【총회초청-01】

Medium vacuum standard by a static expansion method.

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Accurate pressure measurement of medium vacuum (transitional flow regime) is important for advanced science and technology. The sensitivity of an U-tube, however, is not enough for gauge calibration in this range. A dynamic expansion method to generate standard pressure by kinetic theory of gases is useful less than high vacuum. A static expansion system by the Boyl's law is suitable for this range. In this paper, a static expansion system of AIST is described.

The system consists of four chambers; a reference chamber A, an initial chamber B, a pre-expansion chamber C and a main chamber D for gauge calibration, evacuated by turbo-molecular pumps down to 10^7 Pa range. Test gas in the reference chamber A is expanded into the main chamber D followed by pre-expansion processes (expanded into the chamber C, if necessary). The standard pressure generated in the main chamber D is calculated from the pressure in the initial chamber A and volume ratios (inverse of expansion ratios). The initial pressure is measured with a diaphragm gauge calibrated by a piston gauge. The volume ratios including dead volume of valves are determined by the pressure reduction at expansion sequences between four chambers. The uncertainty of the generated pressure is 0.2 to 0.7 % for 100 to 1×10^4 Pa (k = 2). A bilateral comparison of vacuum standard in this range was performed between KRISS and AIST in 1996 using SRG as a reference gauge[1].
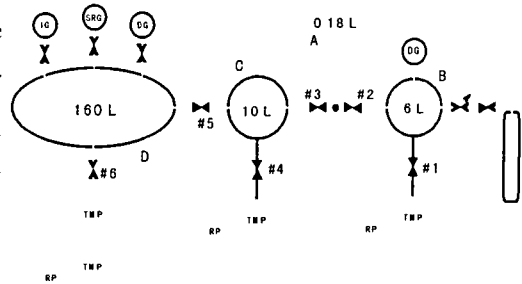

Fig. 1. Schematics of the expansion system

[References]

1) S. S. Hong, K. H. Chung and M. Hirata: Metrologia, 36, 643 (1999).