
International Standard



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Measurement of fluid flow in closed conduits — Velocity-area methods of flow measurement in swirling or asymmetric flow conditions in circular ducts by means of current-meters or Pitot static tubes

Mesure de débit des fluides dans les conduites fermées — Mesure de débit dans les conduites circulaires dans le cas d'un écoulement giratoire ou dissymétrique par exploration du champ des vitesses au moyen de moulinets ou de tubes de Pitot doubles

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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 developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized 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.

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.

International Standard ISO 7194 was developed by Technical Committee ISO/TC 30, *Measurement of fluid flow in closed conduits*, and was circulated to the member bodies in May 1982.

It has been approved by the member bodies of the following countries :

Australia	India	Romania
Belgium	Italy	South Africa, Rep. of
Czechoslovakia	Netherlands	United Kingdom
Egypt, Arab Rep. of	Norway	USSR
France	Poland	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

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USA

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Measurement of fluid flow in closed conduits — Velocity-area methods of flow measurement in swirling or asymmetric flow conditions in circular ducts by means of current-meters or Pitot static tubes

0 Introduction

In order to carry out measurements of the flow-rate of single phase fluids in closed pipes by velocity-area methods, using either current-meters or Pitot static tubes, with satisfactory accuracy (of the order of $\pm 2\%$ for example), it is usually necessary to choose a measuring plane where the velocity distribution approaches that of fully developed flow (see ISO 3354 and ISO 3966).

There are, however, some cases where it is practically impossible to obtain such a flow distribution, but where as good as possible a measurement of the flow-rate is desirable.

1 Scope and field of application

This International Standard specifies velocity-area methods for measuring flow in swirling or asymmetric flow conditions in circular ducts by means of current-meters or Pitot static tubes.

It specifies the measurements required, the precautions to be taken, the corrections to apply, and describes the additional uncertainties which are introduced when a measurement in asymmetric or swirling flow has to be made.

Although methods of using velocity-area integration techniques to measure flow-rate under conditions where there is swirl and/or asymmetry in the flow are described, every effort should nevertheless be made to choose a measuring section in the pipe where the swirl or asymmetry is as small as possible.

Only flows with a negligible radial component are considered, however. Furthermore, it is not possible to make a measure-

ment in accordance with this International Standard if, at any point in the measuring cross-section, the local velocity makes an angle of greater than 40° with the axis of the duct, or where the index of asymmetry Y (defined in annex F) is greater than 0,15.

It should be noted that this International Standard deals only with instruments for measuring local velocity as defined in ISO 3354 and ISO 3966. If Pitot static tubes are used, this International Standard applies only to flows where the Mach number corresponding to local velocities does not exceed 0,25.

2 References

ISO/TR 3313, *Measurement of pulsating fluid flow in a pipe by means of orifice plates, nozzles or venturi tubes, in particular in the case of sinusoidal or square wave intermittent periodic-type fluctuations.*

ISO 3354, *Measurement of clean water flow in closed conduits — Velocity-area method using current-meters.*

ISO 3455, *Liquid flow measurement in open channels — Calibration of rotating-element current-meters in straight open tanks.*

ISO 3966, *Measurement of fluid flow in closed conduits — Velocity-area method using Pitot static tubes.*

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

ISO 5168, *Measurement of fluid flow — Estimation of uncertainty of a flow-rate measurement.*