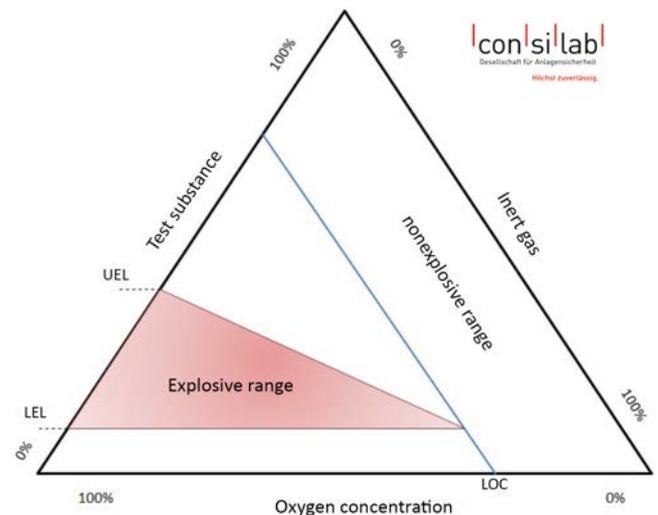




Determining the upper and lower explosion limit as well as the limiting oxygen concentration of gases and vapors

In plants where flammable liquids or gases are used, the presence of explosive atmospheres must be expected. These atmospheres can lead to an explosion if an ignition source is also present. Primary explosion protection – that is, prevention of the formation of an explosive gas/air or vapor/air mixture – can be employed as a possible safety concept.

Important parameters for assessing the presence of an explosive atmosphere are the lower and upper explosion limit (LEL/UEL) and the oxygen limiting oxygen concentration (LOC). These characteristics specify the range within which the mixture of gas and air or vapor and air is flammable (see figure at right).



The determination of these characteristics is described in DIN EN 1839 and is performed by consilab according to the tube method (process T) (see figure on the left). The test mixture used is adjusted using mass flow controllers and consists of the test substance/fuel, air and, when determining the limiting oxygen concentration, also of additional inert gas (e.g. N₂, water vapor).

The test mixture is fed into a mixing chamber for homogenization. The fuel mixture is then fed into the cylinder-shaped explosion chamber and ignited with an ignition spark. Ignition occurs when a flame discharge from the ignition source is detected visually. To test the limiting oxygen concentration, an additional oxygen probe is installed at the exit of the explosion chamber, which allows oxygen to be continuously ascertained.

The above-mentioned parameters are temperature-dependent and generally become more critical as the temperature increases. To enable a determination under real-world conditions, the entire test plant is placed in a circulating air drying cabinet, which can be used to achieve a controlled temperature up to an ambient 200 °C. Low-volatile substances can be tested with an upstream vaporizer. The T method can also be used to test substances that are difficult to ignite, such as ammoniac, amines or substances with a high level of halogenation.

Please do not hesitate to contact us if you have any questions about determining the upper or lower explosion limit or about determining the oxygen limit concentration, as well as about the corresponding applications in your plant or process. Our experts will be happy to advise you. Please also read our previous consiLetter, which is available for download on our website.

