



Standard Test Method for Velocity Measurements of Water in Open Channels with Rotating Element Current Meters¹

This standard is issued under the fixed designation D 4409; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method describes the design and use of cup-type or vane-type vertical axis current meters and propeller-type horizontal axis current meters for measuring water velocities in open channels.

1.2 This test method is intended primarily for those meters customarily used in open-channel hydraulic (as distinguished from oceanographic) applications with an operator in attendance.

1.3 This test method is intended primarily for current meters that measure one component or filament of flow.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 1129 Terminology Relating to Water²

D 2777 Practice for Determination of Precision and Bias of Applicable Methods of Committee D-19 on Water²

D 3858 Test Method for Open-Channel Flow Measurement of Water by Velocity-Area Method²

2.2 ISO Standards:

ISO 2537 Liquid Flow Measurement in Open Channels—Rotating Element Current Meters³

ISO 3454 Liquid Flow Measurement in Open Channels—Direct Depth Sounding and Suspension Equipment³

ISO 3455 Liquid Flow Measurement in Open Channels—Calibration of Rotating-Element Current Meters in Straight Open Tanks³

3. Terminology

3.1 *Definitions:* For definitions of other terms used in this test method, refer to Terminology D 1129.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *current meter*—an instrument used to measure the speed or velocity of flowing water at a point.

3.2.2 *Price-type current meters*—generic name for specific vertical axis meters with a rotating element consisting of six conical cups and constructed as described in Refs (1-3).⁴

3.2.3 *spin test*—a test performed to check the bearings of a current meter. This test is used primarily with vertical axis current meters.

3.2.4 *turbulence*—irregular condition of flow in which the velocity exhibits a random variation with time and space coordinates so that statistically distinct average values can be discerned.

4. Summary of Test Method

4.1 The angular velocity of the rotating element is a function of water speed at the point of immersion. This angular velocity is determined from the meter output and its functional relation to the water speed is determined by calibration.

5. Significance and Use

5.1 This test method describes the design and use of various types of current meters. These current meters are commonly used to measure the velocity at a point in an open channel cross section as part of a velocity-area traverse to determine the flowrate of water. To this end it should be used in conjunction with Test Method D 3858.

6. Interferences

6.1 As with any intrusive flow measuring device, rotating element current meters are subject to damage by debris, especially in high velocity flows, and to fouling by floating materials such as aquatic growths and sewage.

6.2 Owing to bearing friction, each rotating element current meter has a limiting low velocity below which it does not function reliably. This velocity is different for each type of

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² Annual Book of ASTM Standards, Vol 11.01.

³ Published by International Standards Organization and available from American National Standards Institute, 11 W. 42nd St., 13th floor, New York, NY 10036.

⁴ The boldface numbers refer to the list of references at the end of this test method.