Australian Standard™

Measurement of fluid flow in closed conduits

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

[ISO title: Measurement of fluid flow in closed conduits—Guidelines on the effects of flow pulsations on flow-measurement instruments]

Standards Australia

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Australian Water and Wastewater Association

Department of Natural Resources, Qld

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Department of Land and Water Conservation, New South Wales

Department of Public Works and Services, New South Wales

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PREFACE

This Standard was prepared by the Standards Australia Committee CE-024, Measurement of Water Flow in Open Channels and Closed Conduits.

This Standard is identical to and is reproduced from ISO/TR 3313:1998:, *Measurement of fluid flow in closed conduits—Guidelines on the effects of flow pulsations on flow-measurement instruments*.

This Standard is Part 1.5 of AS 2360, *Measurement of fluid flow in closed conduits*, which is published in parts as follows:

AS		
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
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 (this Standard)
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

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Reference to International Standard		*Australian or Australian/New Zealand Standard*	
ISO		AS	
5167-1	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.	2360	Measurement of fluid flow in closed conduits
		2360.1.1	Pressure differential methods—Measurement using orifice plates, nozzles or Venturi tubes—Conduits with diameters from 50 mm to 1200 mm.

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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

1 Scope

This Technical Report defines pulsating flow, compares it with steady flow, indicates how it can be detected, and describes the effects it has on orifice plates, nozzles or Venturi tubes, turbine and vortex flowmeters when these devices are being used to measure fluid flow in a pipe. These particular flowmeter types feature in this Technical Report because they are amongst those types most susceptible to pulsation effects. Methods for correcting the flowmeter output signal for errors produced by these effects are described for those flowmeter types for which this is possible. When correction is not possible, measures to avoid or reduce the problem are indicated. Such measures include the installation of pulsation damping devices and/or choice of a flowmeter type which is less susceptible to pulsation effects.

This Technical Report applies to flow in which the pulsations are generated at a single source which is situated either upstream or downstream of the primary element of the flowmeter. Its applicability is restricted to conditions where the flow direction does not reverse in the measuring section, but there is no restriction on the waveform of the flow pulsation. The recommendations within this Technical Report apply to both liquid and gas flows although with the latter the validity may be restricted to gas flows in which the density changes in the measuring section are small as indicated for the particular type of flowmeter under discussion.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this Technical Report. At the time of publication the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this Technical Report are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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 Definitions

For the purposes of this Technical Report, the following definitions apply.

3.1
steady flow
flow in which parameters such as velocity, pressure, density and temperature do not vary significantly enough with time to prevent measurement to within the required uncertainty of measurement

3.2
pulsating flow
flow in which the flowrate in a measuring section is a function of time but has a constant mean value when averaged over a sufficiently long period of time, which will depend on the regularity of the pulsation