SLOVENSKI STANDARD
SIST EN ISO 5167-1:2004

01-januar-2004

Nadomeġ ena:
SIST EN ISO 5167-1:1997
SIST EN ISO 5167-1:1997/A1:2001

Merjenje pretoka fluida na osnovi tlaġne razlike, povzroġene z napravo, vstavljeno v polno zapolnjen vod s krogġnim prerezom ï 1. del: Splogġna naġela in zahteve (ISO 5167-1:2003)

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 5167-1:2003)

Durchflussmessung von Fluiden mit Drosselgeräten in voll durchströmten Leitungen mit Kreisquerschnitt - Teil 1: Allgemeine Grundlagen und Anforderungen (ISO 5167-1:2003)

Mesure de débit des fluides au moyen d'appareils déprimogenes insérés dans des conduites en charge de section circulaire - Partie 1: Principes généraux et exigences générales (ISO 5167-1:2003)

Ta slovenski standard je istoveten z: **EN ISO 5167-1:2003**

ICS:

17.120.10 Pretok v zaprtih vodih Flow in closed conduits

SIST EN ISO 5167-1:2004 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 5167-1

March 2003

ICS 17.120.10

Together with EN ISO 5167-2:2003,
EN ISO 5167-3:2003 and EN ISO 5167-4:2003,
supersedes EN ISO 5167-1:1995

English version

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 5167-1:2003)

Mesure 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 5167-1:2003)

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This European Standard was approved by CEN on 20 February 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland and United Kingdom.

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

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Foreword

This document (EN ISO 5167-1:2003) has been prepared by Technical Committee ISO/TC 30 "Measurement of fluid flow in closed conduits" in collaboration with CMC.

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 September 2003, and conflicting national standards shall be withdrawn at the latest by September 2003.

This document, together with EN ISO 5167-2:2003, EN ISO 5167-3:2003 and EN ISO 5167-4:2003, supersedes EN ISO 5167-1:1995.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland and the United Kingdom.

NOTE FROM CMC The foreword is susceptible to be amended on reception of the German language version. The confirmed or amended foreword, and when appropriate, the normative annex ZA for the references to international publications with their relevant European publications will be circulated with the German version.

Endorsement notice

The text of ISO 5167-1:2003 has been approved by CEN as EN ISO 5167-1:2003 without any modifications.

INTERNATIONAL STANDARD

ISO 5167-1

Second edition
2003-03-01

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

Part 1: General principles and requirements

Mesure 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

Reference number
ISO 5167-1:2003(E)

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Contents

Page

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 5167-1 was prepared by Technical Committee ISO/TC 30, *Measurement of fluid flow in closed conduits*, Subcommittee SC 2, *Pressure differential devices*.

This second edition of ISO 5167-1, together with the first editions of ISO 5167-2, ISO 5167-3 and ISO 5167-4, cancels and replaces the first edition (ISO 5167-1:1991), which has been technically revised, and ISO 5167-1:1991/Amd.1:1998.

ISO 5167 consists of the following parts, under the general title *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full*:

— *Part 1: General principles and requirements*

— *Part 2: Orifice plates*

— *Part 3: Nozzles and Venturi nozzles*

— *Part 4: Venturi tubes*

Introduction

ISO 5167, consisting of four parts, covers 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 flowrate of the fluid flowing in the conduit. It also gives necessary information for calculating the flowrate and its associated uncertainty.

ISO 5167 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 within specified limits of pipe size and Reynolds number.

ISO 5167 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 tappings. All other instruments or devices required for the measurement are known as “secondary devices”. ISO 5167 covers primary devices; secondary devices[1)] will be mentioned only occasionally.

ISO 5167 consists of the following four parts.

a) This part of ISO 5167 gives general terms and definitions, symbols, principles and requirements as well as methods of measurement and uncertainty that are to be used in conjunction with Parts 2 to 4 of ISO 5167.

b) Part 2 of ISO 5167 specifies orifice plates, which can be used with corner pressure tappings, D and $D/2$ pressure tappings[2)], and flange pressure tappings.

c) Part 3 of ISO 5167 specifies ISA 1932 nozzles[3)], long radius nozzles and Venturi nozzles, which differ in shape and in the position of the pressure tappings.

d) Part 4 of ISO 5167 specifies classical Venturi tubes[4)].

Aspects of safety are not dealt with in Parts 1 to 4 of ISO 5167. It is the responsibility of the user to ensure that the system meets applicable safety regulations.

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

2) Orifice plates with vena contracta pressure tappings are not considered in ISO 5167.

3) ISA is the abbreviation for the International Federation of the National Standardizing Associations, which was succeeded by ISO in 1946.

4) In the USA the classical Venturi tube is sometimes called the Herschel Venturi tube.

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 part of ISO 5167 defines terms and symbols and establishes the general principles for methods of measurement and computation of the flowrate of fluid flowing in a conduit by means of pressure differential devices (orifice plates, nozzles and Venturi tubes) when they are inserted into a circular cross-section conduit running full. This part of ISO 5167 also specifies the general requirements for methods of measurement, installation and determination of the uncertainty of the measurement of flowrate. It also defines the general specified limits of pipe size and Reynolds number for which these pressure differential devices are to be used.

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 referenced documents are indispensable for the application 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 4006:1991, *Measurement of fluid flow in closed conduits — Vocabulary and symbols*

ISO 5167-2:2003, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full — Part 2: Orifice plates*

ISO 5167-3:2003, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full — Part 3: Nozzles and Venturi nozzles*

ISO 5167-4:2003, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full — Part 4: Venturi tubes*

3 Terms and definitions

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

NOTE The following definitions are given only for terms used in some special sense or for terms for which it seems useful to emphasize the meaning.

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 The pressure tapping is usually a circular hole but in certain cases may be an annular slot.

3.1.2
static pressure of a fluid flowing through a pipeline
p
pressure which can be measured by connecting a pressure-measuring device to a wall pressure tapping

NOTE Only the value of the absolute static pressure is considered in ISO 5167 (all parts).

3.1.3
differential pressure
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 Venturi nozzle or a Venturi tube), 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 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

3.2 Primary devices

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

NOTE Standard primary device orifices are circular and coaxial with the pipeline.

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

NOTE 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 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” and 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” and an expanding section called the “divergent” which is conical

3.2.6
diameter ratio
β
⟨of a primary device used in a given pipe⟩ ratio of the diameter of the orifice or throat of the primary device to the internal diameter of the measuring pipe upstream of the primary device

NOTE However, when the primary device has a cylindrical section upstream, having the same diameter as that of the pipe (as in the case of the classical Venturi tube), the diameter ratio is the ratio of the throat diameter and the diameter of this cylindrical section at the plane of the upstream pressure tappings.

3.3 Flow

3.3.1
flowrate
rate of flow
q
mass or volume of fluid passing through the orifice (or throat) per unit time

3.3.1.1
mass flowrate
rate of mass flow
q_m
mass of fluid passing through the orifice (or throat) per unit time

3.3.1.2
volume flowrate
rate of volume flow
q_V
volume of fluid passing through the orifice (or throat) per unit time

NOTE In the case of volume flowrate, it is necessary to state the pressure and temperature at which the volume is referenced.

3.3.2
Reynolds number
Re
dimensionless parameter expressing the ratio between the inertia and viscous forces

3.3.2.1
pipe Reynolds number
Re_D
dimensionless parameter expressing the ratio between the inertia and viscous forces in the upstream pipe

$$Re_D = \frac{V_1 D}{\nu_1} = \frac{4 q_m}{\pi \mu_1 D}$$