# Weather data available for 122 European cities

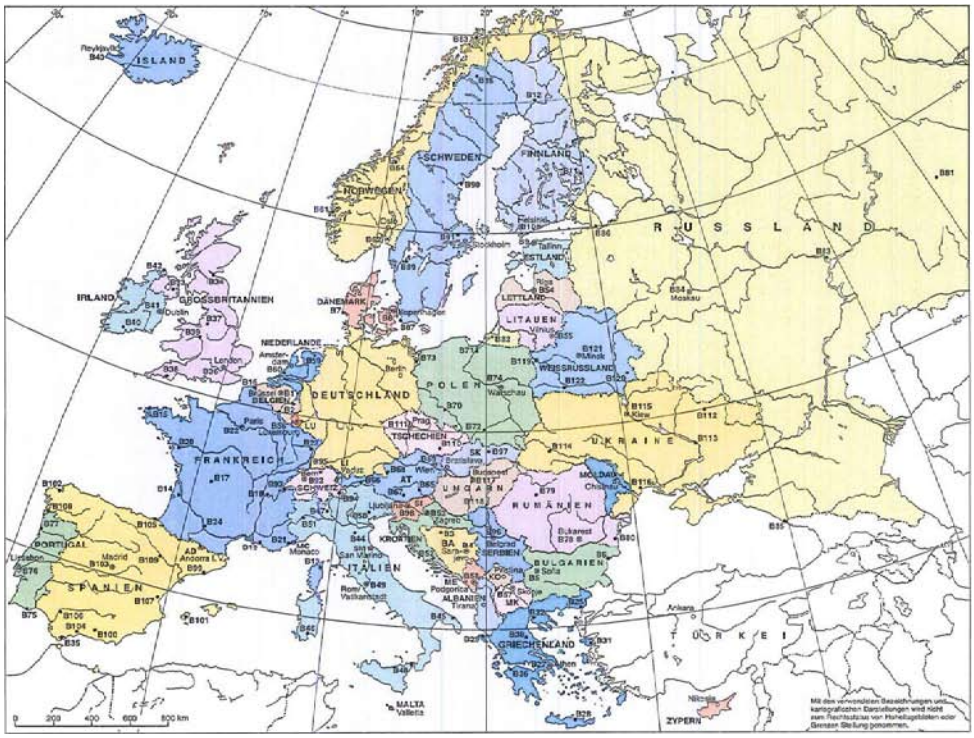
## Short explanation of content of VDI 4710 Part 4 by

CORNELIA BAUGIRDIS, JÜRGEN MASUCH, KARL-JOSEF ALBERS AND KLAUS HOLLENBACH

**Keywords:** climate date, weather data, outdoor temperature, outdoor humidity, wind

### Introduction

The basis for the VDI climate data for 122 European stations, described here by way of examples, was established by the German Institute for Standardization (DIN) who, in cooperation with the German Meteorological Service (DWD), published comprehensive statistics of meteorological data in the first, 1979 edition of DIN 4710 (covering only West Germany at the time) and in the new, 2003 edition, revised to include 15 climate zones in Germany as a whole.




European climate stations VDI 4710.4 (without Germany).

The climate data listed there are *t,x* correlations, one-day-variation curves of outdoor air temperature and humidity on fine, cloudy and overcast days, and radiation and wind data for calculating the energy demand of heating and air-conditioning systems.

The manner of preparing and representing the data in tables was adopted for the climate data published by the VDI.

Whereas the climate data published by the DIN were still determined on the basis of measured data from the latest completed climate normal period (1961–1990), the climate data published by the VDI are generally based on measured data from the years 1991–2005 so that recent changes in climate (climate change) are also taken into account.

The second meteorological half-period (2006–2020) is due to be analysed in 2021. It will then become immediately evident how the climate will have continued to change.

DIN 4710 is currently being revised, and will be a compilation of all presently available meteorological calculation data. Below, an overview is given of the pertinent activities by the VDI together with the DWD, part of which will again contribute to DIN 4710.

### VDI climate data for 20 non-European sites

With the 2008 edition of VDI 4710 Part 1, the VDI for the first time published a compilation of climate data for 20 non-European stations, mostly based on measured data from the years 1990–1999 the scope of the standard being similar to that of DIN 4710.

The selection of stations provides an overview of the diversity of climate zones from Alaska to Australia, and allows a quick and reliable statement to be made about the local meteorological situation.

Statements about the climate at sites remote from the stations can only be made with reservations. However,

the German Meteorological Service (DWD) points out that the global network of measurement stations of the World Meteorological Organization (WMO) supplies data for approximately 5.500 stations, which the DWD can evaluate in terms of, e. g., *t,x* correlations, then to be presented in analogy to DIN 4710.

## VDI climate data for 15 climate zones in Germany

Current discussions on climate change gave rise to the question to what extent the basis of data of DIN 4710 (1961–1990) was outdated.

In 2008, the VDI published VDI 4710 Part 3 based on measured data from the years 1991–2005 in order to provide a more up-to-date basis of data for the *t,x* correlations for 15 climate zones in Germany as published in DIN 4710.

## VDI climate data for 122 European sites

Following publication of VDI 4710 Part 3 pertaining to the German climate zones, the Federation of European Heating, Ventilation and Air-conditioning Associations.

(REHVA) suggested that the German procedure of data provision be extended to cover a larger number of European stations.

The results have now been published in the bilingual German-English draft standard VDI 4710 Part 4, made available through REHVA to all national associations for discussion.

This is not at all meant to curtail the competence of the national meteorological organizations. On the contrary, they are requested to have a critical look at the respective results made available for 122 European stations. However, similar evaluation of the data affords a comparability of results which is independent of national borders and national evaluation procedures.

Supplementing the comments the introduction to be given here will also point out some specifics that are relevant to this European standard.

A similar analysis of the 15-year period from 2006 to 2020 to be performed in approximately the year 2021 is envisioned to quickly reveal the continuing climate change through comparison of the new results with those found here (for 1991 to 2005).

## Comparison of basic evaluations for four example stations

Some basic evaluations, as compiled randomly in the table below, are quickly derived from the *t,x* correlations and are shown directly at the tables so that standard questions are already solved.

Basic evaluations for four European example stations:

| **Extreme temperatures for selection of air conditioning installations**<br>Risk 0.1%/a (about 8h/a) exceeding of the selected value | Reykjavik | Vienna | Yekateringburg | Seville |
|---|---|---|---|---|
| Winter temperature [°C] | −12 | −12 | −32 | +1 |
| Summer temperature [°C] | +18 | +33 | +31 | +42 |
| Summer enthalpy [kJ/kg d.a.] | 41 | 71 | 64 | 84 |
| **Energetic parameters** | | | | |
| Degree days ref. 19 deg C [Dd] | 5.141 | 3.317 | 6.084 | 476 |
| Humidification gram hours ref. 5g/kg dry air [gh/kg d.a.] | 8.921 | 5.261 | 15.498 | 377 |
| Dehumidification gram hours ref. 10g/kg dry air [gh/kg d.a.] | 2 | 2.523 | 1.023 | 2.852 |

## Conclusion

The random examples and their analysis are meant to illustrate how an overview of the meteorological impacts of a site can nowadays be gained from a unified representation, using modern tools. As a matter of course, only some aspects are described (outdoor air temperature, humidity, wind). However, using such tools, building services planners will be more confident in their statements than if they have to limit themselves to their own evaluations based on local, often incomplete, data.

Meanwhile, evaluations in terms of test reference years (TRY) are available for many sites, which also offer important assistance in analyses. Normally, however, only up to approx. 15 % of the data are measured data whereas the remainder has been calculated from measured data using statistical methods. A TRY is calculated such that the entire data record is true to averages. Therefore, the *t,x* correlations given here can be used to check the quality of a TRY by deriving a *t,x* correlation from the TRY and then comparing it to the correct correlation.

VDI 4710 Part 4 is submitted for discussion to REHVA, the Federation of European Heating, Ventilation and Air-Conditioning Associations. ■