

# The Estimate Uncertainty of Indication Error of Mass to Vary Temperature in Calibrated Mass & Center Gravity (C.G.)

Porramate Kaophiphat<sup>a,\*</sup>, Peerapat Suksomboon<sup>a</sup>, Kumpanart Oumkul<sup>a</sup>

<sup>a</sup> Defence Technology Institute (Public Organisation),

Changwattana Road, Nonthaburi, Thailand

E-mail address: Porramate.k@dti.or.th, peerapat.s@dti.or.th, Kumpanart.o@dti.or.th

## ABSTRACT

Objectives of this research are as follows 1. To Calibrate Mass & Center Gravity (C.G.) machine for determination Indication Error of Mass 2.To estimate uncertainty of measurement of calibrate Mass & Center Gravity (C.G.) machine per vary temperature. This research applied measurement principles in a form of direct measurement and criteria for acceptance of measurement standards ISO 10012. In the past of calibration method Mass & Center Gravity (C.G.) machine by using standard weight as the standard reference value which the main basic process of this research and the temperature was controlled between 18-32°C and the relative humidity was controlled between 30%RH to 70%RH. The result of this research found that 1. The Repeatability at Range 76.000 kg which the maximum standard deviation value equals 0.0196 kg at 76.000 kg. 2.The maximum indication error of mass equals 0.2142 kg at 76.000 kg. 3. The uncertainty of measurement of this research was  $\pm 0.081$  kg at the level of confidence of approximately 95%.

**Keyword:** Calibration ,Mass & Center Gravity (C.G.) Machine , Standard Weight, Uncertainty of Measurement

## 1. Introduction

Currently calibration is important to systems of measurement in various kind of industry such as automotive industry, food industry, agricultural industry and defense industry. The importance of calibration will be a confirmation process for guarantee of measuring instrument usage according to each measuring instrument operations which showing effectiveness of measuring instruments according to the rule and definition of calibration. Calibration means confirmation process of effective usage of each measuring instruments compared with standard measuring instrument and reference standards. All of measurement are conducted within the condition and shown the certainty from calibration process.

For the definition of uncertainty of measurement is applied several case study such as Heamawatanachai Study was to evaluate the uncertainties of load cells calibrated with