SLOVENSKI STANDARD
SIST EN ISO 5167-1:2022

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Nadomešča:
SIST EN ISO 5167-1:2004

Merjenje pretoka fluida na osnovi tlačne razlike, povzročene z napravo, vstavljeno v polno zapolnjen vod s krožnim prerezom – 1. del: Splošna načela in zahteve (ISO 5167-1:2022)

Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 1: General principles and requirements (ISO 5167-1:2022)

Durchflussmessung von Fluiden mit Drosselgeräten in voll durchströmten Leitungen mit Kreisquerschnitt - Teil 1: Allgemeine Grundlagen und Anforderungen (ISO 5167-1:2022)

Mesurage de débit des fluides au moyen d'appareils déprimogènes insérés dans des conduites en charge de section circulaire - Partie 1: Principes généraux et exigences générales (ISO 5167-1:2022)

Ta slovenski standard je istoveten z: **EN ISO 5167-1:2022**

ICS:

17.120.10	Pretok v zaprtih vodih	Flow in closed conduits

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 5167-1

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English Version

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This European Standard was approved by CEN on 14 June 2022.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN ISO 5167-1:2022) has been prepared by Technical Committee ISO/TC 30 "Measurement of fluid flow in closed conduits" in collaboration with Technical Committee CEN/SS F05 “Measuring Instruments” the secretariat of which is held by CCMC.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2022, and conflicting national standards shall be withdrawn at the latest by December 2022.

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

This document supersedes EN ISO 5167-1:2003.

Any feedback and questions on this document should be directed to the users’ national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

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Endorsement notice

The text of ISO 5167-1:2022 has been approved by CEN as EN ISO 5167-1:2022 without any modification.

INTERNATIONAL STANDARD

ISO 5167-1

Third edition
2022-06

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

Part 1: General principles and requirements

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

Partie 1: Principes généraux et exigences générales

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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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 procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

ISO 5167-1 was prepared by Technical Committee ISO/TC 30, *Measurement of fluid flow in closed conduits*, Subcommittee SC 2, *Pressure differential devices*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/SS F05, *Measuring instruments*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 5167-1:2003), which has been technically revised

The main changes are as follows:

— improved consistency between ISO 5167-1 to ISO 5167-6 (some items that were new in ISO 5167-5 and ISO 5167-6 have been moved to this document);

— a primary element has been set as part of a differential pressure metering system;

— a short section on diagnostics and CBM (Condition Based Monitoring) has been included;

— a limitation on the use of the 5 % 2° rule for an acceptable profile has been noted;

— improved text about uncertainty calculation and an example in Annex E has been provided;

— annexes on turndown and permanent pressure loss have been included.

A list of all parts in the ISO 5167 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

ISO 5167, consisting of six parts, covers the geometry and method of use (installation and operating conditions) of orifice plates, nozzles, Venturi tubes, cone meters and wedge meters 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.

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 uncalibrated within specified limits of pipe size and Reynolds number, or alternatively they can be used across their calibrated range.

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. ISO 5167 also provides methodology for bespoke calibration of differential pressure meters.

The devices introduced into the pipe are called primary devices. The term primary device also includes the pressure tappings. All other instruments or devices required to facilitate the instrument readings are known as secondary devices, and the flow computer that receives these readings and performs the algorithms is known as a tertiary device. ISO 5167 covers primary devices; secondary devices (see ISO 2186) and tertiary devices will be mentioned only occasionally.

Aspects of safety are not dealt with in ISO 5167-1 to ISO 5167-6. It is the responsibility of the user to ensure that the system meets applicable safety regulations.

Additional documents that may provide assistance include:

— ISO/TR 3313;

— ISO/TR 9464;

— ISO/TR 12767;

— ISO/TR 15377.

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

Part 1: General principles and requirements

1 Scope

This document defines terms and symbols and establishes the general principles for methods of measurement and computation of the flow rate of fluid flowing in a conduit by means of pressure differential devices (orifice plates, nozzles, Venturi tubes, cone meters, and wedge meters) when they are inserted into a circular cross-section conduit running full. This document also specifies the general requirements for methods of measurement, installation and determination of the uncertainty of the measurement of flow rate.

ISO 5167 (all parts) is applicable only to flow that 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.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *Measurement of fluid flow in closed conduits — Vocabulary and symbols*

ISO 5167 (all parts), *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full*

ISO 5168, *Measurement of fluid flow — Procedures for the evaluation of uncertainties*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Pressure measurement

3.1.1
wall pressure tapping
annular slot or circular hole drilled in the wall of a conduit in such a way that the edge of the hole is flush with the internal surface of the conduit

Note 1 to entry: The pressure tapping is usually a circular hole but in certain cases may be an annular slot.

3.1.2
static pressure
p
pressure which can be measured by connecting a pressure-measuring device to a *wall pressure tapping* (3.1.1)

Note 1 to entry: Only the value of the absolute static pressure is considered in ISO 5167 (all parts).

3.1.3
differential pressure
DP
Δp
difference between the (static) pressures measured at the wall pressure tappings, one of which is on the upstream side and the other of which is on the downstream side of a primary device [or in the throat for a throat-tapped nozzle, a *Venturi nozzle* (3.2.4) or a *Venturi tube* (3.2.5)], inserted in a straight pipe through which flow occurs, when any difference in height between the upstream and downstream tappings has been taken into account

Note 1 to entry: In ISO 5167 (all parts) the term "differential pressure" is used only if the pressure tappings are in the positions specified for each standard primary device.

3.1.4
pressure ratio
τ
ratio of the absolute (static) pressure at the downstream pressure tapping to the absolute (static) pressure at the upstream pressure tapping

3.1.5
vena contracta
location in a fluid stream where the diameter of the stream is smallest

3.2 Primary devices

3.2.1
orifice
throat opening of minimum cross-sectional area of a primary device

3.2.2
orifice plate
thin plate in which a circular opening has been machined

Note 1 to entry: Standard orifice plates are described as "thin plate" and "with sharp square edge", because the thickness of the plate is small compared with the diameter of the measuring section and because the upstream edge of the *orifice* (3.2.1) is sharp and square.

3.2.3
nozzle
device which consists of a convergent inlet connected to a cylindrical section generally called the "throat"

3.2.4
Venturi nozzle
device which consists of a convergent inlet which is a standardized ISA 1932 nozzle connected to a cylindrical part called the "throat", which is itself connected to an expanding section called the "divergent" which is conical

3.2.5
Venturi tube
device which consists of a convergent inlet which is conical connected to a cylindrical part called the "throat", which is itself connected to an expanding section called the "divergent" which is conical

3.2.6
cone meter
device which consists of a cone-shaped restriction held in the centre of the pipe with the nose of the cone upstream

3.2.7
wedge meter
device which consists of a wedge-shaped restriction

3.2.8
diameter ratio
β
<of a primary device used in a given pipe> square root of the ratio of the area of the throat of the primary device to the internal area of the measuring pipe upstream of the primary device

Note 1 to entry: In ISO 5167-2 and ISO 5167-3 the diameter ratio is the ratio of the diameter of the throat of the primary device to the internal diameter of the measuring pipe upstream of the primary device.

Note 2 to entry: In ISO 5167-4, where the primary device has a cylindrical section upstream, having the same diameter as that of the pipe, the diameter ratio is the ratio of the throat diameter to the diameter of this cylindrical section at the plane of the upstream pressure tappings.

3.2.9
carrier ring
device which is used to hold the primary element in the centre of the pipe and may incorporate the pressure tappings

3.3 Flow

3.3.1
flow rate
rate of flow
q
mass or volume of fluid passing through the primary device per unit time

3.3.1.1
mass flow rate
rate of mass flow
q_m
mass of fluid passing through the primary device per unit time

3.3.1.2
volume flow rate
rate of volume flow
q_V
volume of fluid passing through the primary device per unit time

Note 1 to entry: In the case of volume flow rate, it is necessary to state the pressure and temperature at which the volume is referenced.