10.009 CURRENT METER, PROPELLER-TYPE

Approval Date: 23 October 2007 **Version: 2**

Purpose

The current meter will be used for flowing water velocity and thus discharge measurements in rivers and canals. It may be used in wading or suspended mode.

Conditions & Requirements

- The current meter shall be of such a design that it operates reliably and accurately under the prevailing flow and environmental conditions.
- The current meter shall be easy to operate and maintain.
- The current meter shall be supplied with the accessories as needed for effective deployment.
- All materials of the current meter shall be non-corrosive.
- An operator's manual, related to the type and model of the current meter, shall be part of the delivery.
- The current meter shall come with the calibration data, i.e. actual calibration velocity versus actual revolutions per second as collected during the calibration process. Calibration data shall uniquely identify the instrument body, the propeller, observer, rating tank, way of suspension, methodology and similar information.
- The current meter shall come with a rating table and a rating chart in m/s versus revolutions per second, uniquely related to the propeller by propeller serial number. Each impeller (propeller) of the current meter is calibrated individually and calibration chart for individual impeller is supplied (multiple calibration)
- The propeller calibration shall be independent of the current meter body, propellers shall be interchangeable from one body to another body of the same model with change in calibration.
- The current meter shall have a provision to adjust its trimming.
- The design shall be sediment resistant and have an oil-filled bearing chamber.
- The bearings shall be field exchangeable.
- The current meter shall come without a protection ring/yoke in front of the propeller; such a yoke would make the current meter sensitive to its alignment into the flow, which should be avoided.
- The current meter shall be as slim as possible to avoid excessive drag.
- The electrical connections shall be small, of a reliable and sturdy construction.
- The current meter and accessories shall be supplied in a sturdy carrying case.
- An appropriate tool-set shall be included in the delivery.
- The current meter shall generally comply with IS 3910-1992
- For operation, adequate fish weight shall be attached below the current meter or integrated with current meter body and tail.
- The fish weight shall have a streamlined form and shall be suspended from a bar of adequate strength.
- Horizontal and vertical tail fins at the rear end shall align the fish weight in the direction of flow.
- Except for the suspension bar, no elements shall protrude from the body.
- The fish weight shall generally comply with IS 4073-1967 and ISO 3454-1983.

Specifications

The purchaser may execute his judicious discretion in the choice of configuration and options.

1. Current meter

current meter range	0.025 to 5 m/s (starting to maximum operational velocity)
propeller	2 to 4 blades
propeller diameter	≥0.1 to ≤0.2 m
propeller length	about 0.1 m

- The current meter may be provided with one propeller or with a set of propellers that differ in their pitch and/or in their diameter.
- The propellers shall be made interchangeable.
- The propellers shall be made of cast material, e.g. bronze, polycarbonate or similar tough, high impact resistant and corrosion proof material.
- The response shall be instantly and consistent to all changes in velocity.
- The rate of change of the angular velocity of the propeller shall be synchronous with the rate of change of the flow velocity.
- Propellers of the same model shall be interchangeable without affecting calibration.
- The propellers shall be uniquely identifiable by engraved serial number.

materials	all materials of the current meter and combinations thereof shall be corrosion proof	
bearing	low friction, field replaceable without affecting the calibration	
rotation sensor	reed switch closure, one closure per revolution	
accuracy	for velocities up to 0.3 m/s	1 % Full Scale
	for velocities >0.3 m/s	0.5 % Full Scale

2. Suspension

Wading

wading rod	total length 3 m, graduation in cm
electrical cable	running from current meter to counter, 10 m

From a cable

suspension cable	suspension cable with single integrated electrical wire for rotation sensor and bottom detector
length	30 m
diameter	2.5 to 3.5 mm
electrical cable	from winch to counter, 7 m
cable torque	torque free suspension cable

The suspension cable should not exert any torque that may adversely affect the alignment of the flow sensor into the direction of flow. In particular in case a heavy suspension weight is used, there is a risk of cable induced torque.

suspension-rod for cable suspended measurements with light weight sinkers

The suspension rod shall have sufficient freedom of movement to allow it to accommodate to inclination of the suspension cable under high current velocities.

inclination range	-45° (forward) to 10° (backward) from vertical.
tail fin length	>0.6 m beyond the attach point of the suspension

The tail fin shall be capable of aligning the current meter in the direction of flow and keep it stable in that position throughout the full velocity range.

3. Fish weight

model	USGS Columbus or similar
material	cast iron or lead

finish	smooth, painted surface
mass of fish weights	25, 50 and 100 kg, as required for depth and current velocity.

The fish weight may be integrated in the instrument or an addition below the instrument.

bottom detector	the bottom detector shall be small and sturdy
bottom detection	bottom detection will be signalled by permanently closing a reed switch. That switch will override the rotation sensor switch. The bottom detection signal will be sent on the same integrated wire as the rotation signals.
suspension	bar, fitting current meter and cable terminal

Option

- propeller for velocities up to 10 m/s
- if the instrument is used from a cable way then an integrated bottom detector is required

Accessories

- standard instrument tools
- spare bearings
- carrying case for current meter with counter
- carrying case for fish weight(s)

Consumables

- bearing oil

10.009 CURRENT METER, PROPELLER-TYPE

As per HP-I

Approval Date: 30 November 2000 **Version: 2**

Purpose

The current meter will be used for flowing water velocity and thus discharge measurements in rivers and canals. It may be used in wading or suspended mode.

Conditions & Requirements

- The current meter shall be of such a design that it operates reliably and accurately under the prevailing flow and environmental conditions.
- The current meter shall be easy to operate and maintain.
- The current meter shall be supplied with the accessories as needed for effective deployment.
- All materials of the current meter shall be non-corrosive.
- An operator's manual, related to the type and model of the current meter, shall be part of the delivery.
- The current meter shall come with the calibration data, i.e. actual calibration velocity versus actual revolutions per second as collected during the calibration process. Calibration data shall uniquely identify the instrument body, the propeller, observer, rating tank, way of suspension, methodology and similar information.
- The current meter shall come with a rating table and a rating chart in m/s versus revolutions per second, uniquely related to the propeller by propeller serial number. Each impeller (propeller) of the current meter is calibrated individually and calibration chart for individual impeller is supplied (multiple calibration)
- The propeller calibration shall be independent of the current meter body, propellers shall be interchangeable from one body to another body of the same model with change in calibration.
- The current meter shall have a provision to adjust its trimming.
- The design shall be sediment resistant and have an oil-filled bearing chamber.
- The bearings shall be field exchangeable.
- The current meter shall come without a protection ring/yoke in front of the propeller; such a yoke would make the current meter sensitive to its alignment into the flow, which should be avoided.
- The current meter shall be as slim as possible to avoid excessive drag.
- The electrical connections shall be small, of a reliable and sturdy construction.
- The current meter and accessories shall be supplied in a sturdy carrying case.
- An appropriate tool-set shall be included in the delivery.
- The current meter shall generally comply with IS 3910-1992
- For operation, adequate fish weight shall be attached below the current meter or integrated with current meter body and tail.
- The fish weight shall have a streamlined form and shall be suspended from a bar of adequate strength.
- Horizontal and vertical tail fins at the rear end shall align the fish weight in the direction of flow.
- Except for the suspension bar, no elements shall protrude from the body.
- The fish weight shall generally comply with IS 4073-1967 and ISO 3454-1975.

Specifications

The purchaser may execute his judicious discretion in the choice of configuration and options.

4. Current meter

current meter range	0.025 to 5 m/s (starting to maximum operational velocity)
propeller	2 to 4 blades
propeller diameter	≥0.1 to ≤0.2 m
propeller length	about 0.1 m

- The current meter may be provided with one propeller or with a set of propellers that differ in their pitch and/or in their diameter.
- The propellers shall be made interchangeable.
- The propellers shall be made of cast material, e.g. bronze, polycarbonate or similar tough, high impact resistant and corrosion proof material.
- The response shall be instantly and consistent to all changes in velocity.
- The rate of change of the angular velocity of the propeller shall be synchronous with the rate of change of the flow velocity.
- Propellers of the same model shall be interchangeable without affecting calibration.
- The propellers shall be uniquely identifiable by engraved serial number.

materials	all materials of the current meter and combinations thereof shall be corrosion proof	
bearing	low friction, field replaceable without affecting the calibration	
rotation sensor	reed switch closure, one closure per revolution	
accuracy	for velocities up to 0.3 m/s	1 % Full Scale
	for velocities >0.3 m/s	0.5 % Full Scale

5. Suspension

Wading

wading rod	total length 3 m, graduation in cm
electrical cable	running from current meter to counter, 10 m

From a cable

suspension cable	suspension cable with single integrated electrical wire for rotation sensor and bottom detector
length	30 m
diameter	2.5 to 3.5 mm
electrical cable	from winch to counter, 7 m
cable torque	torque free suspension cable

The suspension cable should not exert any torque that may adversely affect the alignment of the flow sensor into the direction of flow. In particular in case a heavy suspension weight is used, there is a risk of cable induced torque.

suspension-rod for cable suspended measurements with light weight sinkers

The suspension rod shall have sufficient freedom of movement to allow it to accommodate to inclination of the suspension cable under high current velocities.

inclination range	-45° (forward) to 10° (backward) from vertical.
tail fin length	>0.6 m beyond the attach point of the suspension

The tail fin shall be capable of aligning the current meter in the direction of flow and keep it stable in that position throughout the full velocity range.

6. Fish weight

model	USGS Columbus or similar
material	cast iron or lead
finish	smooth, painted surface
mass of fish weights	25, 50 and 100 kg, as required for depth and current velocity.

The fish weight may be integrated in the instrument or an addition below the instrument.

bottom detector	the bottom detector shall be small and sturdy
bottom detection	bottom detection will be signalled by permanently closing a reed switch. That switch will override the rotation sensor switch. The bottom detection signal will be sent on the same integrated wire as the rotation signals.
suspension	bar, fitting current meter and cable terminal

Option

- propeller for velocities up to 10 m/s
- if the instrument is used from a cable way then an integrated bottom detector is required

Accessories

- standard instrument tools
- spare bearings
- carrying case for current meter with counter
- carrying case for fish weight(s)

Consumables

- bearing oil