

THE NEW HYBRID PNEUMO-ELECTRICAL PISTON MODEL OF LUNGS MECHANICS - PRELIMINARY TESTS

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Abstract

A design principle, construction and results of preliminary tests of a new hybrid physical-electrical model of lungs mechanics has been presented, The methods leading to development of lungs models of different complexity have been also included. The basic component of the model is a voltage controlled Bow source build up with a piston ~ cylinder system driven by a servomotor. This is used to develop a functional module playing a role of an impedance converter transforming an input electrical impedance Z_0 of any electrical network connected to its electrical terminals into a pneumatic impedance Z_{in} . Static and dynamic characteristics of the model connected to different pneumatic signal sources have been presented i.e. for the model connected with the respirator (expiration by the respiratory valve) and for the model with free unobstructed expiration. The very good dynamic features (time constant of the piston Bow source less than 1 ms) and a small resultant error of impedance conversion (less than 1%) enable the model to be applied in many application especially when new methods of lung ventilation are developed.

Keywords: lungs mechanics, hybrid modeling, lungs model s, respiratory system tests.