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CONVECTIVE EFFECTS OF A LARGE CAPACITY AUTOMATIC MASS COMPARATOR

V. Vabson[1,2] (presenting author), T. Kübarsepp[1,2], R. Vendt[1,2], M. Noorma[2]

[1] *Central Office for Metrology, Tartu, Estonia*

[2] *University of Tartu, Institute of Physics, Tartu, Estonia*

e-mail: viktorv@metrosert.ee

High accuracy application of a large capacity (64 kg) fully automated mass comparator with the four-place weight handler is strongly affected by convection effects [1]. The comparator is used for calibration of weights by multiplication in the range from 2 kg to 50 kg and for one-to-one comparisons starting from 1 kg. Mass range from 1 kg up to 5 kg is mostly disturbed.

For quantification of convection effects comparisons of all possible independent mass differences with simultaneous temperature measurements under the individual draft shields covering each of the handler's positions were carried out. For the temperature measurement four reference sensors and 12 additional miniature temperature sensors with the two high-precision readout devices were used. Due to small relaxation time, small contact gradients and absence of internal heating thermocouple sensors were preferred. Calibration uncertainty of sensors is less than 20 mK.

Systematic deviations of mass differences obtained by using comparator and associated temperature gradients under the draft shields were determined. Maximum error for the difference of two 1 kg cylindrical loads with exactly the same shape was 0,3 mg, although temperature differences revealed were smaller than 0,1 K.

References

1. M. Gläser, *Metrologia*, 1999, **36**, 183-197.