The estimate of the critical point from a caloric equation of state

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The dynamic experiments on exploding foils [1] allow the dependences of the specific internal energy and electrical resistivity on the specific volume and pressure to be measured over a wide region of states (in the plane of the specific volume and pressure). As was shown earlier [2], based on the data a caloric equation of state for the metal under study can be constructed, the accuracy of which is determined mainly by the accuracy of the experimental data. In the case of lead-bismuth eutectic [1] the uncertainty in the caloric equation of state, which describes the dependence of the specific internal energy on the specific volume and pressure, is less than 5 percent. The problem which we shall discuss here is formulated as follows: is it possible to estimate the critical point for the liquid-gas transition from an accurate caloric equation of state? Based on the general definition of the critical point derived from the condition of thermodynamic stability, it is shown that such an estimate can be obtained.

[1] Kondratyev A M, Korobenko V N and Rakhel A D 2022 *Journal of Physics: Condensed Matter* **34** 195601
[2] Rakhel A D 2018 *Journal of Physics: Condensed Matter* **30** 295602