January 2004

DIN EN ISO 5167-1



ICS 17.120.10

This standard, together with DIN EN ISO 5167-2 to DIN EN ISO 5167-4, January 2004 editions, supersedes November 1995 edition and DIN EN ISO 5167-1/A1, June 1998 edition.

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) English version of DIN EN ISO 5167-1

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

European Standard EN ISO 5167-1 : 2003 has the status of a DIN Standard.

A comma is used as the decimal marker.

National foreword

This standard has been published in accordance with a decision taken by CMC to adopt, without alteration, International Standard ISO 5167-1 as a European Standard.

The responsible German body involved in its preparation was the *Normenausschuss Technische Grund-lagen* (Fundamentals in Technology Standards Committee).

The DIN Standards corresponding to the International Standards referred to in clause 2 of the EN are as follows:

ISO Standard	DIN Standard
ISO 4006	DIN EN 24006
ISO 5167-2	DIN EN ISO 5167-2
ISO 5167-3	DIN EN ISO 5167-3
ISO 5167-4	DIN EN ISO 5167-4

© No part of this standard may be reproduced without the prior permission of

Amendments

DIN Deutsches Institut für

has the exclusive right of

This standard differs from the November 1995 edition in that it has been completely revised.

Previous editions

DIN 1952: 1948-11, 1969-05, 1971-08, 1982-07; DIN EN ISO 5167-1: 1995-11; DIN EN ISO 5167-1/A1: 1998-06.

Continued overleaf. Document comprises 38 pages.





National Annex NA

Standards referred to

(and not included in Normative references and Bibliography)

- DIN EN 24006 Measurement of fluid flow in closed conduits Vocabulary and symbols (ISO 4006 : 1991)
- DIN EN ISO 5167-2 Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full Part 2: Orifice plates (ISO 5167-2:2003)
- DIN EN ISO 5167-3 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 5167-3 : 2003)
- DIN EN ISO 5167-4 Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full Part 4: Venturi tubes (ISO 5167-4 : 2003)

EUROPEAN STANDARD NORME EUROPÉENNE EUROPÄISCHE NORM

March 2003

ICS 17.120.10

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

This European Standard was approved by CEN on 2003-02-20.

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.

The European Standards exist 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, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, the Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland, and the United Kingdom.



European Committee for Standardization Comité Européen de Normalisation Europäisches Komitee für Normung

Management Centre: rue de Stassart 36, B-1050 Brussels

© 2003. CEN – All rights of exploitation in any form and by any means reserved worldwide for CEN national members.

Ref. No. EN ISO 5167-1 : 2003 E

Foreword

International Standard

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,

which was prepared by ISO/TC 30 'Measurement of fluid flow in closed conduits' of the International Organization for Standardization, has been adopted by CMC as a European Standard.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, and conflicting national standards withdrawn, by September 2003 at the latest.

In accordance with the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard:

Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, the Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland, and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 5167-1 : 2003 was approved by CEN as a European Standard without any modification.

Contents

Page

Forewo	ord	2
Introdu	iction	3
1	Scope	4
2	Normative references	4
3	Terms and definitions	4
4 4.1 4.2	Symbols and subscripts Symbols Subscripts	9 9 0
5 5.1 5.2 5.3 5.4	Principle of the method of measurement and computation	0 0 1 1
6 6.1 6.2 6.3	General requirements for the measurements	3 3 4 4
7 7.1 7.2 7.3 7.4	Installation requirements	4 4 6 6
8 8.1 8.2	Uncertainties on the measurement of flowrate	9 0 0
Annex	A (informative) Iterative computations	2
Annex	B (informative) Examples of values of the pipe wall uniform equivalent roughness, k	4
Annex	C (informative) Flow conditioners and flow straighteners	5
Bibliog	raphy	6

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 devices¹) 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 tappings²), and flange pressure tappings.
- c) Part 3 of ISO 5167 specifies ISA 1932 nozzles³⁾, 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 tubes⁴).

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.

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.