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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 5167-3:2019)

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 02/21

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English Version

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 5167-3:2019)

Mesurage du débit des fluides au moyen d'appareils  
déprimogènes insérés dans des conduites en charge de  
section circulaire - Partie 3: Tuyères et Venturi-tuyères  
(ISO 5167-3:2020)

Durchflussmessung von Fluiden mit Drosselgeräten in  
voll durchströmten Leitungen mit Kreisquerschnitt -  
Teil 3: Düsen und Venturidüsen (ISO 5167-3:2020)

This European Standard was approved by CEN on 24 February 2020.

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## **European foreword**

This document (EN ISO 5167-3:2020) 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of an identical text or by endorsement, at the latest by March 2021, and conflicting national standards shall be withdrawn at the latest by March 2021.

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 5167-3:2003.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## **Endorsement notice**

The text of ISO 5167-3:2020 has been approved by CEN as EN ISO 5167-3:2020 without any modification.



**INTERNATIONAL  
STANDARD**

**ISO  
5167-3**

Second edition  
2020-08

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

**Part 3:  
Nozzles and Venturi nozzles**

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

*Partie 3: Tuyères et Venturi-tuyères*



Reference number  
ISO 5167-3:2020(E)

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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](http://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](http://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](http://www.iso.org/iso/foreword.html).

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

This second edition cancels and replaces the first edition (ISO 5167-3:2003), which has been technically revised. The main changes compared to the previous edition are as follows:

- Addition of [Subclause 5.3](#).

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](http://www.iso.org/members.html).

## ISO 5167-3:2020(E)

### 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 flowrate of the fluid flowing in the conduit. It also gives necessary information for calculating the flowrate 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 within specified limits of pipe size and Reynolds number.

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.

The devices introduced into the pipe are called “primary devices”. The term primary device also includes the pressure tapplings. All other instruments or devices required for the measurement are known as “secondary devices”. ISO 5167 (all parts) covers primary devices; secondary devices<sup>1)</sup> will be mentioned only occasionally.

ISO 5167 consists of the following six parts.

- a) ISO 5167-1 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 ISO 5167-2, ISO 5167-3, ISO 5167-4, ISO 5167-5 and ISO 5167-6.
- b) ISO 5167-2 specifies orifice plates, which can be used with corner pressure tapplings,  $D$  and  $D/2$  pressure tapplings<sup>2)</sup>, and flange pressure tapplings.
- c) ISO 5167-3 specifies ISA 1932 nozzles<sup>3)</sup>, long radius nozzles, throat-tapped nozzles and Venturi nozzles, which differ in shape and in the position of the pressure tapplings.
- d) ISO 5167-4 specifies classical Venturi tubes<sup>4)</sup>.
- e) ISO 5167-5 specifies cone meters.
- f) ISO 5167-6 specifies wedge meters.

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

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1) See ISO 2186:2007.

2) Orifice plates with “vena contracta” pressure tapplings are not considered in ISO 5167-2.

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 3: Nozzles and Venturi nozzles

### 1 Scope

This document specifies the geometry and method of use (installation and operating conditions) of nozzles and Venturi nozzles when they are inserted in a conduit running full to determine the flowrate of the fluid flowing in the conduit.

This document also provides background information for calculating the flowrate and is applicable in conjunction with the requirements given in ISO 5167-1.

This document is applicable to nozzles and Venturi nozzles in which the flow remains subsonic throughout the measuring section and where the fluid can be considered as single-phase. In addition, each of the devices can only be used within specified limits of pipe size and Reynolds number. It is not applicable to the measurement of pulsating flow. It does not cover the use of nozzles and Venturi nozzles in pipe sizes less than 50 mm or more than 630 mm, or where the pipe Reynolds numbers are below 10 000.

This document deals with

- a) three types of standard nozzles:
  - 1) ISA 1932<sup>5)</sup> nozzle;
  - 2) the long radius nozzle<sup>6)</sup>;
  - 3) the throat-tapped nozzle
- b) the Venturi nozzle.

The three types of standard nozzle are fundamentally different and are described separately in this document. The Venturi nozzle has the same upstream face as the ISA 1932 nozzle, but has a divergent section and, therefore, a different location for the downstream pressure tapings, and is described separately. This design has a lower pressure loss than a similar nozzle. For all of these nozzles and for the Venturi nozzle 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.

### 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.

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

6) The long radius nozzle differs from the ISA 1932 nozzle in shape and in the position of the pressure tapings.

**ISO 5167-3:2020(E)**

ISO 4006, *Measurement of fluid flow in closed conduits — Vocabulary and symbols*

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

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