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Flows in Channels with Grooves of Arbitrary Form ALIREZA MOHAMMADI, JERZY M. FLORYAN, University of Western Ontario — Effects of small-amplitude, two-dimensional grooves on pressure losses associated with flows through channels have been analyzed. The grooves can have an arbitrary inclination with respect to the flow direction. It has been demonstrated that reduced order models of grooves' shapes provides acceptable accuracy. Use of such models permits extraction of the relevant details of geometry and formulation of general conclusions. In most cases replacement of the actual geometry with one Fourier mode of the relevant expansion produced sufficient accuracy. It is shown that the grooves' effects can be divided into those due to the change of the mean position of the wall resulting from addition of the grooves and those due to the flow modulations associated with the shapes of the grooves. The former effects can be determined analytically. The latter effects have been determined numerically using spectrally accurate discretization based on the Fourier and Chebyshev expansions. The results show strong dependence of pressure losses on the groove orientation, with the longitudinal grooves producing the smallest drag and the oblique grooves with the inclination angle of $\sim 42^\circ$ exhibiting the largest flow turning potential.

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