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**Measurement of fluid flow by means of  
pressure differential devices inserted in  
circular-cross section conduits running  
full —**

**Part 2:  
Orifice plates**

*Mesure de débit des fluides au moyen d'appareils déprimogènes  
insérés dans des conduites en charge de section circulaire —*

*Partie 2: Diaphragmes*



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# Contents

Page

Foreword .....	iv
Introduction .....	v
1 Scope .....	1
2 Normative references .....	1
3 Terms, definitions and symbols .....	1
4 Principles of the method of measurement and computation .....	2
5 Orifice plates .....	2
5.1 Description .....	2
5.2 Pressure tapings .....	6
5.3 Coefficients and corresponding uncertainties of orifice plates .....	10
5.4 Pressure loss, $\Delta p$ .....	13
6 Installation requirements .....	15
6.1 General .....	15
6.2 Minimum upstream and downstream straight lengths for installation between various fittings and the orifice plate .....	15
6.3 Flow conditioners .....	20
6.4 Circularity and cylindricity of the pipe .....	26
6.5 Location of orifice plate and carrier rings .....	27
6.6 Method of fixing and gaskets .....	28
Annex A (informative) Tables of discharge coefficients and expansibility [expansion] factors .....	29
Annex B (informative) Flow conditioners .....	41
Bibliography .....	46

## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 5167-2 was prepared by Technical Committee ISO/TC 30, *Measurement of fluid flow in closed conduits*, Subcommittee SC 2, *Pressure differential devices*.

This first edition of ISO 5167-2, together with the second edition of ISO 5167-1 and the first editions of ISO 5167-3 and ISO 5167-4, cancels and replaces the first edition of ISO 5167-1:1991, which has been technically revised, and ISO 5167-1:1991/Amd.1:1998.

ISO 5167 consists of the following parts, under the general title *Measurement of fluid flow by means of pressure differential devices inserted in circular-cross section conduits running full*:

- *Part 1: General principles and requirements*
- *Part 2: Orifice plates*
- *Part 3: Nozzles and Venturi nozzles*
- *Part 4: Venturi tubes*

## Introduction

ISO 5167, consisting of four parts, covers the geometry and method of use (installation and operating conditions) of orifice plates, nozzles and Venturi tubes when they are inserted in a conduit running full to determine the flowrate of the fluid flowing in the conduit. It also gives necessary information for calculating the flowrate and its associated uncertainty.

ISO 5167 (all parts) is applicable only to pressure differential devices in which the flow remains subsonic throughout the measuring section and where the fluid can be considered as single-phase, but is not applicable to the measurement of pulsating flow. Furthermore, each of these devices can only be used within specified limits of pipe size and Reynolds number.

ISO 5167 (all parts) deals with devices for which direct calibration experiments have been made, sufficient in number, spread and quality to enable coherent systems of application to be based on their results and coefficients to be given with certain predictable limits of uncertainty.

The devices introduced into the pipe are called "primary devices". The term primary device also includes the pressure tapplings. All other instruments or devices required for the measurement are known as "secondary devices". ISO 5167 (all parts) covers primary devices; secondary devices<sup>1)</sup> will be mentioned only occasionally.

ISO 5167 consists of the following four parts:

- a) ISO 5167-1 gives general terms and definitions, symbols, principles and requirements as well as methods of measurement and uncertainty that are to be used in conjunction with ISO 5167-2, ISO 5167-3 and ISO 5167-4.
- b) ISO 5167-2 specifies orifice plates, which can be used with corner pressure tapplings,  $D$  and  $D/2$  pressure tapplings<sup>2)</sup>, and flange pressure tapplings.
- c) ISO 5167-3 specifies ISA 1932 nozzles<sup>3)</sup>, long radius nozzles and Venturi nozzles, which differ in shape and in the position of the pressure tapplings.
- d) ISO 5167-4 specifies classical Venturi tubes<sup>4)</sup>.

Aspects of safety are not dealt with in Parts 1 to 4 of ISO 5167. It is the responsibility of the user to ensure that the system meets applicable safety regulations.

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1) See ISO 2186:1973, *Fluid flow in closed conduits — Connections for pressure signal transmissions between primary and secondary elements*.

2) Orifice plates with "vena contracta" pressure tapplings are not considered in ISO 5167.

3) ISA is the abbreviation for the International Federation of the National Standardizing Associations, which was succeeded by ISO in 1946.

4) In the USA, the classical Venturi tube is sometimes called the Herschel Venturi tube.

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# Measurement of fluid flow by means of pressure differential devices inserted in circular-cross section conduits running full —

## Part 2: Orifice plates

### 1 Scope

This part of ISO 5167 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 ISO 5167 also provides background information for calculating the flowrate and is applicable in conjunction with the requirements given in ISO 5167-1.

This part of ISO 5167 is applicable to primary devices having an orifice plate used with flange pressure tapings, or with corner pressure tapings, or with  $D$  and  $D/2$  pressure tapings. Other pressure tapings such as “vena contracta” and pipe tapings have been used with orifice plates but are not covered by this part of ISO 5167. This part of ISO 5167 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 referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4006:1991, *Measurement of fluid flow in closed conduits — Vocabulary and symbols*

ISO 5167-1:2003, *Measurement of fluid flow by means of pressure differential devices inserted in circular-cross section conduits running full — Part 1: General principles and requirements*

### 3 Terms, definitions and symbols

For the purposes of this document, the terms, definitions and symbols given in ISO 4006 and ISO 5167-1 apply.