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Vapour vacuum pumps — Measurement of performance characteristics —

Part 2 : Measurement of critical backing pressure

*Pompes à vide à jet de vapeur — Mesurage des caractéristiques fonctionnelles —
Partie 2 : Mesurage de la pression critique de refoulement*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 1608-2 was prepared by Technical Committee ISO/TC 112, *Vacuum technology*.

This second edition cancels and replaces the first edition (ISO 1608-2 : 1978), of which it constitutes a technical revision.

ISO 1608 will consist of the following parts, under the general title *Vapour vacuum pumps — Measurement of performance characteristics*:

- *Part 1: Measurement of volume rate at flow (pumping speed)*
- *Part 2: Measurement of critical backing pressure*
- *Part 3: Gas flow rates*

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Introduction

The purpose of ISO 1608 is to ensure that measurements of the performance characteristics of vapour vacuum pumps are, as far as possible, carried out by uniform procedures and under uniform conditions. It is hoped that, as a result, measurements conducted by different manufacturers or in different laboratories, and statements of performance quoted in manufacturers' literature, will be on a properly comparable basis to the benefit of both user and manufacturer.

It is envisaged that the complete International Standard will, in due course, deal comprehensively with the measurement of a wide range of performance characteristics of the main types of vapour vacuum pumps. In order, however, that useful agreements of more restricted scope may be implemented with the least possible delay, ISO 1608 is published in parts.

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Vapour vacuum pumps — Measurement of performance characteristics —

Part 2 : Measurement of critical backing pressure

1 Scope

1.1 This part of ISO 1608 specifies a method of measuring the critical backing pressure of vapour vacuum pumps.

NOTE — The critical backing pressure is that backing pressure above which the operating conditions of the pump are affected in such a manner that its performance ceases to be satisfactory.

The dependence of the performance of a vapour pump on the backing pressure can only be completely described by means of a curve relating the inlet and backing pressures over the range of operation.

In many cases it is adequate to specify the critical backing pressure by a single parameter, which is defined in 2.1. In some cases, however, especially where ultra-high vacuum performance is of interest, or where gases such as hydrogen and helium are concerned, the complete curve may be required.

1.2 The pumps considered comprise the following three classes of oil and mercury vapour pumps:

- vapour jet vacuum pump;
- diffusion pumps;
- diffusion-ejector pumps.

2 Definitions

For the purposes of this part of ISO 1608, the following definitions apply.

2.1 critical backing pressure:

2.1.1 General case — For a stated throughput, the lowest value of the backing pressure at which a small percentage increment in the backing pressure causes a specified percentage rise in the inlet pressure.

NOTE — For the purposes of this part of ISO 1608, the minimum value of this specified increment is 10 %.

2.1.2 “no-load” critical backing pressure: The value of the critical backing pressure corresponding to zero admitted throughput.

2.1.3 “full-load” critical backing pressure: The value of the critical backing pressure corresponding to the maximum throughput for stable operation of the pump.

2.2 test dome; test header: A chamber of specific form and dimensions attached to the inlet of the pump through which a measured flow of gas may be admitted to the pump, and which is equipped with means of pressure measurement.

2.3 ultimate pressure: The limiting pressure approached asymptotically in the dome, with the gas inlet valve closed and the pump in normal operation.

NOTE — In practice, the limiting pressure is considered as having been reached after pumping for sufficient time to establish that further reduction in pressure will be negligible.

3 Apparatus

3.1 Test dome, as shown in figure 1 and described in ISO 1608-1.

The general arrangement of the test equipment should be as shown in figure 2. The following equipment is required:

- 1) A controllable valve (A) for admitting gas to the test dome, combined with a suitable throughput-measuring device.
- 2) A controllable gas admittance valve (B), mounted at the inlet on the backing pump, to regulate the backing pressure.

The length of the backing line between the valve (B) and the place of attachment of the gauge tubulation attachment should be more than 200 mm (see figure 2).

- 3) A gauge (C) for measuring the pressure in the backing line adjacent to the outlet of the vapour pump. This gauge is fitted in a straight uniform portion of the backing line, the diameter of which should be equal to that of the outlet of the vapour pump. Its tubulation should be perpendicular to the axis of this portion of the backing line and should terminate flush with its internal surface.

The tubulation dimensions of the gauge (C) should ensure its maximum conductance. The length of the backing line between the place of the gauge tubulation attachment should not exceed 150 mm.