



## Information sheet on 'wind speed'

### Beaufort wind speed and wind strength

When a wind blows, peak wind speeds (gusts) can occur that are significantly higher than the mean (average) wind speed. To classify this, two different 'wind speeds' were defined. The mean wind speed of the wind or storm is the wind speed that is averaged over a period of 10 minutes. The height of the mean wind speed will be referred to as wind strength and given in the unit Beaufort (Bft). To measure the wind strength, an anemometer is used and the sampled values are averaged over 10 min.

Example: Beaufort (Bft) 8, or simply wind strength 8, is referred to as 'gale, fresh gale' in meteorology and states that the wind speed averaged over 10 minutes is between 62 and 74 km/h. See also the information from the DWD (German Weather Service) at: <https://www.dwd.de/DE/service/lexikon/Functions/glossar.html?lv2=100310&lv3=100390> Don't overlook the word 'average' wind speed here.

A short-term maximum or peak wind speed is called gust speed. Often, only the (one) maximum gust speed that has occurred during a wind/storm event is given. Fig. 1 shows the difference between mean wind speed and gust speed.

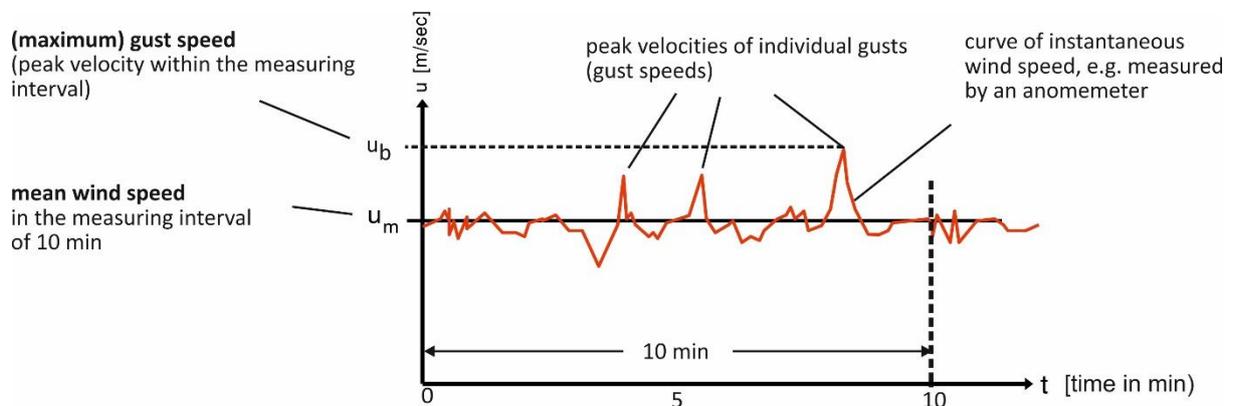


Fig. 1: To differentiate between mean wind speed (given in Beaufort) and gust speed

All wind speeds are usually based on a standard height of 10 m, which should be indicated in a wind expertise. Shall the wind be calculated in another height, conversion formulas must be used, see e.g. in Europe DIN EN 1991-1-4: 2010-12, Tables NA.B.2 and NA.B.4 (EUROCODE).

### **Gusts at wind strength X**

The maximum gust speed that occur during a wind/storm event depends on the type of the surrounding terrain and is 1.1-1.6 times higher than the mean wind speed (the mean wind speed in terrain category II - agricultural area - serves as a reference).

Example: Beaufort 8 corresponds to a 10 min mean wind speed of at least 62 km / h. The associated gust speeds, e.g. in suburban areas (gust factor approx. 1.5) are therefore at least 93 km/h.

### **Gusts of wind strength X or wind strength X in gusts**

It has (unfortunately) become common practice to specify gust speeds with e.g. 'gusts of wind strength 8' or 'wind strength 8 in gusts'. This information is actually incorrect, because as explained above, the Beaufort wind strength describes a 10-minute average wind speed, which logically excludes that with 'wind strength' a short-term gust speed (of 2-3 seconds duration) can be specified. If the information is given as 'gusts of wind strength 8' or 'wind strength 8 in gusts', then you have to know that the wind strength classification according to Beaufort is used as pure speed scale (without the background that this is actually a 10 min mean speed).

Example: Gusts of wind strength 8 are gusts with a gust speed of at least 62 km/h. (But these are not the gust speeds that belong to an average wind speed of at least 62 km/h, see above.)

The terms "gusts at wind strength X" and "gusts of wind strength X" are very often confused and, wrongly, no difference is made. The difference between "gusts at wind strength X" and "gusts of wind strength X" is for the assessment of wind damage of immense importance and, depending on the type of terrain, amounts up to 60% of the occurring wind speed. Since the wind force is proportional to the square of the wind speed, the difference in wind loads is up to 150% (!).

### **Wrong hurricane warnings**

The terms (mean wind speed, gust speed, gusts of wind strength X, wind strength X in gusts, etc.) must be understood and used exactly. Unfortunately, the terminology clutter is fueled very much by some unsuspecting radio and television weather forecasters. As an example it should be mentioned that the wind condition "hurricane" is announced in Germany more often per year because "the gust speeds are above 118 km / h". This is total nonsense, because for a hurricane it is not the gust speed, but the mean wind speed that have to be above 118 km / h. Hurricane is an event of the century and of course does not occur every year and certainly not several times a year. False hurricane warnings cost considerable sums of money, because in a real hurricane situation a lot of precautions and safety measures must be taken on buildings and infrastructure - for example, barring just one old church (because of the roof) costs several thousand euros. One should think about these effects and make those forecasters liable for their false and negligent hurricane warning.