# Turbulence Intensity and Peak Gust from Wind Data

Turbulence intensity from the mean and standard deviation of wind speed, the expected peak gust with a peak factor, the gust factor and the gust load ratio.

**Method:** Turbulence intensity and peak-factor gust estimate

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Mean wind speed (for example 10-minute average) | 10.000 | m/s |
| Standard deviation of wind speed | 1.6000 | m/s |
| Peak factor (about 3–3.5 for a 3-second gust in 10 minutes) | 3.2000 | |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Turbulence intensity σ/Ū | 16.000 | % |
| Peak gust speed | 15.120 | m/s |
| Gust factor U_g/Ū | 1.5120 | |
| Gust dynamic pressure ratio | 2.2861 | |

**Notes for this case**

• TI = σ_U/Ū; peak gust U_g = Ū + gσ_U. Typical TI is 6–10 % offshore, 10–15 % over open land and above 20 % over forests and in complex terrain; fatigue loads rise strongly with TI.

## Formula and method

$$TI = \frac{\sigma_U}{\bar{U}}, \quad U_g = \bar{U} + g\sigma_U, \quad G = 1 + gTI$$

### Variables

| | | |
|---|---|---|
| $\bar{U}$ | Mean wind speed (for example 10-minute average) | m/s |
| $\sigma_U$ | Standard deviation of wind speed | m/s |
| $g$ | Peak factor (about 3–3.5 for a 3-second gust in 10 minutes) | - |
| $TI$ | Turbulence intensity σ/Ū | - |
| $U_g$ | Peak gust speed | m/s |
| $G$ | Gust factor U_g/Ū | - |
| $G^2$ | Gust dynamic pressure ratio | - |

### Method and standards

Turbulence statistics.

### Assumptions and limits

- Stationary wind within the averaging period; Gaussian fluctuations.

### References

Turbulence intensity and peak-factor gust estimate

## Report details

| | |
|---|---|
| Report reference | FCC-YRY3-Q5TA (the same inputs always give the same reference) |
| Generated | 23 November 2026, 17:34 UTC |
| Calculator | Turbulence Intensity and Peak Gust from Wind Data |
| Method last reviewed | 17 November 2026 |
| Software release | FireCAD Calc, release of 22 November 2026 |
| Release checks | 3 reference cases of this calculator, computed independently, are checked on every release |

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

### This calculator online

https://calc.firecad.com/environmental/wind-power/wind-turbulence-intensity-gust

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.