Micrometer-sized cylindrical capillaries with well-controlled dimensions are fabricated using deep reactive ion etching. The flow through the capillaries is experimentally characterized for varying pressures, temperatures, and diameters. For the parameters used, it is shown that the Knudsen number is in the intermediate flow regime, and Knudsen's expression for the flow fit the data well. The flow properties of the capillaries make them ideal for introducing gas into vacuum systems and in particular mass spectrometers. ©2005 American Institute of Physics