



## Marine Current Meter Calibration Using GNSS Receivers, a Comparison with Commercial Method

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### Abstract

Getting information from marine current requires that accurate and calibrated current meter is used. Current meter calibration is carried out in accordance with specific standard in calibration laboratories. To evaluate the performance and health of a current meter, one should compares velocity and heading it with a velocity and heading reference. In this paper, the innovative method for evaluate velocity and heading resulted from impeller marine current meter is presented. In this method, current meter is to be attached to buoy that is installed on it tow GNSS receivers; and by towing it in a lake, simultaneous velocity and heading of the current meter are recorded. Also data position of buoy by GNSS is recorded. Accurately calculated velocity and heading of buoy by using GNSS data to be used as a criterion to evaluate the current meter velocity and heading. Finally, the calibration equation that is known as the final result of the calibration process was determined for velocity and heading of current meter with reasonable accuracy. Also, current meter is tested in this paper evaluated commercial method in calibration laboratory. The results were compared with the results of the proposed method. The results indicated the success of the GNSS-based method for the Performance analysis of a marine current meter.

**Keywords:** Current Meter Calibration; GNSS; Heading; Doppler Velocity; Relative Kinematic Positioning.

## 1. Introduction

Current metering and getting information from marine current velocity and direction are important and essential parameters in many industrial and research projects in the field of sea, and therefore they needs to be used accurate and calibrated current meter. Calibration of a current meter means experimental determination of the relationship between liquid velocity and the velocity directly indicated by the current meter. For this purpose, the current meter is mounted on a towing carriage and drawn through still water contained in a straight tank of a uniform cross section at a number of steady speeds of the towing carriage. Simultaneous measurements of the speed of the towing carriage and the velocity indicated by the current meter are made. In the case of stationary sensor type current meters, the velocity indicated by its display unit is compared with the corresponding carriage speed to know the error in measurement. The result of current meter calibration typically expressed by calibration curve, calibration equation and calibration table. The calibration points are normally entered in a graphic system with the carriage velocity  $V$  as the vertical axis and the velocity indicated by the current meter  $v$  as the horizontal axis. The final result of calibration of the current meter is expressed in the form of one or more equations of the straight lines as a best fit for the calibration curve. These equations shall be given in  $V = a + bv$ , where  $a$  and  $b$  are constants determined for each equation [1].

The current meter calibration is in accordance with international standards (BS ISO 3455: 2007) and it used in calibration laboratories. In this paper, the innovative method for evaluate velocity and heading resulted from impeller marine current meter is presented. In this method, current meter is to be attached to a buoy that is installed on it tow GNSS receivers and by towing it in a Lake, Simultaneous velocity and heading of the current meter and also data position of the buoy by GNSS is recorded. Now, accurate calculated velocity and heading of buoy by using GNSS data are used to be as a criterion to evaluate the current meter velocity and heading. In addition to the velocity, heading

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