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The previously proposed model for the kinetics of first-order phase transitions (Barsuk et al., 2013) is generalized for r order and m control parameters. Bifurcation and stability analyses of the equilibrium states in thermodynamic systems described by the Landau-type kinetic potential with two order parameters is performed both in the absence of an external field, and in the presence of constant and periodic external fields. Kinetics of thermodynamic systems described by such potential in a small neighborhood of the equilibrium states is also studied. Mean transition time for lysozyme protein in dependence of control parameters is obtained based on the developed model. A detailed bifurcation analysis of the cubic equation solutions is given in Appendix.