

The difference between the flash point and the lower explosion point

Examining the safety-related properties of flammable liquid substances or mixtures is not only important for legally compliant classification of chemicals, but also serves to identify explosion hazards in potentially explosive atmospheres. In this context, the probability of the presence of a hazardous explosive atmosphere and the presence of potential ignition sources are important criteria for the analysis of the explosion hazard. To create a sufficient basis of data for the former, the experimental determination of multiple safety parameters is essential.

The **flash point** (see consiLetter No. 12) is defined as the lowest temperature at which, under specified test conditions, the vapor phase of the sample is ignited by an effective ignition source and the flame spreads over the surface of the sample. The flash point is normally determined using a dynamic method in which the sample volume is considerably lower than the volume of the gas space.

In contrast, the **lower explosion point** (LEP) in accordance with DIN 15794 is the temperature of a flammable liquid at which the concentration of the saturated vapor mixed with air equals the lower explosion limit (LEL). The lower explosion point depends on the physical and chemical properties of the sample as well as the test vessel, but also on variables such as the energy of the ignition spark and the pressure. The experimental determination is carried out as a pure equilibrium method, which is why the volume ratio between sample and gas space has no influence. The lower explosion point lies below the flash point. In practice, this temperature difference can in fact reach up to 15 K, especially for substance mixtures. Substances and mixtures that do not have a flash point can also have explosion limits and thus a lower explosion point.

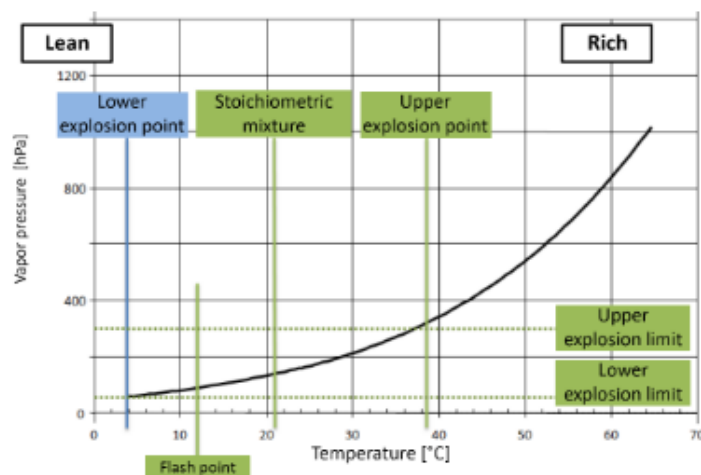


Figure 1: Diagram of the explosive range of a substance in an atmosphere containing oxygen.

To determine the lower explosion point, the liquid sample is heated to a defined temperature in a oven. As soon as a state of equilibrium has been established between the liquid and gas phase, an ignition is attempted using an induction spark. If flame discharge or a sharp increase in temperature is detected, this is considered a positive ignition. By adjusting the equilibrium state, not only pure substances but also mixtures with different proportions of substances can be measured very precisely. Depending on the nature of the sample and/or operational requirements, the storage time can be adjusted up to the ignition test. The upper explosion point, i.e. the temperature of a flammable liquid at which the concentration of saturated vapor in air is equal to the upper explosion limit, can also be determined experimentally. The legal basis for this is provided by DIN EN 15794.

The risk assessment of explosion hazards governed by DIN EN 1127-1 stipulates that the determination of the LEP may also be substituted with the experimental determination of the flash point, as this can usually be determined with less effort. In addition, it is quite possible to estimate the LEP via the flash point (DIN EN 15794 and TRGS721). However, for specific safety-related questions, such as those that frequently arise within a process, narrowing the LEPs provides valuable information for the analysis of the explosion hazard and thus helps evaluate the probability of the formation of an explosive atmosphere.

Please do not hesitate to contact us if you have any questions about the lower/upper explosion point or flash point. We will support you in determining the characteristics as well as in implementing the results in your process and your plant.