# Explosive limits and hygiene limits for substances in the air

| Substance name | Explosive limits % vol. | | 10% LEL | | | 20% LEL | | | 50% LEL | | | Conversion to ppm | conversion to mg/m³ | PEL | NPK-P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DMV | HMV | % vol. | ppm | mg/m3 | % vol. | ppm | mg/m3 | % vol. | ppm | mg/m3 | to mg/m3 | to ppm | mg/m3 | mg/m3 |
| **ammonia** | 15 | 28 | 1.5 | 15,000 | 9225 | 3 | 30,000 | 1854 | 7.5 | 75,000 | 46,125 | 0.615 | 1.63 | 14 | 36 |
| **cyclohexanone** | 0.9 | 3.5 | 0.09 | 900 | 3600 | 0.18 | 1800 | 7200 | 0.45 | 4500 | 1800 | 4 | 0.25 | 40 | 80 |
| **trichloroethylene** | 7.9 | 41 | 0.8 | 8000 | 42,000 | 1.6 | 16,000 | 84,200 | 4 | 40,000 | 210,400 | 5.26 | 0.19 | 250 | 750 |
| **EDC** | 5.6 | 16 | 0.56 | 5600 | 22232 | 1.12 | 11,200 | 44464 | 2.8 | 28,000 | 111,160 | 3.97 | 0.26 | 10 | 20 |
| **ethylene** | 3 | 32 | 0.3 | 3000 | 3450 | 0.6 | 6000 | 6900 | 1.5 | 15,000 | 17,250 | 1.15 | 0.87 | | |
| **Chlorine** | | | | | | | | | | | | 2.786 | 0.34 | 0.5 | 1.5 |
| **hydrogen chloride** | | | | | | | | | | | | 1.47 | 0.68 | 8 | 15 |
| **propylene** | 2.2 | 10.3 | 0.22 | 2200 | 3784 | 0.44 | 4400 | 7568 | 1.1 | 11,000 | 18,920 | 1.72 | 0.58 | | |
| **hydrogen** | 4 | 75 | 0.4 | 4000 | 328 | 0.8 | 8000 | 656 | 2 | 20,000 | 1640 | 0.082 | 12.2 | | |
| **VCM** | 3.6 | 33 | 0.36 | 3600 | 9216 | 0.72 | 7200 | 18432 | 1.8 | 18,000 | 46,080 | 2.56 | 0.38 | 7.5 | 15 |
| **sulfur dioxide** | | | | | | | | | | | | 2.62 | 0.38 | 5 | 10 |
| **natural gas** | 4.4 | 15 | 0.44 | 4400 | 2860 | 0.88 | 8800 | 5720 | 2.2 | 22,000 | 14300 | 0.65 | 1.54 | | |

**DMV** - lower explosive limit

**HMV** - upper explosion limit

**PEL -** Permissible exposure limits are time-weighted averages of concentrations of gases, vapors, and aerosols in the workplace air to which, according to current knowledge, employees may be exposed during an eight-hour workday without causing damage to their health or endangering their ability to work and perform their duties, even if exposed throughout their entire working life. Fluctuations in the concentration of a chemical substance from the permissible exposure limit to the maximum permissible concentration must be compensated for during the shift by a decrease in concentration so that the permissible exposure limit is not exceeded. Permissible exposure limits apply provided that the employee is engaged in physical work during which their average lung ventilation does not exceed 20 liters per minute and the duration of work does not exceed 8 hours.

**NPK-P** - The maximum permissible concentrations of chemical substances in the working environment are concentrations to which an employee must not be exposed at any time during a work shift. With regard to the possibilities of chemical analysis, when assessing the working atmosphere, the time-weighted average concentration of a given chemical substance over a maximum period of 10 minutes may be compared with the maximum permissible concentration of that chemical substance.

## Definition of hazardous areas

**Explosive atmosphere (see Annex 6 to this Directive)**

An area classified by explosion protection documentation into individual zones based on the frequency of occurrence of explosive atmospheres.

- Explosive atmosphere is present frequently, for long periods or continuously.
  - Zone 0 - explosive atmosphere (gas, vapor, mist)
  - Zone 20 - explosive atmosphere (dust)
- explosive atmosphere is likely to occur occasionally,
  - Zone 1 - explosive atmosphere (gas, vapor, mist)
  - Zone 21 - explosive atmosphere (dust)
- an explosive atmosphere is unlikely to occur (if it does, it will be exceptional and short-lived)
  - Zone 2 - explosive atmosphere (gas, vapor, mist)
  - Zone 22 – explosive atmosphere (dust)

The zones listed must be marked with an "Ex Zone" sign.

**Hazardous area in terms of increased risk to health at work**

A completely or partially enclosed space or space below ground level in which at least one of the following risks exists:

a) dangerous oxygen concentration,
b) accumulation of toxic, flammable, or explosive substances,
c) restricted entry or exit,
d) temperature above

60°C. This may include:

a) storage facilities for bulk, liquid, or gaseous materials,
b) production equipment (e.g., distillation columns, washing machines, large-diameter pipes, furnaces, boilers),
c) railway and road tankers,
d) industrial, rainwater, sewage, and water supply networks, sewage tanks, treatment plants, septic tanks, sewers,
e) underground shafts, cable ducts,
f) excavations, etc.