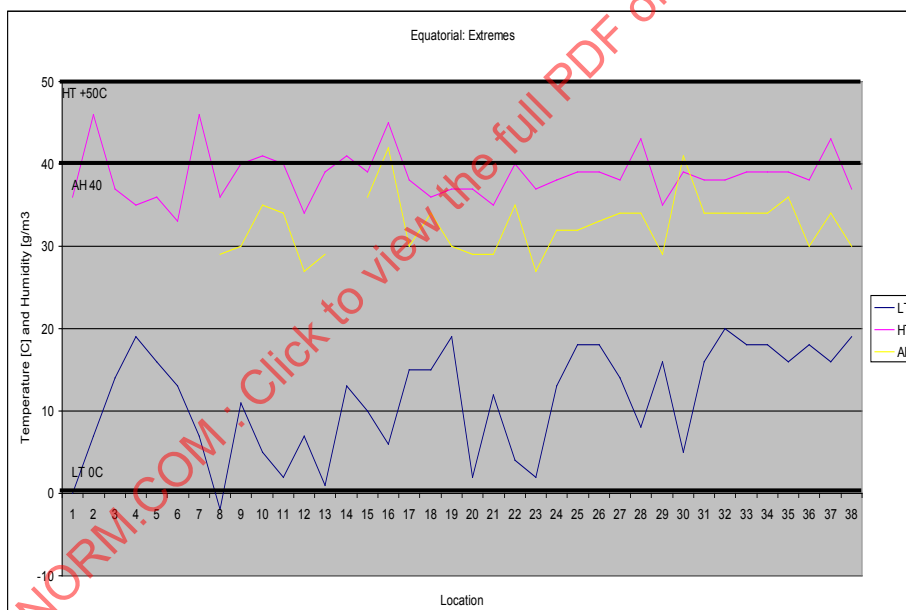
IEC 1713/12

Figure A.13 – Arid: Daily means



IEC 1714/12

Figure A.14 – Arid: Annual means



IEC 1715/12

Figure A.15 – Arid: Extremes

Annex B (informative)

Climatic data from various locations

The following tables provide data from different locations for polar, cold, temperate, arid and tropical climatic types from reference 1 and 2.

Table B.1 – Data for polar climatic type

City or Location	Climate type	Mean value of the annual extreme values of temperature and humidity				Mean value of the annual extreme values of temperature and humidity				Absolute extreme value of temperature and humidity				Years on record	
		Low temperature (°C)	High temperature (°C)	Lowest absolute humidity	Highest absolute humidity	Low temperature (°C)	High temperature (°C)	Lowest absolute humidity	Highest absolute humidity	Lowest temperature (°C)	High temperature (°C)	Lowest absolute humidity	Highest absolute humidity		
Akureyri, IL	polar	-11	19	13	8	-17	23	14	21	-19	27	21	21	1973-1992	Expert CD, 1997
Jan Mayen, No	polar	-14	11	8	9	-19	12	8	11	-26	18	11	11	1973-1992	Expert CD, 1997
Godthab, GL	polar	-14	14	9	9	-21	18	10	13	-28	21	13	13	1973-1992	Expert CD, 1997
Eureka, CN	polar	-35	1	5	5	-50	15	7	9	-53	19	9	9	1973-1992	Expert CD, 1997
Mould Bay, airport, CN	polar	-34	2	5	5	-47	13	8	11	-53	19	11	11	1973-1992	Expert CD, 1997
Resolute airport, CN	polar	-32	2	7	7	-45	13	9	16	-51	16	25	25	1973-1992	Expert CD, 1997
Sondre Stromford	polar	-26	15	8	8	-40	21	9	22	-46	22	11	11	1973-1992	Expert CD, 1997
Forbisher, CN	polar	-26	10	8	8	-42	23	10	25	-45	25	32	32	1973-1992	Expert CD, 1997
Thule, CN	polar	-26	8	6	6	-39	16	7	20	-44	20	9	9	1973-1992	Expert CD, 1997
Fort Reliance, CN	polar	-27	16	10	10	-45	28	14	33	-52	33	21	21	1973-1992	Expert CD, 1997
	Polar	-40	25	15	15	-50	30	20	35	-60	35	25	25		