
**Hydrometry — Selection,
establishment and operation of a
gauging station**

*Hydrométrie — Sélection, établissement et exploitation d'une station
hydrométrique*

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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. www.iso.org/directives

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 113, *Hydrometry*, Subcommittee SC 1, Velocity area methods.

ISO 18365 cancels and replaces ISO 1100-1:1996 and ISO/TR 8363:1997, which have been merged and technically revised.

Hydrometry — Selection, establishment and operation of a gauging station

1 Scope

This International Standard gives requirements for the establishment and operation of a gauging station for the measurement of stage, or stage and discharge, of a lake, reservoir, river or canal or other artificial open channel. It also describes how a gauging station utilizing one of the measurement methods listed should be operated and maintained.

Requirements are provided for stage only measurement stations, stage–discharge stations and direct–discharge measurement stations in natural channels, as well as for stage–discharge stations with artificial structures. Additionally, some requirements are given for measurements under difficult conditions, such as under ice conditions.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 772, *Hydrometry — Vocabulary and symbols*

3 Terms, definitions and symbols

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

4 General requirements and considerations

4.1 Requirements

Before commencing work on establishment and operation of a gauging station, the following requirements shall be identified:

- a) range of levels required to be measured;
- b) range of flows required to be measured;
- c) customer's requirements for type of data;
- d) customer's requirements for timeliness of data;
- e) allowable uncertainty in the results;
- f) other potential users of the data;
- g) life expectancy of the station;
- h) available budget;
- i) agreements for access to land and construction permits.

4.2 Other constraints

In addition to the requirements as in 4.1, other constraints shall be identified including the following:

- a) local environmental issues;
- b) accessibility of the site under all conditions of flow;
- c) availability of power and communication links;
- d) stability of the watercourse embankments;
- e) stability of the watercourse bed;
- f) identification of any proposed hydraulic modifications planned for the future;
- e.g. bridges, tunnels (including pipe crossings), harbours or piers;
- g) potential of vandalism;
- h) influence of submergence of the gauging site due to downstream impounding structures (lakes, dams, weirs);
- i) potential stream losses in karst areas;
- j) aquatic weed growth in the watercourse;
- k) ice conditions during winter in cold and arctic regions.

Knowledge of the above requirements and local constraints will ensure the provision of appropriate measurement and recording facilities as well as the adoption of an appropriate maintenance philosophy.

5 Water level (Stage) only gauging stations

5.1 Preliminary survey and selection criteria

5.1.1 General

The site selected for determination of stage shall be selected according to the purpose for which the readings are required. Accessibility of the site and the availability of an observer if the gauge is to be non-recording are important criteria as is the availability of an appropriate power supply and data communication capabilities if the gauge is to be recording.

Gauges on lakes and reservoirs are normally located near the outlet, but shall be located sufficiently far away from the zone where an increase in velocity causes a drawdown in water level. Gauges on large bodies of water shall also be located so as to reduce the effect of strong winds which may cause misleading data which may not be representative of the body of water being measured. Hydraulic conditions (preferably a sufficiently long uniform stretch of water channel with uniform bed topography) are important factors in site selection in open channels, particularly where water levels may later be used in the computation of discharge. To ensure repeatability of the readings, ideally a bed or channel control shall be present, which itself shall be stable and sensitive to changes in the level of the water. For the purpose of monitoring water levels e.g. for flood warning purposes, this may not be a strict requirement.

5.1.2 Preliminary survey

A detailed examination of a 1:50,000 or larger scale map of the area is required in the first instance. Aerial surveys, satellite imagery, or maps available in the public domain such as Google Earth can be used as a basis for selecting potential sites, which can then be evaluated more precisely by ground reconnaissance. This will include a detailed visual examination. Enquiries shall be made to determine

whether or not any plans exist for the modification of the river reach which would modify the stream bed regime and would have an impact on the proposed gauging station.

Enquiries shall also be made into any known past flow history including low water events, floods and other high water events, existence of any overflow area leading to flow by-passing the site, and very importantly, any knowledge of bed instability.

It may be appropriate to discuss and outline proposals at an early stage with the owners of the site identified to ensure they are amenable to the proposed installation.

Surveys of channel geometry and flow velocity patterns using an Acoustic Doppler Current Profiler may provide useful information.

Collection of data from hydrometric measurement stations is dominated by the use of telemetry; availability and quality of methods of data transmission shall be investigated.

5.1.3 Selection criteria

A list of potential sites shall be established with their advantages and disadvantages identified. Site selection can then be made according to the criteria identified in [Clause 4](#). The establishment of the gauge zero shall be chosen so as to avoid negative readings. Thus it shall be set well below the level of the control feature. This zero point shall be correlated with a national datum through a station benchmark and should be checked annually with respect to this benchmark. This will ensure that, should loss or damage to the reference gauge occur, it can be replaced at exactly the same level.

The benchmark itself shall be checked regularly in order to confirm that it still represents the national datum. The frequency of such checks shall be dependent on local soil dynamics.

5.2 Stage measurement and recording

5.2.1 General

The reading of stage may be required as a single instantaneous measurement, as a short series of instantaneous measurements or as a continuous or practically continuous record of the fluctuations of stage. The basis of any of the above shall include the installation of a vertical staff gauge, a ramp gauge, or a wire-weight gauge.

5.2.2 Vertical staff gauge

A vertical staff gauge comprises a scale (normally 1 metre in length with graduations or scale divisions of 5 or 10 mm) marked on or securely attached to a suitable and stable vertical surface. The gauge shall be made of material with a low coefficient of expansion. Where the range of measurement required exceeds the capacity of a single vertical gauge, other gauges shall be installed on the line of a cross-section normal to the direction of flow. The scales on such a series of stepped staff gauges shall overlap by not less than 15 cm in order to safeguard continuity of readings and also to confirm their consistency with each other.

5.2.3 Ramp or inclined gauge

A ramp or inclined gauge consists of a scale marked on or securely attached to a suitable and stable inclined surface, which conforms closely to the contour of the river bank. The gauge shall be made of material with a low coefficient of expansion. Throughout its length the gauge may lie on one continuous slope or may be a compound of two or more slopes. The gauge shall lie on a line of a cross-section normal to the direction of flow.

5.2.4 Wire or tape weight gauge

A wire or tape weight gauge consists of a weight which is manually lowered until the weight touches the surface of the water. The wire or tape may be wound on a drum attached to a winding mechanism