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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 2624.2-2006

Replacing GB/T 2624-1993

**Measurement of fluid flow by means of pressure differential
devices inserted in circular cross-section conduits running full
- Part 2: Orifice plates**

用安装在圆形截面管道中的差压装置测量满管流体流量 第2部分:孔板
(English Translation)

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1 Scope

This part of GB/T 2624 specifies the geometry and method of use (installation and operating conditions) of orifice plates when they are inserted in a conduit running full to determine the flowrate of the fluid flowing in the conduit.

This part of GB/T 2624 also provides background information for calculating the flowrate and is applicable in conjunction with the requirements given in GB/T 2624.1.

This part of GB/T 2624 is applicable to primary devices having an orifice plate used with flange pressure tapplings, or with corner pressure tapplings, or with D and D/2 pressure tapplings. Other pressure tapplings such as "vena contracta" and pipe tapplings have been used with orifice plates but are not covered by this part of GB/T 2624. This part is applicable only to a flow which remains subsonic throughout the measuring section and where the fluid can be considered as single phase. It is not applicable to the measurement of pulsating flow. It does not cover the use of orifice plates in pipe sizes less than 50 mm or more than 1 000 mm, or for pipe Reynolds numbers below 5 000.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of GB/T 2624. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references,

the latest edition of the normative document referred to applies.

GB/T 2624.1-2006 Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 1: General principles and requirements (ISO 5167-1:2003, IDT)

GB/T 17611-1998 Measurement of fluid flow in closed conduits-Vocabulary and symbols (idt ISO 4006:1991)

3 Terms, definitions and symbols

For the purposes of this document, the terms and definitions given in GB/T 17611-1998 and GB/T 2624.1-2006 apply.

4 Principles of the method of measurement and computation

The principle of the method of measurement is based on the installation of an orifice plate into a pipeline in which a fluid is running full. The presence of the orifice plate causes a static pressure difference between the upstream and downstream sides of the plate. The mass flowrate, q_m , can be determined using Equation (1):

(1)

The uncertainty limits can be calculated using the procedure given in Clause 8 of GB/T 2624.1-2006.

Computation of the mass flowrate, which is a purely arithmetic process, can be performed by replacing the different terms on the right hand side of the basic Equation (1) by their numerical values.

Similarly, the value of volume flowrate, q_V , is calculated from:

(2)

Where,

ρ is the fluid density at the temperature and pressure for which the volume is stated.

As will be seen later in this part of GB/T 2624, the coefficient of discharge, C , is dependent on the Reynolds number, Re , which is itself dependent on q_m , and has to be obtained by iteration (see Annex A of GB/T 2624.1-2006 for guidance regarding the choice of the iteration procedure and initial estimates).

The diameters d and D mentioned in the formula are the values of the diameters at working conditions. Measurements taken at any other conditions should be corrected for any possible expansion or contraction of the orifice plate and the pipe due to the values of the temperature and pressure of the fluid during the measurement.

It is necessary to know the density and the viscosity of the fluid at the working conditions. In the case of a compressible fluid, it is also necessary to know the isentropic exponent of the fluid at working conditions.

5 Orifice plates

NOTE 1 The various types of standard orifice meters are similar and therefore only a single description is needed. Each type of standard orifice meter is characterized by the arrangement of the pressure tapings.

NOTE 2 Limits of use are given in 5.3.1.

5.1.1 General

The axial plane cross-section of a standard orifice plate is shown in Figure 1.

The letters given in the following text refer to the corresponding references in Figure 1.

Key

1 upstream face A

2 downstream face B

a Direction of flow.

Figure 1 - Standard orifice plate

5.1.2.1

The part of the plate inside the pipe shall be circular and concentric with the pipe centreline. The faces of the plate shall always be flat and parallel.

5.1.2.2

Unless otherwise stated, the following requirements apply only to that part of the plate located within the pipe.

5.1.2.3

Care shall be taken in the design of the orifice plate and its installation to ensure that plastic buckling and elastic deformation of the plate, due to the magnitude of the differential pressure or of any other stress, do not cause the slope of the straight line defined in 5.1.3.1 to exceed 1 % under working conditions.

NOTE Further information is given in 8.1.1.3 of ISO/TR 9464:1998.

5.1.3.1

The upstream face A of the plate shall be flat when the plate is installed in the pipe with zero differential pressure across it. Provided that it can be shown that the method of mounting does not distort the plate, this flatness may be measured with the plate removed from the pipe. Under these circumstances, the plate may be considered to be flat when the maximum gap between the plate and a straight edge of length D laid across any diameter of the plate (see Figure 2) is less than $0,005(D - d)/2$, i.e. the slope is less than 0,5 % when the orifice plate is examined prior to insertion into the meter line. As can be seen from Figure 2, the critical area is in the vicinity of the orifice bore. The uncertainty requirements for this dimension can be met using feeler gauges.