

Title: **An improved ring method for calibration of hydrometers**

Authors: Fazrul Mohd Nor ^a, Abd Khamim Ismail ^b, Mark Clarkson ^c, Hafidzah Othman ^a

^a National Metrology Institute of Malaysia, Lot PT 4803 Bandar Baru Salak Tinggi, 43900 Sepang, Malaysia

^b Department of Physics, Faculty of Science, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia

^c Measurement Standards Laboratory of New Zealand, Industrial Research Limited, Lower Hutt, New Zealand

Journal: Measurement, Volume 48, February 2014, Pages 1–5

Abstract

This paper describes an improved hydrometer calibration method using a ring type sinker as a reference standard mass. This calibration method can be used for any surface tension and reference temperature design of hydrometer. A suitable dimension of standard ring was used to sink hydrometers into distilled water. The distilled water was used as standard liquid, traceable to a standard solid density determined by hydrostatic weighing method. A tensiometer consisting of balance and Wilhelmy plate was used to measure the surface tension of the distilled water. The calibration results showed an improvement in the calibration range between 0.600 g/ml and 1.000 g/ml with uncertainty in the order of 0.0002 g/ml for hydrometers with scale graduations of 0.0005 g/ml. The differences in measured scale corrections of this method compared to the comparison method indicate a bias smaller than half of the hydrometer graduation. In comparison, this method offers simpler, cheaper calibration with accuracy comparable to other existing hydrometer calibration methods. Furthermore, no harmful chemicals were used as standard liquid especially mixtures of volatile hydrocarbons or aqueous solutions of acids.