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ISO 2537:1988

Australian Standard®

# Measurement of water flow in open channels

# Part 6.1: Measuring devices, instruments and equipment—Rotating element current-meters

[ISO title: Liquid flow measurement in open channels—Rotating element current-meters]

This Australian Standard was prepared by Committee CE/24, Measurement of Water Flow in Open Channels and Closed Conduits. It was approved on behalf of the Council of Standards Australia on 9 January 1992 and published on 16 April 1992.

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The following interests are represented on Committee CE/24:

The Association of Consulting Engineers of Australia

Australian Water and Wastewater Association

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Engineering and Water Supply Department of South Australia

Forestry Commission, N.S.W.

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# Measurement of water flow in open channels

## Part 6.1: Measuring devices, instruments and equipment—Rotating element current-meters

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# PREFACE

This Standard was prepared by the Standards Australia Committee on Measurement of Water Flow in Open Channels and Closed Conduits. It is identical with and has been reproduced from ISO 2537:1988, *Liquid flow measurement in open channels — Rotating element current-meters*.

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This Standard is one of a series which deals with methods of measurement of water flow in open channels. The series when complete will consist of the following parts:

Part 1: *Vocabulary and symbols*

Part 2.1: *General — Guidelines for the selection of methods of measurement*
Part 2.2: *General — Establishment and operation of a gauging station*
Part 2.3: *General — Determination of the stage-discharge relation*
Part 2.4: *General — Estimation of uncertainty of a flow-rate measurement*
Part 2.5: *General — Guidelines for the selection of flow gauging structures*

Part 3: *Velocity-area methods*
Method 3.1: *Measurement by current-meters and floats*
Method 3.2: *Measurement by moving-boat method*
Method 3.3: *Measurement by slope-area method*
Method 3.4: *Collection and processing of data for determination of errors in measurement*
Method 3.5: *Investigation of total error*
Method 3.6: *Measurement of flow in tidal channels*
Method 3.7: *Measurement by ultrasonic (acoustic) method*
Method 3.8: *Electromagnetic method using a full-channel-width coil*

Part 4: *Measurement using flow gauging structures*
Method 4.1: *Thin-plate weirs*
Method 4.2: *Rectangular broad-crested weirs*
Method 4.3: *Round-nose horizontal broad-crested weirs*
Method 4.4: *V-shaped broad-crested weirs*
Method 4.5: *Triangular profile weirs*
Method 4.6: *Flat-V weirs*
Method 4.7: *Rectangular, trapezoidal and U-shaped flumes*
Method 4.8: *Trapezoidal profile weirs*
Method 4.9: *Parshall and Saniiri flumes*
Method 4.10: *End-depth method for estimation of flow in rectangular channels with a free overfall*
Method 4.11: *End-depth method for estimation of flow in non-rectangular channels with a free overfall (approximate method)*

Part 5: *Dilution methods*
Method 5.1: *Constant-rate injection method for the measurement of steady flow*
Method 5.2: *Integration method for the measurement of steady flow*

Part 6: *Measuring devices*
Part 6.1: *Measuring devices, instruments and equipment — Rotating element current-meters (this Standard)*
Part 6.2: *Measuring devices, instruments and equipment — Direct depth sounding and suspension equipment*
Part 6.3: *Measuring devices, instruments and equipment — Calibration of rotating element current-meters in straight open tanks*
Part 6.4: *Measuring devices, instruments and equipment — Echo sounders for water depth measurements*
Part 6.5: *Measuring devices, instruments and equipment — Water level measuring devices*
Part 6.6: *Measuring devices, instruments and equipment — Cableway system for stream gauging*
Part 6.7: *Measuring devices, instruments and equipment — Ultrasonic (acoustic) velocity meters*
Part 6.8: *Measuring devices, instruments and equipment — Position fixing equipment for hydrometric boats*

For the purposes of this Australian Standard, the ISO text should be modified as follows:

(i) Wherever the words 'International Standard' appear, referring to this Standard, they should be read as 'Australian Standard'.

(ii) Wherever the word 'fluid' appears, it should be read as 'water'.

(iii) Substitute a full point (.) for a comma (,) as a decimal marker.

(iv) The references to other publications should be replaced by references to Australian Standards as follows:

| *Reference to International Standard or other Publication* | | *Australian Standard* | |
|---|---|---|---|
| ISO | | AS | |
| | | 3778 | Measurement of water flow in open channels |
| 748 | Liquid flow measurement in open channels—Velocity area method | 3778.3.1 | Method 3.1: Velocity-area methods—Measurement by current-meters and floats |
| 772 | Liquid flow measurement in open channels—Vocabulary and symbols | 3778.1 | Part 1: Vocabulary and symbols |
| 3454 | Liquid flow measurement in open channels—Direct depth sounding and suspension equipment | 3778.6.2 | Part 6.2: Measuring devices, instruments and equipment—Direct depth sounding and suspension equipment |
| 3455 | Liquid flow measurement in open channels—Calibration of rotating-element current-meters in straight open tanks | 3778.6.3 | Part 6.3: Measuring devices, instruments, and equipment—Calibration of rotating element current-meters in straight open tanks |

## CONTENTS



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# Measurement of water flow in open channels—

# Part 6.1:
Measuring devices, instruments and equipment—
Rotating element current-meters

## 1 Scope and field of application

This International Standard specifies the operational requirements, construction, calibration, and maintenance of rotating element devices for the measurement of flow velocities in open channels. This International Standard does not define the form of the signal produced by the equipment or the signal receiving equipment.

For the use of these devices, refer to ISO 748.

## 2 References

ISO 748, *Liquid flow measurement in open channels — Velocity-area method*.

ISO 772, *Liquid flow measurement in open channels — Vocabulary and symbols*.

ISO 3454, *Liquid flow measurement in open channels — Direct depth sounding and suspension equipment*.

ISO 3455, *Liquid flow measurement in open channels — Calibration of rotating-element current-meters in straight open tanks*.

## 3 Definitions

For the purposes of this International Standard, the definitions given in ISO 772 apply.

## 4 Principle of operation

### 4.1 Proportionality

The rotating element of a current-meter is driven by the fluid at an angular velocity which is proportional to the local velocity of the fluid at the point of immersion when that velocity exceeds a critical value.

### 4.2 Positioning

The axis of the rotating element may be at right angles or it may be parallel to the direction of flow.

### 4.3 Types of current-meter

#### 4.3.1 Cup-type current-meters

Cups or curved vanes attached at equal intervals around the perimeter of a hub comprise an assembly which will rotate when placed in a fluid flow. It is usual to mount the rotor with the axis vertical.

#### 4.3.2 Propeller-type current-meters

An assembly consisting of a number of straight, angled vanes attached at equal intervals around the perimeter of a hub, or two or more helical screw blades formed around a hub that will rotate about a horizontal axis when placed in a fluid flow.

### 4.4 Flow velocity

The velocity of the fluid is determined by counting the number of revolutions of the rotor during a specified time interval or by observing the time required by the rotor to turn a given number of revolutions and consulting the meter calibration table or rating equation. The velocity of fluid movement may be determined from the sensing of signals emitted (such as electrical pulses) through the rotation of the rotor. The velocity may be determined from a direct reading of the speed of rotation of the rotating element by means of equipment designed for this purpose.

## 5 Operational requirements

### 5.1 Positioning

The equipment should maintain alignment with the flow in such a way that the rotating element 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 (see ISO 3454).

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 International Standard.

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