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**Measurement of fluid flow by means of  
pressure-differential devices — Guidelines  
to the effect of departure from the  
specifications and operating conditions  
given in ISO 5167-1**

*Mesurage du débit des fluides au moyen d'appareils déprimogènes —  
Lignes directrices relatives aux effets de divergence par rapport aux  
spécifications et conditions de fonctionnement données dans l'ISO 5167-1*



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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.

The main task of technical committees is to prepare International Standards. In exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 12767, which is a Technical Report of type 3, was prepared by Technical Committee ISO/TC 30, *Measurement of fluid flow in closed conduits*, Subcommittee SC 2, *Pressure-differential devices*.

Annex A of this Technical Report is for information only.

## Introduction

ISO 5167-1 is an International Standard for flowrate measurement using a differential-pressure device. Adherence to that standard will result in flowrate measurements the uncertainty of which will lie within specified limits. If, however, a flowmetering installation departs, for whatever reason, from the conditions specified in ISO 5167-1, the specified limits of uncertainty may not be achieved. Many metering installations exist where these conditions either have not been or cannot be met. In these circumstances it is usually not possible to evaluate the precise effect of any such deviations. However, a considerable amount of data exists which can be used to give a general indication of the effect of non-conformity to ISO 5167-1, and it is presented in this Technical Report as a guideline to users of flow-metering equipment.

# Measurement of fluid flow by means of pressure-differential devices — Guidelines to the effect of departure from the specifications and operating conditions given in ISO 5167-1

## 1 Scope

This Technical Report provides guidance to assist in estimating the flowrate when using pressure-differential devices constructed or operated outside the scope of ISO 5167-1.

It should not be inferred that additional tolerances or corrections can necessarily compensate for the effects of deviating from ISO 5167-1. The information is given, in the first place, to indicate the degree of care necessary in the manufacture, installation and maintenance of pressure-differential devices by describing some of the effects of non-conformity to the requirements; and in the second place, to permit those users who may not be able to comply fully with the requirements to assess, however roughly, the magnitude and direction of the resulting error in flowrate.

Each variation dealt with is treated as though it were the only one present. Where more than one is known to exist, there may be unpredictable interactions and care has to be taken when combining the assessment of these errors. If there is a significant number of errors, means of eliminating some of them must be considered. The variations included in this Technical Report are by no means complete and relate largely to examples with orifice plates. There are, no doubt, many similar examples of installations not conforming to ISO 5167-1 for which no comparable data have been published. Such additional information from users, manufacturers and any others may be taken into account in future revisions of this Technical Report.

## 2 Reference

ISO 5167-1:1991, *Measurement of fluid flow by means of pressure-differential devices — Part 1: Orifice plates, nozzles and Venturi tubes inserted in circular cross-section conduits running full.*

## 3 Symbols and definitions

### 3.1 Symbols

For the purposes of this Technical Report, the symbols given in Table 1 apply.

### 3.2 Definitions

For the purposes of this Technical Report, the definitions given in ISO 5167-1 and the following definitions apply.

#### 3.2.1

##### **square edge**

angular relationship between the orifice bore of the flow measurement device and the upstream face, when the angle between them is  $90^\circ \pm 0,3^\circ$

#### 3.2.2

##### **sharpness**

radius of the edge between the orifice bore of the flow measurement device and the upstream face

**NOTE** The upstream edge of the orifice bore is considered to be sharp when its radius is not greater than  $0,0004 d$ , where  $d$  is the diameter of the orifice bore.