



# SLOVENSKI STANDARD

SIST EN ISO 748:2008

01-januar-2008

BUXca Yý U.

SIST EN ISO 748:2001

---

<]Xfca Yff]U!`A Yf`Yb`Y`dfYfc\_UHY\_c ]b`j`cXdfh]`\_UbU]`n`i dcfUvc` ]Xfca Yff] b]`\_f]`U]`d`Uj U Yj`fGC`+(, .&\$+\$L

Hydrometry - Measurement of liquid flow in open channels using current-meters or floats (ISO 748:2007)

Hydrometrie - Durchflussmessung in offenen Gerinnen mittels Fließgeschwindigkeitsmessgeräten oder Schwimmern (ISO 748:2007)

(standards.iteh.ai)

Hydrométrie - Mesurage du débit des liquides dans les canaux découverts au moyen de débitmetres ou de flotteurs (ISO 748:2007)

<https://standards.iteh.ai/catalog/standards/sist/6cb84824-4245-4a90-8bba-6f74c84a62ef/sist-en-iso-748-2008>

**Ta slovenski standard je istoveten z: EN ISO 748:2007**

---

**ICS:**

17.120.20 Pretok v odprtih kanalih Flow in open channels

**SIST EN ISO 748:2008 en**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 748:2008

<https://standards.iteh.ai/catalog/standards/sist/6cb84824-4245-4a90-8bba-6f74c84a62ef/sist-en-iso-748-2008>

English Version

## Hydrometry - Measurement of liquid flow in open channels using current-meters or floats (ISO 748:2007)

Hydrométrie - Mesurage du débit des liquides dans les canaux découverts au moyen de débitmètres ou de flotteurs (ISO 748:2007)

Hydrometrie - Durchflussmessung in offenen Gerinnen mittels Fließgeschwindigkeitsmessgeräten oder Schwimmern (ISO 748:2007)

This European Standard was approved by CEN on 21 September 2007.

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 CEN 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 CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

[SIST EN ISO 748:2008](https://standards.iteh.ai/catalog/standards/sist/6cb84824-4245-4a90-8bba-6f74c84a62ef/sist-en-iso-748-2008)

<https://standards.iteh.ai/catalog/standards/sist/6cb84824-4245-4a90-8bba-6f74c84a62ef/sist-en-iso-748-2008>



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

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

**Contents**

Page

Foreword.....3

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 748:2008

<https://standards.iteh.ai/catalog/standards/sist/6cb84824-4245-4a90-8bba-6f74c84a62ef/sist-en-iso-748-2008>

## Foreword

This document (EN ISO 748:2007) has been prepared by Technical Committee ISO/TC 113 "Hydrometric determinations" in collaboration with Technical Committee CEN/TC 318 "Hydrometry" the secretariat of which is held by BSI.

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 April 2008, and conflicting national standards shall be withdrawn at the latest by April 2008.

This document supersedes EN ISO 748:2000.

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

### Endorsement notice

The text of ISO 748:2007 has been approved by CEN as a EN ISO 748:2007 without any modification.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**  
SIST EN ISO 748:2008  
<https://standards.iteh.ai/catalog/standards/sist/6cb84824-4245-4a90-8bba-6f74c84a62ef/sist-en-iso-748-2008>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 748:2008

<https://standards.iteh.ai/catalog/standards/sist/6cb84824-4245-4a90-8bba-6f74c84a62ef/sist-en-iso-748-2008>

---

---

**Hydrometry — Measurement of liquid  
flow in open channels using current-  
meters or floats**

*Hydrométrie — Mesurage du débit des liquides dans les canaux  
découverts au moyen de débitmètres ou de flotteurs*

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 748:2008

<https://standards.iteh.ai/catalog/standards/sist/6cb84824-4245-4a90-8bba-6f74c84a62ef/sist-en-iso-748-2008>



**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 748:2008

<https://standards.iteh.ai/catalog/standards/sist/6cb84824-4245-4a90-8bba-6f74c84a62ef/sist-en-iso-748-2008>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2007

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland



# Contents

Page

Foreword.....	v
<b>1</b> <b>Scope</b> .....	<b>1</b>
<b>2</b> <b>Normative references</b> .....	<b>1</b>
<b>3</b> <b>Terms and definitions</b> .....	<b>1</b>
<b>4</b> <b>Principle of the methods of measurements</b> .....	<b>1</b>
<b>5</b> <b>Selection and demarcation of site</b> .....	<b>2</b>
5.1 <b>Selection of site</b> .....	2
5.2 <b>Demarcation of site</b> .....	3
<b>6</b> <b>Measurement of cross-sectional area</b> .....	<b>3</b>
6.1 <b>General</b> .....	3
6.2 <b>Measurement of width</b> .....	3
6.3 <b>Measurement of depth</b> .....	4
<b>7</b> <b>Measurement of velocity</b> .....	<b>5</b>
7.1 <b>Measurement of velocity using current-meters</b> .....	<b>5</b>
7.1.1 <b>Rotating-element current-meters</b> .....	5
7.1.2 <b>Electromagnetic current-meters</b> .....	5
7.1.3 <b>Measurement procedure</b> .....	5
7.1.4 <b>Oblique flow</b> .....	6
7.1.5 <b>Determination of the mean velocity in a vertical</b> .....	7
7.1.6 <b>Errors and limitations</b> .....	10
7.2 <b>Measurement of velocity using floats</b> .....	11
7.2.1 <b>General</b> .....	11
7.2.2 <b>Selection of site</b> .....	11
7.2.3 <b>Measuring procedure</b> .....	11
7.2.4 <b>Types of float</b> .....	11
7.2.5 <b>Determination of velocity</b> .....	12
7.2.6 <b>Main sources of error</b> .....	13
<b>8</b> <b>Computation of discharge</b> .....	<b>13</b>
8.1 <b>General</b> .....	13
8.2 <b>Graphical method</b> .....	13
8.2.1 <b>Depth-velocity-integration</b> .....	13
8.2.2 <b>Velocity-area integration method (velocity-contour method)</b> .....	14
8.3 <b>Arithmetic methods</b> .....	16
8.3.1 <b>Mean-section method</b> .....	16
8.3.2 <b>Mid-section method</b> .....	16
8.4 <b>Independent vertical method</b> .....	17
8.5 <b>Mean-section method — Horizontal planes</b> .....	20
8.6 <b>Determination of discharge from surface-float velocity measurements</b> .....	20
8.7 <b>Determination of discharge for variations of water level</b> .....	22
8.7.1 <b>General</b> .....	22
8.7.2 <b>Computation of discharge</b> .....	22
8.7.3 <b>Computation of mean water level</b> .....	22
<b>9</b> <b>Uncertainties in flow measurement</b> .....	<b>23</b>
9.1 <b>General</b> .....	23
9.2 <b>Definition of uncertainty</b> .....	23
9.3 <b>Method of calculating the uncertainty in discharge by measurement of velocity by current-meter</b> .....	24
9.3.1 <b>General</b> .....	24

9.3.2	Contributory uncertainties .....	24
9.3.3	Example.....	26
9.3.4	Combined uncertainty .....	26
9.4	Method of calculating the uncertainty in discharge by measurement of velocity using floats .....	27
9.4.1	General .....	27
9.4.2	Contributory uncertainties .....	27
9.4.3	Combined uncertainty in discharge .....	28
9.4.4	Example.....	28
Annex A	(informative) Correction for sag, pull, slope and temperature in measurement of cross-section width by tape or wire.....	30
Annex B	(informative) Distance measurement across the cross-section .....	33
Annex C	(informative) Corrections for wetted length of wire when measuring depths with wire not normal to surface .....	36
Annex D	(informative) Correction for drift .....	39
Annex E	(informative) Uncertainties in the velocity-area measurement.....	40
Annex F	(informative) Determination of mean velocity from float measurements .....	44
Bibliography	.....	46

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 748:2008

<https://standards.iteh.ai/catalog/standards/sist/6cb84824-4245-4a90-8bba-6f74c84a62ef/sist-en-iso-748-2008>

## 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 748 was prepared by Technical Committee ISO/TC 113, *Hydrometry*, Subcommittee SC 1, *Velocity area methods*.

This fourth edition cancels and replaces the third edition (ISO 748:1997), which has been technically revised.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 748:2008

<https://standards.iteh.ai/catalog/standards/sist/6cb84824-4245-4a90-8bba-6f74c84a62ef/sist-en-iso-748-2008>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 748:2008

<https://standards.iteh.ai/catalog/standards/sist/6cb84824-4245-4a90-8bba-6f74c84a62ef/sist-en-iso-748-2008>

# Hydrometry — Measurement of liquid flow in open channels using current-meters or floats

## 1 Scope

This International Standard specifies methods for determining the velocity and cross-sectional area of water flowing in open channels without ice cover, and for computing the discharge therefrom.

It covers methods of employing current-meters or floats to measure the velocities. It should be noted that although, in some cases, these measurements are intended to determine the stage-discharge relation of a gauging station, this International Standard deals only with single measurements of the discharge; the continuous recording of discharges over a period of time is covered in ISO 1100-1 and ISO 1100-2.

NOTE The methods for determining the velocity and cross-sectional area of water flowing in open channels with ice cover are specified in ISO 9196.

## 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 772, *Hydrometric determinations — Vocabulary and symbols*

ISO 1088, *Hydrometry — Velocity-area methods using current-meters — Collection and processing of data for determination of uncertainties in flow measurement*

ISO 2537, *Hydrometry — Rotating-element current-meters*

ISO 3455, *Hydrometry — Calibration of current-meters in straight open tanks*

ISO/TS 15768, *Measurement of liquid velocity in open channels — Design, selection and use of electromagnetic current meters*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 772 apply.

## 4 Principle of the methods of measurements

**4.1** The principle of these methods consists of determining velocity and cross-sectional area. A measuring site is chosen conforming to the specified requirements (see Clause 5); the width, depending on its magnitude, is measured either by means of steel tape or by some other surveying method, and the depth is measured at a number of points (known as verticals) across the width, sufficient to determine the shape and area of the cross-section (see Clause 6).

Velocity observations using current-meters are made at each vertical preferably at the same time as measurement of depth, especially in the case of unstable beds (see 7.1.5).

Velocity observations can also be made using surface floats or velocity-rods (see 7.2).

**4.2** The discharge is computed either arithmetically or graphically by summing the products of the velocity and corresponding area for a series of observations in a cross-section. If unit width discharge is required, it is generally computed from the individual observations at each measurement vertical.

## 5 Selection and demarcation of site

### 5.1 Selection of site

The site selected should comply as far as possible with the following requirements.

- a) The channel at the measuring site should be straight and of uniform cross-section and slope in order to minimize abnormal velocity distribution. When the length of the channel is restricted, it is recommended for current-meter measurements that the straight length upstream should be at least twice that downstream.
- b) Flow directions for all points on any vertical across the width should be parallel to one another and at right angles to the measurement section.
- c) The bed and margins of the channels should be stable and well defined at all stages of flow in order to facilitate accurate measurement of the cross-section and ensure uniformity of conditions during and between discharge measurements. (standards.iteh.ai)
- d) The curves of the distribution of velocities should be regular in the vertical and horizontal planes of measurement. SIST EN ISO 748:2008  
<https://standards.iteh.ai/catalog/standards/sist/6cb84824-4245-4a90-8bba-6f74e84af3ef/sist-en-iso-748-2008>
- e) Conditions at the section and in its vicinity should also be such as to preclude changes taking place in the velocity distribution during the period of measurement.
- f) Sites displaying vortices, reverse flow or dead water should be avoided.
- g) The measurement section should be clearly visible across its width and unobstructed by trees, aquatic growth or other obstacles.
- h) Measurement of flow from bridges can be a convenient and sometimes safer way of sampling width, depth and velocity. When gauging from a bridge with divide piers, each section of the channel should be measured separately. Particular care should be taken in determining the velocity distribution when bridge apertures are surcharged or obstructed.
- i) The depth of water at the section should be sufficient at all stages to provide for the effective immersion of the current-meter or float, whichever is to be used.
- j) If the site is to be established as a permanent station, it should be easily accessible at all times with all necessary measurement equipment.
- k) The section should be sited away from pumps, sluices and outfalls, if their operation during a measurement is likely to create unsteady flow conditions.
- l) Sites where there is converging or diverging flow should be avoided.
- m) In those instances where it is necessary to make measurements in the vicinity of a bridge, it is preferable that the measuring site be upstream of the bridge. However, in certain cases and where accumulation of ice, logs or debris is liable to occur, it is acceptable that the measuring site be downstream of the bridge.

