

ABSTRACT

A pressure-type flow rate control apparatus for use especially in the gas supply system in semiconductor manufacturing facilities. The flow control apparatus is provided with a bore-variable orifice, which permits easy switching of the fluid flow rate control range as well as size reduction of the pressure-type flow control apparatus, and offers other advantages including improved gas replaceability, prevention of dust formation, and reduced manufacturing costs of the flow control system.

The pressure-type flow rate control apparatus comprises an orifice, a control valve provided on the upstream side of the orifice, a pressure detector provided between the control valve and the orifice, and a control unit to calculate a fluid flow rate Q on the basis of a pressure P_1 detected by the pressure detector with the equation $Q = KP_1$ ($K = \text{constant}$) and to output in a drive for the control valve the difference between the set flow rate signal Q_s and the calculated flow rate signal Q as control signal Q_y , wherein the pressure P_1 on the upstream side of the orifice is regulated by actuating the control valve for controlling the flow rate of the fluid downstream of the orifice with the ratio P_2/P_1 between the pressure P_1 on the upstream side of the orifice and the downstream pressure P_2 maintained at not higher than the ratio of the critical pressure of the controlled fluid, characterized in that a direct touch type metal diaphragm valve unit functions as the orifice and that the ring-shaped gap between the valve seat and the diaphragm serves as variable orifice wherein the gap is adjusted by the orifice drive.