

Abstract Submitted
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An indirect pressure-gradient technique for measuring instantaneous flow rate in unsteady duct flows G.J. BRERETON, H.J. SCHOCK, M.A.A. RAHI, Dept. of Mech. Eng., Michigan State University — A technique is presented for making measurements of the instantaneous flow rate in unsteady laminar pipe flows. It utilizes a relationship expressing flow rate as a functional of pressure-gradient history that is an exact solution to the Navier-Stokes equations for parallel, developed flow of constant-property Newtonian fluids undergoing *arbitrary* unsteadiness from an initially (or to a finally) steady or stationary state. The technique applies instantaneously during momentary reversals of the flow, and requires that the velocity field only remain laminar and symmetric about its axis. Experimental comparisons between direct measurements of the cumulative flow and the results of this technique indicate it is capable of providing measurements of cumulative flow and flow rate that are accurate to within a few percent at any instant during a flow transient, provided the instantaneous pressure gradient can be resolved with this accuracy.

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