SLOVENSKI STANDARD
SIST ENV 14028:2001

01-november-2001

Hidrometrija - Uporaba turbinskih pretoļnih meril in njihova kalibracija

Hydrometry - The application of propeller-type current meters and their calibration

Hydrometrie - Anwendung von Fließgeschwindigkeitsmessen mit Geschwindigkeitsmessflügeln und ihre Kalibrierung

Hydrométrie - Techniques opératoires pour l'étalonnage des moulinets hydrométriques a hélice

Ta slovenski standard je istoveten z: ENV 14028:2001

ICS:

17.120.20 Pretok v odprtih kanalih Flow in open channels

SIST ENV 14028:2001 **en**

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English version

Hydrometry - The application of propeller-type current meters and their calibration

This European Prestandard (ENV) was approved by CEN on 7 March 2001 as a prospective standard for provisional application.

The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into a European Standard.

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 318 "Hydrometry", the secretariat of which is held by BSI.

The text of the International Standard ISO 2537 : 1988 has been modified by the Technical Committee CEN/TC 318 "Hydrometry", which has decided to submit this European Standard for approval as an ENV.

This standard includes a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this European Prestandard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Prestandard specifies the operational requirements, calibration and maintenance of propeller-type devices for the measurement of flow velocities in open channels. The requirements of the calibration facility are laid down. The result of calibration is the relationship between water velocity and rate of revolution of the propeller.

This European Prestandard does not define the form of the signal produced by the equipment or the signal receiving equipment.

2 Normative References

This European Prestandard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

ISO 772 : 1996
Hydrometric determinations – Vocabulary and symbols

3 Terms and definitions

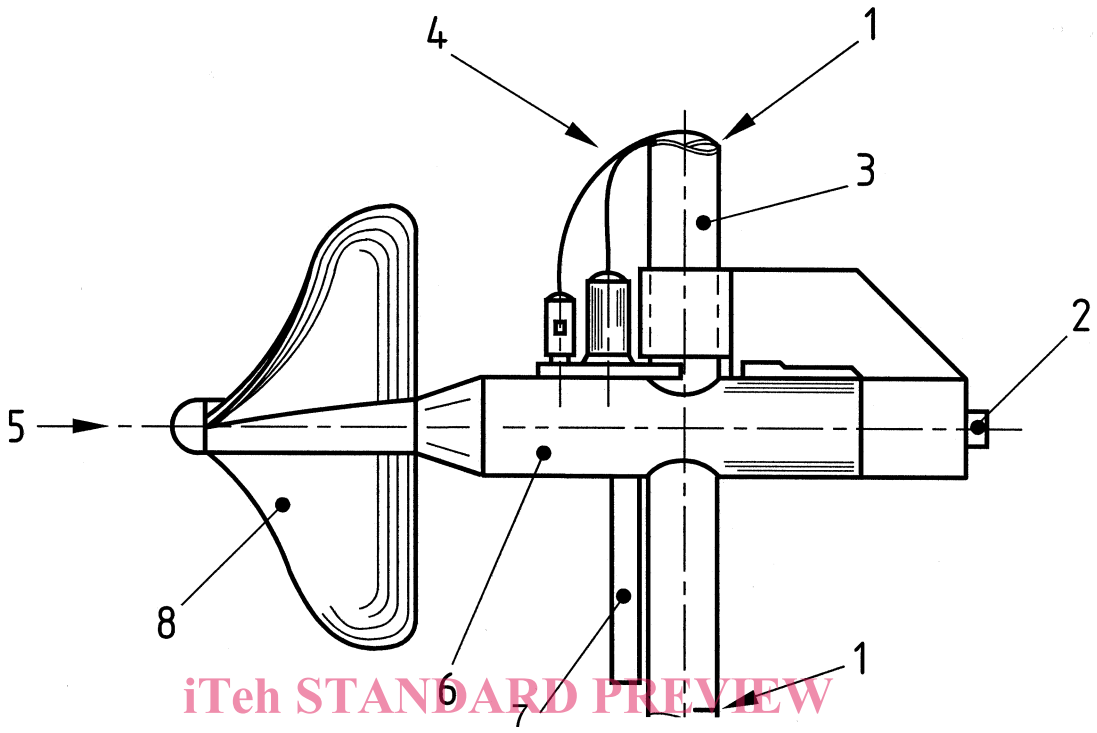
For the purposes of this European Standard, the terms and definitions given in ISO 772 :1996 apply.

4 Principle of operation and calibration

The propeller of a current meter is driven by the fluid at an angular velocity which is a function of the local velocity of the fluid at the point of immersion when that velocity exceeds a critical value.

The axis of the propeller should be parallel to the direction of flow.

The calibration procedure consists of towing the current meter through still water at a number of known velocities, at which the precise rate of revolution is determined after a constant speed has been reached. The rate of revolution of the propeller, the time taken, and distance travelled are measured when the current meter is travelling at constant speed. The rates of revolution of the propeller are related to the speed of the rating carriage by means of one or more equations, for which the limits of application are given.



Key

1 Rod
2 Current meter mounted by screw
3 Slide support
4 Cable transmitting the signals
5 Direction of flow
6 Body of the current meter
7 Distance pin for protection of the propeller
8 Propeller

Figure 1 - Propeller-type Current Meter (rod suspension)

5 Operational requirements

5.1 Positioning

The equipment should maintain alignment with the flow in such a way that the propeller responds to flow movement as intended. If a pivoted suspension is incorporated within the current meter, it should permit freedom in the vertical plane to ensure correct alignment with the liquid flow. Alignment in the horizontal plane may be affected by the correct choice of suspension equipment.

Current meters of conventional construction are intended to operate in a horizontal or near-horizontal position. Current meters designed to operate in other positions are not covered by this European Standard.

5.2 Limits of use

The propeller of the current meter shall be such that, when driven by the fluid, it rotates at an angular velocity which has a known relationship to the velocity of the flow within the calibrated velocity range stated by the

manufacturer of the current meter or rating laboratory.

The suspension system used shall be as specified by the manufacturer of the current meter.

The current meter shall be used only in liquids with properties similar to those in which the meter was calibrated. If the liquid properties are significantly different, the meter shall be recalibrated in a liquid with properties similar to that in which the meter is to be used.

Unless otherwise indicated, the current meter shall be capable of being used in waters containing suspended sediment and in saline waters.

The manufacturer shall state the maximum hydrostatic pressure to which the instrument may be subjected.

5.3 Maintenance

Under conditions of normal operation, the user shall follow recommended check procedures before and after each discharge measurement, as laid down in the manufacturer's operation and service manual.

Spare parts shall be fully interchangeable so as to have uniform functional characteristics. The manufacturer shall state the maximum uncertainty introduced by fitting a replacement part.

5.4 Operating and service manual

A comprehensive operating and servicing manual shall be supplied with each instrument. It shall present full instructions, illustrated where necessary, and include appropriate circuit diagrams with component values.

6 Calibration

6.1 Frequency of calibration

Meters shall be recalibrated whenever their performance is suspect. The use of a reference current meter is recommended for early diagnosis of a fault occurring in the performance of the current meter. In practice, for individually rated meters, recalibration is sometimes carried out at two yearly intervals or after 300 h of use, whichever is the shorter.

6.2 Effect of suspension

The performance of a meter may be affected by its mode of suspension and the sounding weight used. For individual ratings, it is advisable that the calibration be carried out using the means of suspension and the sounding weight intended to be used during a measurement. The distances from the bottom, the top and the side walls of the calibration tank to the meter, for the calibrated configuration, shall be specified by the rating laboratory or manufacturer.

It is possible to derive by experiment coefficients which can be applied to gauging data to correct for the effects (if any) of different sounding weights and different types, size, and shape of suspension.

Such coefficients are applicable only to the specific combination for which data have been experimentally obtained.

6.3 Calibration tank

The dimensions of the calibration tank will influence calibration and also limit the number of instruments that can be towed simultaneously. The cross-section of the tank shall be identical along the entire length of travel.

6.3.1 Cross-section

The depth of the water in the calibration tank may influence the results of measurement if the towing speed is in the region of the speed of propagation of surface waves (Epper effect). The wave propagation speed v_c is given by the following equation:

$$v_c = \sqrt{gh}$$

where:

g is the acceleration due to gravity (9,81 m/s^2);

h is the depth of water in the calibration tank (m).

The cross-section of the tank has an effect on the accuracy of the calibration (the narrower the tank, the greater the effect). The Epper effect is best determined experimentally. Its effects are dependent on the rod cross-section and on the type of current meter.

The cross-section of the tank limits the number of current meters that can be calibrated simultaneously, and exerts an influence on the tank's stilling properties (the time required for the water movement to die away sufficiently to allow another calibration run to take place, see 7.6.3).

6.3.2 Length of the calibration tank

The length of the calibration tank comprises:

– accelerating reach;

– stabilizing reach;

– measuring reach;

– braking reach;

– safety reach.

Various dimensions are possible, depending on carriage construction and type of operation. The length of the measuring reach selected shall be such that the superimposed tolerances of the distance and time measurements at maximum speed do not exceed the total tolerance of the calibration facility. The length of the measuring reach also depends on the configuration to be calibrated.

6.4 Guide system for the rating carriage

The guide system shall run straight and parallel to the calibration tank, and as far as possible allow vibration-free operation of the rating carriage.

6.5 Rating carriage

The construction of the rating carriage shall be such as to ensure that its operation is as vibration-free as possible. It shall be capable of carrying the current meter mounting rods and cables adjusted to various positions. There are various possible modes of propulsion. The main requirements are as follows:

– sufficient adjustability;

– constant velocity over the whole measuring reach.