INTERNATIONAL STANDARD

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Hygrothermal performance of buildings — Calculation and presentation of climatic data —

Part 1: Monthly means of single meteorological elements

Performance hygrothermique des bâtiments — Calcul et présentation des données climatiques —

Partie 1: Moyennes mensuelles des éléments météorologiques simples

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Foreword

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

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member 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 shall not be held responsible for identifying any or all such patent rights.

ISO 15927-1 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 2, *Calculation methods*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read "...this European Standard..." to mean "...this International Standard...".

ISO 15927 consists of the following parts, under the general title *Hygrothermal performance of buildings — Calculation and presentation of climatic data:*

— *Part 1: Monthly means of single meteorological elements*

— *Part 4: Data for assessing the annual energy demand for cooling and heating systems*

— *Part 5: Winter external design air temperatures and related data*

Further parts are in preparation.

Contents

Foreword

This document (EN ISO 15927-1:2003) has been prepared by Technical Committee CEN/TC 89, "*Thermal performance of buildings and building components*", the secretariat of which is held by SIS, in collaboration with Technical Committee ISO/TC 163, *"Thermal performance and energy use in the built environment"*, Subcommittee SC 2 "*Calculation methods"*.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2004, and conflicting national standards shall be withdrawn at the latest by April 2004.

This standard is one of a series of standards on calculation methods for the design and evaluation of the thermal and moisture performance of buildings. EN ISO 15927, *Hygrothermal performance of buildings – Calculation and presentation of climatic data,* consists of six parts:

Part 1: *Monthly means of single meteorological elements*;
Part 2: *Data for design cooling loads and risk of overheating*;
Part 3: *Calculation of a driving rain index for vertical surfaces from hourly wind and rain data*;
Part 4: *Data for assessing the annual energy for heating and cooling*;
Part 5: *Winter external design air temperatures and related wind data*;
Part 6: *Accumulated temperature differences for assessing energy use in space heating*.

Annexes A and B are informative.

This document includes a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies procedures for calculating and presenting the monthly means of those parameters of climatic data needed to assess some aspects of the thermal and moisture performance of buildings. Numerical values should be obtained from the meteorological service in the relevant country.

This European Standard covers the following single climate variables:

— air temperature;
— atmospheric humidity;
— wind speed;
— precipitation;
— solar radiation;
— longwave radiation.

Meteorological instrumentation and methods of observation are not covered; these are specified by the World Meteorological Organisation (WMO).

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

World Meteorological Organisation: *Guide to meteorological instruments and methods of observation.* 6th Edition WMO - No.8 1996.

3 Terms, definitions, symbols and units

3.1 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1.1
mixing ratio
ratio of the mass of water vapour to the mass of dry air with which the water vapour is associated

3.1.2
water vapour pressure
part of the total atmospheric pressure exerted by water vapour

3.1.3
saturated vapour pressure over water
vapour pressure of moist air in equilibrium with a plane liquid water surface

3.1.4
relative humidity
ratio of the vapour pressure of moist air to the vapour pressure it would have if it were saturated

3.1.5
reference wind speed
wind speed measured at a height of 10 m above ground level in open country without nearby obstacles

3.1.6
gust speed
greatest instantaneous wind speed observed during the period over which the mean is calculated

3.1.7
solar irradiance
radiation power per area generated by the reception of solar radiation on a plane of any tilt and orientation

The following special quantities can be distinguished according to the conditions of reception:

3.1.7.1
global solar irradiance
irradiance generated by reception of solar radiation from the full hemisphere

NOTE According to the following definitions it is equal to the reception of direct solar and diffuse solar radiation on a horizontal plane. In the case of tilted planes a portion of the ground reflected global solar radiation is also received.

3.1.7.2
direct solar irradiance
irradiance generated by the reception of solar radiation from a conical angle which surrounds concentrically the apparent solar disk

NOTE 1 Also referred to as "beam solar radiation".

NOTE 2 The horizontal component of the direct solar irradiance is a part of the global solar irradiance.

NOTE 3 Any component of the direct solar irradiance is generated nearly exclusively from unscattered solar radiation.

NOTE 4 The diameter of the apparent solar disk corresponds to about 0,5 degrees; for technical reasons the available radiometers receive the direct solar irradiance from solid angles around the solar disk which correspond mostly to field-of-view angles between 3° and 6°.

3.1.7.3
diffuse solar irradiance
irradiance generated by the reception of scattered solar radiation from the full sky hemisphere , with the exception of that solid angle which is used to measure the direct solar irradiance

NOTE 1 Practical measurement requires a sun following disk, which permanently shades the receiver of the radiometer with a ‘field of shade’ angle which equals the field of view angle used for measuring direct solar irradiance. This allows the global irradiance to be calculated as the sum of diffuse solar and the horizontal component of the direct solar irradiance.

NOTE 2 The use of a ring to shade the sun along its daily path instead of a disk requires an equation to correct for the corresponding losses of diffuse solar irradiance.

3.1.7.4
reflected solar irradiance
irradiance generated by reception of the rising reflected global radiation on a downward looking plane

NOTE 1 The ratio of reflected solar and global solar irradiance is called albedo.

NOTE 2 Part of the reflected global solar radiation is received on any tilted plane.

3.1.8
solar irradiation
radiant energy per area received from the sun on a plane of defined inclination and orientation during a given period of time

NOTE The same components as indicated in 3.1.7 for irradiance can be distinguished.

3.1.9
longwave (terrestrial) radiation
radiation with wavelength greater than 3 μm from surfaces at the ground and from the atmosphere

NOTE The exchange of longwave radiation occurs permanently between buildings, the ground and the atmosphere at temperatures between 240 K and 340 K.

3.1.10
thermometer screen
white painted, wooden, plastic, or aluminium louvered enclosure, which allows a free flow of air over thermometers while shielding them from solar radiation, longwave radiation and precipitation

3.2 Symbols and units

Symbol	Quantity	Unit
C_R	roughness coefficient	-
C_T	topography coefficient	-
D	wind direction from North	°
d_m	number of days in a month	-
d_y	number of days in a year	-
$G_{l,a}$	longwave irradiancefrom the atmosphere on a horizontal plane	°W/m^2
G_s	solar irradiance	W/m^2
$G_{s,b}$	direct (beam) solar irradiance	W/m^2
$G_{s,d}$	diffuse solar irradiance	W/m^2
$G_{s,g}$	global solar irradiance	W/m^2
$G_{s,r}$	reflected global solar irradiance	W·m^2
H	effective height of topographic feature	m
H_s	solar irradiation	MJ/m^2
h_m	number of hours in a month	-
K_R	terrain factor	-
L_d	actual length of downwind slope	m
L_e	effective length of upwind slope	m
L_u	actual length of upwind slope	m
R	rainfall total (or equivalent amount of melted solid precipitation)	mm
P	total atmospheric pressure	hPa
p	water vapour pressure	hPa
$p_{sat}\ (\theta)$	saturated vapour pressure over water at temperature θ	hPa
s	scale factor for topography coefficient	-
T	temperature	K
v	wind speed	m/s
$\hat{v}$	gust wind speed	m/s