Phase transitions in rotating Bose-Einstein condensates\footnote{supported by NSF (USA), CEA (France)} MAHIR HUSSEIN, Max Planck Institut für Physik Komplexer Systeme, Dresden, Germany; PIET VAN ISACKER, Grand Accelerateur National d’Ions Lourds, KLAUS BARTSCHAT, Drake University, OLEG VOROV, UNC at Charlotte — The transition to the Abrikosov state has been observed in cold atomic gases. Such critical behavior is very sensitive \cite{1} to the interaction between the particles in the condensate \cite{2,3}. We give an analytic description \cite{1} of the phase-transition point and classify the types of the corresponding instabilities that depend on the interaction. This toy model of a continuous phase transition predicts the same behavior patterns for all systems governed by a similar energy functional. \cite[1]{1} O. K. Vorov, P. Van Isacker, M. S. Hussein and K. Bartschat, Phys. Rev. Lett. 95, 230406 (2005). \cite[2]{2} O. K. Vorov, M. S. Hussein and P. Van Isacker, Phys. Rev. Lett. 90, 200402 (2003). \cite[3]{3} O. K. Vorov, P. Van Isacker, M. S. Hussein and K. Bartschat, to be submitted to Nature (2007).