

# SOME TYPES, CLASSIFICATION AND DEFINITIONS OF INSTABILITY IN ROTATING MACHINERY

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## **ABSTRACT**

In the paper, attention is focused on various types of instability appearing in Rotor Dynamics (RD). First, flow induced instabilities in RD, namely whirl and whip and their more detailed cases are tackled and classified. The corresponding theoretical background is mentioned, based on assumption of constant rotor speed and linear formulation via complex notation and stiffness. Proper and concise definitions of above types and cases are based on classification of various kinds of precession.

Another types of instability occurs when fluctuation of rotor speed in steady state occurs due to finite power of a driving machine of the rotating system and its variable moment of inertia and/or load. Classification of possible instabilities in this case is given both for linearized and nonlinear formulation of autonomous and nonautonomous problem in question.

For linearized case various kinds of parametric resonances are classified and defined. For nonlinear case namely not so known extraparametric resonance is classified and defined and its characteristic features are described. Also special cases of instability of amplitude and of the mean value of fluctuated rotor speed are covered and described. Some instability cases are illustrated and supplemented by results of analytical/numerical solution or simulation.

**Keywords:** rotor dynamics, instability, various types, classification, definition.