INTERNATIONAL STANDARD

ISO 772

Sixth edition
2022-02

Hydrometry — Vocabulary and symbols

Hydrométrie — Vocabulaire et symboles

Reference number
ISO 772:2022(E)

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.

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).

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).

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 113, *Hydrometry,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 318, *Hydrometry,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This sixth edition cancels and replaces the fifth edition (ISO 772:2011) which has been technically revised. The main changes compared with the previous edition are as follows:

— terms related to precipitation have been added in a new Clause 9;

— additional terms have been added in Clause 10;

— Figures 1, 3, 4, 5, 6, 9, 11 and 12 have been modified and updated.

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.

Introduction

In the preparation of this document, the following principles were adopted wherever possible:

a) to standardize suitable terms and symbols without perpetuating unsuitable ones;

b) to discard any term or symbol with differing meanings in different countries, or for different people, or for the same person at different times, and to replace that term or symbol by one which has an unequivocal meaning;

c) to exclude terms which are self-evident.

Terms in existing International Standards have been included as much as possible; however, these terms can be subject to future amendments.

NOTE Similar or identical terms can have separate definitions under the different categories.

It is recognized that it is not possible to produce a complete set of definitions which will be universally acceptable, but it is hoped that the definitions provided and the symbols used will find widespread acceptance and that their use will lead to a better understanding of hydrometric practices.

The terminology entries are presented in systematic order, grouped into sections according to particular methods of determination or in relation to particular subjects. Annex A lists the symbols used in this document.

The structure of each entry is in accordance with the ISO 10241 series. Country codes are in accordance with ISO 3166-1.

Hydrometry — Vocabulary and symbols

1 Scope

This document defines terms and symbols used in standards in the field of hydrometry.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
hydrometry
science and practice of measuring the components of the *hydrological cycle* (3.92), including *rainfall* (9.10), *water level* (3.64), flow and *sediment transport* (8.2) of surface waters, and *groundwater* (11.1) characteristics

3.2
hydrology
science that deals with the waters above and below the land surfaces of the Earth, their occurrence, circulation and distribution, their properties and their reaction with the environment

3.3
flow
water flowing on or below the land surface under gravitational influence

3.4
runoff
volume of water flowing through a given channel cross-section related to a given *drainage basin* (3.103) in a defined period of time

3.5
discharge
Q
volume of water flowing through a given channel cross-section in unit time

3.6
current
directed movement of water

3.7
steady flow
flow (3.3) in which parameters [such as *velocity* (3.113), pressure, density and temperature] are constant with respect to time

3.8
unsteady flow
flow (3.3) in which one or more parameters [such as *velocity* (3.113), pressure, density and temperature] change with respect to time

3.9
uniform flow
flow (3.3) in which the magnitude and direction of flow at a given moment are constant with respect to distance

Note 1 to entry: For uniform flow, the velocity vector is constant along every stream line. Uniform flow is possible only in an *open channel* (3.19) of constant slope and cross-section.

3.10
non-uniform flow
flow (3.3) in which the magnitude and direction of flow at a given moment are changing with respect to distance

3.11
critical flow
<open channel flow> *flow* (3.3) in an *open channel* (3.19) in which the specific energy is a minimum for a given *discharge* (3.5)

Note 1 to entry: Under this condition, the *Froude number* (3.89) is equal to unity and small surface disturbances cannot travel upstream.

3.12
subcritical flow
flow (3.3) in an *open channel* (3.19) at less than *critical velocity* (3.17), which has a *Froude number* (3.89) of less than unity and in which small surface disturbances can travel upstream

3.13
supercritical flow
flow (3.3) in an *open channel* (3.19) at more than *critical velocity* (3.17), which has a *Froude number* (3.89) of greater than unity and in which small surface disturbances cannot travel upstream

3.14
transverse flow
lateral flow
flow (3.3) horizontally perpendicular to the main direction of flow

Note 1 to entry: Transverse (lateral) flow is frequently associated with secondary flow.

Note 2 to entry: Transverse (lateral) flow in *open channels* (3.19) with a curved plan form causes superelevation of the water surface at the outside of the bend.

3.15
stratification
state of a water body that consists of two or more layers arranged according to their density, the lightest layer being on top and the heaviest at the bottom

3.16
critical depth
depth (3.78) of *flow* (3.3) at which *critical flow* (3.11) occurs

3.17
critical velocity
velocity (3.113) of *flow* (3.3) that has minimum specific energy for a given *discharge* (3.5) or has unit *Froude number* (3.89)

3.18
channel
course of a *river* (3.27), *stream* (3.26) or other watercourse

3.19
open channel
longitudinal boundary surface consisting of the bed and banks or sides within which water flows with a free surface

3.20
canal
man-made *channel* (3.18), usually of regular cross-sectional shape

3.21
stable channel
open channel (3.19) in which the bed and the sides remain essentially stable over a substantial period of time in the *reach* (3.34) under consideration, and in which the scour and *deposition* (10.5) during the rising and falling stages are negligible

3.22
unstable channel
open channel (3.19) that changes frequently and significantly in its plan form and/or cross-sectional form for the *reach* (3.34) under consideration

3.23
tidal channel
open channel (3.19) in which the *flow* (3.3) is subject to tidal influence

3.24
tide
periodic rise and fall of water due principally to the gravitational attraction of the sun and the moon

3.25
estuary
lower tidal *reaches* (3.34) of a *river* (3.27) that is freely connected with the sea which receives fresh water supplies from upland drainage areas

3.26
stream
water course, water flowing in an *open channel* (3.19)

3.27
river
large natural water course

3.28
large river
major river
large natural water course that generally flows into the sea

3.29
creek
brook
small natural water course

3.30
torrent
small natural water course that is characterized by steep slopes and significant rapid changes in *discharge* (3.5) and that can transport considerable volumes of solid material

3.31
alluvial river
river (3.27) which flows through alluvium formed from its own deposits

3.32
incised river
river (3.27) which has formed its *channel* (3.18) by a process of erosion

3.33
braided river
river (3.27) characterized by a wide and shallow *open channel* (3.19) in which *flow* (3.3) passes through a number of small interlaced *channels* (3.18)

3.34
reach
length of *open channel* (3.19) between two defined cross-sections

3.35
meandering channel
water course formed by natural flow processes and movement of sediments following generally an alternating regular sinuous path

3.36
thalweg
line joining the lowest points of successive cross-sections of a water course

3.37
unit discharge
discharge per unit width
q_u
discharge (3.5) through a unit width of a given vertical section

3.38
yield specific discharge
q
discharge (3.5) per unit area of catchment or *aquifer* (11.15)

3.39
stream gauging
discharge measurement
flow measurement
stream flow measurement
river gauging
all of the operations necessary for the measurement of *discharge* (3.5) of a *stream* (3.26)

3.40
gauge
device installed at a gauging station for measuring the level of the surface of water relative to a datum

3.41
left bank
bank to the left of an observer looking downstream

3.42
right bank
bank to the right of an observer looking downstream

3.43
channel bed
invert
stream bed
stream bottom
channel bottom
lower part of the stream channel situated between the banks

3.44
bed slope
bottom slope
S_o
difference in elevation of the bed per unit horizontal distance, measured in the direction of *flow* (3.3)

Note 1 to entry: The slope is usually mathematically negative in the direction of flow.

3.45
bed profile
shape of the bed in a longitudinal vertical plane

3.46
side slope
difference in elevation between the bottom and top of a bank per unit horizontal distance

3.47
surface slope
S_w
inclination of the surface of the *stream* (3.26) in a *reach* (3.34) measured in the direction of *flow* (3.3)

3.48
fall
difference in elevation of the water surface between the extremities of a defined *reach* (3.34) at a given instant of time

EXAMPLE As recorded at a *slope station* (3.71).

3.49
top width
width of the *open channel* (3.19) measured across the *stream* (3.26) at the water surface normal to the direction of *flow* (3.3)

3.50
wetted perimeter
P_w
contact length between a *stream* (3.26) of flowing water and its containing *open channel* (3.19), measured in a direction normal to the *flow* (3.3)

3.51
wetted cross-section
<of a stream> section normal to the mean direction of *flow* (3.3) bounded by the free surface and *wetted perimeter* (3.50)

3.52
gauging section
measuring section
section at which *discharge* (3.5) measurements are taken

3.53
high water mark
flood mark
mark left on a structure or any other object indicating exceptional stages of flood

3.54
debris line
trash line
traces of any kind left on the banks or obstacles or flood plain by a flood

Note 1 to entry: The debris line may be used to determine the highest level attained by the water surface during a flood.

3.55
surface velocity
flow (3.3) *velocity* (3.113) at a given point on the surface

3.56
mean velocity
<at a cross-section> *flow* (3.3) *velocity* (3.113) at a given cross-section of a *stream* (3.26), obtained by dividing the *discharge* (3.5) by the cross-sectional area

3.57
slush ice
mass of loosely packed *anchor ice* (3.105) that is released from the bottom, or *frazil ice* (3.104) that floats or accumulates under *surface ice* (3.107)

3.58
velocity head
theoretical vertical height to which liquid particles can be elevated by kinetic energy

Note 1 to entry: It is expressed as the square of the *velocity* (3.113) divided by twice the acceleration due to gravity.

3.59
gauged head
elevation of the free surface above the horizontal datum of a section

3.60
total head
energy head
H
sum of the elevation of the free surface above the horizontal datum of a section plus the *velocity head* (3.58) based on the *mean velocity* (3.56) at that section

Note 1 to entry: The total head, *H*, is given by the following formula:

$$H = h + \alpha \frac{\bar{v}^2}{2g}$$

where

- h is the gauged head of *water level* (3.64);
- $\bar{v}$ is the mean velocity of the water;
- α is the Coriolis coefficient;
- g is the acceleration due to gravity.

Note 2 to entry: The Coriolis coefficient ($\alpha \geq 1$), also known as “energy coefficient” or “energy correction factor”, takes into account the non-uniform velocity distribution. In many cases, α is assumed to equal unity.

3.61
total head line
energy head line
plot of the *total head* (3.60) in the direction of *flow* (3.3)

3.62
energy gradient
difference in *total head* (3.60) per unit horizontal distance, measured in the direction of *flow* (3.3)

3.63
energy loss
head loss
difference in *total head* (3.60) between two cross-sections in the direction of *flow* (3.3)

3.64
water level
stage
gauge height
elevation of the free surface of a *stream* (3.26), lake or reservoir relative to a specified datum

3.65
reference gauge
stage gauge that *discharge* (3.5) is normally linked to

3.66
stage-discharge relation
rating curve
rating table
equation, curve or table that expresses the relation between the stage and the *discharge* (3.5) in an *open channel* (3.19) at a given cross-section

3.67
hydrograph
<open channel flow> graphical representation of changes of hydrometric parameters with respect to time

Note 1 to entry: Typically, stage and discharge hydrographs are used for open channel flows.

3.68
cumulative volume curve
curve in which the cumulative value of a hydrometric parameter is plotted against time

Note 1 to entry: Integral of the *hydrograph* (3.67), such as cumulative discharge curve.

3.69
storage curve
table
curve depicting the volume of stored water plotted against *water level* (3.64)

3.70
gauging station
site on a *stream* (3.26), *river* (3.27) or lake at which systematic measurements of *water level* (3.64), *velocity* (3.113) or *discharge* (3.5) or any combination of the three are made

3.71
slope station
twin-gauge station
gauging station (3.70) at which two water-level *gauges* (3.40) define a *reach* (3.34) for measurement of water-surface slope as an essential parameter for establishing a *stage-discharge relation* (3.66)

3.72
control
physical properties of a cross-section or a *reach* (3.34) of an *open channel* (3.19), either natural or artificial, that govern the relation between stage and *discharge* (3.5) at a location in the open channel

3.73
rating
relation between *discharge* (3.5) and other variables, or the taking of observations and making of calculations needed to establish the relation

3.74
unit-fall rating
relation between stage and *discharge* (3.5) when the *fall* (3.48) is equal to one

3.75
afflux
rise in *water level* (3.64) immediately upstream of, and due to, an obstruction

3.76
backwater curve
profile of water surface, along an *open channel* (3.19), from the raised surface at an obstruction or confluence to the point upstream at which the *flow* (3.3) is at normal *depth* (3.78)

Note 1 to entry: The term is also used to denote all liquid surface profiles that are non-uniform with respect to distance upstream or downstream. However, this usage is deprecated.

3.77
drawdown curve
profile of the liquid surface when its *surface slope* (S_w) (3.47) exceeds the *bed slope* (S_o) (3.44)

Note 1 to entry: From the point at which the bed slope increases, or bed level drops abruptly, to the point at which normal *depth* (3.78) occurs, the profile along an *open channel* (3.19) is convex upwards in an upstream direction and concave upwards in a downstream direction.

3.78
depth
D
linear dimension measured in the vertical direction from the water surface to the bed

3.79
peak stage
maximum instantaneous stage during a given period

3.80
friction
drag
boundary shear resistance that opposes the *flow* (3.3) of a liquid

3.81
conveyance
K
carrying capacity of a *channel* (3.18)

Note 1 to entry: The term “conveyance factor” is also used, e.g. in the formula:

$$K = QS^{-1/2}$$

where

K is the conveyance factor;

Q is the total *discharge* (3.5);

S is the *energy gradient* (3.62).

3.82
hydraulic jump
sudden transition from *supercritical flow* (3.13) to *subcritical flow* (3.12)

Note 1 to entry: Immediately upstream of the hydraulic jump, the *velocity* (3.113) and the *depth* (3.78) are respectively greater and less than their critical values. Beyond the jump, the velocity and the depth are respectively less and greater than their critical values.

3.83
hydraulic mean depth
mean depth
D_m
area of the cross-section of water flowing in an *open channel* (3.19) divided by the width of the open channel at the water surface

3.84
hydraulic radius
r_h
wetted cross-sectional area of water flowing in an *open channel* (3.19) divided by the length of the *wetted perimeter* (3.50) at that cross-section

3.85
gauge datum
elevation of the zero of the *gauge* (3.40) to which the level of the liquid surface is referred

Note 1 to entry: The gauge datum is related to a *benchmark* (3.86).

3.86
benchmark
permanent mark, the elevation of which should be related, where practicable, to a national datum

3.87
gauge/float well
stilling well/tube
chamber open to the atmosphere and connected with the *stream* (3.26) in such a way as to permit the measurement of the *water level* (3.64) in relatively still water

3.88
roughness coefficient
coefficient that characterizes the roughness of the channel cross-section and which is taken into account when computing the resistance to *flow* (3.3) or the *energy gradient* (3.62)

Note 1 to entry: The common types are the Manning's/Strickler n, Chezy C or an element roughness height, k.

3.89
Froude number
Fr
mean velocity (3.56) divided by the square root of the product of the *hydraulic mean depth* (3.83) and the acceleration due to gravity

$$Fr = \frac{\bar{v}}{(gD_m)^{1/2}}$$

where

$\bar{v}$ is the mean velocity of the liquid;