

Australian Standard<sup>®</sup>

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**Measurement of fluid flow in  
closed conduits**

**Part 1.1: Pressure differential  
methods—Measurement using  
orifice plates, nozzles or Venturi  
tubes—Conduits with diameters  
from 50 mm to 1200 mm**

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[ISO title: 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]

This Australian Standard was prepared by Committee CE/24, Measurement of Water Flow in Open Channels and Closed Conduits. It was approved on behalf of the Council of Standards Australia on 3 August 1993 and published on 20 December 1993.

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The following interests are represented on Committee CE/24:

Association of Consulting Engineers of Australia  
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Forestry Commission of New South Wales  
Institute of Instrumentation and Control, Australia  
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## PREFACE

This Standard was prepared by the Standards Australia Committee on Measurement of Water Flow in Open Channels and Closed Conduits. It is identical with and has been reproduced from 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*.

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This Standard is one of a series, to be published progressively, which deals with methods of measurement of fluid flow in closed conduits. The following Parts were published concurrently with this Part:

## AS

- 2360 Measurement of fluid flow in closed circuits
- 2360.0 Part 0: Vocabulary and symbols
- 2360.1.1 Part 1.1: Pressure differential methods—Measurement using orifice plates, nozzles or Venturi tubes—Conduits with diameters from 50 mm to 1200 mm (*this Standard*)
- 2360.1.2 Part 1.2: Pressure differential methods—Measurement using orifice plates or nozzles—Conduits with diameters less than 50 mm
- 2360.1.3 Part 1.3: Pressure differential methods—Measurement using orifice plates, nozzles or Venturi tubes—Guide to the use of methods specified in Parts 1.1 and 1.2
- 2360.1.4 Part 1.4: Pressure differential methods—Measurement using orifice plates, nozzles or Venturi tubes—Guide to the effect of departure from the conditions specified in Part 1.1
- 2360.1.5 Part 1.5: Pressure differential methods—Measurement using orifice plates, nozzles or Venturi tubes—Pulsating flow, in particular sinusoidal or square wave intermittent periodic-type fluctuations
- 2360.6.1 Part 6.1: Volumetric methods—By mass
- 2360.6.2 Part 6.2: Volumetric methods—By volume
- 2360.7.1 Part 7.1: Assessment of uncertainty in the calibration and use of flow measurement devices—Linear calibration relationships
- 2360.7.2 Part 7.2: Assessment of uncertainty in the calibration and use of flow measurement devices—Non-linear calibration relationships

At the date of publication of this Part the following Parts, with the numbers of the parent international Standards in parenthesis, had not been published:

Pressure differential methods—Measurement using orifice plates, nozzles or Venturi tubes—Connections for pressure signal transmissions between primary and secondary elements (ISO 2186)

Pitot static tube methods—Measurement of velocity at a point of the cross-section of a conduit (ISO 7145)

Pitot static tube methods—Measurement using Pitot-static tubes (ISO 3966)

Pitot static tube methods—Measurement in swirling or asymmetric flow conditions using ISO 3966 or ISO 3354 (ISO 7194)

Current meters method—Measurement of clean water in full conduits and under regular flow conditions using current meters (ISO 3354)

Non-radioactive tracer methods—Review of alternative methods (ISO 2975.1)

Non-radioactive tracer methods—Measurement using constant rate injection (ISO 2975.2)

Non-radioactive tracer methods—Measurement using transit time (ISO 2975.6)

Weighing methods—Verification of static type (ISO 9368.1)

Weighing methods—Verification of dynamic type (ISO 9368.2, not published)

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<i>Reference to International Standard</i>		<i>Australian Standard</i>	
ISO		AS	
468	Surface roughness—Parameters, their values and general rules for specifying requirements	2536	Surface texture
4006	Measurement of fluid flow in closed conduits—Vocabulary and symbols	2360	Measurement of fluid flow in closed conduits
		2360.0	Part 0: Vocabulary and symbols
5168	Measurement of fluid flow—Evaluation of uncertainties	3778	Measurement of water flow in open channels
		3778.2.4	Part 2.4: General—Estimation of uncertainty of a flow-rate measurement

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# Measurement of fluid flow in closed conduits

## Part 1.1:

### Pressure differential methods—Measurement using orifice plates, nozzles or Venturi tubes—Conduits with diameters from 50 mm to 1200 mm

#### 1 Scope

This part of ISO 5167 specifies 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 flow-rate of the fluid flowing in the conduit. It also gives necessary information for calculating the flow-rate and its associated uncertainty.

It applies only to pressure differential devices in which the flow remains subsonic throughout the measuring section and is steady or varies only slowly with time and where the fluid can be considered as single-phase. In addition, each of these devices can only be used within specified limits of pipe size and Reynolds number. Thus this part of ISO 5167 cannot be used for

pipe sizes less than 50 mm or more than 1 200 mm or for pipe Reynolds numbers below 3 150.

It 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 tapings. All other instruments or devices required for the measurement are known as “secondary devices”. This part of ISO 5167 covers primary devices; secondary devices<sup>1)</sup> will be mentioned only occasionally.

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