PD ISO/TR 12767:2023



BSI Standards Publication

Measurement of fluid flow by means of pressure differential devices — Guidelines on the effect of departure from the specifications and operating conditions given in ISO 5167

bsi.

National foreword

This Published Document is the UK implementation of ISO/TR 12767:2023. It supersedes PD ISO/TR 12767:2007, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee CPI/30/2, Differential pressure methods.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

This publication is not to be regarded as a British Standard.

© The British Standards Institution 2023
Published by BSI Standards Limited 2023

ISBN 978 0 539 24467 0

ICS 17.120.10

Compliance with a Published Document cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 September 2023.

Amendments/corrigenda issued since publication

Date	Text affected

PD ISO/TR 12767:2023

TECHNICAL REPORT

ISO/TR 12767

Third edition
2023-09-22

Measurement of fluid flow by means of pressure differential devices — Guidelines on the effect of departure from the specifications and operating conditions given in ISO 5167

Mesurage du débit des fluides au moyen d'appareils déprimogènes — Lignes directrices relatives aux effets des écarts par rapport aux spécifications et aux conditions d'utilisation données dans l'ISO 5167

Reference number
ISO/TR 12767:2023(E)

© ISO 2023



COPYRIGHT PROTECTED DOCUMENT

© ISO 2023, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

© ISO 2023 – All rights reserved

Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Symbols **2**
5 Effect of errors on flowrate calculations **3**
5.1 General 3
5.2 Quantifiable effects 3
6 Effects of deviations in construction **3**
6.1 Orifice-plate edge sharpness 3
6.2 Thickness of orifice edge 4
6.3 Condition of upstream and downstream faces of orifice plate 5
6.4 Position of pressure tappings for an orifice 6
6.4.1 General 6
6.4.2 Calculation of discharge coefficient 6
6.4.3 Estimation of additional uncertainty 6
6.4.4 Example 6
6.5 Condition of pressure tappings 7
7 Effects of pipeline near the meter **7**
7.1 Pipe diameter 7
7.2 Steps and taper sections 7
7.3 Diameter of carrier ring 8
7.4 Undersize joint rings 11
7.5 Protruding welds 11
7.6 Eccentricity 11
8 Effects of pipe layout **13**
8.1 General 13
8.2 Discharge coefficient compensation 14
8.2.1 Corrections 14
8.2.2 Additional uncertainty 15
8.3 Pressure tappings 16
8.4 Devices for improving flow conditions 16
9 Operational deviations **16**
9.1 General 16
9.2 Deformation of an orifice plate 17
9.2.1 General 17
9.2.2 Elastic deformation 17
9.2.3 Plastic deformation 17
9.3 Deposition on the upstream face of an orifice plate 18
9.4 Deposition in the meter tube 22
9.5 Orifice-plate edge sharpness 23
9.5.1 Deterioration 23
9.5.2 Plate reversal 23
9.6 Deposition and increase of surface roughness in Venturi tubes 24
9.6.1 General 24
9.6.2 Deposition 24
9.6.3 Surface roughness 24
10 Pipe roughness **25**
10.1 General 25

© ISO 2023 – All rights reserved

10.2 Upstream pipe 26
10.3 Downstream pipe 30
10.4 Reduction of roughness effects 30
10.5 Maintenance 30

Bibliography **32**

© ISO 2023 – All rights reserved

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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.

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

This third edition cancels and replaces the second edition (ISO/TR 12767:2007), which has been technically revised.

The main changes are as follows:

— editorial changes throughout the document.

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.

© ISO 2023 – All rights reserved

Introduction

ISO 5167 series specifies methods for flowrate measurement using pressure differential devices. Adherence to ISO 5167 series results in flowrate measurements whose uncertainty lies within specified limits. If, however, a flow-metering installation departs, for whatever reason, from the conditions specified in ISO 5167 series, the specified limits of uncertainty might not be achieved. Many metering installations exist where these conditions either have not been or cannot be met. In these circumstances, it is usually not possible to evaluate the precise effect of any such deviations. However, a considerable amount of data exists which can be used to give a general indication of the effect of non-conformity to ISO 5167 series and it is presented in this document as a guideline to users of flow-metering equipment.

© ISO 2023 – All rights reserved

TECHNICAL REPORT **ISO/TR 12767:2023**

Measurement of fluid flow by means of pressure differential devices — Guidelines on the effect of departure from the specifications and operating conditions given in ISO 5167

1 Scope

This document provides guidance on estimating the flowrate when using pressure differential devices constructed or operated outside the scope of ISO 5167 series.

Additional tolerances or corrections cannot necessarily compensate for the effects of deviating from ISO 5167 series. The information is given, in the first place, to indicate the degree of care necessary in the manufacture, installation and maintenance of pressure differential devices by describing some of the effects of non-conformity to the requirements; and in the second place, to permit those users who cannot comply fully with the requirements to assess, however roughly, the magnitude and direction of the resulting error in flowrate.

Each variation dealt with is treated as though it were the only one present. Where more than one is known to exist, there might be unpredictable interactions and care has to be taken when combining the assessment of these errors. If there is a significant number of errors, means of eliminating some of them have to be considered. The variations included in this document are by no means complete and relate largely to examples with orifice plates. An example with Venturi tubes has been placed at the end of its section. This document does not apply to cone meters or wedge meters. There are, no doubt, many similar examples of installations not conforming to ISO 5167 series for which no comparable data have been published. Such additional information from users, manufacturers and any others can be taken into account in future revisions of this document.

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 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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5167-1 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
square edge
angular relationship between the orifice bore of the flow-measurement device and the upstream face, when the angle between them is 90° ± 0,3°

© ISO 2023 – All rights reserved